

# **DOMINICAN MEDICINAL PLANTS: A GUIDE FOR HEALTH CARE PROVIDERS**

**Second Edition—Web Text Version**

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## **IMPORTANT NOTICE:**

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*Este libro está dedicado a la comunidad Dominicana de la Ciudad de Nueva York, y especialmente a las/los especialistas en plantas medicinales, dueñas/dueños y trabajadores de botánicas, curanderas/curanderos, espiritistas, santeras/santeros y otra gente que ha dado su sabiduría y tiempo con tanta generosidad para hacer posible esta publicación.*

This book is dedicated to the Dominican community of New York City and especially to the herbalists, healers, *botánica* proprietors and staff, *espiritistas*, *santeras/santeros* and others who have so generously given of their time and knowledge to make this publication possible.

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The ethnobotanical information in this book is the culmination of more than ten years of ethnomedical research in the New York City area. As such, we wish to acknowledge the efforts of collaborators and co-investigators from the Urban Ethnobotany Project, a previous ethnomedical research initiative which paved the way for the present endeavor: Fredi Kronenberg, Marian Reiff, Andreana Ososki, Kimberly Johnson, Patricia Lohr, Maria Roble, Bonnie O'Connor, Adriane Fugh-Berman and

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Additional information on Dominican medicinal plants and their uses has been added to this revised edition of the guidebook based on the preliminary results of the “Dominican Ethnomedicine in New York City” project funded by an R21 grant from the National Institutes of Health, National Center for Complementary and Alternative Medicine (Principal Investigator: Michael J. Balick, PhD; Grant # R21-AT001889). We sincerely thank Dr. Ina Vandebroek, the director of that project, who has generously shared this information with us to enhance the scope and relevance of the ethnomedicinal data in this publication. She wishes to extend her gratitude to the following research assistants, interns and volunteers who assisted her with this project: Yadira Arias, Frans Beltran, Tomas Diaz, Levenia Durán, Ashley Duval, Daniel Kulakowski, Greta Meyers, Saneddy Quezada, Claudia Remes, Kate Sokol, Samuel Stein and Margaret Terrero.

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# TABLE OF CONTENTS

## Part 1

Introduction and How to Use this Book

## Part 2

Quick Guide to Dominican Home Remedies

## Part 3

Medicinal Plant Monographs

## APPENDICES

A. Key to Abbreviations and Symbols

B. Glossary of Botanical Terms

# PART 1

## INTRODUCTION AND HOW TO USE THIS BOOK: BACKGROUND, METHODS AND EXPLANATION OF LAYOUT

### INTRODUCTION

During ethnomedical interviews while conducting fieldwork for this publication, practitioners of traditional medicine from the Dominican Republic repeatedly responded with the same popular expression when asked about medicinal plants: “*Hay plantas que curan y plantas que matan* (There are plants that heal and plants that kill).” This wise saying encapsulates one of the primary goals of this book. Knowing the difference between potentially harmful substances and beneficial therapies is of crucial importance for anyone, especially health care providers and individuals who self-medicate with herbal remedies.

However, sometimes the difference between potentially toxic vs. safe therapies is not as clear-cut as it might seem at first glance. As physicians have known since the time of Paracelsus, the difference between poison and medicine is in the dose. Even foods or pharmaceutical drugs that are generally regarded as safe can be toxic or cause adverse effects depending on the context of their use. Herb-drug interactions are another important concern as research has shown that many popular botanical therapies may negatively affect drug metabolism. Reliable information on the safety, contraindications and potential drug interactions of complementary and alternative therapies is needed now more than ever before. Although abundant research data is available for mainstream dietary supplements and herbs, very little attention has been given to the botanical therapies and traditional remedies used by immigrant communities and minority ethnic groups here in the United States, particularly among low-income and underserved populations.

In an era of globalization characterized by increasing urbanization and transnational migration, health care providers frequently encounter patients from diverse backgrounds. Clinicians may not speak the same language as their patients or be familiar with their health-related cultural beliefs and practices, some of which may affect adherence to treatment protocols and health outcomes. With widespread use of complementary and alternative therapies, including traditional herbal remedies, how can clinicians determine the safety of the non-pharmaceutical therapies that their patients may be using, especially if they are unfamiliar or referred to by regional vernacular or unknown names? The primary aim of this book is to address these questions with respect to immigrants from the Dominican Republic in New York City by providing information on traditional Dominican uses of medicinal plants and a review of the available scientific literature on their safety and efficacy.

The present volume, *Dominican Medicinal Plants: A Guide for Health Care Providers*, is intended as a reference manual for clinicians to support culturally effective health care and greater understanding of the traditional medical practices of immigrants from the Dominican Republic in New York City. By providing information about complementary and alternative therapies, including traditional herbal remedies, among Latino/Caribbean immigrants in the United States, this book can be used to help facilitate informed dialogue and enhance disclosure regarding patients’ use of medicinal plants. As an informational and educational tool, this book can support patient-provider communication and enhance cross-cultural understanding in a clinical setting. In addition to information about the plants themselves, this guidebook also provides explanations of key ethnomedical concepts and customs related to the use of herbal medicine to clarify the cultural context of Dominican ethnomedical traditions.

Ultimately, the main goal of this guidebook is to enhance the quality of patient care for Dominicans in New York City by supporting informed patient-provider communication and raising awareness about the use of home remedies and their relevance to health care. We sincerely hope that this book can serve as a model for other educational initiatives to enhance the quality of health care for

underserved, minority or immigrant populations with strong traditions of herbal medicine through relevant cultural competency training and curricular materials.

The ethnobotanical information in this book is based on ongoing ethnographic fieldwork conducted in New York City with immigrants from the Dominican Republic between 1995-2009. Although there are notable cross-cultural similarities between traditional medical practices among Spanish-speaking populations from different Latin American countries, the reader is advised that common names and ethnomedical uses of medicinal plants may vary considerably between different Latino/Hispanic cultural groups or even within a particular community. Therefore, the Dominican ethnomedical information included in this book may not reflect the herbal medicine practices of other Latin American or Caribbean populations. Please keep this regional and cultural specificity in mind when reading this book.

## **BACKGROUND**

Beginning in 1985, researchers from The New York Botanical Garden's Institute of Economic Botany, in collaboration with scientists and medical doctors from The Richard and Hinda Rosenthal Center for Complementary and Alternative Medicine at Columbia University's College of Physicians and Surgeons have worked with traditional healers from diverse immigrant communities in New York City to document their use of medicinal plants. In 1995, this research team chose to focus on Dominican healing traditions as practiced in an urban, cosmopolitan setting and conducted ethnobotanical research with specialists in Dominican herbal medicine from predominantly Latin-American and Caribbean immigrant neighborhoods in the Bronx and Northern Manhattan.

Since that time, researchers have documented detailed information on the ethnobotany and ethnomedicine of commonly used medicinal plants, particularly within the context of women's health and general concepts of disease etiology (see Balick et al. 2000, Ososki et al. 2002, Reiff et al. 2003, Yukes et al. 2003). In 2005 ethnobotanists from The New York Botanical Garden (NYBG), in collaboration with institutions in the United States and the Caribbean, initiated a comparative survey entitled: "Dominican Ethnomedicine in New York City and the Dominican Republic: Medicinal Plants for Common Health Conditions." The purpose of this survey was to study the use of medicinal plants by Dominicans in New York City and the Dominican Republic, investigating both generalist knowledge (i.e. of laypersons who self-medicate with home remedies) and specialist knowledge (i.e. of healers and practitioners of Dominican traditional medicine).

This project, supported by an R21 grant from the National Institutes of Health (NIH), National Center for Complementary and Alternative Medicine (NCCAM; grant number R21-AT001889, Principal Investigator: Michael J. Balick, PhD), included questions about herbs used for a wide range of common health conditions (Vandebroek et al. 2007). As a result of the past decade of research on Dominican urban ethnomedical practices, the authors embarked on the present applied research project to facilitate the dissemination of information on Dominican medicinal plants to health care providers who work with Dominican patients.

Throughout the preparation of this publication, the authors have collaborated with an Advisory Board consisting of physicians, ethnobotanists, medical anthropologists and representatives from Dominican community-based organizations (see "Advisory Board and Collaborators" listed on the title page. The present volume is the result of the combined efforts of the following organizations: The New York Botanical Garden, Institute of Economic Botany; Albert Einstein College of Medicine at Yeshiva University, Family Medicine and Hispanic Center of Excellence, Alianza Dominicana; Community Pediatrics, New York-Presbyterian Hospital; and Columbia University College of Physicians and Surgeons, Mailman School of Public Health, Center for Population and Family Health; Columbia University Medical Center, Community Pediatrics, Morgan Stanley Children's Hospital of New York-Presbyterian; Columbia University, Associates in Internal Medicine Clinic and Charles B. Rangel Community Health Center; New York University School of Medicine, Emergency Medicine and the New



York Poison Control Center. Support for this project was generously provided by the United Hospital Fund, The New York Community Trust and The Jacob and Valeria Langeloth Foundation.

From January through March 2006, the first edition of this guidebook was pilot tested with a select group of twenty-five health care providers and medical professionals in the New York City area. The goal of this pilot testing was to determine the usefulness of this book as a clinical reference and as a tool for facilitating cultural understanding in a primary care setting. Participants in this pilot-testing phase completed a short survey after consulting the book, evaluating its relevance, ease-of-use and efficacy in supporting culturally sensitive and knowledgeable discussion of the use of botanical therapies with Dominican patients. Feedback and suggestions for improvement from these pilot-testing surveys have been incorporated into the revised second edition of this guidebook.

## **METHODS**

This reference manual is a synthesis of three general disciplines, each encompassing different types of information and involving unique methodological approaches: 1. medical ethnobotany and anthropology: original ethnomedical and ethnobotanical research on the use of herbal remedies by Dominicans in New York City for common health conditions; 2. botany and taxonomy: collection of botanical specimens utilized by Dominicans in healing and taxonomic identification of commonly used medicinal plants to determine their Latin binomial (genus and species); and, 3. biomedical literature research: a review of the available scientific literature on the safety and efficacy of selected medicinal plants, including database searches of published results from toxicology and pharmacology studies.

### ***Ethnobotany and Medical Anthropology***

Ethnobotany is the study of the complex relationships between people and plants, such as cultural beliefs and practices associated with the use of plants for food, medicine and ritual, local systems for naming and classifying plants species, traditional knowledge about ecological relationships and botany-related songs, stories and legends. Medical anthropology, including the sub discipline ethnomedicine, is the academic field devoted to the cultural dimensions of medicine and health care, including traditional systems of healing. Both disciplines are interrelated, especially medical ethnobotany and ethnomedicine, and are highly relevant to health care in an era of medical pluralism in which multiple systems of medicine operate simultaneously. In this book, the term “traditional medicine” is used to describe medical traditions, health beliefs and healing practices that historically have been passed down orally and which are typically associated with a particular cultural group or region. Traditional medicine is a type of complementary and alternative medicine (CAM) that is often used alongside, in combination with or instead of allopathic medicine and may incorporate elements of conventional health care, such as pharmaceutical pills or injections, terminology and diagnostic techniques. The terms “biomedicine” or “conventional medicine” are used to describe allopathic health care, particularly the dominant system of standard practice medicine.

Dominican health-related cultural practices and beliefs as reported in this guidebook are based on research conducted using ethnomedical and ethnobotanical methods. These methods include semi-structured interviews, exploratory ethnography, market studies, participant-observation and qualitative data analysis. Study participants were identified through informal social networks. Both specialists and generalists in Dominican herbal medicine were interviewed. Specialists were defined as recognized experts in plant-based healing, such as herbalists and practitioners of traditional medicine, whereas generalists included individuals who reported that they used home remedies for self-care or sought the health advice of traditional healers but were not considered experts themselves. All study participants stated that they acquired their knowledge of medicinal plants while in the Dominican Republic or from Dominican family members, friends, relatives or healers in the United States.

All interviews were tape-recorded and transcribed. Interview questions addressed the following topics: concepts of health and illness, disease etiology, anatomical terms, methods of diagnosis, spiritual aspects of healing, treatment choice and health decision making. Results were entered into a MS Access

database and interview transcripts were coded using qualitative data analysis software (Atlas.ti). Plants included in this book were selected based on their frequency of use as reported by more than one of the following sources: traditional healers, herbal specialists at Latino herb shops (*botánicas*) or Dominican study participants who use plant-based home remedies and prepare them for family members and relatives.

### ***Botany and Plant Taxonomy***

One key component of ethnobotanical research is determining the correct scientific name for Dominican medicinal plants because the biomedical literature on botanical therapies is typically indexed by Latin binomial rather than the Dominican Spanish common name as reported by participants in ethnobotanical interviews. To determine the correct scientific names of medicinal plants included in this guidebook, botanical specimens were collected whenever possible for identification by ethnobotanists and plant taxonomy specialists at The New York Botanical Garden. However, since most plants used were only available as food items from grocery stores or sterile plant fragments, in many cases a reference collection of plant photographs and purchased plant material was used.

The following references were consulted to determine the appropriate botanical descriptions, synonyms, family classification and spelling of authors for each species: Angiosperm Phylogeny Website (Stevens 2008), *Diccionario Botánico de Nombres Vulgares de La Española* (Liogier 2000), *Flora of St. John* (Acevedo-Rodríguez 1996), Harvard University Herbaria Index of Botanists, International Plant Names Index (Stevens 2008), International Plant Names Index (IPNI 2004), *Manual of Vascular Plants of Northeastern United States and Adjacent Canada, Second Edition* (Gleason & Cronquist 1991) and the Missouri Botanical Garden's VAST (VAScular Tropicos) nomenclatural database (VAST 2008). Additional botanical references consulted are cited in the “Botanical Description” section of each monograph.

Because of the importance of knowing the genus and species for plant-based home remedies in order to evaluate the scientific literature on their safety and efficacy, botanical research institutions such as The New York Botanical Garden can play a unique role in mediating between the realms of traditional healing systems and biomedical health care.

### ***Biomedical Literature Research***

To compile relevant biomedical literature on the safety and efficacy of medicinal plants included in this guidebook, several databases and references have been consulted. For clinical, preclinical (in vitro and in vivo), pharmacological and toxicity studies of the plants in this book, searches for the scientific name (Latin binomial) and English common name, when appropriate, of each plant species were conducted in PubMed (<http://www.ncbi.nlm.nih.gov/PubMed/>). Additional information was compiled from the following databases: BIOSIS (<http://www.biosis.org/>), FDA GRAS (<http://www.cfsan.fda.gov/~lrd/fcfl82.html>), Jim Duke's Phytochemical Database (<http://www.ars-grin.gov/duke/>), NAPRALERT (<http://www.napralert.org/>), ToxNet (<http://toxnet.nlm.nih.gov/>) and the USDA Nutritional Database (<http://www.ars.usda.gov/nutrientdata>).

For information on safety, precautions, biological activity, indications and usage, reliable clinical references were consulted, including: *A Caribbean Herbal Pharmacopoeia* (Germosén-Robineau 2007), *The 5-Minute Herb and Dietary Supplement Consult* (Fugh-Berman 2003), the *German Commission E Monographs* (Blumenthal et al. 1998) and the *Physicians Desk Reference for Herbal Medicines* (Gruenwald et al. 2004). For information on contraindications and potential drug interactions, the above sources as well as *Herb Contraindications and Drug Interactions, 2nd Ed* (Brinker 1998) were consulted. Many of these books, particularly publications by TRAMIL such as *A Caribbean Herbal Pharmacopoeia*, served as informative models for the organization and presentation of information in this volume.

For all reported studies from the biomedical literature, it is important to pay attention to the plant part used, form of preparation and mode of administration evaluated in each experiment. Those that reflect traditional uses are most relevant. When available, data from randomized, double-blind, placebo

controlled clinical trials is given priority over preclinical studies. However, many plant species have not been tested in humans.

Preclinical and laboratory studies are also included in this guidebook, even though generally their results cannot be applied to humans. Such *in vitro* and *in vivo* studies may be useful when they validate traditional uses of medicinal plants or when they elucidate biological activities that may interfere with medication or other therapies. For example, if a particular plant is applied topically as an herbal remedy for dermatological conditions, *in vitro* or animal studies that demonstrate the antimicrobial or anti-inflammatory activity of the traditional preparation of the plant could support or validate its external use as long as the plant has been shown to be nontoxic.

It is important to keep in mind that considerable variation exists in the amount of published clinical and pharmacological research available for a given plant. For example, widely used plants such as *ajo* (garlic, *Allium sativum*) and *sábila* (aloe, *Aloe vera*) have been studied extensively in human clinical trials and laboratory studies; however, for other plants that are lesser known outside of the Caribbean and Latin America, such as *batata de burro* (Caribbean coralfruit, *Doyerea emetocathartica*), very little information is available on their pharmacological activity or clinical applications. Plants for which more research has been conducted (particularly those that are sold commercially on a large scale) will have more information available on safety, contraindications, herb-drug interactions and clinical applications. Other less-studied plants may also have important contraindications and herb-drug interactions, but not enough research has been conducted on their use in conjunction with medications and in special populations to be able to provide this information. In many cases, a plant species' relative safety or efficacy cannot be determined based on the available data.

## CONTENT AND LAYOUT OF THIS GUIDEBOOK

Several clinical references on botanical medicine have served as informative models for this guidebook. In particular, the following publications were key references in the preparation of this manual: the *Caribbean Herbal Pharmacopoeia, Second Edition* (Germosén-Robineau 2007), the *German Commission E Monographs* (Blumenthal et al. 1998), the *Physicians Desk Reference for Herbal Medicines* (Gruenwald et al. 2004) and other clinical guides for herbal medicine (Brinker 1998, Fugh-Berman 2003). These references provide reliable information about the therapeutic applications of botanical therapies, including both traditional cultural uses (historical and contemporary) and biomedical data, such as pharmacological activity, clinical trials, chemical constituents, herb-drug interactions, contraindications and indications and usage. All of the above publications were consulted extensively in the preparation of this manuscript.

Most notably, the publications of the non-governmental organization TRAMIL (formerly known as “Traditional Medicine in the Islands”) have inspired and informed the approach of this guidebook. TRAMIL is a multidisciplinary network dedicated to applied research on medicinal plants of the Caribbean region. In addition to the *Caribbean Herbal Pharmacopoeia, Second Edition* (in Spanish and English, Germosén-Robineau 2005 & 2007), other TRAMIL publications include several volumes of *Elements for a Caribbean Pharmacopoeia* (Germosén-Robineau 1995), each containing numerous monographs describing medicinal plants commonly used in the Caribbean.

Members of the interdisciplinary network TRAMIL not only review and synthesize data on the safety and biological activity of medicinal plants, they also conduct original research on the pharmacology and potential toxicity of medicinal plants. TRAMIL members include experts from the disciplines of medicine, botany, chemistry, toxicology, pharmacology, natural products development and pharmacognosy. As a group, TRAMIL convenes regularly at scientific workshops and editorial meetings to evaluate the available data on commonly used Caribbean medicinal plants in order to assess their safety and efficacy. Based on this information, TRAMIL classifies the traditional use of each evaluated medicinal plant as either “REC” (recommended), “INV” (needs more investigation) or “TOX” (toxic). “REC” or “recommended” means that the particular traditional use specified (including part used, preparation and mode of administration) is recommended for human use based on significant documented

traditional use and available biomedical data on safety and efficacy. “INV” or “needs more investigation” means that there is insufficient evidence to support the clinical use of the particular plant and more research is needed to make a recommendation. “TOX” or “toxic” means that the plant has shown significant toxic effects in biomedical studies and is therefore not recommended for human use.

In addition to print and electronic publications, TRAMIL has made this information on medicinal plants available to the public through an online database, which was consulted for information on medicinal plants included in the present volume. This database is a valuable resource for those interested in further study on Caribbean medicinal plants: <http://www.funredes.org/tramil/>. The most recent TRAMIL publication, the *Caribbean Herbal Pharmacopoeia, Second Edition*, is an excellent reference for physicians and clinicians who provide health care to patients from Latin American and Caribbean countries. It is currently printed in Spanish and published in English and French as an electronic book on CD-ROM. Please refer to the above website for more details.

## HOW TO USE THIS BOOK

To provide easy-to-use and detailed information about Dominican medicinal uses of herbal remedies along with a review of the scientific literature on their safety and efficacy, this book uses two different formats for presenting medicinal plant information: a “Quick Guide” (Part 2) and “Medicinal Plant Profiles” (Part 3). For a brief summary of the clinically relevant information on a particular plant, consult Part 2: “**A Quick Guide to Home Remedies**” by searching for the common name of the plant. Information in this section is organized alphabetically by Spanish or English common name. For more detailed information about medicinal plants, including botanical descriptions, photographs or illustrations, indications and usage (if available) and references cited, see Part 3: “**Medicinal Plant Profiles**.”

Entries are arranged in alphabetical order according to the Spanish common name most frequently used by Dominicans in New York City based on previous and ongoing ethnobotanical and ethnomedical fieldwork (Balick et al. 2000, Ososki et al. 2002, Vandebroek et al. 2007, Vandebroek et al. 2008, Yukes et al. 2003) and current research with healers and herbal medicine specialists. In this section, each medicinal plant profile contains the following information organized according to the headings and subheadings listed in the table below. Main headings are indicated in small caps font and subheadings are italicized.

<b>Heading</b>	<b>Explanation</b>
SPANISH COMMON NAME	The most widely used Spanish common name for each plant is provided as the title for the entry. Dominican Spanish plant names are based on ethnobotanical fieldwork with immigrants from the Dominican Republic in New York City.
<i>Note</i>	If the same plant species has more than one common name, or if more than one plant species is referred to by the same common name, an explanation is provided as a “ <b>Note</b> ” below the Latin name.
OTHER COMMON NAMES	Other Spanish and English common names, besides the one most frequently reported for that species, are listed.
SCIENTIFIC NAME	The Latin binomial for the plant (genus and species) is provided. Botanical synonyms (other accepted scientific names that are used widely in the literature), are listed when appropriate. The Latin name of the plant family to which each species belongs is designated in brackets, and the corresponding common name for the family is included in parentheses. For an explanation of naming conventions and plant identification, see “ <b>A Note on Botanical Nomenclature</b> ” at the end of this section.

<b>Heading</b>	<b>Explanation</b>
DOMINICAN MEDICINAL USES	Traditional medicinal uses of each plant are listed in alphabetical order. This information is based on data from ethnobotanical interviews with Dominican traditional medicine practitioners, herbal experts and individuals who self-medicate with home remedies in New York City. For each health condition, the part of the plant used is indicated along with its basic preparation and possible combination with other ingredients or herbs (see subheadings in italics below).
<i>Plant Part Used</i>	Indicates which part of the plant is used most frequently as a remedy. Knowing the part of the plant used for preparing herbal remedies is extremely important as each part of a plant may have substantially different chemical constituents or varying concentrations of the same constituents, which will affect their potential toxicity and pharmacological activity.
<i>Traditional Preparation</i>	Frequently reported modes of preparation (i.e. tea or bath) and administration (i.e. oral or topical) are described in this section. Detailed explanations of each type of preparation are provided in the “Quick Guide” section of this book, listed by Spanish name (see Part 2).
<i>Traditional Uses</i>	A detailed description of the reported traditional therapeutic uses of the plant, including possible combinations with other herbs, is provided in this section.
<i>Availability</i>	Sources from which each plant is typically procured in the New York City area (or other urban areas in the United States) are listed in this section based on botanical collection and ethnomedical interviews with Dominican New Yorkers. When relevant, information on how each plant is sold is included.
BOTANICAL DESCRIPTION	A description of the key morphological features of each plant is provided to aid in distinguishing it from other plants that might have the same or similar common names*. These key features include the following: type of plant (habit) and size (length, height); notable characteristics of the stem, bark or roots; and leaf, flower and fruit shape and structure. These descriptions are written using nontechnical terms whenever possible for ease-of-use by non-botanists. However, where botanical terms were necessary, they are defined in the <b>Glossary of Botanical Terms</b> in the back of the book (See Appendix B). <i>*Important Note:</i> Positive identification of a plant sample typically requires a specimen of the entire plant, including reproductive parts, and confirmation from a botanist or individual trained in plant taxonomy who is familiar with the botanical family of the species in question.
<i>Distribution</i>	The origin and range of each plant, including preferred habitat, is included when available. The exact origin of a particular species may be difficult to determine and is often disputed within the botanical community.
SAFETY AND PRECAUTIONS	Any information identified in the scientific literature on the safety and potential adverse effects of each plant is provided in this section, including precautions, contraindications, drug interactions and results of toxicity studies when available (see subheadings below).
<i>Animal Toxicity Studies</i>	Results of in vivo studies of toxicity in animals are included here. This information is separated from the initial description on safety and precautions because it is difficult (if not impossible) to apply and extrapolate the results from animal toxicity studies to humans. However, when no clinical safety or toxicity studies are available, in vivo studies in animal models or case reports of livestock poisoning are reported when appropriate.

<b>Heading</b>	<b>Explanation</b>
<i>Contraindications</i>	Precautions and special considerations are described in this section, including cases, conditions or particular populations in which this plant should not be used, such as children, pregnant women, lactating women or persons with particular health conditions.
<i>Drug Interactions</i>	Based on consulting standard references on herb-drug interactions and other publications, this section summarizes any published information identified in the available literature on potential or documented adverse reactions or precautions associated with combining the use of this medicinal plant with pharmaceutical drugs.
SCIENTIFIC LITERATURE	A review of the scientific literature on the pharmacological activity and therapeutic efficacy of each plant species is summarized. If numerous relevant biomedical studies have been published on a particular plant, these are presented in table format for ease-of-use at the end of each plant entry (see “Clinical, Preclinical and Laboratory Data Tables” section below); otherwise, results are summarized in paragraph form. Major chemical constituents are listed based on relative abundance and/or biological activity when this information is available.
INDICATIONS AND USAGE	For plants with substantial scientific research supporting their safety and efficacy, information on potential indications and usage are provided based on reputable medical references, recommendations from botanical medicine regulation committees or documented historical use. Standard dosage and administration suggestions are provided if published by a formally recognized institution or publication, such as the <i>German Commission E Monographs</i> or TRAMIL. <b>NOTE: The information provided in this book is for educational purposes only and is not intended to diagnose, prescribe or substitute for appropriate medical care from a qualified health professional (see “Disclaimer and Important Notice” at the beginning of this book).</b>
CLINICAL AND PRECLINICAL AND LABORATORY DATA TABLES	Published laboratory research (in vitro and in vivo animal studies) and human clinical trials that have been identified in the scientific literature for each plant are summarized in table form, including the following information: pharmacological activity or effect being tested, plant preparation (type of extract, parts used), study design (in vitro, in vivo or human clinical trial), results (observed activity and significance) and reference information (author-date format; see bibliography at the end of each entry for details). Studies for which no activity or effect was demonstrated (i.e. those which showed negative results) are listed in a separate table entitled “ <b>Effect Not Demonstrated</b> ” located at the end of the monograph.
REFERENCES	A list of the literature cited is provided at the end of each entry.

## IMPORTANT NOTE ON PLANT IDENTIFICATION

The authors have made every attempt to be botanically accurate, but regional variations in plant names, growing conditions and availability may affect the accuracy of the information provided. In some cases a particular plant species may have more than one common name, or the same name may refer to more than one species. To confirm the identity of a specific plant and to make sure that the information consulted in this book is relevant to the plant in question, please review the botanical description and photo or illustration in the “Plant Profiles” section of this book. A positive identification of an individual plant specimen is most likely when a freshly collected part of the plant, including leaves and flowers or fruits, is presented to a knowledgeable botanist or horticulturist. For more information on plant identification, please see the “Methods: Botany and Plant Taxonomy” section of this introduction.

*A Note on Botanical Nomenclature:* The botanical identification of each plant is based on collecting voucher specimens of the plant whenever possible, consulting the botanical literature and

comparing these specimens with herbarium collections at The New York Botanical Garden and other herbaria to determine the correct scientific name of the plant (for more detailed information on this process, see the “Methods” section of this introduction).

Botanical nomenclature is based on the taxonomic work of Carolus Linnaeus (1707-1778), the botanist who established the binomial system of plant nomenclature. Linnaeus helped to standardize botanical nomenclature by establishing a genus and species name for each plant, followed by its designator. A plant’s botanical (binomial) name consists of both the genus and the species, e.g. *Allium sativum* (the Latin name for garlic). By convention, both genus and species’ names are italicized or underlined. *Allium* is the name of the genus, and the first letter is always capitalized. A genus (the plural of which is genera) may be composed of a single species or several hundred. The second part of the binomial, in this case *sativum*, is the particular species within the genus, and it is always written in lower case letters.

When first citing a particular plant species, it is important to include the name of the person (often abbreviated) who named the particular species as part of the scientific name in order to minimize confusion between similar or related plant species. This person is called the author of the species name; for example, in the case above, the complete name, which would allow for the most precise identification, is *Allium sativum* L.; “L.” is the accepted abbreviation for Carolus Linnaeus, the author of the species name.

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## PART 2:

# QUICK GUIDE TO HOME REMEDIES

This Quick Guide to Home Remedies includes a brief summary of clinically-relevant information for medicinal plants used by Dominicans in New York City. Entries are organized alphabetically by the most frequently reported common name for each plant based on ethnomedical fieldwork. For more detailed information about medicinal plants from this section, including a botanical description, illustration or photograph and references cited for each plant, see **Part 3: Medicinal Plant Profiles**. The following Quick Guide also includes brief explanations and English translations of Spanish terms that are associated with Dominican traditional medicine and home remedies, including types of herbal preparations, plant parts used, non-plant-based ingredients in home remedies and descriptions of other relevant healing practices.

If you do not find a particular plant listed in this section, check the index in the back of the book as it may be included under a different common name. Also, while hundreds of Dominican medicinal plant species have been documented in ethnobotanical studies, this book includes information on only 85 commonly used medicinal plants.

The example below shows how information is organized for each medicinal plant described in this Quick Guide and explains each of the headings. Entries for other items besides plants are presented as brief descriptions and do not follow the format specified below.

### Spanish name

English name (*Scientific name*).

#### **Plant Part Used**

Part(s) of the plant used as medicine (i.e. leaf, root, flower, fruit, bulb, bark or whole plant).

#### **Dominican Medicinal Uses**

Plant part used: preparation (i.e. tea), mode of administration and illnesses or therapeutic activities for which it is used as a remedy.

#### **Safety**

Results of toxicity studies and case reports of adverse effects from the available literature.

#### **Contraindications**

Conditions in which use is to be avoided.

#### **Drug Interactions**

Description of potential herb-drug interactions.

#### **Clinical Data**

Summary of effects investigated in clinical trials involving human subjects.

#### **Laboratory and Preclinical Data**

Summary of biological activities investigated in preclinical studies using in vitro or animal models.

## Aceite de \_\_\_\_\_

Means “oil of (plant or animal name)”; look up the plant or animal name specified for more information. The most common plant-based oils used for medicine include: coconut (*coco*), castor bean plant (*higuereta*), sesame (*ajonjolí*), olive (*aceituna*) and avocado (*aguacate*) oils. For certain illnesses (particularly asthma), these oils are taken by the spoonful, sometimes in combination with oils from animal sources such as snake (*culebra*), turtle (*tortuga*), shark (*tiburón*) and cod fish (*bacalao*). These animal-based oils are reportedly used by some individuals in an asthma remedy called *botella de aceites* which is typically given to children.

## Achiote

See *Bija*.

## Agave

See *Maguey*.

## Agua

Water or **water infused with herbs** when used in the context of energetic/spiritual healing; such preparations are often scented with perfume oil, **extracted in alcohol** and/or tinted with artificial coloring agents. These *aguas* are often associated with attracting good luck or dispelling undesirable energy and frequently used as ingredients in baths (*baños*) or for cleansing rituals (*limpiezas*).

## Agua bendita

**Holy water** or water that has been blessed and sanctified by a priest or bishop, typically in the Catholic church and some other religions. This water may be attributed healing properties and used in spiritual and ritual healing or in therapies for physical ailments.

## Agua de rosas

**Rosewater**; the hydrosol of the distillate of rose petals; a byproduct of making rose essential oil; may also contain other ingredients, including alcohol, glycerine, coloring or flavoring agents and preservatives; may be attributed therapeutic properties and used for physical illness treatments and spiritual cleansing rituals.

## Agua florida

**Floral water**; a popular alcohol-based cologne or perfume with a floral scent; used in baths and as part of spiritual cleansing and healing practices.

## Aguacate\*

Avocado (*Persea americana*).

### Plant Part Used

Leaves, seed, fruit.

### Dominican Medicinal Uses

The leaves are traditionally prepared as an infusion and taken orally for diabetes, diarrhea, inducing abortion, intestinal worms, menstrual cramps, parasites and vaginal infections, and the seed decoction is taken for contraception. The fruit is typically used for nutritional and culinary purposes.

### Safety

No data on the safety of the leaf or the seed in humans has been identified in the available literature; animal toxicity studies have shown equivocal results. The fruit is commonly consumed as food and generally regarded as safe.

### Contraindications

Oral use of the leaves is contraindicated during pregnancy (due to emmenagogue and uterine muscle stimulating effects) and lactation (due to potential for harmful effects based on case reports in goats). No information on the safety of the leaves in children has been identified in the available literature.

### Drug Interactions

Warfarin: fruit may inhibit anticoagulant effect. Monoamine-oxidase inhibitors (MAOI): one case of hypertension crisis has been reported due to concomitant ingestion of the fruit and MAOI.

#### **Clinical Data**

The following effects of this plant have been investigated in human clinical trials: fruit: cholesterol and lipid-lowering, treatment of non-insulin dependent diabetes mellitus and triglyceride-lowering; avocado/soybean unsaponifiables: treatment of osteoarthritis; and oil: treatment of plaque psoriasis.

#### **Laboratory & Preclinical Data**

The following biological activities of this plant have been investigated in laboratory and preclinical studies (in vitro or animal models): analgesic, anti-inflammatory, antihemorrhage, hepatoprotective, immuno-modulating, uterine muscle stimulant, trypanocidal, uterine stimulant and vasorelaxant.

\* See entry for *Aguacate* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## **Ají\***

Pepper, bell pepper, chili pepper, cayenne (*Capsicum annuum*, *C. frutescens* & *C. chinense*).

#### **Plant Part Used**

Leaf, fruit.

#### **Dominican Medicinal Uses**

The leaf is traditionally prepared as a warm poultice and applied topically for skin abscesses, boils or infections, or prepared as a tea and taken orally for menstrual cramps and related disorders. The fruit is typically used for culinary and nutritional purposes and is said to increase heat in the body.

#### **Safety**

No data on the safety of the leaf in humans (for internal or external use) has been identified in the available literature; however, in animal studies, topical application of the leaf did not show signs of toxicity or adverse effects. The fruit is widely consumed and considered safe in moderate amounts. Prolonged or excessive use may cause irritation of the mucosa or other adverse effects.

#### **Contraindications**

No data on the safety of this plant during pregnancy, lactation or in children has been identified in the available literature. The fruit should not be taken by patients with inflammatory gastro-intestinal or renal disorders. Avoid contact with the eyes or open wounds due to potential irritation of the mucosa.

#### **Drug Interactions**

Consumption of the fruit may inhibit liver microsomal enzymes and potentiate drugs metabolized by these enzymes. Aspirin and salicylic acid compounds: bioavailability may be reduced by concurrent use of peppers.

Barbiturates: concomitant use of the dried fruit has been shown to potentiate the effects of hexobarbital. Anticoagulants, antiplatelet agents, thrombolytic agents: concomitant use of the fruit may increase the risk of bleeding.

#### **Clinical Data**

No human clinical trials of the leaf have been identified in the available literature. The fruit has been investigated in clinical trials for the following effects: analgesic, carotenoid bioavailability enhancement, gastroprotective, swallowing dysfunction treatment and urinary incontinence treatment.

#### **Laboratory & Preclinical Data**

The following biological activities of this plant have been investigated in laboratory and preclinical studies (in vitro or animal models): antimicrobial, antioxidant, antitumor, chemopreventive, cytotoxic, learning enhancement, learning impairment amelioration and renoprotective.

\* See entry for *Ají* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## **Ajo\***

Garlic (*Allium sativum*).

#### **Plant Part Used**

Bulb.

#### **Dominican Medicinal Uses**

The bulb is traditionally ingested raw for high blood pressure, upper-respiratory infection, common cold, flu-like symptoms and cough, and the alcohol extract is taken internally for sinusitis. The bulb skins are traditionally prepared as a tea and taken internally for indigestion and gastro-intestinal complaints.

**Safety**

The bulb is generally regarded as safe for human consumption. Reported adverse effects include skin burns due to topical application (especially in children with prolonged exposure). Adverse effects associated with internal use include halitosis, body odor, gastrointestinal irritation, constipation, headache, nausea, fatigue and vertigo.

**Contraindications**

Not to be taken at therapeutic doses for 10 days prior to surgery due to antiplatelet activity and risk of excessive bleeding. The bulb is contraindicated during lactation.

**Drug Interactions**

Chlorzoxazone: garlic may reduce drug metabolism. Indomethacin and NSAIDs: risk of excessive bleeding. Protease inhibitors: reduced blood levels. Drugs metabolized by cytochrome P450 2E1: garlic may inhibit efficacy. Forskolin: garlic may potentiate antiplatelet activity.

**Clinical Data**

The following effects have been investigated in human clinical trials: treatment of atherosclerosis, common cold, coronary artery disease, hyperlipidemia, hypertension and unstable angina pectoris.

**Laboratory & Preclinical Data**

The following biological activities have been investigated in laboratory and preclinical studies (in vitro or animal models): antibacterial, anticarcinogenic, antifungal, antihypertensive, antineoplastic, antinociceptive, antioxidant, antiplatelet-aggregant, antithrombic, antiviral and immune enhancing.

## Ajonjolí\*

Sesame (*Sesamum indicum*).

**Plant Part Used**

Seed, seed oil.

**Dominican Medicinal Uses**

The seed oil is traditionally taken orally for asthma, bronchitis, common cold, flu and pneumonia, and the seed emulsion is taken orally for asthma, administered to both children and adults.

**Safety**

The seed and seed oil are generally regarded as safe for human consumption, and no adverse reactions have been reported in clinical studies.

**Contraindications**

None identified in the available literature.

**Drug Interactions**

None identified in the available literature.

**Clinical Data**

The following effects of the seed oil or seeds have been investigated in human clinical trials: antidiabetic, dry nasal mucosa treatment, enterolactone precursor, hypocholesterolemic, hypotensive, infant growth stimulus, postmenopausal support, sex hormone binding globulin increase, sleep improvement, thiobarbituric acid reacting substance decrease and Vitamin E status improvement.

**Laboratory & Preclinical Data**

The following biological activities have been investigated in laboratory and preclinical studies (in vitro or animal models): antitumor, antineoplasm, antihypertensive, antioxidant, hypocholesterolemic and improved Vitamin E bioavailability.

\* See entry for *Ajonjolí* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Albahaca\*

Basil (*Ocimum basilicum*).

**Plant Part Used**

Aerial parts: leaf, stem, flower.

**Dominican Medicinal Uses**

The aerial parts or leaves are traditionally prepared as a tea and taken orally for stomach ache, indigestion, gastro-intestinal pain, internal cleansing and women’s health conditions.

**Safety**

This herb is generally regarded as safe for human consumption in moderate amounts and widely used as a culinary seasoning.

**Contraindications**

The essential oil should not be used during pregnancy, lactation or in small children.

**Drug Interactions**

Synergistic effects may occur with drugs that share similar pharmacological activities as those described for this plant in the “Laboratory and Preclinical Data” section; metabolism of one of basil’s active constituents, estragole, may be hindered by concomitant use of medications metabolized by UGT2B7 or UGT1A9 phase II enzymes.

**Clinical Data**

No human clinical trials of this plant have been identified in the available literature.

**Laboratory & Preclinical Data**

The following biological activities of this plant have been investigated in laboratory and preclinical studies (in vitro or animal models): analgesic, antifungal, antimicrobial, antispasmodic, anti-ulcerogenic, gastric anti-ulcerogenic, glutathione S-transferase and smooth muscle relaxant.

\* See entry for *Albahaca* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Alcanfor\*

Camphor (*Cinnamomum camphora*).

**Plant Part Used**

Essential oil.

**Dominican Medicinal Uses**

The crystallized essential oil is traditionally prepared as an ointment and applied topically for treating sinusitis, headache, upper-respiratory tract infections, muscle pain, joint pain, asthma, bronchitis, difficulty breathing and phlegm in the lungs. For internal use, a small amount of the essential oil is dissolved in water and taken orally for gas, indigestion and stomach ache.

**Safety**

Internal use of the essential oil can be highly toxic (adult lethal dose = 20 g; toxic at 2 g; child lethal dose < 1 g). External use may cause skin irritation. Overdose symptoms include: delirium, spasms, intoxicated states and irregular breathing.

**Contraindications**

Caution advised when administered topically to children, and external use is contraindicated in cases of broken skin. In infants and small children (< 2 years), the oil should not be administered near the nose or via inhalation due to potential nervous system overstimulation or possibility of seizures. Avoid internal use during pregnancy (due to emmenagogue and uterine stimulant effects) and lactation (due to potential toxicity).

**Clinical Data**

The following effects of the essential oil have been investigated in human clinical trials: nasal sensation of cold, central nervous system

stimulant, antiplatelet, *Demodex* rosacea treatment and ophthalmic disorder treatment.

**Laboratory & Preclinical Data**

The following biological activities of the essential oil or its constituents have been investigated using in vitro or animal models: anti-inflammatory, antioxidant, biosurfactant, cytotoxic, positively inotropic, ribosome inactivation, smooth muscle stimulant and superoxide dismutase.

\* See entry for *Alcanfor* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Algodón\*

Cotton, creole cotton (*Gossypium barbadense*).

**Plant Part Used**

Leaf, flower, root.

**Dominican Medicinal Uses**

The leaf is traditionally prepared as a decoction and taken orally for vaginal infections, genitourinary inflammation, excess vaginal discharge and infections in general. The flower is typically prepared as a decoction and administered as a douche for excess vaginal discharge and genitourinary infections.

**Safety**

No information on the safety of the leaf, root or flower has been identified in the available literature. In human clinical trials the isolated constituent gossypol showed the following adverse effects: hypokalemia, irreversible anti-fertility (in men), fatigue, decreased libido and gastrointestinal disorders.

**Contraindications**

Insufficient information has been identified in the available literature.

**Drug interactions**

Insufficient information has been identified in the available literature.

**Clinical Data**

The isolated constituent gossypol has been investigated in human clinical trials for antifertility effects in men.

**Laboratory & Preclinical Data**

In animal studies the leaf aqueous extract has shown hypotensive effects. In vitro, gossypol has shown antifertility effects against sperm cells.

\* See entry for *Algodón* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Aloe

See *Sábila*.

## Aloe vera

See *Sábila*.

## Alquitira\*

Prickly pear cactus (*Opuntia ficus-indica*).

### Plant Part Used

Cactus pad (leaf-stem).

### Dominican Medicinal Uses

The fresh cactus pad is traditionally prepared as a juice taken orally for diabetes, high blood pressure, heart disease, stomach ailments and indigestion. The gel from inside the leaf-stem is typically applied topically for wound-healing.

### Safety

The cactus pad and fruit are widely consumed and generally considered safe. Caution is advised during handling due to sharp spines and glochids which cover the surface; these spiny projections should be removed before use. Cases of contact dermatitis have been reported.

### Contraindications

Contraindicated in individuals with a history of allergy or hypersensitivity to *Opuntia* and other cactus species. Due to lack of available data, avoid use during pregnancy or breastfeeding and in small children.

### Drug Interactions

Besides potential synergistic effects with drugs that share similar biological activities to this plant (see “Laboratory and Preclinical Data”), particularly diabetes and blood-sugar modulating medications, insufficient information has been identified on herb-drug interactions in the available literature.

### Clinical Data

The following effects of this plant have been investigated in human clinical trials: anti-hangover, anti-inflammatory, antioxidant and anti-lipid peroxidation.

### Laboratory & Preclinical Data

The following activities of this plant have been shown in laboratory and preclinical studies: anti-inflammatory, antioxidant, chondroprotective, gastro-protective, hypoglycemic, immunomodulatory, neuroprotective, radical scavenging and wound-healing.

\* See entry for *Alquitira* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Altamisa\*

Ragweed (*Ambrosia artemisiifolia* and *A. peruviana*).

### Plant Part Used

Leaf, aerial parts.

### Dominican Medicinal Uses

The leaf is traditionally prepared as a tea and taken orally for arthritis, delayed menses, diarrhea (in children and adults), infections, kidney ailments, menstrual pain, postpartum cleansing and stomach ache. It is also used externally as a poultice for menstrual pain and as a bath for energetic cleansing, good luck and spiritual protection.

### Safety

The pollen of *Ambrosia* species is a common allergen and may cause symptoms of hayfever in hypersensitive individuals. Plant material should be washed thoroughly before use to remove pollen. Cases of contact dermatitis, eczema, allergic conjunctivitis and other adverse effects have been associated with this plant.

### Contraindications

Due to lack of available safety information, avoid use during pregnancy or lactation and in children under 5 years of age.

### Drug Interactions

Synergistic interactions may occur with medications that share similar biological activities to those demonstrated by this herb (see “Clinical Data” and “Laboratory & Preclinical Data” below).

### Clinical Data

The following effects of *Ambrosia artemisiifolia* have been investigated in human clinical trials: allergenic, immunotherapeutic and irritant.

### Laboratory & Preclinical Data

*Ambrosia* species have shown the following biological activities in laboratory or preclinical studies using in vitro or animal models:

analgesic, anti-inflammatory, antimycobacterial and cytotoxic.

\* See entry for *Altamisa* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Alucema\*

Lavender (*Lavandula angustifolia*).

### Plant Part Used

Dried flower buds.

### Dominican Medicinal Uses

The dried flower buds are traditionally prepared as a tea and taken orally for anxiety/nervousness, stomach ache, indigestion, gas, menopausal hot flashes, common cold and flu.

### Safety

Lavender is generally regarded as safe when used in moderation. Potential adverse effects include drowsiness, gastrointestinal upset and skin irritation.

### Contraindications

Excessive internal use of this herb is contraindicated during early pregnancy due to its emmenagogue effect demonstrated in laboratory studies. Due to lack of sufficient data on safety, avoid use during lactation and in small children.

### Drug Interactions

Concomitant use of this herb with sedative or tranquilizing drugs, such as pentobarbital, may potentiate their effects based on evidence from animal studies. Additional herb-drug interactions may occur in medications with effects similar to those demonstrated by this plant clinical and preclinical studies (see below).

### Clinical Data

The following effects of this plant have been investigated in human clinical trials: antianxiety, antidepressant, anti-stress, anxiolytic, dysmenorrhea treatment, hypnotic, insomnia treatment, retrospective pain perception and sedative.

### Laboratory & Preclinical Data

This plant has shown the following biological activities in laboratory and preclinical studies: acaricidal, antibacterial, anticonvulsant, antifungal, anti-inflammatory, antimicrobial, antineoplastic, antitumor, sedative and hypolipidemic.

\* See entry for *Alucema* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Anamú\*

Guinea-hen-weed (*Petiveria alliacea*).

### Plant Part Used

Leaf, root, stem.

### Dominican Medicinal Uses

The root is traditionally prepared as a tincture in alcohol and taken orally for arthritis, joint and muscle pain. The leaf and/or root is typically prepared as an infusion and taken orally for nausea and stomach ailments, women’s health conditions (dysmenorrhea, menorrhagia, menopausal symptoms, ovarian cysts, labor pains, postpartum recovery, uterine fibroids) and to cleanse the blood. The leaf is also prepared as a poultice and applied topically for skin infections.

### Safety

No data on the safety of this plant in humans has been identified in the available literature.

Animal studies of the leaf have shown relatively low toxicity, and TRAMIL has approved this herb for particular traditional uses.

### Contraindications

Avoid use during pregnancy, lactation and in children under 12 years of age.

### Drug Interactions

Concomitant use of this herb with insulin and hypoglycemic drugs may potentiate their effects.

### Clinical Data

No human clinical trials have been identified in the available literature.

### Laboratory & Preclinical Data

The following biological activities have been demonstrated in laboratory and preclinical studies (using in vitro or animal models): analgesic, antifungal, anti-inflammatory, antinociceptive, chemopreventive, cytotoxic and hypoglycemic.

\* See entry for *Anamú* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Anís

There are at least five different species of anise-like medicinal plants that are recognized in

Dominican healing traditions. Those that are included in the present edition of this book are listed below in bold along with their other common Spanish names:

- **Anís chiquito** = *anis de comer, anís de cocinar, anís pequeño, aniscito* (*Pimpinella anisum*)
- *Anís comino* = *comino* (*Cuminum cyminum*) or **hinojo**
- **Hinojo** = *anis hinojo* (*Foeniculum vulgare*) or *anis comino*
- **Anís de estrella** = *anis estrellada, anís grande* (*Illicium verum*)
- **Aniseto** = *aniceto* (*Piper marginatum*)

The common names of the first three types of *anis* are easily confused because their dried fruits or “seeds” (the part of the plant traditionally used for medicine) are similar in appearance, taste and shape. For more information on a specific type of *anis*, see the plant entry for the appropriate common name listed in bold above.

## Anís chiquito\*

Anise, anise burnet-saxifrage (*Pimpinella anisum*).

### Plant Part Used

Fruit (seed).

### Dominican Medicinal Uses

The seeds are traditionally prepared as a decoction and taken orally for colic (in children and adults), common cold, *empacho*, flatulence, flu, gastrointestinal disorders, headache, indigestion, nervous tension, *pasmo* and stress.

### Safety

The seeds are generally regarded as safe for human consumption in moderation and widely used as a culinary spice. Caution is advised if this herbal remedy is combined with *anis de estrella* due to potential contamination with a toxic look-alike (see entry for “*Anís de estrella*”).

### Contraindications

Studies show conflicting recommendations regarding safety of internal use during pregnancy and lactation. Use of this herb in combination with *anis de estrella* is contraindicated in children (due to potential for contamination with the toxic look-alike *Illicium anisatum* (see “*Anís de estrella*”)); however, *anis*

*chiquito* is considered safe for children when used appropriately.

### Drug interactions

Anticoagulants, NSAIDs, antiplatelet drugs, warfarin: Avoid use of *anis chiquito* if taking any of these medications due to potential risk of excessive bleeding as a result of interaction with coumarin derivatives.

### Clinical Data

No clinical trials of the oral use of this herb have been identified in the available literature. One open clinical trial has evaluated the pediculicidal effects of anise oil in combination with other ingredients.

### Laboratory & Preclinical Data

The following biological activities of this plant have been investigated in laboratory studies using in vitro or animal models: anticonvulsant, antidiuretic, antifatulent, antifungal, antimicrobial, antispasmodic, estrogenic, expectorant, hypotensive, liver regeneration, muscle stimulant and mutagenic.

\* See entry for *Anís chiquito* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Anís comino

See **Hinojo**. May also be *comino* (cumin; *Cuminum cyminum*) which is not included in this book.

## Anís de comer

See **Anís chiquito**.

## Anís de cocinar

See **Anís chiquito**.

## Anís de estrella\*

Chinese star anise (*Illicium verum*).

### Plant Part Used

Fruit, seed.

### Dominican Medicinal Uses

The fruits or seeds are traditionally prepared as a decoction and taken orally for flatulence, headache, indigestion, stomach ache, upper respiratory tract infection and cleansing the intestines.



### **Safety**

The fruit is generally considered safe for human consumption in small amounts and is widely used as a culinary spice. When taken in excessive quantities, isolated compounds from the fruit have shown neurotoxic effects in animal studies. Caution is advised due to possible adulteration with the highly poisonous look-alike, Japanese star anise (*Illicium anisatum*).

### **Contraindications**

Avoid use in small children due to potential contamination with misidentified toxic look-alike. Caution and avoidance is advised in patients with a history of convulsive disorders including epilepsy due to case reports of seizures associated with internal use of the tea. Caution advised in patients prior to surgery due to potential risk of increased bleeding.

### **Drug Interactions**

Anticoagulants, antiplatelet medications and NSAIDs: based on animal studies in mice, star anise increases cytochrome P450 dependent 7-ethoxycoumarin O-deethylase activity which may affect the metabolism of these drugs.

### **Clinical Data**

No human clinical trials evaluating this plant species have been identified in the available literature.

### **Laboratory & Preclinical Data**

The following biological activities of this plant have been demonstrated in laboratory and preclinical studies using in vitro or animal models: antiangiogenic, antibacterial, antimicrobial, insecticidal, neurotropic and sepsis prevention.

\* See entry for *Anís de estrella* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## **Anís estrellada**

See *Anís de estrella*.

## **Anís grande**

See *Anís de estrella*.

## **Anís pequeño**

See *Anís chiquito*.

## **Aniscito**

See *Anís chiquito* if the seed or fruit is the part of the plant most commonly used as an herbal remedy. If the leaves or other plant parts are used, see *Aniseto*.

## **Anise**

See *Anís*.

## **Aniseto\***

Cake bush (*Piper marginatum*).

### **Plant Part Used**

Leaf.

### **Dominican Medicinal Uses**

The leaf is traditionally prepared as a decoction and taken orally for flatulence, indigestion and stomach pain.

### **Safety**

No data on the safety of this plant in humans or animals has been identified in the available literature.

### **Contraindications**

Insufficient information has been identified in the available literature.

### **Drug Interactions**

Insufficient information has been identified in the available literature.

### **Clinical Data**

No human clinical trials of this plant have been identified in the available literature.

### **Laboratory & Preclinical Data**

The following biological activities of the essential oil or plant extracts have been demonstrated in laboratory studies using in vitro assays: antibacterial, antifungal and antiparasitic.

\* See entry for *Aniseto* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## **Anisito**

See *Anís chiquito* if the seeds are used most commonly. If the leaves or other plant parts are used, see *Aniseto*.

## **Apasote\***

Wormseed (*Chenopodium ambrosioides*).

**Plant Part Used**

Leaf, aerial parts.

**Dominican Medicinal Uses**

The leaf and aerial parts are traditionally prepared as an infusion or crushed to extract their juice which is administered orally for colic, diarrhea, stomach ache, intestinal parasites and gas.

**Safety**

The leaves are widely consumed as a culinary seasoning in small amounts. Cases of contact dermatitis due to handling the plant have been reported. The leaves have shown relatively low toxicity in animal studies, and the seed oil and isolated constituents can be highly toxic.

**Contraindications**

Avoid use of the oil in pregnancy (due to abortifacient effects) and young children (< 4 y). Internal use is contraindicated in the following conditions: gastro-intestinal inflammation (mucosal irritant), heart disease (cardiac depressive), liver disease (hepatotoxic) and kidney disease (renotoxic).

**Drug Interactions**

Insufficient information identified in the available literature.

**Clinical Data**

The leaf and plant extract have been investigated in human clinical trials for the following effects: antiparasitic and antiascariasis.

**Laboratory & Preclinical Data**

The following biological activities of this plant have been demonstrated in laboratory and preclinical studies using in vitro or animal models: in vivo: analgesic, antimalarial, antimicrobial, antiulcerogenic, sedative (plant extracts or constituents); anthelmintic, antifungal (essential oil).

In vitro: analgesic, antibacterial, antimalarial, insecticidal, sedative (plant extracts or constituents); antifungal (essential oil).

\* See entry for *Apasote* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Apio\*

Celery (*Apium graveolens* variety *dulce*).

**Plant Part Used**

Stalk, leaves, roots, seeds.

**Dominican Medicinal Uses**

The stalks and leaves are traditionally eaten raw or taken as a juice for treating obesity, high blood pressure, high cholesterol, diabetes and menopausal hot flashes.

**Safety**

The stalks, leaf and root are widely consumed and generally considered safe. Cases of allergic reaction to the root have been reported. Plants infected with pink rot fungus can cause phototoxicoses.

**Contraindications**

Internal use of the seeds and essential oil are contraindicated during pregnancy (emmenagogue, abortifacient, uterine stimulating effects) and patients with renal disorders (potential kidney-irritating effect of oil).

**Drug Interactions**

Celery seeds and seed extract: anticoagulants, warfarin (risk of bleeding, drug potentiation); thyroxine (lowered T<sub>4</sub> levels).

**Laboratory & Preclinical Data**

In vivo: anti-hyperlipidemic, anti-inflammatory, antinociceptive (plant extract); hepatoprotective (seeds).

In vitro: antimicrobial, antioxidant (plant extract); cercaricidal (essential oil); vasodilation (chemical constituent).

\* See entry for *Apio* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Apple

See *Manzana*.

## Avena\*

Oats, oatmeal, oatstraw (*Avena sativa*).

**Plant Part Used**

Seeds (oat grain), fruiting tops.

**Dominican Medicinal Uses**

Oats are traditionally boiled in water to make oatmeal or an oatmeal-like beverage and taken orally for high cholesterol, to stimulate lactation, for nutrition and strength and to relieve menopausal hot flashes.

**Safety**

Oats are commonly consumed and generally regarded as safe. They have shown low potential

for allergic reaction in gluten-sensitive individuals.

#### **Contraindications**

In patients with celiac disease, oats may cause gastrointestinal irritation, but they have been shown to be well-tolerated in recent clinical studies.

#### **Drug Interactions**

Lovastatin and statin drugs (impaired absorption of HMG-CoA reductase inhibitors).

#### **Clinical Data**

The following effects of oats or oat extracts have been investigated in human clinical trials: anti-diabetic, cholesterol-lowering, hypoglycemic, hypocholesterolemic, smoking cessation (grain extract or oat bran); antihyperlipidemic, antihypertensive, reduced heart disease risk, stimulation of bile acid secretion and synthesis, tolerance in celiac patients (whole-grain and oat bran); anti-skin irritant, burn wound-healing, itch reduction (topical oil-based preparation).

\* See entry for *Avena* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Avocado

See *Aguacate*.

## Auyama\*

Squash, pumpkin (*Cucurbita pepo* & *C. moschata*).

#### **Plant Part Used**

Seeds, fruit pulp, oil.

#### **Dominican Medicinal Uses**

The seeds are traditionally prepared as an infusion and taken orally for diarrhea, intestinal parasites and worms. The fruit pulp is traditionally prepared as an infusion or juice for the common cold and flu.

#### **Safety**

The fruit and seeds are commonly consumed and generally regarded as safe. In animal studies the fruit was shown to be relatively nontoxic.

#### **Drug Interactions**

Warfarin (increased clotting time – 1 case; based on a study using the multi-herb supplement Cucurbitacin®).

#### **Clinical Data**

The following effects of the seed or seed extracts have been investigated in human clinical trials: improved urinary symptoms of benign prostatic hyperplasia and inhibited urolithiasis.

#### **Laboratory & Preclinical Data**

In animal studies the plant or seed extract has shown antiallergenic and hepatoprotective effects. In vitro, isolated compounds from the seed have shown antiproliferative activity. Nutritionally the fruit and flower are a significant source of pro-vitamin A and the seeds are a source of L-tryptophan.

\* See entry for *Auyama* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Baño

**Bath;** common ingredients in baths include herbs, flowers, *aguas* (fragrant flower or plant essences, usually alcohol-based and artificially colored) and scented oils or perfumes; popular bath ingredients can be used individually or combined as a mixture of dried herbs and powders in packets or already prepared and infused in water. They are often sold at *botánicas* as packets or already prepared in liter-size bottles (usually recycled plastic soda bottles, juice jugs or milk containers). Bath preparations are used therapeutically for physical illness or as part of spiritual healing traditions to attract positive energy or dispel unwanted energy.

## Basil

See *Albahaca*.

## Batata\*

Sweet potato (*Ipomoea batatas*).

#### **Plant Part Used**

Root (tuber), leaf, stem.

#### **Dominican Medicinal Uses**

The fresh root is traditionally prepared as a poultice and applied topically for burns and wounds. The root is also cooked and ingested, for women’s health conditions and nutrition. The leaves and stems may be prepared as an aqueous

maceration and applied topically for wound-healing.

#### **Safety**

The tuber is widely consumed and generally considered safe except if contaminated by a toxic fungal infection. No data has been identified in the available literature on the safety of the leaves and stems.

#### **Clinical Data**

Human clinical trials: antidiabetic, improved vitamin A status (tuber).

#### **Laboratory & Preclinical Data**

In vivo: antidiabetic, antioxidant, hypoglycemic (tuber, extracts or constituents).

In vitro: aldose reductase inhibition, antimicrobial, antioxidant, immune-enhancing (tuber, extracts or constituents)

\* See entry for *Batata* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Batata de burro\*

Caribbean coralfruit (*Doyerea emetocathartica*).

#### **Plant Part Used**

Leaf, root.

#### **Dominican Medicinal Uses**

Leaves: tea for diabetes. Root: infusion or multi-herb tincture, orally, for sexually transmitted infections, menstrual disorders, uterine fibroids, digestive and colon ailments.

#### **Safety**

No studies on the safety of this plant in humans or animals have been identified in the available literature.

#### **Contraindications**

Unknown; insufficient information identified in the available literature.

#### **Drug Interactions**

Unknown; insufficient information identified in the available literature.

#### **Clinical, Laboratory & Preclinical Data**

Unknown; insufficient information identified in the available literature.

\* See entry for *Batata de burro* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Bebedizo

Literally, “drink”; a **mixture of plants** (can be a few or several; i.e. up to 20-30 different plant species) prepared as a **strong decoction**, boiled for a long time and often sweetened and thickened after boiling with either molasses (*melaza*) or honey (*miel de abeja*); similar to a *botella*; often prescribed for women’s health conditions, especially as a postpartum tonic.

## Bejuco de barraco

See *Timacle*.

## Bejuco de indio\*

Chewstick (*Gouania lupuloides*).

#### **Plant Part Used**

Stem, leaf, root, water from inside stem.

#### **Dominican Medicinal Uses**

The stem is traditionally used in multi-herb preparations and taken orally for infections, kidney ailments, reproductive disorders, venereal disease, blood-cleansing, menstrual disorders, uterine fibroids and menopause symptoms.

#### **Safety**

No data on the safety of this plant in humans has been identified in the available literature. This plant has shown some evidence of toxicity in animal studies, but more research is needed.

#### **Contraindications**

Unknown; insufficient information identified in the available literature.

#### **Drug Interactions**

Unknown; insufficient information identified in the available literature.

#### **Laboratory & Preclinical Data**

In animal studies the leaf and branch extract has shown muscle-relaxant effects. In vitro isolated compounds have demonstrated anti-inflammatory and antimicrobial activity and CNS sedative effects and the plant extract has shown vasodilatory effects.

\* See entry for *Bejuco de indio* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Berenjena\*

Eggplant (*Solanum melongena*).

#### **Plant Part Used**

Fruit.

#### **Dominican Medicinal Uses**

The raw fruit is traditionally chopped and soaked in water to extract its bitter constituents, and this water is taken as a drink for diabetes, high cholesterol and obesity.

#### **Safety**

The fruit is considered safe as a widely consumed vegetable.

#### **Clinical Data**

The fruit has been investigated in human clinical trials as a potential treatment for eye and vision problems due to its interocular pressure-lowering effects.

#### **Laboratory & Preclinical Data**

In laboratory and preclinical studies the fruit constituents have shown antioxidant activity in animal models. The following activities of this plant have been demonstrated using in vitro assays: antioxidant, antitumor and spasmogenic. \* See entry for *Berenjena* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Berro\*

Watercress (*Nasturtium officinale*).

#### **Plant Part Used**

Leaf.

#### **Dominican Medicinal Uses**

The fresh leaf is traditionally eaten raw or juiced and administered orally for anemia, diabetes, high cholesterol, high blood pressure, heart disease, upper respiratory tract infection, bronchitis and tuberculosis.

#### **Safety**

The leaves and stems of this plant are widely consumed and generally regarded as safe. Caution is advised as this plant may carry liver flukes or other parasites if grown in contaminated water.

#### **Contraindications**

Pregnancy, children under 4 y, stomach or intestinal ulcers, inflammatory renal disease.

#### **Clinical Data**

Clinical: anticancer, chemopreventive, potential inhibition of oxidative metabolism of acetaminophen (fresh plant).

\* See entry for *Berro* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Bicarbonato de sodio

**Baking soda**; used as a gargle for sore throat and tonsillitis, sometimes combined with *vinagre blanco* (white vinegar) or with *limón* (lemon) and *miel de abeja* (honey); can be combined with other herbal remedies such as poultices that are applied externally.

## Bija\*

Annatto (*Bixa orellana*).

#### **Plant Part Used**

Seed coats, leaves.

#### **Dominican Medicinal Uses**

The powdered seed coats are traditionally combined with other plants to make a tea or vegetable juice drink for treating anemia, cysts, dysmenorrhea, tumors, uterine fibroids and to support post-partum recovery. The seeds coats and/or leaves are also used externally for topical burns, injury and musculoskeletal trauma.

#### **Safety**

The seeds and seed coats are generally regarded as safe and commonly used as a culinary flavoring and coloring agent. Animal studies have shown this plant to be relatively nontoxic, although allergic reactions reported.

#### **Contraindications**

Hypersensitivity; history of allergic reaction.

#### **Laboratory & Preclinical Data**

The seed extract has shown the following activities in animal studies: anti-inflammatory, chemopreventive, hyperglycemic. In vitro the plant extract has demonstrated antibacterial, antifungal, antimicrobial and antiplatelet effects, and the seed extract has shown anti-inflammatory, anti-tumor and immunomodulatory activity.

\* See entry for *Bija* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Bitter melon

See *Cundeamor*.

## Bitter orange

See *Naranja agria*.

## Black nightshade

See *Hierba mora*.

## Bohuco de indio

See *Bejuco de indio*.

## Borraja

Indian heliotrope (*Heliotropium indicum*).

### Plant Part Used

Leaf.

### Dominican Medicinal Uses

The leaves are traditionally boiled in water and taken as a tea or bath for skin conditions including rash, papules, pustules, measles and chicken pox.

### Safety

This plant contains toxic pyrrolizidine alkaloids. No studies on the safety of this plant in humans have been identified in the available literature. Cases of mortality in grazing animals due to ingestion of this plant have been reported.

### Clinical Data

In human clinical trials, isolated plant constituents (alkaloids) have been investigated for their anti-cancer effects.

### Laboratory & Preclinical Data

The leaves have shown anti-inflammatory activity in animal studies, and the ethanolic extract has shown wound-healing effects. In vitro, plant extracts have demonstrated antitumor activity.

## Botánica

**Store** that sells **herbs** and **religious** or **spiritual items** from **Latino and Afro-Caribbean** traditions, such as candles, beads, statues of saints, perfume oils, incense, fragrant sprays, baths, plant-infused water, etc. Many *botánicas* offer consultations (*consultas*) with healers, herbalists or spiritual counselors. *Botánicas* can also serve as **community gathering place** similar to a church or place of worship and celebration for Espiritismo, Santería and other religions.

## Botella

Literally “bottle”; refers to multi-herb preparations that are administered orally or topically and are often stored in bottles; typically there are four different types of *botellas*:

1. **multi-herb decoction** – made by boiling several plants (usually roots ) for a long time to make a strong brew and adding other ingredients for flavor, therapeutic effect and/or as preservatives; (see also *bebedizo*);
2. **alcohol-based tincture** – prepared by steeping a combination of plants in alcohol (usually gin, rum or wine) for several days or weeks and using the alcohol extract medicinally;
3. **oil mixture** – prepared by combining a number of vegetable and/or animal oils; usually administered by the spoonful; (see *aceite*).
4. **juice mixture** – prepared by combining the fresh fruit, leaf or root juice (*zumo* or *jugo*) of different plants.

The first two types of preparations are the most common ones referred to by the term *botella*.

## Brasil\*

Brazilwood (*Caesalpinia brasiliensis* and related species).

### Plant Part Used

Wood.

### Dominican Medicinal Uses

The wood is traditionally prepared as a cold infusion and taken orally for diabetes, high blood pressure, kidney infections, women’s health conditions, menstrual disorders, poor circulation, uterine fibroids and cysts.

### Safety

No studies on the safety of this plant in humans have been identified in the available literature. However, a related species has shown relatively low toxicity in animal studies.

### Laboratory & Preclinical Data

The following activities have been reported in *Caesalpinia* species related to *Brasil* and may not reflect the bioactivity of *Caesalpinia brasiliensis*. In animal studies the seed kernel extract has shown antidiabetic and hypoglycemic activity and the leaf extract has shown muscle stimulant activity. In vitro, plant extracts have shown anticancer, antibacterial, antioxidant, antitumor and inhibition of nitric

oxide formation, serine proteinase and xanthine oxidase effects.

\* See entry for **Brasil** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Brazilwood

See **Brasil**.

## Bruja\*

Life plant (*Kalanchoe pinnata*).

**Note:** this name can also refer to: **Mala madre**.

Distinguishing feature: *bruja* leaves are shorter than those of *mala madre*.

### Plant Part Used

Leaf.

### Dominican Medicinal Uses

The leaves are traditionally heated until wilted and squeezed to extract the juice from inside the leaf which is applied topically for earache. The bruised, fresh leaves are also applied topically for headache, and the fresh leaves or leaf juice are taken orally for stomach ache and ulcers.

### Safety

In a clinical case report, the leaf extract (30 g fresh leaves per day taken orally for 14 days) did not show any signs of toxicity or adverse effects in one adult female patient. The leaf orally administered to mice for 30 days did not show signs of toxicity to the liver, heart or kidney.

### Contraindications

No information has been identified in the available literature on the safety of this plant in children or during pregnancy or lactation.

### Clinical Data

In one clinical case report the leaf extract was investigated for its potential in treating leishmaniasis.

### Laboratory & Preclinical Data

In animal studies the leaf extract has shown antitumor effects and the leaf juice has shown hepatoprotective activity. In vitro, the leaf extract or constituents have demonstrated antitumor and uterine stimulant effects.

\* See entry for **Bruja** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cabbage

See **Repollo**.

## Cacao\*

Chocolate (*Theobroma cacao*).

### Plant Part Used

Leaf, seeds.

### Dominican Medicinal Uses

The seeds are traditionally prepared as a tea by decoction (i.e. hot chocolate) taken orally for fatigue and weakness. The leaf decoction is used for kidney and urinary tract disorders.

### Safety

Chocolate is widely consumed and generally regarded as safe. No data on the safety of the leaf has been identified in the available literature.

### Contraindications

Avoid use in individuals with a history of heart disorders (due to cardiac stimulant effects) or hypersensitivity (due to potential skin reactions or migraines).

### Drug Interactions

Avoid concomitant use with phenelzine due to potential for high blood pressure. The following medications may inhibit caffeine metabolism or clearance: oral contraceptives, cimetidine, furafylline, verapamil, disulfiram, fluconazole, mexiletine, phenylpropanolamine, numerous quinolone antibiotics (i.e. enoxacin, piperimidic acid, ciprofloxacin, norfloxacin), idrocilamide and methoxsalen.

### Clinical Data

The following effects of the seed extract have been investigated in human clinical trials: anti-ulcer, antioxidant and decreased platelet function.

### Laboratory & Preclinical Data

In animal studies the seed extract has shown anti-ulcer effects. In vitro the seed extracts and/or constituents have shown antibacterial, antioxidant, anti-tumor, cardio-protective, dopaminergic, immunomodulatory and red blood cell production stimulant effects.

\* See entry for **Cacao** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cadillo de gato\*

Cockleburr (*Xanthium strumarium*).

### Plant Part Used

Leaf, root.

### Dominican Medicinal Uses

The leaf and root are traditionally prepared as a tea by decoction and taken orally for kidney, gallbladder, liver disorders and hepatitis.

### Safety

No data on the safety of this plant has been identified in the available literature. Animal toxicity studies suggest that therapeutic use of this plant may be considered safe in moderation.

### Laboratory & Preclinical Data

In animal studies the leaf extract has shown antitrypanosomal and cytotoxic effects and the fruit extract has exhibited CNS depressant and antidiabetic activity. In vitro, isolated plant constituents have shown anti-tumor, antimalarial and antimicrobial effects and the leaf extract has demonstrated cytotoxic effects.

\* See entry for *Cadillo de gato* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cadillo tres pies

Gingerbush (*Pavonia spinifex*).

### Plant Part Used

Leaf, root.

### Dominican Medicinal Uses

The leaf and root are traditionally prepared as a tea by decoction and administered orally for disorders of the kidney, gallbladder or liver, blood in the urine, hepatitis, sexually transmitted infections, uterine fibroids, tumors, cysts and menopausal hot flashes.

### Safety

Insufficient information identified.

### Contraindications

Unknown; insufficient information identified in the available literature.

### Drug Interactions

Unknown; insufficient information identified in the available literature.

### Laboratory & Preclinical Data

The chloroform extract of the plant has shown antibacterial activity in vitro.

\* See entry for *Cadillo de gato* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Café\*

Coffee (*Coffea arabica*).

### Plant Part Used

Seed, leaf.

### Dominican Medicinal Uses

The roasted seeds are traditionally brewed to prepare coffee and taken orally as a laxative, diuretic, stimulant, blood cleanser and for treating sexually transmitted infections or used as a mouthwash for toothache and inflammation of the mouth or gums. The seeds tinctured in alcohol are applied topically for arthritis and muscle pain. The leaves are typically prepared as a tea by infusion and taken orally for diarrhea, and may also be prepared as a bath for skin ailments.

### Safety

The seeds and seed decoction are widely consumed and generally considered safe. One of the primary active constituents in coffee is caffeine. Potential adverse effects from excess coffee intake include diarrhea, insomnia, headache, heart palpitations, hyperacidity and stomach irritation. No data on the safety of the leaf in humans has been identified in the available literature. In animal studies, the leaf showed no evident signs of toxicity.

### Contraindications

Excess caffeine consumption (including coffee) is not advised during pregnancy or lactation. Caution is advised in patients with renal dysfunction and hyperthyroidism. No data on the safety of the leaves in pregnancy, lactation or small children has been identified in the available literature.

### Drug Interactions

Coffee may interfere with drug resorption. The following medications may inhibit caffeine metabolism or clearance: oral contraceptives, cimetidine, furafylline, verapamil, disulfiram, fluconazole, mexiletine, phenylpropanolamine, numerous quinolone antibiotics (i.e. enoxacin, piperimidic acid, ciprofloxacin, norfloxacin), idrocilamide and methoxsalen.

### Clinical Data



Caffeine has been investigated in human clinical trials for its cognitive enhancement effects, and coffee has been studied as a colonic stimulant and common cold treatment.

#### **Laboratory & Preclinical Data**

In animal studies, coffee has shown hypercholesterolemic effects, and in vitro it has shown antioxidant activity.

\* See entry for *Café* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cajuil\*

Cashew (*Anacardium occidentale*).

#### **Plant Part Used**

Seed case, dried bark.

#### **Dominican Medicinal Uses**

Traditionally the dried bark or seed case is prepared as a decoction by boiling in water and taken orally for diarrhea in both children and adults.

#### **Safety**

The fresh seed case is a potent skin irritant and is considered poisonous although roasting neutralizes this toxin. The juice of the fruit-stem is widely consumed as a beverage and generally considered safe. The seeds are commonly eaten and considered safe as long as they are properly roasted and processed. No information on the safety of the dried seed case or bark has been identified in the available literature.

#### **Laboratory & Preclinical Data**

In animal studies, the nut extract in milk has demonstrated antiarthritic and antioxidant effects, and the aqueous plant extract has shown antidiabetic activity. Extracts of the bark have shown anti-inflammatory and hypoglycemic activity, and the nut shell oil and fruit stem juice have demonstrated antioxidant effects in vivo. In vitro, extracts of the plant or bark have exhibited antibacterial, antifungal, antileishmaniasis, tyrosinase inhibition and vasorelaxant activity.

\* See entry for *Cajuil* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Calabash

See *Higüero*.

## Calabaza

See *Auyama*.

## Calaguala

Rabbit's foot fern (*Polypodium aureum*).

#### **Plant Part Used**

Leaf (fern frond).

#### **Dominican Medicinal Uses**

The leaf is traditionally prepared as an infusion and taken orally for the common cold, flu and upper respiratory tract infections.

#### **Safety**

In a human clinical trial of the plant extract, no toxic or adverse effects were reported.

#### **Contraindications**

Insufficient information identified in the available literature.

#### **Drug Interactions**

Insufficient information identified in the available literature.

#### **Clinical Data**

The plant extract has been studied in one human clinical trial for its photoprotective effects and was recommended as a potential therapy.

#### **Laboratory & Preclinical Data**

Plant extracts have shown antiparasitic, anti-inflammatory, antioxidant, immunosuppressant effects in animal studies. Isolated constituents (calagualine) or plant extracts have shown anti-tumor, antiviral, immunomodulatory and leukotriene formation inhibition activity in vitro.

## Calcio

**Calcium**; this powdered mineral is often added as a supplement to herbal and other medicinal preparations and is often used in the treatment of anemia.

## Camphor

See *Alcanfor*.

## Canela\*

Cinnamon (*Cinnamomum verum* or *Cinnamomum cassia*).

#### **Plant Part Used**

Inner bark.

### **Dominican Medicinal Uses**

The inner bark is traditionally prepared as a decoction and taken orally for allergy, anxiety, arthritis, low blood pressure, kidney ailments, common cold, flu, sinusitis and women's health conditions.

### **Safety**

The bark is generally regarded as safe and widely consumed as a culinary spice. Excessive or prolonged use may cause irritation.

### **Contraindications**

Large quantities of cinnamon should not be during pregnancy due to potential teratogenic effects.

### **Drug Interactions**

Methacyclines (interferes with dissolution).

### **Clinical Data**

Human clinical trials: antidiabetic (bark).

### **Laboratory & Preclinical Data**

In vivo: antioxidant (bark).

In vitro: antibacterial, antifungal, headlice treatment, HEp-2 treatment (essential oil).

\* See entry for *Canela* in "Part 3: Dominican Medicinal Plant Profiles" of this book for more information, including references.

## **Canelilla\***

Allspice, bay rum tree (*Pimenta dioica*).

### **Plant Part Used**

Leaf, berry, essential oil.

### **Dominican Medicinal Uses**

Leaves: tea for common cold, flu; externally: mashed and applied topically for arthritis, joint pain; multi-herb tincture: taken internally for impotence, infertility, sexually transmitted infections. Berries, essential oil: externally for joint pain.

### **Safety**

Potential hypersensitivity to essential oil. Leaf extract: low to moderate toxicity when taken orally.

### **Contraindications**

Lack of information on use in pregnancy, lactation or young children.

### **Laboratory & Preclinical Data**

In vitro: antibacterial, antifungal (essential oil).

In vivo: anti-inflammatory, anti-nociceptive (leaf extract).

\* See entry for *Canelilla* in "Part 3: Dominican Medicinal Plant Profiles" of this book for more information, including references.

## **Canfor**

See *Alcanfor*.

## **Cañafístula\***

Golden shower tree (*Cassia fistula*).

### **Plant Part Used**

Fruit (seed pod).

### **Dominican Medicinal Uses**

Seed pods: decoction, orally, for constipation, to expel worms and as a laxative.

### **Safety**

No health risks identified in literature for proper use; however, long-term or excessive use can have adverse effects.

### **Contraindications**

Pregnancy, lactation, children under 12 y; persons with acute intestinal inflammatory disease or appendicitis.

### **Laboratory & Preclinical Data**

In vivo: anti-diabetic (leaf and bark extracts), antifertility, sedative, CNS depressant (seed extract), anti-inflammatory (leaf extract), anti-neoplastic, anti-tumor (fruit extract), antioxidant, hypocholesterolemic.

In vitro: anti-alzheimer's (root extract), antibacterial.

\* See entry for *Cañafístula* in "Part 3: Dominican Medicinal Plant Profiles" of this book for more information, including references.

## **Cardo Santo\***

Mexican prickly poppy (*Argemone mexicana*).

### **Plant Part Used**

Leaf, flower, root and stem.

### **Dominican Medicinal Uses**

Leaf/whole herb: prepared as a tea for blood-cleansing, cancer, stomach ulcers, delayed menstruation, vaginal infection, menopause symptoms; prepared as a douche for vaginal infection and inflammation; as a multi-herb mixture for ovarian cysts, uterine fibroids and tumors; root: boiled tea for stomach pain.

### **Safety**

Entire plant shown to be hepatotoxic due to sanguinarine and alkaloid content, especially concentrated in the seeds; internal use strongly cautioned against.

**Contraindications**

Pregnancy, lactation, children.

**Laboratory & Preclinical Data**

In vitro: antifungal, anti-HIV, anti-tumor, morphine-withdrawal alleviation, uterine stimulant (organic plant extracts).

\* See entry for *Cardo santo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cartílago de tiburón

Shark cartilage; reported for use in preventing or treating cancer, tumors and uterine fibroids, sometimes combined with medicinal plants in home remedies; it is also taken for nourishing brain function.

## Carrot

See *Zanahoria*.

## Cáscara de \_\_\_\_\_

Typically means “**bark** or **fruit rind** of (plant name)”; look up the plant name which follows this description of the plant part used.

## Cashew

See *Cajuil*.

## Cataplasma

Poultice; an external application of herbs (either mashed up fresh or boiled and then cooled before applying to the affected area); often used for skin conditions or muscle pain.

## Cat’s claw

See *Uña de gato*.

## Cebolla\*

Onion (*Allium cepa*; *cebollín* = var. *aggregata*).

**Plant Part Used**

Bulb.

**Dominican Medicinal Uses**

Bulb: raw, taken internally, for asthma, bronchitis, common cold, flu, upper respiratory tract infections.

**Safety**

Commonly consumed as food; generally considered safe; potentially irritating to stomach or skin if taken in large quantities.

**Contraindications**

None identified.

**Drug Interactions**

Platelet aggregation inhibitors (potentiated).

**Laboratory & Preclinical Data**

In vivo: antiasthmatic, antihyperlipidemic, anti-atherosclerosis, antioxidant, anti-platelet aggregant, anti-tumor. In vitro: (oil, aqueous extract) antibacterial, antifungal.

\* See entry for *Cebolla* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cebolla roja

See *Cebolla*.

## Cebollín

See *Cebolla*.

## Celery

See *Apio*.

## Chamomile

See *Manzanilla*.

## Chocolate

See *Cacao*.

## Cilantro\*

Cilantro, coriander (*Coriandrum sativum*).

**Plant Part Used**

Leaf, seed.

**Dominican Medicinal Uses**

Leaf: infusion/decoction, orally, for gastrointestinal disorders: flatulence, gastritis, acid-reflux, heartburn, indigestion and stomach pain.

**Safety**

Widely consumed as a condiment; generally considered safe; potential for hypersensitivity.

**Laboratory & Preclinical Data**

In vivo: hypolipidemic (seeds), inflammatory bowel disease treatment (multi-herbal extract).

In vitro: antioxidant (seed aqueous extract).

\* See entry for *Cilantro* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cilantro ancho

See *Cilantro*.

## Cinnamon

See *Canela*.

## Coco\*

Coconut (*Cocos nucifera*).

**Plant Part Used**

Fruit, oil.

**Dominican Medicinal Uses**

Fruit: milk, orally, for kidney infection, kidney stones, intestinal parasites, asthma; oil, orally, for asthma, cough, bronchitis and pulmonary infection.

**Safety**

Widely consumed and generally considered safe; potential for cross-reactivity in individuals with nut allergies

**Laboratory & Preclinical Data**

In vivo: hypolipidemic (flavonoids).

In vitro: anti-tumor (husk extract), antibacterial (plant extracts).

\* See entry for *Coco* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Coffee

See *Café*.

## Cola de caballo\*

Horsetail (*Equisetum* species).

**Plant Part Used**

Leaf-stem.

**Dominican Medicinal Uses**

Leaves and stems: decoction, orally, for bladder, urinary tract or kidney infection, kidney stones, kidney ailments (general), infections (general), vaginal infections, menstrual cramps, to cleanse the blood and as a diuretic.

**Safety**

Considered safe when used appropriately; must be taken with plenty of water due to diuretic effect; high silica content may be toxic if plant is ingested.

**Contraindications**

Children, case of heart or kidney disorders.

**Drug Interactions**

Cardiac glycosides, digitalis (may enhance toxicity); thiamine (breaks down vitamin).

**Clinical Data**

Human clinical trials: diuretic (aqueous plant extract), metabolism effects and renal excretion (standardized extract).

**Laboratory & Preclinical Data**

In vivo: diuretic, anti-ulcer, gastroprotective, hypoglycemic (organic plant extracts).

In vitro: anti-platelet-aggregant, antimicrobial, contractile response enhancement, cytogenic, hepatoprotective, radical scavenging (plant extracts and constituents).

\* See entry for *Cola de caballo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Corteza de \_\_\_\_\_

Means “**bark** of (plant name)”; look up the plant name which follows this description of the plant part used.

## Cranberry\*

Cranberry (*Scientific name*).

**Plant Part Used**

Fruit.

**Dominican Medicinal Uses**

Fruit: juice, orally, urinary tract infection, kidney ailments, high cholesterol.

**Safety**

Juice is widely consumed and generally considered safe. In a clinical trial, ingestion of fruit extract tablets caused increase in urinary oxalate levels and may indicate risk of nephrolithiasis.

**Drug Interactions**

Warfarin (risk of bleeding).

#### **Clinical Data**

Human clinical trials: anti-inflammatory, anti-adhesion of urinary bacteria, antioxidant, heart disease prevention, urinary tract infection treatment and prevention (juice).

#### **Laboratory & Preclinical Data**

In vitro: antibacterial, anticancer, antifungal, antioxidant, antitumor, antiviral (fruit juice or constituents).

\* See entry for **Cranberry** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cristal

**Gel**; the clear gel from inside the leaves of *Aloe vera*; see **Sábila**.

## Cuaba\*

Caribbean pine (*Pinus caribaea*).

#### **Plant Part Used**

Wood.

#### **Dominican Medicinal Uses**

Wood: decoction, gargle for sore throat; decoction, for arthritis, joint pain, body aches, blood-cleansing, menopausal symptoms and to induce abortion.

#### **Safety**

No adverse effects known associated with proper use of needles or oil; however, data is needed on the safety of the internal use of the wood decoction.

#### **Laboratory & Preclinical Data**

In laboratory studies, *Pinus* species have shown the following effects: anti-influenza virus (pine cone extract), anticancer, antimicrobial, antioxidant (pitch/tar extracts); antitumor (cone constituents); antiviral (plant extracts).

\* See entry for **Cuaba** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Cundeamor\*

Bitter melon (*Momordica charantia*).

#### **Plant Part Used**

Leaf, stem, aerial parts.

#### **Dominican Medicinal Uses**

Leaf, stem: decoction, orally, for diabetes, fever, stomach problems, menstrual disorders, dysmenorrhea, vaginal infection, excess vaginal discharge, sexually transmitted infection, menopausal hot flashes, cancer; fresh juice or decoction, poultice or wash, topically, for skin rash, measles, insect bites, itching and skin infection.

#### **Safety**

Shown to be relatively non-toxic for internal and external use in animal studies.

#### **Contraindications**

Pregnancy, lactation, children < 3 years.

#### **Laboratory & Preclinical Data**

In vitro: anthelmintic (fresh fruit juice), antimicrobial (leaf and extracts).

\* See entry for **Cundeamor** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Dandelion

See **Diente de león**.

## Decoction

An **aqueous extract** of one or a few herbs ; a common method for preparing tea (*té*) or *tizana*; typically 2 teaspoons of dried plant material (1/4 cup if fresh) are boiled in hot water, either in a covered pot to trap volatile oils or with the cover removed so that the water boils off for a more concentrated brew; typically, roots and woody, fibrous plant matter are boiled for a longer period of time and flowers or leaves are boiled for a shorter period of time because less time is needed to extract their properties; most Dominican herbal remedies are prepared as decoctions; see also **infusion** and *té*.

## Despojo

Energetic cleansing; literally, “dispossession”; often done ritually, using the recitation of prayers, burning of incense and bundles of herbs which are swept or shaken over the body or in ones’ living space to dispel negative or unwanted energy. This can also be accomplished through using a medicinal bath (*baño*) and/or washing ones living area with an herbal preparation.

## Diente de león\*

Dandelion (*Taraxacum officinale*).

### Plant Part Used

Leaf, root.

### Dominican Medicinal Uses

Leaf: fresh juice, orally, for liver conditions.

### Safety

Leaves are widely consumed and generally considered safe; root and leaf: relatively nontoxic.

### Contraindications

Root: digestive, biliary or gallbladder conditions, stomach inflammation, irritable bowel, digestive weakness, bowel obstruction (due to laxative, stomach acid stimulating & cholagogue effects);

### Drug Interactions

Lithium (potential exacerbation of toxicity).

### Laboratory & Preclinical Data

In vivo: analgesic, anti-inflammatory, anti-tumor, bile flow stimulant (root extracts); diuretic, hypoglycemic (leaf water extract).

In vitro: anti-inflammatory in CNS, anti-tumor, cytotoxic, antidiabetic, nitric oxide production, insulin secretion (root or plant extract); antioxidant (flowers),

Nutritional: potassium.

\* See entry for *Diente de León* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Ducha

**Douche**; also means “shower” when used in a non-therapeutic context; for a vaginal douche, herbs or other preparations are used to wash or irrigate the vagina. Also called *ducha vaginal* or *lavado vaginal*.

## Ducha vaginal

Vaginal douche; see *ducha*.

## Eggplant

See *Berenjena*.

## Epazote

See *Apasote*.

## Eucalipto\*

Eucalyptus (*Eucalyptus globulus*).

### Plant Part Used

Leaf, essential oil.

### Dominican Medicinal Uses

Leaf: infusion or decoction, orally or inhaled vapor, for asthma, common cold, flu-like symptoms, congestion, cough and pulmonary infection.

### Safety

Leaves considered safe for internal and external use if administered appropriately; essential oil is highly toxic if taken internally and may cause allergic reaction when administered topically; vapor inhalation may transmit fungal spores.

### Contraindications

Young children and infants (inhalation or topical administration may lead to respiratory disorders); gastro-intestinal inflammatory conditions (internal use may irritate mucosa), history of allergy or hypersensitivity to eugenol (essential oil constituent).

### Drug Interactions

Antidiabetic drugs (may potentiate effect), barbiturates (may decrease effect), pyrrolizidine-containing herbs (may exacerbate hepatotoxic effects).

### Laboratory & Preclinical Data

In vivo: anti-inflammatory, bronchitis treatment (essential oil).

In vitro: antibacterial, antioxidant (essential oil)

\* See entry for *Eucalipto* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Eucalyptus

See *Eucalipto*.

## Extracto de malta

**Malt extract**; contains alcohol; sometimes added to herbal preparations.

## Fennel

See *Hinojo*.

## Flecha

An **aromatic, alcohol-based liniment** containing menthol, eucalyptus oil, **methyl salicylate** and other ingredients; Chinese formula; manufactured in the Dominican Republic; used externally for joint and muscle pain.

## Flor de \_\_\_\_\_

Means “**flower** of (plant name)”; look up the plant name which follows this description of the plant part used.

## Fruta de \_\_\_\_\_

Means “**fruit** of (plant name)”; look up the plant name which follows this description of the plant part used.

## Gárgara

**Gargle**; it is often used for sore throat, cough and inflammation of the gums or mouth. This remedy can be prepared as an infusion of medicinal plant(s) or as a mixture of the fresh plant juice and other ingredients such as salt (*sal*), baking soda (*soda bicarbonato*) or honey (*miel de abeja*); this preparation is typically used only as a gargle and is not swallowed. Similar terms: *buche* (mouthwash) and *enjuague* (mouthrinse).

## Grapefruit

See *Toronja*.

## Guácima\*

West Indian elm (*Guazuma ulmifolia*).

### Plant Part Used

Root.

### Dominican Medicinal Uses

Leaf: decoction, orally, for cough, common cold and flu symptoms. Bark: multi-herb decoction, orally, for menstrual disorders, fibroids, ovarian cysts, menopausal symptoms.

### Safety

Leaf: considered safe when used appropriately; low toxicity of shown in animal and clinical studies. No information on safety of the bark.

### Contraindications

No information on safety of leaf or bark in children and pregnant or lactating women.

### Laboratory & Preclinical Data

In vivo: antidiabetic, hypoglycemic (bark extracts).

In vitro: antibacterial, antiprotozoal and antioxidant (organic plant extracts); antisecretory (bark extract); enzyme inhibition (bark extracts).

\* See entry for *Guácima* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guajabo\*

Senna (*Senna alata*).

### Plant Part Used

Leaf, flower.

### Dominican Medicinal Uses

Leaves: decoction, orally, for blood-cleansing, infection, diarrhea, parasites; topically as a wash for skin disease and *pañó*.

### Safety

Considered safe for therapeutic use when administered appropriately; relatively low toxicity shown in animal studies; avoid prolonged or excessive use.

### Contraindications

Intestinal obstruction, gastro-intestinal inflammatory disease, anal prolapse, hemorrhoids, pregnancy, lactation, children < 12 y, abdominal pain or appendicitis of unknown origin.

### Drug Interactions

Diuretics, cardiac glycosides.

### Laboratory & Preclinical Data

In vivo: bovine dermatophilosis treatment (leaf extract).

In vitro: anti-inflammatory (leaf extract), antimicrobial (leaf and bark extracts), platelet aggregation inhibition (leaf constituent).

\* See entry for *Guajabo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guanábana\*

Soursop (*Annona muricata*).

**Plant Part Used**

Leaf, fruit.

**Dominican Medicinal Uses**

Leaf: tea, orally, for common cold, flu, musculoskeletal injury, menopausal symptoms, nervousness/anxiety; externally as a bath for fever in children. Fruit: eaten, diuretic and fever-reducing.

**Safety**

Fruits are commonly consumed; reports of toxicity from ingestion of leaves in humans; contradictory results from animal toxicity studies; possibly implicated in atypical parkinsonism in the Caribbean.

**Laboratory & Preclinical Data**

In vivo: antioxidant (stem bark alcohol extract). In vitro: human serotonin receptor binding activity, antiviral (HSV-1), cytotoxic in cancer cells, molluscicidal in schistosomiasis vector (plant extracts and constituents).

\* See entry for *Guanábana* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guandúl\*

Pigeon pea (*Cajanus cajan*).

**Plant Part Used**

Leaf, root, seed (bean).

**Dominican Medicinal Uses**

Seeds: cooked as a legume for nutrition. Leaf: poultice, applied externally for arthritis and joint pain. Root: strong decoction, to induce abortion.

**Safety**

Seeds widely consumed and generally considered safe; plant extracts have shown toxic effects in animal studies; more information needed to determine safety of plant in humans.

**Laboratory & Preclinical Data**

In vitro: antibacterial, antimicrobial, antigonorrheal (leaf extracts); antimalarial (root constituents); antisickling (seed extract).

\* See entry for *Guandúl* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guatapanál\*

Divi divi (*Caesalpinia coriaria*).

**Plant Part Used**

Fruit (dried seed pod).

**Dominican Medicinal Uses**

Fruit (dried seed pod): decoction, gargle or mouthwash, for sore throat, tonsillitis, toothache, oral inflammation or infection; decoction, douche, for vaginal infection, inflammation of the ovaries, venereal disease, menstrual disorders, pelvic pain and cleansing the reproductive system; decoction, orally, fever, inflammation and infection.

**Safety**

Unknown; no information found.

**Clinical, Laboratory & Preclinical Data**

No data identified in the literature. See *Brasil* for information on closely related species.

\* See entry for *Guatapanál* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guayacán\*

Lignum vitae (*Guaiacum officinale*).

**Plant Part Used**

Stem, wood.

**Dominican Medicinal Uses**

Stem, wood: tincture, orally, for upper respiratory tract infections, skin ailments, arthritis and venereal disease; tincture, externally, for arthritis, rheumatism, joint pain (also orally in small amount); decoction, externally, to prevent hair loss.

**Safety**

Considered safe if used appropriately; adverse effects include skin rash, diarrhea, gastroenteritis and intestinal colic.

**Laboratory & Preclinical Data**

In an animal study of a closely related *Guaiacum* species, the following effects were shown: anti-inflammatory and hypoglycemic.

\* See entry for *Guayacán* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Guazuma

See *Guácima*.

## Hierba mora\*

Black nightshade (*Solanum americanum*; also, *Solanum nigrescens*).



### **Plant Part Used**

Leaf.

### **Dominican Medicinal Uses**

Leaf: decoction, orally, for allergies, vaginal infections, cysts, fibroids, cancer (early stages), blood-cleansing, childbirth and postpartum recovery.

### **Safety**

Leaf extracts in moderate amounts have shown relatively low toxicity; in excess, can cause adverse reactions; fruits contain toxic alkaloids.

### **Clinical Data**

Human clinical trials: treatment of vaginal candidiasis (plant extract).

### **Laboratory & Preclinical Data**

In vivo: immunomodulatory (leaf extract).

In vitro: antidermatophytic, antifungal (plant extract); antimicrobial (leaf extract); antitrypanosomal (plant extract).

\* See entry for *Hierba mora* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Hierbabuena\*

Mint (*Mentha* species).

### **Plant Part Used**

Leaf, stalk, flower.

### **Dominican Medicinal Uses**

Leaves and stems: tea, orally, for stomach pain, indigestion, stress, anxiety, diabetes, menstrual cramps; poultice, externally, for topical burns and minor abrasions.

### **Safety**

Widely consumed and generally considered safe.

### **Laboratory & Preclinical Data**

Antispasmodic, antiflatulent, stimulant, antimicrobial and sedative.

\* See entry for *Hierbabuena* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Hierro

**Iron**; used for the treatment of anemia and other illnesses; typically sold as a powder; added as an ingredient to *botellas* and herbal preparations; often sold in the amount of a single dose, packaged in an envelope (*sobre*).

## Higüero\*

Calabash (*Crescentia cujete*).

### **Plant Part Used**

Fruit pulp.

### **Dominican Medicinal Uses**

Fruit pulp: added fresh to multi-herb preparations, taken internally for infections in general, vaginal infections, infertility, fibroids, cysts, menopausal symptoms, childbirth and post-partum recovery.

### **Safety**

Signs of toxicity exhibited in birds and cattle.

### **Contraindications**

Pregnancy; not to be used for ear infection if ear secretions or perforation of ear drum is evident.

### **Laboratory & Preclinical Data**

In vitro: antimicrobial (leaf and stem ethanol extracts, fruit pulp).

In vivo: anti-inflammatory (hydroalcoholic leaf extract).

\* See entry for *Higüero* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Hinojo\*

Fennel (*Foeniculum vulgare*).

### **Plant Part Used**

Seeds.

### **Dominican Medicinal Uses**

Seeds: decoction, orally, for digestive ailments, flatulence, stomach pain, *pasmo*, infant colic, inflammation, allergy, sinus infection and women’s health. Leaves: decoction, orally, for stomach ache, indigestion and gas.

### **Safety**

Widely consumed and considered safe; caution advised if used in anise tea: seeds are often combined with *anís de estrella* which may be adulterated by poisonous look-alike.

### **Contraindications**

Essential oil: epileptics, young children, pregnancy; herb considered safe for children and pregnant women.

### **Clinical Data**

Human clinical trial: infant colic treatment (seed extract and essential oil emulsion).

\* See entry for *Hinojo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Hoja de \_\_\_\_\_

Means “**leaf** of (plant name)”; look up the plant name following this description of the plant part used.

## Horsetail

See *Cola de caballo*.

## Huevo

**Egg**; also, *yema de huevo* (egg yolk); used for treating anemia; said to fortify red blood cells; eggshell (*cáscara de huevo*) can be added as an ingredient to home remedies.

## Infusion

An **aqueous extract** of one or a few herbs ; a common method for preparing tea (*té*); typically 2 teaspoons of dried plant material (1/4 cup if fresh) in 1 cup of hot (boiling) water, infused for 10-15 minutes; technically, an infusion is not boiled, whereas when making a **decoction**, the herbs are boiled in water. Most Dominican herbal remedies are prepared as decoctions.

## Jabón de cuaba

**Pine tar soap**, particularly from the Caribbean pine; used as an external treatment in home remedies.

## Jagua\*

Genipap (*Genipa americana*).

### Plant Part Used

Fruit.

### Dominican Medicinal Uses

Fruit: juice or cold water extract, for high blood pressure, infection, inflammation, kidney ailments, blood purification, diuretic, headache, vaginal infection, menopausal symptoms, menstrual disorders, prevention of cysts, fibroids and tumors.

### Safety

The fruit is widely consumed in tropical regions.

### Laboratory & Preclinical Data

Phytochemical: anti-tumor (identified active compounds in leaves and fruit).

\* See entry for *Jagua* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Jarabe

**Syrup**; typically prepared one of two ways: 1. a strong aqueous decoction or infusion of a plant, reduced to a fraction of its original volume by boiling for an extended period of time and then thickened or sweetened with molasses (*melaza*), honey (*miel de abeja*) or sugar (*azucar*). 2. *Jarabe* can also be prepared with raw plant ingredients such as raw garlic (*ajo*), onion (*cebolla, cebollín*), aloe vera gel (*sábila*), fresh lemon juice (*limón*) and/or a sweetener (see above); administered orally by the spoonful.

## Jugo de \_\_\_\_\_

Means “**juice** of (plant name)”; look up the plant name which follows this description of the plant preparation used.

## Lavado vaginal

Vaginal wash; see *ducha*.

## Lavender

See *Athucema*.

## Leche

**Milk**; usually cow’s milk; sometimes used as a substitute for water in the preparation of herbal remedies; can also be coconut milk (*leche de coco*); cow’s milk reported for use in treating kidney ailments and anemia and for preparing decoctions of *calabaza* or *auyama* seeds.

## Lechosa\*

Papaya (*Carica papaya*).

### Plant Part Used

Fruit (ripe and unripe), papain enzymes.

### Dominican Medicinal Uses

Fruit: eaten for digestive ailments, flatulence, stomachache, intestinal pain, heartburn, heart

disease, hypertension, menopausal hot flashes, urinary tract infection, skin infection.

#### **Safety**

Ripe fruit is widely consumed and generally considered safe; topical application of the unripe fruit did not show toxicity in rabbits; other plant preparations have shown mixed results in animal toxicity studies.

#### **Contraindications**

Pregnancy and lactation (unripe fruit and papain); children under 12 years (due to lack of clinical data); history of hypersensitivity to fruit.

#### **Drug Interactions**

Warfarin (w/papain may cause excessive bleeding).

#### **Clinical Data**

Human clinical trials: guinea worm infection (leaves), immunomodulation (papain enzymes), burn wound-healing (fruit).

#### **Laboratory & Preclinical Data**

In vivo: abortifacient (unripe fruit constituents), anthelmintic (latex), antifertility—inhibits sperm motility (seed extract), antihypertensive (unripe fruit ethanolic extract); anti-ulcer (unripe fruit latex); diuretic (root); reversible azoospermia (seed extract).

In vitro: antiamebic (seed extract), antihypertensive (unripe fruit ethanolic extract), antimicrobial, antioxidant (unripe fruit and seed), anti-salmonella (leaf and root extracts), immunomodulatory, immunostimulatory (seed extract), uterine stimulatory (fruit latex extract).

\* See entry for *Lechosa* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Lemon

See *Limón*.

## Lemongrass

See *Limoncillo*.

## Limón\*

Lemon (*Citrus* spp.; typically *Citrus limon*).

#### **Plant Part Used**

Fruit, leaf, root.

#### **Dominican Medicinal Uses**

Fruit: juice or tea, orally for common cold, flu, kidney stones, musculoskeletal injury, diarrhea; juice, topically, for burns, bruises and dermatological conditions. Root: multi-herb decoction or tincture, orally, menstrual disorders.

#### **Safety**

Fruit is widely consumed and generally considered safe; little data available on safety of root and leaves.

#### **Laboratory & Preclinical Data**

Anti-inflammatory, antioxidant, diuretic, nutritive.

\* See entry for *Limón* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Limoncillo\*

Lemongrass (*Cymbopogon citratus*).

#### **Plant Part Used**

Leaf, stalk.

#### **Dominican Medicinal Uses**

Leaf/stalk: infusion, orally, for asthma, common cold, flu-symptoms, stomach ailments, indigestion, gastro-intestinal pain, diarrhea (in children), menopausal hot flashes, arthritis, internal bruising and musculoskeletal injury.

#### **Safety**

This plant is nontoxic according to clinical studies; the essential oil potential may cause allergic reaction to skin or lung irritation if inhaled.

#### **Contraindications**

Pregnancy.

#### **Laboratory & Preclinical Data**

In vivo: anti-inflammatory, antimalarial, lowered heart rate (leaf infusion, essential oil); antinociceptive (essential oil); chemopreventive, inhibition of hepatocarcinogenesis (leaf extract); hypocholesterolemic (leaves).

In vitro: antibacterial, antifungal, antimicrobial, antioxidant, antitumor, polyphenol oxidase inhibition (essential oil or constituents); enzyme inhibition, vasorelaxant (leaf/stalk extract).

\* See entry for *Limoncillo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Limpieza

**Cleaning, cleansing or clearing;** this term has two uses: to describe (1.) the **internal cleansing** action of remedies inside the body; or (2.) an external spiritual/energetic **cleansing ritual**:

1. Herbal preparations taken internally are sometimes said to “**cleanse the body [internally]**” (*limpiar el sistema*), particularly the digestive tract, kidneys, liver and/or reproductive system; in this sense, it can be used to describe laxative or diuretic herbs, remedies that cleanse the blood or preparations that clear obstruction in the reproductive system.

2. a cleansing ritual is performed using herbs and/or other items to ritually clear or dispel unwanted energy around a person’s body or in a physical space (i.e. a room, house, office or car); this ritual often includes the use of incense, prayer and bundles of herbs that are swept or shaken over the body or in ones living space. Often, water-based preparations of herbs, fragrant *aguas* and/or perfume oils are used for washing ones living area, especially the floor; then a similar mixture of herbs is prepared as a bath for washing the physical body as part of this spiritual/energetic cleansing ritual.

## Linden

See *Tilo*.

## Llantén\*

Plantain (*Plantago major* or *P. lanceolata*).

### Plant Part Used

Leaf.

### Dominican Medicinal Uses

Leaf: fresh juice or tea, orally, for liver disorders, vaginal infections, high cholesterol, stomach ache, menopausal symptoms, abortion; juice, externally, wound-healing; as a salve or poultice, externally, for headache, migraine and nausea.

### Safety

Results of toxicity studies and published literature.

### Clinical Data

Human clinical trials: bronchitis treatment (plant extract).

### Laboratory & Preclinical Data

In vivo: antibacterial (leaf compound), antidiarrheal (leaf extract), chemopreventive

(constituents), antinociceptive (seed and leaf extract), antitumor (leaf).

In vitro: antiviral, immuno-enhancing, laxative and gastroprotective (extracts and compounds).

\* See entry for *Llantén* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Lydia Pinkham

**Manufactured herbal preparation** sold at *botánicas* and used for women’s health conditions, including menopause, infertility, vaginal infections, menstrual irregularities and uterine fibroids.

## Maguey\*

Agave, tequila plant (*Agave* species).

### Plant Part Used

Leaf, husk/bark, root.

### Dominican Medicinal Uses

Leaf: tea, orally, for stomach ache, ulcers; fresh juice added to mixture for asthma, lung infection; applied externally for headache, sprains and muscle strain; alcohol tincture for sexually transmitted infections; decoction, douche for vaginal infection. Bark/husk: decoction, orally for arthritis, joint pain and to cleanse the blood; multi-herb internal mixture for cysts, fibroids, tumors.

### Safety

Little data on toxicity; contact dermatitis reported due to oxalate crystals in leaves.

### Contraindications

Pregnancy.

### Laboratory & Preclinical Data

In vivo: anti-inflammatory (plant extract).

In vitro: inhibition of cell division and capillary permeability (plant extracts and constituents).

\* See entry for *Maguey* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Mala madre\*

Palm beach-bells (*Kalanchoe gastonis-bonniei*).

### Plant Part Used

Leaf.

### Dominican Medicinal Uses

Leaf: decoction, orally, for pain, infection, inflammation; as a douche, for vaginal infection; added to multi-herb preparations for menstrual disorders, uterine fibroids, ovarian cysts, menopausal symptoms and tumors.

**Safety**

Animal studies have shown moderate- to low toxicity when administered orally.

**Laboratory & Preclinical Data**

In vivo: antifertility and contraceptive effects on sperm (leaf juice).

\* See entry for *Mala madre* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Malagueta\*

Allspice (*Pimenta dioica*).

**Plant Part Used**

Unripe, dried fruit (“seeds”).

**Dominican Medicinal Uses**

Seeds: tea (decoction), orally for diabetes, depression, lack of energy, menstrual disorders, internal cleansing, post-partum depression, gastro-intestinal ailments, nausea, stress, anxiety, sinus infection, allergy and respiratory infection.

**Safety**

Widely used as a culinary spice, generally considered safe; low toxicity shown in animal studies.

**Contraindications**

No information available on use in children or during pregnancy or lactation.

**Laboratory & Preclinical Data**

In vivo: anti-hemorrhage due to snake venom (organic plant extract).

In vitro: antioxidant (seed/berry constituents).

\* See entry for *Malagueta* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Malta

**Malt beverage**; malt beverage; used as a remedy by itself or combined with other ingredients; two main brands: *Malta India* and *Malta Morena*; often added to *botellas* or *bebedizos*.

## Malta alemana

**German malt beverage**; strong, bitter taste; used as a remedy by itself or combined with other ingredients; often added to *botellas* or *bebedizos*.

## Manteca

**Butter**; can be butter from cow’s milk or the semi-solid fat of certain animals, such as snake butter (*manteca de culebra*) or iguana butter (*manteca de iguana*).

## Manzana\*

Apple (*Malus pumila*).

**Plant Part Used**

Leaf, root, flower, fruit, bulb, bark, whole plant.

**Dominican Medicinal Uses**

Fruit: raw, ingested, for treatment or prevention of high blood pressure, high cholesterol, heart disease and nutrition; tea, orally, for common cold, flu-like symptoms, menopausal hot flashes and relaxation.

**Safety**

Fruit is widely consumed and generally considered safe.

**Clinical Data**

Human clinical trials: alleviation of gastro-intestinal enteritis (fruit).

**Laboratory & Preclinical Data**

In vivo: anti-inflammatory, antirheumatic (ethanol extract).

In vitro: antioxidant (phenols).

\* See entry for *Manzana* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Manzanilla\*

Chamomile (*Matricaria recutita* & *Chamaemelum nobile*).

**Plant Part Used**

Flower.

**Dominican Medicinal Uses**

Flowers: decoction/infusion, orally, for anxiety, nervousness, stress, insomnia (adults and children), menstrual cramps, post-partum recovery, childbirth and regulating blood pressure.

### **Safety**

Considered safe for internal use; slight potential for hypersensitivity, especially in patients with a history of allergic reaction to *Aster* species.

### **Contraindications**

Pregnancy: oral administration of whole plant extract at high doses may have emmenagogue effects; however, flower extracts have not shown this effect.

### **Clinical Data**

Clinical case report: mouthwash for oral mucositis (plant extract).

### **Laboratory & Preclinical Data**

In vivo: antipruritic, antiulcerogenic (plant extract); anxiolytic (constituents); hypoglycemic (aerial parts of *Chamaemelum nobile*).

In vitro: antifungal (plant extracts).

\* See entry for *Manzanilla* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Melaza

**Molasses**; made from sugar cane; contains many minerals and vitamins that are not found in refined sugar; often added to home remedies or teas as a sweetener and for medicinal purposes; also called *Miel de pulga*.

## Miel, miel de abeja

**Honey**; bee honey; often used for sweetening teas and infusions or for making syrups (*jarabes*); used in treatments for asthma, *gripe*, *pecho apretado* and anemia; given to children.

## Miel de rosa

**Rose honey**; used in home remedies; sometimes given to children when teething or if they have an infection in the mouth.

## Miel de pulga

**Molasses**; also called *Melaza*.

## Mint

See *Hierbabuena*.

## Naranja agria\*

Bitter orange (*Citrus aurantium*).

### **Plant Part Used**

Leaf, fruit.

### **Dominican Medicinal Uses**

Leaves: decoction, orally, common cold, flu, headache; poultice or salve, externally, for headache, sinusitis. Fruit: juice, decoction, for diarrhea.

### **Safety**

Considered safe if used appropriately.

### **Clinical Data**

Human clinical trial: antifungal (essential oil).

### **Laboratory & Preclinical Data**

In vitro: antioxidant (constituent), insecticidal (fruit peel extract), relaxant (essential oil).

\* See entry for *Naranja agria* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Oat, oatmeal, oastraw

See *Avena*.

## Onion

See *Cebolla*.

## Orégano

This common name can refer to several different plant species, but most commonly designates *orégano de comer*. Other types of oregano are listed below and will be included in forthcoming editions of this book.

- *Orégano poleo* (*Coleus amboinicus*)
- *Orégano mejorana* (*Origanum marjorana*)
- *Oreganillo* (*Lippia micromera*)

## Orégano de comer\*

Oregano (*Origanum vulgare*).

### **Plant Part Used**

Leaf, stem, aerial parts.

### **Dominican Medicinal Uses**

Leaves: decoction, orally, for indigestion, stomach complaints, gastro-intestinal inflammation, diarrhea, nausea, vomiting, *pasmo*, gas, pelvic pain, *padrejón*; poultice or

oil, topically, for sinus infection, allergies, nasal congestion and common cold.

#### **Safety**

Therapeutic use generally considered safe.

#### **Contraindications**

Pregnancy: avoid excess internal use.

#### **Clinical Data**

Human clinical trial: antiparasitic (essential oil).

#### **Laboratory & Preclinical Data**

In vitro: anticancer (constituent), antifungal, antimicrobial, antioxidant (essential oil and constituents).

\* See entry for *Orégano de comer* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Palo de \_\_\_\_\_

Means “stick or wood of (plant name)”; look up the plant name which follows this description of the plant part used for medicine.

## Papaya

See *Lechosa*.

## Penca de \_\_\_\_\_

Means “leaf of (plant name)”; usually refers to the rigid, cactus-like leaves of agave or aloe; look up the plant name which follows this description of the plant part used.

## Pigeon pea

See *Guandul*.

## Pineapple

See *Piña*.

## Piña\*

Pineapple (*Ananas comosus*).

#### **Plant Part Used**

Fruit, fruit rind.

#### **Dominican Medicinal Uses**

Fruit: juice, taken orally as a diuretic for urinary tract or kidney disorders, cleansing the body internally, for treating bacterial infection, cancer, high blood pressure, high cholesterol,

menopausal hot flashes; fruit rind: fermented in sugar and water for internally cleansing and refreshing the body.

#### **Safety**

Commonly consumed as food; relatively nontoxic; repeated exposure can cause hypersensitivity.

#### **Contraindications**

Caution advised during pregnancy due to possible abortifacient effects of plant steroids.

#### **Drug Interactions**

For bromelain (protease enzymes from stem): antibiotics, tetracyclines (elevated drug serum levels), anticoagulants and thrombocyte aggregation inhibitors (increased bleeding).

#### **Laboratory & Preclinical Data**

In vivo: antidiabetic, antioxidant, antidiyslipidemic (ethanolic leaf extract); antifertility (unripe fruit juice); burn debridement (bromelain—stem enzymes); diuretic (root extract).

In vitro: antitumor (bromelain—stem enzymes).

\* See entry for *Piña* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Plantain

This English common name can refer to more than one species. For the banana-like plantain fruit, see *Plátano*; for the low-lying herb whose leaves are primarily used medicinally, see *Llantén*.

## Polvo de \_\_\_\_\_

“Powder of (plant or mineral name)”; see plant or mineral name specified.

## Pomada

**Pomade, salve or ointment**; an oil-based preparation of medicinal plants for external application, often used for healing skin ailments, muscle pain or sinus conditions.

## Pomada de manteca

**Butter pomade**; a slightly solidified nut butter used externally as an ointment or salve; for

example, made from peanuts (*mani*) or sesame seeds (*ajonjoli*).

## Prickly pear cactus

See *Alquitira*.

## Pumpkin

See *Calabaza*.

## Quimaque

See *Timacle*.

## Raíz de \_\_\_\_\_

Means “**root** of (plant name)”; look up the plant name following this description of the plant part used.

## Rama de \_\_\_\_\_

Means “**branch** of (plant name)”; this would include the leaves and stem of the plant; look up the plant name which follows this description of the plant part used.

## Ramita de \_\_\_\_\_

Means “**small branch** or **sprig** of (plant name)”; look up the plant name which follows this description of the plant part used.

## Red Onion

See *Cebolla*.

## Remolacha\*

Beets (*Beta vulgaris*).

### Plant Part Used

Root.

### Dominican Medicinal Uses

Eaten raw, juiced or boiled for anemia, cysts, tumor, uterine fibroids.

### Safety

Common food, generally considered safe.

### Laboratory & Preclinical Data

In vivo: anti-inflammatory, anticarcinogenic (plant extract); antidiabetic, antihepatotoxic,

anticarcinogenic, antioxidant, estrogenic, hypoglycemic, influenza-preventative (leaf).

Nutritional: carotenes, fiber, iron (root).

\* See entry for *Remolacha* in “Part 3:

Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Repollo\*

Cabbage (*Brassica oleracea* variety *capitata*).

### Plant Part Used

Leaves (cabbage head), juice from leaves.

### Dominican Medicinal Uses

Leaves: eaten raw, juiced, cooked, as a soup, taken internally for treating obesity, diabetes, heart disease, gynecological conditions (uterine fibroids), intestinal parasites or for nutrition; fresh leaves used externally for wound-healing.

### Safety

Considered safe; widely consumed; shown to be nontoxic in animal studies.

### Contraindications

Thyroid conditions (may interfere with thyroid iodine absorption).

### Drug Interactions

Prothrombopenic anticoagulants (may be antagonized); hypothyroid drugs (may interfere).

### Laboratory & Preclinical Data

In vivo: antitumor, antiulcer (plant extracts).

Nutrition: calcium, vitamins K and U.

\* See entry for *Repollo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Roble\*

Indian bean (*Catalpa longissima*).

### Plant Part Used

Bark.

### Dominican Medicinal Uses

Bark: infusion, orally, for common cold, flu symptoms, menstrual disorders, uterine fibroids, dysmenorrhea and as an abortifacient.

### Safety

Low toxicity shown in animal studies.

### Laboratory & Preclinical Data

In vitro: anti-inflammatory, antinociceptive(plant extracts and constituents); oxytocic, uterine relaxant (leaf decoction).

In vivo: antiulcer (plant extracts).



\* See entry for **Roble** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Sábila\*

Aloe, aloe vera (*Aloe vera*).

### Plant Part Used

Leaf, leaf gel.

### Dominican Medicinal Uses

Leaf gel: applied topically for skin conditions: minor abrasions, burns, cuts, fungal infection, scrapes, sunburn, wound-healing; taken orally for common cold, flu-like symptoms, pulmonary infection.

### Safety

Results of toxicity studies and published literature.

### Contraindications

Internal use: pregnancy, lactation, children under 12 y, individuals with inflammatory intestinal disease.

### Drug Interactions

Internal use: cardiac glycosides, antiarrhythmic drugs (potential potassium loss and intensified drug effect); thiazide diuretics, loop diuretics, licorice, corticosteroids (risk of potassium loss); antidiabetic drugs: (risk of hypoglycemia).

### Clinical Data

Clinical: anesthetic, antiviral, burn-healing, wound-healing (leaf gel).

### Laboratory & Preclinical Data

In vivo: antidiabetic, anti-inflammatory, antiulcer, chemomodulatory, hypothyroid, wound-healing (leaf pulp/gel).

In vitro: antileukemic, antimutagenic, antitumor, cytotoxic, enzyme inhibition (chemical constituents).

\* See entry for **Sábila** in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Sal

**Salt**; used as an ingredient in gargles for sore throat or tonsillitis and as a douche with water for treating vaginal infections.

## Semilla de \_\_\_\_\_

Means “seed of (plant name)”; look up the plant name which follows this description of the plant part used.

## Señora Mueller

**Manufactured herbal preparation** sold at *botánicas* and used for women’s health conditions, including menopause, infertility, vaginal infections, menstrual irregularities and uterine fibroids.

## Sesame

See *Ajonjolí*.

## Siempreviva

See *Bruja*.

## Sopa

**Soup**; many different types of soups can be given as a nourishing food to support the immune system and strengthen the body to facilitate healing.

## Sorosí

See *Cundeamor*.

## Soursop

See *Guanábana*.

## Squash

See *Calabaza*.

## Star anise

See *Anís de estrella*.

## Sweet potato

See *Batata*.

## Tabaco\*

Tobacco (*Nicotiana tabacum*).

**Plant Part Used**

Leaf.

### **Dominican Medicinal Uses**

Leaves: poultice, topically, for wounds, skin infections, bug bites, sinus infection and headache.

### **Safety**

Cases of toxic effects in humans have been reported due to ingestion of the dried leaf or nicotine and excessive exposure to the fresh leaf.

### **Contraindications**

Pregnancy, lactation, children under 5 years.

### **Laboratory & Preclinical Data**

In vitro: acaricidal, antifungal, insecticidal (methanolic leaf extracts); antifungal (seed).

\* See entry for *Tabaco* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Tamarind

See *Tamarindo*.

## Tamarindo\*

Tamarind (*Tamarindus indica*).

### **Plant Part Used**

Fruit pulp, leaf, root, branch.

### **Dominican Medicinal Uses**

Fruit pulp: aqueous extract, orally, for insomnia, hormonal imbalance, hot flashes and night sweats. Leaf, bark, branch: decoction, orally, liver, kidney and prostate disorders and hepatitis.

### **Safety**

Fruit pulp: widely consumed and generally considered safe; fruit or seed pods may contain an irritating, hypoglycemic alkaloid.

Bark/leaves: insufficient information available.

### **Drug Interactions**

Ibuprofen (fruit extract increases bioavailability).

### **Laboratory & Preclinical Data**

In vivo: antidiabetic (seed extract), anti-inflammatory (plant extracts), colonic cell proliferation effects (fruit pulp).

In vitro: antioxidant (plant extract).

\* See entry for *Tamarindo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Té

**Tea**; a simple **infusion** of one or a few herbs; typically 2 teaspoons of dried plant material (1/4 cup if fresh) in 1 cup of water, infused for 10-15 minutes. This term may also refer to a **decoction** which is typically stronger than an infusion and prepared by boiling the plant material in water in a covered pot for an extended period of time.

## Thyme

See *Tomillo*.

## Tilo\*

Linden (*Tilia* species).

### **Plant Part Used**

Flower and attached leaf bract.

### **Dominican Medicinal Uses**

Flower and leaf bract: infusion, orally, for relief from anxiety, insomnia, nervousness, stress; women's health: menorrhagia, uterine fibroids, menopausal hot flashes. Given to children.

### **Safety**

Considered relatively safe; no adverse effects known; if taken in excess or for a long time, may be harmful to the heart.

### **Laboratory & Preclinical Data**

In vivo: antinociceptive, anti-inflammatory (leaf flavonoids); anxiolytic (flower extract).

In vitro: antigenotoxic, antioxidant, GABA<sub>A</sub> receptor inhibition (water plant extract), iron-uptake promoting (flower extract).

\* See entry for *Tilo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Timacle\*

West Indian snowberry (*Chiococca alba*).

### **Plant Part Used**

Root, leaf, flower, aerial parts.

### **Dominican Medicinal Uses**

Root: ingredient in alcohol-based herbal mixtures or strong infusions for genitourinary or sexually transmitted infections, reproductive disorders, respiratory tract infection, cleansing the body internally. Whole plant used as an astringent, diuretic, emetic, emollient.

### **Safety**

Aqueous root extract given at moderate dosages did not show toxic effects although ethanolic root extract showed signs of toxicity in animal studies.

#### **Laboratory & Preclinical Data**

In vivo: anti-inflammatory.

In vitro: antibacterial.

\* See entry for *Timacle* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Timaque

See *Timacle*.

## Tisana

**Strong tea**; an **infusion** or **decoction** of several herbs; slightly stronger or thicker than a simple tea (*té*), meaning that it is often boiled or infused for a longer period of time or combined with thickening ingredients (i.e. molasses, powdered vitamins, honey, etc.). This preparation typically does not contain as many herbs as a *botella* or *bebedizo* which are stronger, more complex preparations. However, interpretations of this term vary, as some consider a *té* and a *tisana* to be the same thing.

## Tobacco

See *Tabaco*.

## Tomillo\*

Thyme (*Thymus vulgaris*).

#### **Plant Part Used**

Leaf, branches.

#### **Dominican Medicinal Uses**

Leaves: infusion, orally, for digestive and gastro-intestinal disorders, cough, upper-respiratory tract infection; bath, externally, for skin conditions.

#### **Safety**

Widely consumed as a culinary seasoning; generally considered safe; potential for allergic reaction.

#### **Contraindications**

Acute urinary tract or gastro-intestinal inflammation: avoid internal use of herb. Severe

skin conditions or injuries, high fevers and heart conditions: avoid whole-body baths.

#### **Laboratory & Preclinical Data**

In vivo: antioxidant (essential oil), liver enzyme activity (leaf constituents).

In vitro: antibacterial (essential oil, plant extracts), antifungal (essential oil), anti-inflammatory (plant extracts), antioxidant (leaf extract), anti-platelet aggregant (leaf constituents), antiprotozoal (essential oil), antispasmodic (plant and ethanol extract), spasmolytic (flavonoids).

\* See entry for *Tomillo* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Tope-tope

See *Bruja*.

## Toronja\*

Grapefruit (*Citrus × paradisi*).

#### **Plant Part Used**

Fruit.

#### **Dominican Medicinal Uses**

Fruit: juice, orally, for diabetes, constipation, indigestion and intestinal obstruction.

#### **Safety**

Fruit and juice are widely consumed and generally considered safe.

#### **Drug Interactions**

Cytochrome P450-metabolized drugs (may inhibit potency or potentiate activity).

#### **Laboratory & Preclinical Data**

In vivo: anticancer, chemopreventive (essential oil); anti-ulcer, gastroprotective (seed extract).

In vitro: inhibition of acetylcholinesterase activity (essential oil), inhibition of cytochrome P450 enzymes (fruit juice).

\* See entry for *Toronja* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Trementina

**Turpentine**; used in energetic cleansing and spiritual healing practices; derived from pine trees; known eye, mucous membrane and skin irritant; toxic if inhaled in large amounts or

ingested; central nervous system depressant; can cause convulsions.

## Tuna

See *Alquitira*.

## Uña de gato\*

Cat's claw (*Uncaria tomentosa*).

### Plant Part Used

Inner bark, stem, root.

### Dominican Medicinal Uses

Bark, root, stem: infusion or multi-herb tincture, orally, for arthritis, cancer, diabetes, kidney disorders, leukemia, obesity and women's health.

### Safety

No toxicity shown in clinical and animal studies; long-term use may affect hormone levels.

### Contraindications

Pregnancy, lactation; autoimmune disorders or implanted organs (immune stimulating properties).

### Drug Interactions

Anticoagulants, antiplatelet and thrombolytic agents and low molecular weight heparins (potential risk of excessive bleeding); immunosuppressants (may interfere with drug); P450 3A4-metabolized drugs (potential inhibition).

### Clinical Data

Clinical: DNA repair, immune enhancement, immunostimulant, rheumatoid arthritis treatment (bark extract).

### Laboratory & Preclinical Data

In vivo: anti-amnesic (alkaloids), anti-inflammatory, antioxidant, antimutagenic, antinociceptive, DNA repair, immune enhancement, immunomodulatory (plant extracts).

In vitro: anticancer, anti-inflammatory, antimutagenic, antioxidant, antitumor, antiviral, cytoprotective, immunomodulatory (bark or leaf extracts).

\* See entry for *Uña de gato* in "Part 3: Dominican Medicinal Plant Profiles" of this book for more information, including references.

## Vapór

**Steam**; making a decoction of herbs and using the steam from the decoction for inhalation or for moistening and healing the skin, often used to treat sinus infections, congestion, or skin conditions.

## Verbena\*

Porterweed (*Stachytarpheta jamaicensis*).

### Plant Part Used

Aerial parts: leaf, stem, flower.

### Dominican Medicinal Uses

Leaf: tea, orally, for indigestion, flatulence, diarrhea, anxiety, nervousness, stress and menopausal symptoms and to cleanse the blood.

### Safety

Animal studies show low to moderate toxicity; leaves considered relatively atoxic.

### Laboratory & Preclinical Data

In vivo: analgesic, antioxidant, antispasmodic, hypotensive, hypertensive (plant/leaf extracts).  
In vitro: antioxidant, antispasmodic, insecticidal, nematocidal, spasmogenic (plant/leaf extracts).

\* See entry for *Verbena* in "Part 3: Dominican Medicinal Plant Profiles" of this book for more information, including references.

## Vinagre blanco

**White vinegar**; sometimes used as a gargle for treating sore throat and tonsillitis, combined with *bicarbonato de sodio* (baking soda); it is said to have a drying effect on the tonsils when used this way; vinegar is also used as a douche for treating vaginal infections, urogenital inflammation and menstrual disorders.

## Watercress

See *Berro*.

## Wormseed

See *Apasote*.

## Yerba buena

See *Hierbabuena*.

## Yerba mora

See *Hierba mora*.

## Zanahoria\*

Carrot (*Daucus carota*).

### Plant Part Used

Root.

### Dominican Medicinal Uses

Root: juice, orally, for diabetes, anemia, cancer, improved vision, tumors, uterine fibroids, menopausal hot flashes, nourishment, to strengthen the blood, diarrhea, stomach ailments, gastrointestinal inflammation and liver disorders.

### Safety

Generally considered safe; root is widely consumed.

### Clinical Data

Human clinical trials: antioxidant, colonic motility, dental caries, hypocholesterolemic (root).

### Laboratory & Preclinical Data

In vivo: hepatoprotective (root).

In vitro: antibacterial, antispasmodic, antitumor (seed extract or constituents), antioxidant, carotene bioavailability, hormonal effects (root).

Nutrition: vitamin A precursors.

\* See entry for *Zanahoria* in “Part 3: Dominican Medicinal Plant Profiles” of this book for more information, including references.

## Zumo de \_\_\_\_\_

Typically means “**fresh juice** of (plant name)”; can also refer to the seed oil of a plant. Look up the plant name which follows this description of the plant preparation used. To prepare a *zumo*, the fresh or raw plant part used (whether a fruit, leaf, root, seed or entire plant) is squeezed, liquefied in a blender or juicer or grated and strained to extract its juice. This preparation may be administered orally or topically.

## **PART 3**

### **MEDICINAL PLANT MONOGRAPHS: BOTANICAL SPECIES USED MEDICINALLY BY DOMINICAN IMMIGRANTS IN NEW YORK CITY**

Herb profiles are listed in alphabetical order according to the most frequently reported Spanish common name based on ethnomedical interviews.

# Aguacate

## OTHER COMMON NAMES

*Hojas de aguacate* (Spanish); avocado (English).

## SCIENTIFIC NAME

*Persea americana* Mill. [Lauraceae (Laurel Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Abortifacient
- Arthritis
- Diabetes
- Diarrhea
- Intestinal parasites
- Intestinal worms
- Menstrual cramps (dysmenorrhea)
- Vaginal infections

**Plant Part Used:** Leaves, seed and fruit.

**Traditional Preparation:** The leaves are typically prepared as a tea. To prepare an infusion, a handful of leaves are steeped in 8 oz boiling water for 15-20 minutes; a small cupful (roughly 2 oz) is taken orally 2-3 times daily. The seed may be crushed or pulverized and ingested or boiled in water as a decoction. The fruit is highly nutritious and commonly eaten raw.

**Traditional Uses:** The leaves of *aguacate morado* (the dark-skinned variety) are used for arthritis and menstrual cramps. The seed is described as a bitter herbal remedy that is sometimes perceived to be poisonous and has been used for contraception. The leaves are sometimes combined with sweet orange (*naranja*) leaves when prepared as a tea or an infusion.

**Availability:** In New York City, *aguacate* fruits are sold in grocery stores and neighborhood markets (*bodegas*). The dried leaves are often available at *botánicas* that sell herbal remedies.

## BOTANICAL DESCRIPTION

*Aguacate* (*Persea americana*) is a tropical evergreen tree or shrub that can grow 20-30 m tall. Leaves of this tree grow in an alternate pattern and are simple, narrow, elliptical and pointed (10-20 cm long). Flowers are small and light green. Fruits are pear-shaped with glossy green or purple skin and contain light green or yellowish flesh of a buttery consistency with a single large, inedible seed (Bailey Hortorium Staff 1976).

**Distribution:** The range of this tree extends throughout tropical America, most likely originating in Central and South America, and it is cultivated widely in the Caribbean (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

*Agavacate* fruit is a highly nutritious food that is widely consumed and generally regarded as safe. Avocado oil has no known harmful side effects and is considered safe for use according to standard dosages (Gruenwald et al. 2004). Studies on the effects of the fruit and oil in humans have been conducted (see “Clinical Data” section below); however, no human clinical trials of the leaf, which is the part most often used as an herbal remedy, have been identified in the literature. Hypersensitivity to avocado has been correlated with allergic reactions to latex, chestnut and banana (Blanco et al. 1994).

***Animal Toxicity Studies:*** The fresh leaf (20 g/kg body weight) fed to lactating goats caused damage to the mammary glands and reduced milk production (Craigmill et al. 1989). Cases of poisoning due to ingestion of avocado leaves have been reported in goats (Stadler et al. 1991, Grant et al. 1991). Multiple varieties of the fresh leaf administered orally to sheep at variable dosages showed clinical signs of respiratory and cardiac distress and caused cardiomyopathy and myocardial lesions as revealed in autopsy (Grant et al. 1991). The LD<sub>50</sub> in mice of the dry plant material (fruit and leaf) administered orally is 12.5 g/kg (Herrera 1988). The fruit and leaf (50% of each) prepared as an aqueous decoction (boiled for 10 minutes) and neutralized to pH7, given to mice orally and intraperitoneally for 10 days and administered to mice orally for 30 days at quantities of 25, 50 and 75% of the LD<sub>50</sub> showed low toxicity. The LD<sub>50</sub>=12.5 g (dry plant)/kg orally and 8.828 g/kg intraperitoneally (Herrera 1988).

***Contraindications:*** Internal use of the leaves is contraindicated for pregnant women due to emmenagogue and uterine muscle stimulating effects (Herrera et al. 1986). The leaves are also contraindicated during lactation because of potentially harmful effects based on case reports in goats (Craigmill et al. 1989). No information on the safety of the leaves in children has been identified in the available literature.

***Drug Interactions:*** Ingestion of large amounts of avocado (fruit) has been shown to inhibit Warfarin’s anticoagulant effect (Wells et al. 1994). One case of a hypertension crisis in an individual who had ingested the fruit while concomitantly taking monoamine-oxidase inhibiting (MAOI) medication has been reported (Germosén Robineau 2007).

## SCIENTIFIC LITERATURE

No clinical trials of the leaf or leaf extracts have been identified in the available literature; however, the fruit has been shown to lower total cholesterol levels and is recommended for dyslipidemia and hypercholesterolemia. An avocado-enriched diet has shown glycemic control and plasma lipid triglycerol-lowering effects in patients with non-insulin dependent diabetes mellitus. Avocado and soy unsaponifiables have been shown to alleviate pain, decrease use of painkillers and reduce joint space loss. A cream containing the oil was well-tolerated and showed long-term beneficial effects in the treatment of plaque psoriasis (see “Clinical Data” table below). In preclinical and laboratory studies, the following effects of this plant have been shown: analgesic, anti-inflammatory, antihemorrhage, anticancer, hepatoprotective, macrophage-stimulating, uterine muscle stimulant, trypanocidal and vasorelaxant (see “Laboratory and Preclinical Data” table below).

Major chemical constituents include the following: the leaf contains volatile oil, flavonoids and coumarins; the fruit contains sesquiterpenes and carbohydrates; the seed contains fixed oil consisting of vitamin A, D-3, alpha tocopherol and cholesterol (Germosén-Robineau 2005). The fruit is a significant source of protein, monounsaturated fatty acids, vitamin A, thiamin, riboflavin, niacin, vitamin B6, vitamin C, vitamin E, folate, vitamin K, pantothenic acid, magnesium, manganese, phosphorus and the amino acids tryptophan, valine, tyrosine, threonine, phenylalanine and methionine (US Department of Agriculture 2006).

***Indications and Usage:*** TRAMIL has classified this herb as REC meaning “RECommended” specifically for its use in treating amenorrhea (based on demonstrated significant documented traditional use, low toxicity and demonstrated pharmacological activity) and for asthma, bronchitis, flatulence, urinary



infections and cough (based on significant documented traditional use and low toxicity; Germosén-Robineau 2007). The recommended dosage, as determined by TRAMIL, is an aqueous decoction of 3 spoonfuls (20 grams) of the crushed or pulverized leaf in 4 cups (1 liter) of water, administered in doses of half to 1 cup, 3-4 times daily (Germosén-Robineau 2007).

### **Clinical Data: *Persea americana***

<b><i>Activity/Effect</i></b>	<b><i>Preparation</i></b>	<b><i>Design &amp; Model</i></b>	<b><i>Results</i></b>	<b><i>Reference</i></b>
<b>Cholesterol- &amp; lipid lowering</b>	Fruit ingested	13 patients with phenotype II dyslipidemia; prospective, transversal & comparative clinical study; random assignment of 4-wk diets: vegetarian, vegetarian & avocado vs. free diet with avocado	Reduced triglyceride & high density lipoprotein cholesterol serum levels	Carranza-Madrigal et al. 1997
<b>Cholesterol-lowering</b>	Fruit ingested; diet comparison: avocado-enriched diet (high in monounsaturated fatty acids) vs. high complex carbohydrate diet	Randomized trial; 15 females (age 37-59 yrs); duration of each dietary phase: 3 wks	Both diets showed decreased in total cholesterol levels; avocado-enriched diet more effective & also decreased low-density-lipoprotein cholesterol & apolipoprotein B; carbohydrate diet decreased high-density lipoprotein concentrations whereas they remained the same in avocado diet	Colquhoun et al. 1992
<b>Lipid-lowering</b>	Avocado ingested in rich monounsaturated fatty acid (RMF)-low saturated-fat diet; also added to free diet (FME) compared w/low-saturated fat (LSF) diet w/o avocado	Randomized 3-diet trial; 16 healthy volunteers; diet duration: 2 wks	RMF & LSF diets reduced plasma total cholesterol & low-density lipoprotein levels; plasma levels of triacylglycerol were significantly reduced in RMF & FME diets but increased in LSF diet; avocado-enriched diet recommended for preventing hyperlipidemia	Alvizouri-Munoz et al. 1992

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Treatment of non-insulin dependent diabetes mellitus (NIDDM)</b>	Fruit ingested in controlled diet (2 isocaloric diets: one rich in oleic acid from avocado & olive oil, the other rich in complex carbohydrates)	Randomized crossover study; 4 wks baseline period & 4-wk on each diet w/4 wks washout period btw diets; 12 women with NIDDM	Avocado diet decreased postprandial serum triglyceride levels more than complex carbohydrate diet; both diets had similar effects on glycemic control; avocado-enriched diet recommended for management of NIDDM	Lerman-Garber et al. 1994
<b>Treatment of osteoarthritis</b>	Avocado/soybean unsaponifiables; one capsule per day	Prospective, randomized, double-blind, placebo-controlled, parallel-group trial; 163 patients w/primary femorotibial or hip osteoarthritis; duration: 3 mo	Reduced analgesic & nonsteroidal anti-inflammatory drug (NSAID)-use; pain scores remained similar in placebo & treatment groups on visual analog scale pain score & functional index; treatment shown to be safe for human use	Blotman et al. 1997
<b>Treatment of osteoarthritis</b>	Avocado/soybean unsaponifiables; 300 mg or 600 mg dosage	Double blind, prospective, placebo-controlled study; duration: 3 mo; male & female patients with femoro-tibial knee osteoarthritis	Significant improvement of all efficacy parameters; decreased intake of analgesics by 50% & 71%; both dosages consistently performed superior to placebo without detectable differences between doses	Appelboom et al. 2001
<b>Treatment of osteoarthritis</b>	Avocado/soybean unsaponifiables; duration: 6 mo w/2 mo follow-up after treatment; pre-trial 15-day washout period for NSAIDs	Prospective, double-blind, randomized, placebo-controlled, parallel-group trial; 164 patients symptomatic of primary osteoarthritis (of the knee & hip) w/regular pain	Significant decrease in pain, slight decrease in NSAID consumption, reduced overall functional disability (particularly for hip osteoarthritis); effect was persistent post-treatment	Maheu et al. 1998
<b>Treatment of osteoarthritis</b>	Avocado & soybean unsaponifiables	Randomized, parallel group, double-blind, placebo-controlled trial (2 yrs duration; 108 symptomatic patients with pain & loss of joint space)	Joint space loss progression was significantly reduced (in post-hoc analysis in subgroup of patients with advanced joint space narrowing); results may be due to structural effect	Lequesne et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Treatment of plaque psoriasis</b>	Vitamin B(12) cream containing avocado oil; applied topically; compared with calcipotriol	Randomized, prospective clinical trial; intraindividual right/left-side comparison (13 patients with chronic plaque psoriasis; observed for 12 wks)	Long-term beneficial effects shown; therapy was well-tolerated	Stucker et al. 2001
<b>Triglyceride-lowering</b>	Ingestion of fruit in diet of restricted saturated fat & increased carbohydrates	Crossover diet trial; patients w/8 phenotype IV & II; two-diet trial: monounsaturated fatty acid-rich diet w/avocado vs. low-saturated fat diet without avocado (4 wks duration/diet)	Avocado diet showed mild lowering of triglyceride levels whereas low-saturated fat diet increased triglyceride levels; avocado increased HDL-cholesterol concentrations; avocado shown to be a good source of monounsaturated fatty acids	Carranza et al. 1995

### **Laboratory and Preclinical Data: *Persea americana***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic &amp; anti-inflammatory</b>	Aqueous leaf extract	In vivo: rodent; acetic acid writhing, hot plate pain threshold & paw edema tests	Active; showed dose-dependent effects in all tests	Adeyemi et al. 2002
<b>Antihemorrhage</b>	Ethanollic, ethyl acetate & aqueous extracts	In vivo: mouse bioassay with hemorrhaging activity caused by <i>Bothrops asper</i> snake venom	Active; showed total inhibition of hemorrhage	Castro et al. 1999
<b>Antiproliferative</b>	Acetone plant extract	In vitro: androgen-dependent & -independent prostate cancer cell lines	Active; inhibited cancer cell growth; effect attributed to lipid-soluble carotenoids	Lu et al. 2005
<b>Hepatoprotective</b>	Fruit	In vivo: rats with liver damage induced by liver toxin (D-galactosamine)	Active; showed remarkably potent liver injury-suppressing activity; active compounds isolated	Kawagishi et al. 2001
<b>Immuno-modulating</b>	Fruit water extract	In vitro	Active; showed macrophage stimulating activity	Miwa et al. 1990
<b>Trypanocidal (against agent of Chagas disease)</b>	Methanolic seed extract	In vitro: against <i>Trypanosoma cruzi</i>	Showed moderate activity against epimastigotes of <i>Trypanosoma cruzi</i>	Abe et al. 2005

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Uterine stimulant</b>	Aqueous decoction (steeped for 10 min) of fruit and leaf	In vitro using the isolated uterus of mice (from animals in estrus)	Significant stimulation of uterine muscle exhibited at a dosage of 16.66 mg plant/mL H <sub>2</sub> O	Herrera 1986
<b>Vasorelaxant</b>	Leaf extract (aqueous)	In vitro: isolated rat aorta	Active; showed significant vasorelaxant effect	Owolabi et al. 2005

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# Ají

## OTHER COMMON NAMES

*Ají caballero, ají caribe, ají dulce, ají de gallina, ají jobito* (Spanish); pepper, chili pepper, cayenne, paprika (English).

## SCIENTIFIC NAME

*Capsicum annuum* L., *C. frutescens* L., *C. chinense* Jacq. and varieties [Solanaceae (Nightshade Family)].

**Note:** Due to the wide variation in cultivars of each of these species, their tendency to hybridize and difficulty in distinguishing between subspecies in commerce, these plants are grouped together under the same common name. However, particular varieties do have distinct common names and are often associated with unique properties (i.e. pungency, color, size, culinary uses, etc.).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Abscesses
- Boils (*nacíos*)
- Furuncles (*forínculos*)
- Menstrual cramps (dysmenorrhea)
- Skin infections
- Sores

**Plant Part Used:** Leaf, fruit (fresh or dried).

**Traditional Preparation:** For skin conditions and dermatological infections, the leaves are heated and applied externally to the affected area as a poultice. For menstrual cramps and symptoms related to dysmenorrhea, the leaves are prepared as a tea by decoction or infusion.

**Traditional Uses:** Most commonly known for treating infections of the skin, the specific dermatological conditions for which this plant is used include boils (*nacíos*), sores or abscesses (*llagas*) and furuncles or staphylococcal infections of hair follicles (*forínculos*); the leaves are prepared by heating them and applying them to the affected area. Chili peppers, the fruits of this plant, are considered hot and spicy condiments that are said to warm the body and are often added to nutritious, healing soups.

**Availability:** As a popular culinary seasoning, this plant is commonly available for purchase at grocery stores and supermarkets. Particular varieties from Latin American countries are sometimes sold at *bodegas* or open-air markets.

## BOTANICAL DESCRIPTION

*Ají* (*Capsicum annuum*) is an upright, shrubby annual or perennial herb, 20-100 cm in height, with many branches. Leaves grow in an alternate pattern along stems and are narrowly-oval to lance-shaped (3-13 cm long) with smooth leaf-edges. Flowers grow singly at nodes along the stem and have 5-pointed petals arranged in a star-like shape that are whitish to cream or purple in color and fused together at the base (1.5 cm across). Fruits are pod-like berries with tough, leathery skins that can be deeply grooved or pitted, contain numerous circular or kidney-shaped seeds and change from green to red, orange or yellow when ripe; shape, color, size and pungency vary considerably between cultivars (Bailey Hortorium Staff 1976).

**Distribution:** Native to tropical America with a range that extends from southern United States and Mexico to Colombia, this plant is cultivated widely in warm regions for its spicy peppers (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No data on the safety of the leaves in humans (either applied topically or taken internally) has been identified in the available literature. The fruits of *Capsicum* spp. are used widely as a foodstuff and culinary seasoning; however, when particular cultivars (especially cayenne) are taken in excess or for a prolonged duration, they can cause severe adverse reactions. Possible negative side effects of external use of cayenne include the following: skin irritation (sensations of burning or stinging and redness of the skin), especially of the eyes or mucous membranes if accidentally contacted and blistering. These negative effects usually subside within 3 days of initiating regular topical treatment and are lessened by applying no more than 3-4 times daily (Bernstein et al. 1989).

When taken internally, potential adverse effects include: increased gastrointestinal peristalsis resulting in diarrhea, intestinal discomfort and gallstone colic (Gruenwald et al. 2004). In a case-control study of 972 persons in Mexico, high consumption of cayenne peppers as food correlated with increased risk of gastric carcinoma (Lopez-Carrillo et al. 1994); however, another study concluded that low doses of cayenne may be anti-carcinogenic (Surh et al. 1995). Should over dosage occur, life-threatening hypothermia can result from the effect of this herb on thermoreceptors; over extended periods, high doses of the herb can lead to chronic gastrointestinal disorders, kidney or liver damage and neurotoxic effects (Gruenwald et al. 2004). Contact dermatitis from direct handling of chili peppers has been reported (Williams et al. 1995).

**Animal Toxicity Studies:** *Capsicum annuum* leaves: Topical administration of the fresh leaves (0.6 g plant material in hot vegetable oil) to the shaved skin (6 cm<sup>2</sup> patch) of three female New Zealand rabbits in the Draize's test showed no signs of edema or erythema during a 72 hour observation period (Martinez et al. 2005a). In Wistar rats, topical application of the fresh leaves (0.6 g plant material) in hot oil to the shaved skin (4 × 3 cm) for 24 hours did not show any signs of mortality or adverse effects during a 14 day observation period (Martinez et al. 2005b).

*Capsicum frutescens* aerial parts: Intraperitoneal administration of the hydroalcoholic extract (1:1) of the aerial parts in mice showed an LD<sub>50</sub> = 0.375 g/kg (Dhawan et al. 1977). *Capsicum* spp. fruit: In mice fed a control diet versus ground red chili mixed into their diet (at levels of 0.5, 1.0, 2.5, 5.0, 7.5 and 10% by weight) for four weeks, no adverse effects were observed on general health, body weight and food intake although slight glycogen depletion and anisocytosis of hepatocytes was detected in the 10% group. This study concluded that chili is relatively non-toxic at the doses tested (Jang et al. 1992).

**Contraindications:** Not to be applied to open wounds or the eyes or to be inhaled directly. Should not be taken internally by patients with stomach ulcers, gastric inflammation, irritable bowel syndrome and gastrointestinal or renal disorders (Palevitch & Craker 1993, Gruenwald et al. 2004). No information on the safety of the fruit or the leaves in children or during pregnancy or lactation has been identified in the available literature.

**Drug Interactions:** Caution is advised due to *Capsicum* species' potential inhibition of hepatic microsomal enzymes which may potentiate drugs metabolized by these enzymes, including the nifedipine group (Germosén-Robineau 2007). Barbiturates: concomitant use of hexobarbital and the dried fruit of *Capsicum frutescens* (dose: 200.0 mg/kg administered intraperitoneally and intragastrically) showed barbiturate potentiation and prolonged sleeping time in mice (Han et al. 1984). Aspirin and salicylic acid compounds: bioavailability reduced when taken concurrently (100 mg capsaicin per gram of extract) due to gastrointestinal effects (Cruz et al. 1999). Angiotensin-converting enzyme (ACE) inhibitors: associated with cough (Hakas 1990, O'Hollaren & Porter 1990). Anticoagulants, antiplatelet agents, thrombolytic agents and low molecular weight heparins: concurrent use may increase risk of bleeding; barbiturates: until clinical significance of interaction is determined, discourage concomitant use of capsaicin. Theophylline: caution is advised and symptoms of possible theophylline toxicity should be closely monitored (Gruenwald et al. 2004).

## SCIENTIFIC LITERATURE

Clinical trials have shown the following effects: analgesic (in treating post-herpetic neuralgia, applied topically), carotenoid bioavailability enhancement, gastroprotective, swallowing dysfunction treatment and urinary incontinence treatment. The bioavailability of carotenoids from the fruit has also been studied. Laboratory and preclinical studies have demonstrated the following activities: antimicrobial, antioxidant, antitumor, chemopreventive, learning enhancement and renoprotective (see "Clinical Data" and "Laboratory and Preclinical Data" tables below).

The majority of published scientific literature on this plant has focused on cayenne which is one particular variety of this species that is commonly used for medicine. None of the studies identified evaluated the biological activity of the leaves (the part of the plant most commonly used by Dominicans in New York City); instead, available research focuses on extracts of the fruit. Major chemical constituents of the fruit include: capsaicin (trans-8-methyl-N-vanillyl-6-nonenamide; Bernstein et al. 1987). The fruit (red bell pepper variety, raw) is a significant source of folate, iron, potassium and vitamins A, B6, C and K (U.S. Department of Agriculture 2006).

**Indications and Usage:** Topical use of the leaf for skin boils and ganglion inflammation has been designated "REC" meaning "RECommended" due to its significant traditional use in the Caribbean as reported by TRAMIL surveys (Germosén-Robineau 2007). Cayenne, one variety of *Capsicum annum*, has been approved by the German *Commission E* for muscular tension and rheumatism (Blumenthal et al. 1998). Use should be limited to 2 days duration, only to be used again after 2 weeks.

**Caution:** Hands should be washed immediately after handling (unless treating the hands) to avoid accidental contact with the eyes or mucous membranes which can be highly irritating. When used externally as a cream, capsaicin content should be no more than 50 mg in 100 g neutral base, not to be applied more than 3-4 times daily; tincture (1:10); taken internally, 2 cups of tea per day (Gruenwald et al. 2004).



### Clinical Data: *Capsicum* spp.

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic</b>	Capsaicin cream vs. placebo—cream vehicle (6 wks duration)	Double-blind clinical trial: 32 elderly patients with chronic postherpetic neuralgia	80% pain relief based on visual analogue scales & clinical evaluation	Bernstein et al. 1989
<b>Analgesic</b>	Capsaicin cream applied topically for 4 wks	Preliminary clinical trial: 12 patients with postherpetic neuralgia	75% experienced significant pain relief; 1 adverse reaction: burning sensation	Bernstein et al. 1987
<b>Analgesic</b>	Capsaicin cream (0.075%)	Double-blind, vehicle-controlled trial: 143 patients w/chronic postherpetic neuralgia; long term open-label follow-up for up to 2 y	Showed significant improvement; recommended as a safe & effective treatment for pain due to postherpetic neuralgia	Watson et al. 1993
<b>Carotenoid bioavailability enhancement</b>	Paprika oleoresin containing: 6.4 mg zeaxanthin, 4.2 mg beta-cryptoxanthin, 6.2 mg beta-carotene, 35.0 mg capsanthin & 2.0 mg capsorubin	Clinical trial: human volunteers (n=9); ingested single dose after fasting overnight	Measured carotenoid presence in human chylomicrons; determined to be an adequate source of provitamin A carotenoids beta-carotene & beta-cryptoxanthin & the macular pigment zeaxanthin	Perez-Galvez et al. 2003
<b>Gastroprotective</b>	Capsaicin (1-8 µg/mL, 100 mL); intragastric administration	Randomized controlled clinical trial: 84 healthy human subjects with ethanol- & indomethacin-induced gastric mucosal damage	Co-administration of capsaicin w/gastric mucosal irritant protected against microbleeding; mechanism attributed to sensory nerve ending stimulation	Mozsik et al. 2005
<b>Swallowing dysfunction treatment</b>	Capsaicin troche; daily with meals for 4 wks	Randomized controlled clinical trial: 64 participants in nursing homes (age 81.9 ± 1.0)	Significantly improved protective upper respiratory reflexes	Ebihara et al. 2005
<b>Urinary incontinence treatment</b>	Capsaicin (100 mL) in glucidic solvent; intravesical instillation vs. placebo of glucidic solvent only	Double blind, randomized placebo-controlled clinical trial: 33 patients with neurogenic detrusor overactivity (NDO); evaluated on days 0, 30 & 90	Showed short-term efficacy over placebo; treatment was well-tolerated overall; adverse effect of temporary pubic pain upon instillation	De Seze et al. 2006

### Laboratory and Preclinical Data: *Capsicum* spp.

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Heated aqueous extract & 2 isolated compounds: capsaicin & dihydrocapsaicin	In vitro: filter disk assay; <i>Bacillus cereus</i> , <i>Bacillus subtilis</i> , <i>Clostridium sporogenes</i> , <i>Clostridium tetani</i> & <i>Streptococcus pyogenes</i>	Exhibited varying degrees of inhibition	Cichewicz & Thorpe 1996
<b>Antioxidant</b>	<i>Capsicum</i> spp. at different stages of maturity; pepper juice models tested in vitro	In vitro & phytochemical analysis of carotenoids, flavonoids, phenolic acids & ascorbic acid levels	Concentration of antioxidant chemical constituents increased with maturity; combined with caffeic & ascorbic acid showed additive or competitive peroxy radical scavenging ability	Howard et al. 2000
<b>Antioxidant</b>	Isolated capsaicin derivative	In vitro	Demonstrated the same antioxidant activity as capsaicin without the pungent taste	Ochi et al. 2003
<b>Learning enhancement</b>	20% (w/w) lyophilized fruit powder; dietary	In vivo: senescence-accelerated mice (SAMP8)	Showed improved acquisition in passive avoidance tasks	Suganuma et al. 1999
<b>Renoprotective &amp; antioxidant</b>	Capsaicin (dietary antioxidants); 10 mg/kg/d by gavage	In vivo: rats with cisplatin-induced nephrotoxicity	Significantly reduced lipid peroxidation & nephrotoxicity	Shimeda et al. 2005

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# Ajo

## OTHER COMMON NAMES

Garlic (English).

## SCIENTIFIC NAME

*Allium sativum* L. [Liliaceae (Lily Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Arthritis
- Common cold
- Cough
- Diabetes
- Flu
- High blood pressure
- High cholesterol
- Indigestion
- Sinusitis
- Skin fungal infections
- Sore throat
- Stomach ache and abdominal pain

- Upper or lower respiratory tract infections

**Plant Part Used:** Bulb (*cabeza*) or cloves (*dientes*)—fresh, dried, powdered or extracted in oil.

**Traditional Preparation:** To make a thick syrup or *botella* for treating upper or lower respiratory tract infections, the fresh bulb is chopped and combined with honey, lime/lemon (*limón*) and/or aloe vera (*sábila*) gel. This mixture is kept in the refrigerator and is administered by the spoonful as needed, approximately 2-3 tablespoons per day (Yukes et al. 2007).

**Traditional Uses:** For high blood pressure, raw garlic can be eaten, prepared as a tea or combined with orange juice and taken as a drink. Fresh cloves of garlic are used to treat upper or lower respiratory tract infections such as cold, flu, sore throat and cough. A tea can be prepared to alleviate stomach ache, abdominal pain, upset stomach or indigestion using garlic cloves and/or skins (*cáscara*), sometimes combined with star anise (*anis de estrella*) and anise (*anis*). This plant is also used for arthritis, diabetes and high cholesterol as a tea prepared by infusion or decoction. For sinusitis, *ajo* is extracted in gin (*jinebra*) and taken internally to clear up the nasal passages. For fungal skin infections (*hongos*), the fresh bulb is crushed and applied topically to the affected area.

## BOTANICAL DESCRIPTION

*Ajo* (*Allium sativum*) or garlic is a strongly-scented, perennial herb that grows to 100 cm in height. The bulb of this plant, which is used as a culinary seasoning, is actually a cluster of smaller bulbs, each of which is commonly called a clove (in English) or a *diente* (in Spanish, literally “tooth”). Leaves are straight, narrow, long and lance-shaped. Flowers are numerous and small with reddish to greenish-white petals (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to the Northern Hemisphere, most likely originating in Central or South Asia and is cultivated widely for culinary purposes (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

The most commonly reported undesirable side effects of *ajo* include garlic breath and odor and gastrointestinal difficulties such as belching, gas and constipation (Stevinson et al. 2000; Gardner et al. 2001). Other adverse effects associated with garlic reported in the literature include headache, burns, nausea, anaphylaxis, anticoagulation, myalgia, fatigue and vertigo (Holzgartner 1992) as well as gastrointestinal upset, disturbance of intestinal flora and allergic reactions such as contact dermatitis and asthma (Courturier & Bousquet 1982). When used externally, there have been numerous reports (particularly in young children) of irritation, necrosis and burning of the skin; however, these cases mostly involve extremely prolonged exposure (several hours or even days; cases with children: Parish et al. 1987, Garty 1993; cases with adults: Roberge et al. 1997, Farrell and Staughton 1996).

**Contraindications:** It is recommended that garlic not be taken medicinally for 10 days prior to surgery as its antiplatelet activity may increase risk of excessive bleeding (German et al. 1995); also, not to be taken therapeutically while breastfeeding (Gruenwald et al. 2004).

**Drug Interactions:** Concomitant use of garlic and the following drugs may result in herb-drug interactions: anticoagulants, antiplatelet agents, low molecular weight heparins, thrombolytic agents (due to potential for excessive bleeding; Gruenwald et al. 2004); chlorzoxazone (reduced drug metabolism; Gurley et al. 2002); indomethacin and NSAIDs (potential for excessive bleeding; Gruenwald et al. 2004); protease inhibitors, including saquinavir (may reduce blood levels of drug; Piscitelli et al. 2002). Garlic may also inhibit the efficacy of drugs that are metabolized through cytochrome P450 2E1 (Gurley et al. 2002) and potentiate the effects of forskolin (*Coleus forskoli*; due to risk of excessive bleeding; Apitz-

Castro et al. 1986; Gruenwald et al. 2004). Caution is advised during concomitant use and if both are administered together, patients should be monitored for signs of adverse effects due to drug interactions.

## SCIENTIFIC LITERATURE

Numerous clinical trials have demonstrated *ajo*'s therapeutic activity as a hypocholesterolemic, hypolipidemic and antihypertensive agent, and studies have supported its use as an antianginal, antiatherosclerotic, antiplatelet and hypotensive agent and as a treatment for the common cold and coronary artery disease (see "Clinical Data" table below). Preclinical laboratory and animal studies have demonstrated the following effects of *ajo*: anticarcinogenic, antihypertensive, antinociceptive, antioxidant, antithrombotic, cytochrome P450 inhibition, hypoglycemic and immunomodulatory (see "Laboratory and Preclinical Data" tables below). Evidence suggests that eating fresh garlic may be the most therapeutic way to use this herb because one of its most active constituents, allicin, loses its potency when heated (Gruenwald et al. 2004).

Major chemical constituents include the active compounds allicin and garlicin. Fresh garlic is a significant source of calcium, isoleucine, manganese, selenium, valine and vitamins B6 and C (U.S. Department of Agriculture 2006).

**Indications and Usage:** *Allium sativum* is approved by the German *Commission E* for use as a supportive therapy or preventive agent for arteriosclerosis, hypertension and high cholesterol, administered as minced fresh bulb, dried and powdered bulb, oil or other preparations made from the fresh bulb. Daily dosage is 4 g fresh garlic (Blumenthal et al. 1998).

### Clinical Data: *Allium sativum*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antianginal</b>	Intravenous garlicin (60 mg/day)	Randomized, controlled clinical trial (n=34): duration: 10 days; patients with peripheral artery occlusion disease; control: nitroglycerine (n=21)	Significant improvement in electrocardiogram (62%) & symptoms; lowered blood sugar & plasma endothelin levels	Li et al. 2000
<b>Anti-atherosclerotic</b>	900 mg powder daily	Randomized, double-blinded, placebo-controlled clinical trial: 152 participants; duration: 48 mo	Significant reduction in plaque volume; results suggest possible curative role in plaque regression	Koscielny et al. 1999
<b>Antihypertensive</b>	Garlic tablet (Garlet); 800 mg/day	Randomized, single-blinded, placebo-controlled clinical trial (n=100): during 3 <sup>rd</sup> trimester of pregnancy	Reduced incidence of hypertension but not preeclampsia in nulliparous pregnant women	Ziaei et al. 2001
<b>Antiplatelet</b>	Aged garlic extract (AGE); 2.4 & 7.2 g/d vs. equal doses of placebo	Randomized, double-blind, placebo-controlled crossover study (n=34; duration: 44 wks)	Showed selective inhibition of platelet aggregation & adhesion	Steiner & Li 2001

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Common cold treatment &amp; prevention</b>	Allicin-containing garlic extract; 1 capsule daily	Randomized, double-blinded, placebo-controlled study (n=146): duration: 12 wks	Shown to prevent incidence of common colds, reduced recovery time & alleviated symptoms	Josling 2001
<b>Coronary artery disease (CAD) treatment</b>	Capsules containing ethyl acetate extract of 1 g peeled & crushed raw garlic; daily dose: 2 × 2 capsules	Placebo controlled clinical trial: 30 patients with CAD; duration: 3 mo	Significantly reduced total cholesterol & triglyceride serum levels; increased HDL-cholesterol & fibrinolytic activity; no effect on blood sugar or fibrinogen levels	Bordia et al. 1998
<b>Hypo-cholesterolemic</b>	Enteric-coated supplement with high allicin content (9.6 mg); also, dietary advice	Randomized, double-blind, placebo-controlled intervention study: 46 subjects with hypercholesterolemia; duration: 12 wks	Active; cholesterol-lowering effect shown; may be due to bioavailability of enteric-coated dose form	Kannar et al. 2001
<b>Hypo-cholesterolemic &amp; antihypertensive</b>	Aged garlic extract (7.2 g/day) & modified diet	Double-blind, placebo-controlled, cross-over evaluation: 41 hypercholesterolemic men; duration: 6 & 4 mos	Reduced total & LDL serum cholesterol & lowered systolic blood pressure	Steiner et al. 1996
<b>Hypolipidemic</b>	Garlic preparation (Sapex, Kwai); 900 mg garlic powder (1.3% allicin) daily & low-fat diet	Randomized double-blind clinical trial vs. bezafibrate (600 mg); 98 patients with primary hyperlipoproteinaemia; pre-phase: 6 wks; duration: 12 wks	Active; significantly reduced total & LDL cholesterol & triglyceride levels; increased HDL cholesterol	Holzgartner et al. 1992

### **Laboratory and Preclinical Data: *Allium sativum***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anticarcinogenic</b>	Ingested fresh or cooked (9-10 cloves/wk)	Meta-analysis of observational epidemiological studies in humans (1966-99)	Reduced risk of stomach or colorectal cancer	Fleischauer et al. 2000
<b>Anticarcinogenic</b>	Aqueous garlic extract (250 mg/kg body weight, 3 ×/wk, duration: 14 wks)	In vivo: hamsters with induced oral carcinogenesis	Suppressed oral carcinogenesis and incidence of neoplasms	Balasenthil et al. 1999

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antihypertensive</b>	Garlic (gavage: 100 mg/kg body wt, duration: 5 days)	In vivo: rats	Completely inhibited acute hypoxic pulmonary vasoconstriction	Fallon et al. 1998
<b>Antioxidant</b>	Aged garlic extract	In vitro: bovine pulmonary artery endothelial cells and murine macrophages	Extract inhibited low density lipoprotein oxidation and minimized cell injury resulting from oxidation.	Ide & Lau 1999
<b>Antithrombotic</b>	Aqueous extract (both boiled and raw; dose: 50 and 500 mg/kg), given orally or intraperitoneally daily for 4 wks	In vivo: rats; measured serum levels of thromboxane B2	Raw garlic extract demonstrated significant antithrombotic effect while boiled garlic extract had very little effect; no adverse effects reported due to taking garlic frequently in low doses	Bordia et al. 1996
<b>Cytochrome P450 inhibition</b>	Fresh garlic and various garlic extracts	In vitro study of P450 isoenzymes and P-glycoprotein	Showed inhibition of cytochrome P450 2C, 2D & 3A mediated-metabolism of isoforms	Foster et al. 2001
<b>Hypoglycemic &amp; antinociceptive</b>	Ethanol extract (45 mg/kg body wt/day for 28 days)	In vivo: diabetic mice	Extract lowered serum glucose levels, nociceptive response	Kumar & Reddy 1999
<b>Immunomodulatory</b>	Aged garlic extract	In vivo: psychological stress-exposed mice	Extract inhibited stress-induced immune suppression as evidenced by its prevention of the anticipated decrease in spleen weight & cell quantity	Kyo et al. 1999

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hypo-cholesterolemic</b>	Dehydrated; 500 and 1000 mg	Randomized, double-blind, placebo-controlled clinical trial (n=53)	No significant reduction in serum cholesterol levels	Gardner et al. 2001



<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hypo-cholesterolemic</b>	Garlic extract capsules (Kwai); 300 mg 3 × daily	Randomized, double-blind, placebo-controlled clinical trial (n=30 pediatric patients; duration: 8 wks)	Not active; ineffective in lowering cholesterol in children with familial hyperlipidemia	McCordle et al. 1998
<b>Hypo-cholesterolemic</b>	Garlic supplements (diverse mono-preparations)	Meta-analysis of 13 double-blind, placebo-controlled, randomized clinical trials (1981-98; n=796)	Overall garlic shown to be somewhat more effective than placebo in lowering total cholesterol levels	Stevinson et al. 2000
<b>Hypolipidemic</b>	Standardized garlic tablet (300 mg 3 × daily)	Randomized, double-blind, placebo-controlled study (n=50 hypercholesterolemic patients; for 12 wks)	No significant effect on lowering plasma lipids, lipoproteins or HDL & LDL subclasses	Superko & Krauss 2000
<b>Hypolipidemic</b>	Powder (900 mg/d for 12 wks)	Multicenter, randomized, double-blind, placebo-controlled study of hypercholesterolemic patients; 28 treatment & 22 placebo patients	Effect not shown; no significant changes in lipid or lipoprotein levels; “ineffective in lowering cholesterol levels”	Isaacsohn et al. 1998

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# Ajonjolí

## OTHER COMMON NAMES

Sesame (English).

## SCIENTIFIC NAME

*Sesamum indicum* L. Synonym: *Sesamum orientale* L. [Pedaliaceae (Sesame Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Asthma
- Bronchitis
- Common cold
- Cough
- Expectorant
- Flu

- Pneumonia

**Plant Part Used:** Seeds, oil.

**Traditional Preparation:** To make a milk-like emulsion, the seeds are ground in a blender or with a mortar and pestle, mixed with water and sometimes sweetened with sugar. To make sesame oil, the seeds are toasted, pulverized and then left undisturbed so that the oil (*aceite* or *zumo*) separates from the seed paste and can be skimmed or poured off the top.

**Traditional Uses:** To treat asthma, chest congestion (*pecho apretado*) and for nutritional purposes, a milk-like beverage is prepared using the ground seeds of *ajonjolí* and water, taken orally. *Ajonjolí* is said to expel phlegm from the lungs. For asthma, bronchitis, common cold, cough, flu and pneumonia, toasted sesame oil is combined with fresh coconut (*coco*) milk and administered orally. In children, the dosage is 1-2 teaspoons taken 2-3 times daily. In adults, this remedy is often also combined with castor bean plant (*higuereta*) oil and other ingredients, and a few ounces are taken daily as an expectorant.

**Availability:** As a popular food item, the seeds and seed oil are available at most grocery stores and supermarkets and are occasionally sold at *botánicas*.

## **BOTANICAL DESCRIPTION**

*Ajonjolí* (*Sesamum indicum*) is an annual herb that can grow to approximately 100 cm in height. Each plant has a single erect stem with oval-shaped, pointed leaves and pronounced veins. Flowers are purple to white and fragrant, and seed capsules are long and burst open when ripe. Seeds are very small, light brown to black in color and shaped like flattened-teardrops (Bailey Hortorium Staff 1976).

**Distribution:** This plant is cultivated worldwide in tropical and subtropical temperate regions and is primarily produced in India, Sudan, Myanmar and China (Bailey Hortorium Staff 1976).

## **SAFETY & PRECAUTIONS**

As a common food, sesame seeds and sesame oil are generally regarded as safe. No adverse effects have been reported in conjunction with the appropriate therapeutic use of sesame, although some individuals may be allergic to it (Gruenwald et al. 2004).

**Contraindications:** None identified in the available literature.

**Drug Interactions:** None identified in the available literature.

## **SCIENTIFIC LITERATURE**

In clinical studies, ingestion of the seed oil has shown the following effects: blood glucose modulating, enterolactone precursor, hypocholesterolemic, hypotensive and vitamin E status improvement. Massage with sesame oil improved growth and sleep duration in infants. In postmenopausal women, beneficial hormonal, antioxidant and blood lipid effects were demonstrated. Administration of sesame oil as a nasal spray reduced dryness of nasal mucosa in another human clinical study (see “Clinical Data” table below). In vivo and in vitro studies have demonstrated the following activity: antihypercholesterolemic, antihypertensive, antineoplastic, antioxidant, antiproliferative, antitumor, chemoprotective, lignan level increase, tocopherol bioavailability, vasodilatory and vitamin E level increase (see “Laboratory and Preclinical Data” table below). Use of sesame oil to relieve cough symptoms in children was not supported in one clinical trial (see “Effect Not Demonstrated” table below).

Sesame seed lignans are polyphenolic phytoestrogens which when metabolized are converted into enterolactones (mammalian lignans) by gut flora (Peñalvo 2005). Enterolactones may exert a weak

estrogenic effect in the human body and have been associated with lowered risk of breast cancer and cardiovascular disease (Pietinen et al. 2001, Vanharanta et al. 2003). According to the *Physicians' Desk Reference for Herbal Medicines*, research supports the topical use of the seed oil for treatment of dermatological problems related to dry skin. In addition, its use in the treatment of constipation may be warranted as this oil is reported to have stool-softening properties (Gruenwald et al. 2004).

Major chemical constituents of the seeds include: oil (oleic, linoleic, palmitic and stearic fatty acids primarily); lignans and sterols (Gruenwald et al. 2004). Two novel lignans have been isolated from the seed coat: (+)-saminol and (+)-episesaminone-9-O-beta-D-sophoroside (Grougnet et al. 2006). Sesame oil improves vitamin E status in the body and may have important health effects due to the antioxidant properties of this nutrient and its association with lowered risk of cancer and heart disease (Frank 2005). Sesame seeds are a significant source of calcium, folate, iron, magnesium, manganese, monounsaturated and polyunsaturated fatty acids, niacin, omega 3 fatty acids, phosphorus, thiamin, tryptophan, vitamin B6 and zinc (U.S. Department of Agriculture 2006). Although flaxseed has been reputed to be one of the richest source of plant lignans, the total concentration of lignans in sesame seed (2180 mcmmol/100 g) was shown to be greater than that of flaxseed (820 mcmmol/100 g; Liu et al. 2006).

**Indications and Usage:** According to the *German Commission E*, the recommended dosage of the seeds is 30 to 60 g daily for the treatment of constipation (Blumenthal et al. 1998).

### **Clinical Data: *Sesamum indicum***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Dry nasal mucosa treatment</b>	Pure sesame oil (14 days) vs. isotonic sodium chloride solution (14 days)	Randomized crossover study: 79 patients w/nasal mucosa dryness (dry winter climate)	Sesame oil significantly improved nasal mucosa dryness, nasal stuffiness & nasal crusts with few & temporary adverse effects	Johnsen et al. 2001
<b>Dry nasal mucosa treatment</b>	Sesame oil nasal spray (Nozoil); administered 3 × daily in each nostril for 20 days	Clinical trial: 20 patients with nasal dryness & 20 post-nasal irradiation patients w/dryness	Significant decrease in nasal problems & reduction of dryness of nasal mucosa	Bjork-Eriksson et al. 2000
<b>Enterolactone precursor</b>	Seeds ingested after following a low-lignan diet for 1 wks; sesamin (in vitro)	Human clinical study; n=4; in vitro: incubated with human fecal inoculum to mimic digestion in gut	Enterolactone shown to be the major metabolite of sesamin	Peñalvo et al. 2005
<b>Hypo-cholesterolemic</b>	Sesame lignan; 3.6 mg sesamin w/18 mg vitamin E in 180 mg wheat germ oil in capsules; dosage: 3 capsules 3 × per day & 6 capsules 3 × per day	Randomized placebo-controlled clinical trial: 12 male patients with hypercholesterolemia (Type IIa & b); duration: 4 wks at each dosage	Significantly reduced serum total cholesterol levels & especially low-density-lipoprotein (LDL) cholesterol; no side effects observed (except one case of temporary diarrhea most likely due to excess wheat germ oil); may decrease risk for atherosclerosis	Hirata et al. 1996

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hypotensive &amp; anti-diabetic</b>	Open label sesame oil: used in place of regular cooking oil for 45 days & then switched to another cooking oil (such as palm or peanut oil) for 45 more days	Pilot study: hypertensive diabetics taking atenolol (beta-blocker) & glibenclamide (sulfonylurea); n=22 male & 18 female patients	Showed significantly decreased systolic & diastolic blood pressure which increased when sesame oil substitution ended; reduced body weight, body mass index, waist & hip girth, waist:hip ratio, plasma glucose, low-density lipoproteins & triglyceride levels	Sankar et al. 2006
<b>Infant growth stimulus &amp; sleep improvement</b>	Sesame oil (compared to massage w/herbal oil, mustard oil, mineral oil vs. control without massage)	Full term healthy infants (n=125; 5-7 wks of age): randomly assigned to five groups	Massage in infancy with sesame oil significantly improved growth and post-massage sleep; massage w/sesame oil showed greater beneficial effects than other oils	Agarwal et al. 2000
<b>Sex hormone binding globulin increase, thiobarbituric acid reacting substance decrease, hypocholesterolemic &amp; postmenopausal support</b>	Sesame seed powder; 50 g ingested daily for 5 wks followed by 3-wk washout period; placebo: 50 g rice powder for 5 wks	Randomized, placebo-controlled, crossover study: n=24 healthy postmenopausal women	Significantly decreased plasma total cholesterol, low-density lipoprotein (LDL), thiobarbituric acid reactive species in oxidized LDL & serum dehydroepiandrosterone sulfate; significantly increased serum sex hormone-binding globulin & urinary 2-hydroxyesterone; results suggest eating sesame offers multiple benefits to postmenopausal women	Wu et al. 2006
<b>Vitamin E level increase</b>	Sesame oil muffin (vs. corn oil muffin); ingested	Human clinical study: urine samples collected (72 hours)	Active; sesame oil muffin consumption significantly reduced d2-gamma-CEHC & total gamma-CEHC excretion in urine tests	Frank 2005

### Laboratory and Preclinical Data: *Sesamum indicum*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antihypertensive</b>	Sesamin (seed oil lignan); dietary	In vivo: rats w/spontaneous hypertension; salt-loaded vs. unloaded stroke-prone groups	Significantly suppressed hypertension development in salt-loaded rats for an extended time; reduced renal damage; results suggest prophylactic as treatment for malignant hypertension or water & salt retention	Matsumura et al. 1998
<b>Antihypertensive</b>	Sesamin (seed oil lignan)	In vivo: rats with deoxycorticosterone acetate-salt induced hypertension	Active; suppressed development of hypertension & protected against aortic & mesenteric vascular hypertrophy	Matsumura et al. 1995
<b>Antihypertensive</b>	Sesamin (seed lignan); dietary	In vivo: rats with deoxycorticosterone acetate-salt-induced hypertension & acetylcholine-induced aortic vasodilation	Significantly reduced the effects of experimentally-induced hypertension; improved vasodilatory response; possibly due to nitric oxide-dependent mechanism	Matsumura et al. 2000
<b>Antioxidant</b>	Sesamol (seed oil lignan); 1% of diet	In vivo: rats; fed sesamol-supplemented diet for 2 wks	Active; reduced kidney & liver lipid peroxidation	Kang et al. 1998
<b>Antioxidant</b>	Sesamol, an aqueous & lipid soluble isolated compound (5-hydroxy-1,3-benzodioxole)	Hydroxyl, one-electron oxidizing, organo-haloperoxyl, lipid peroxy & tryptophanyl radicals	Active: showed potent radical scavenging activity; inhibited lipid peroxidation, hydroxyl radical-induced deoxyribose degradation & DNA cleavage	Joshi et al. 2005
<b>Antioxidant &amp; tocopherol bioavailability</b>	Seed oil & lignans: sesamin & sesamol; ingested	In vivo: rats with iron-induced oxidative stress	Increased bioavailability of tocopherols (possibly due to regeneration of oxidized tocopherols); lignans increased hepatic antioxidant enzymes	Hemalatha et al. 2004

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiproliferative</b>	Sesamin	In vitro: human breast cancer cell line MCF-7, lung cancer, renal, keratinocyte, melanoma & osteosarcoma cells	Arrested cell cycle at G1 phase, dephosphorylated tumor-suppressor retinoblastoma protein & down-regulated cyclin D1 by promoting proteasome degradation of this protein; may explain mechanism of antiproliferative activity	Yokota et al. 2007
<b>Chemoprotective</b>	Sesame oil	In vivo: female mice w/cisplatin-induced hepatic & renal injuries	Active; strong attenuation of hepatic & renal injuries; decreased lipid peroxidation (LPO); did not affect antitumor effects of cisplatin; mechanism involves inhibition of nitric oxide-associated LPO	Hsu et al. 2007
<b>Anti-hypercholesterolemic</b>	Sesame oil (24% of diet)	In vivo: rats; experimentally-induced hypercholesterolemia; 24 hr lymph monitoring	Active; significantly reduced lymph cholesterol & fatty acid levels	Satchithanandam et al. 1994
<b>Lignan level increase</b>	Sesamin (plant lignan from seed); fed to rats: 15 mg/kg body weight for 10 days) & 10 % sesame diet	In vivo: rats; in vitro: sesamin fermentation with human fecal inoculum	Showed an increase in urinary mammalian lignan excretion in rats; analyzed intermediate metabolites & proposed metabolic pathway; intestinal microflora converted sesamin to mammalian lignans in vitro	Liu et al. 2006
<b>Tocopherol bioavailability</b>	Seeds, oil & sesamin (vs. flaxseed oil preparations); ingested	In vivo: rats; fed experimental diet for 4 wks	Strong activity; increased gamma-tocopherol levels in liver & plasma; reduced TBARS concentrations in plasma	Yamashita et al. 2003
<b>Vitamin E hydroxylase inhibition</b>	Sesamin (seed lignan)	In vitro: Hep G2 cells	Inhibited tocopherol-omega-hydroxylase activity at concentrations of 2 μm	Frank 2005
<b>Vitamin E level increase</b>	Sesamin (seed lignan) added to diet	In vivo: rats; duration: 4 wks	Active; increased liver & plasma concentrations of gamma-tocopherol	Frank 2005



## Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antitussive</b>	Sesame oil: 5 mL orally before going to bed for 3 consecutive nights	Randomized, double-blind, placebo controlled clinical trial: children (2-12 yrs of age) with cough due to common cold; n=107	Did not show significant improvement in cough symptoms compared to placebo as measured by cough frequency & strength Likert scale; no adverse effects were reported	Saab et al. 2006

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# Albahaca

## OTHER COMMON NAMES

Basil (English).

## SCIENTIFIC NAME

*Ocimum basilicum* L. Synonym: *Ocimum gratissimum* L. (Germosén-Robineau 1997). [Lamiaceae (Mint Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Constipation
- *Empacho*
- Gastrointestinal pain
- Indigestion
- Laxative
- *Limpiar el sistema*
- Menopausal symptoms
- Stomach ache and abdominal pain
- Vaginal infections

**Plant Part Used:** Fresh or dried aerial parts (leaf, stem, flower); oil extracted from the plant or the essential oil made from distillation of the dried herb.

**Traditional Preparation:** A tea is prepared of the dried (or sometimes fresh) leaves by infusion or decoction. The leaves may also be added to therapeutic, aromatic baths.

**Traditional Uses:** *Albahaca* is considered a sweet herb with cooling and refreshing properties. For spiritual healing, it is used in baths of sweet herbs for good luck, especially during the New Year. The aerial parts of this plant, particularly the leaves, are used for culinary purposes as a seasoning agent.

**Availability:** In New York City, *albahaca* is often sold fresh in *botánicas*, either in a refrigerated case or on the counter, tied into small bundles with a rubber band and kept in a container with their roots or stems covered in a small amount of water to keep them fresh.

## BOTANICAL DESCRIPTION

*Albahaca* (*Ocimum basilicum*) or basil is an herbaceous plant that grows 20-40 cm in height with an erect stem, covered with small, soft hairs. The leaves are egg-shaped in outline, pointed at the tip, with leaf edges that can be smooth or irregularly toothed. Flowers grow from the tips of branches and are white with 6 petals. One defining characteristic is its strong scent and flavor (Bailey Hortorium Staff 1976).

**Distribution:** This plant most likely originated in India and the Middle-East, and it is now cultivated worldwide as a culinary herb (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No negative side effects or adverse reactions due to use of this plant have been encountered in the literature besides the contraindications specified for the use of the essential oil. As a culinary herb, it is generally considered safe for regular consumption in moderate amounts as a condiment. The fresh juice of the leaf has demonstrated mild narcotic activity (Duke 1985).

**Animal Toxicity Studies:** Estragole and safrole, constituents of the essential oil, have shown mutagenic and carcinogenic effects in vitro and in animal experiments (see contraindications below; Gruenwald et al. 2004). The LD<sub>50</sub> of the powdered plant in rats is greater than 6 g/kg (Akhtar & Munir 1989). The aqueous extract of the dry leaf produced bradycardia in rats and cats at a dosage of 10-20 mg/kg (Ojewole, Adekile & Odebii 1982).

**Contraindications:** Use of this plant is contraindicated in children under 5 years of age and during pregnancy and lactation (Germosén-Robineau 2007).

**Drug Interactions:** Besides potential synergistic effects with drugs that share the same or similar pharmacological activities of this herb (see “Laboratory and Preclinical Data” table below), little information is available on herb-drug interactions for this plant. Medications that are metabolized by UGT(UDP-Glucuronosyltransferase)2B7 or UGT1A9 (i.e. morphine) may hinder the metabolism of estragole which is one of the primary active constituents of basil (Iyer et al. 2003).

## SCIENTIFIC LITERATURE

No clinical trials of the oral use of this herb have been identified in the available literature; however, numerous preclinical and laboratory studies have been conducted showing the following effects: analgesic, antifungal, anti-inflammatory, antimicrobial, antioxidant, antispasmodic, antitumor, antiulcer, antiviral, chemomodulatory, ear infection treatment (acute otitis media), glutathione S-transferase inhibition, hypolipidemic and smooth muscle relaxant (see “Laboratory and Preclinical Data” table below).

Major chemical constituents include the following: essential oil chief constituents: linalool (54.95%), methylchavicol (11.98%), methyl cinnamate (7.24%) and linolen (0.14%; Opalchenova & Obreshkova 2003). Other constituents present in a significant quantity (>1000 ppm) include: acetic acid, aspartic acid, beta sitosterol, caffeic acid, caryophyllene, chavicol, citral, citronellol, essential oil, estragole, eugenol, eugenol methyl ether, geranial, geraniol, methyl chavicol, methyl cinnamate, methyl eugenol, mucilage, oleanolic acid, p-methoxycinnamialdehyde, phytosterols, rosmarinic acid, thymol and ursolic acid (Duke & Beckstrom-Sternberg 1998). The dried, ground leaves are a significant source of calcium, iron and vitamins A and K (US Department of Agriculture 2006).

**Indications and Usage:** According to TRAMIL, based on significant traditional use and the available scientific literature, the following therapeutic applications of this plant are classified as REC meaning “RECommended”: use for stomachache, vomiting and earache. These uses are recommended only if strict hygiene measures are observed and proper diagnosis and care is provided by a qualified health practitioner (Germosén-Robineau 2007). Administration and dosage, based on traditional use, is as follows: for stomachache and vomiting: an infusion (2 spoonfuls of the fresh leaf steeped in 2 cups of boiling water) taken as 1 cup 3 times daily; and for earache: crushed leaf applied locally (Germosén-Robineau 2007).

### Laboratory and Preclinical Data: *Ocimum basilicum*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antifungal</b>	Essential oil	In vitro	Antifungal against <i>Aspergillus aegyptiacus</i> , <i>Penicillium cyclopium</i> , <i>Trichoderma viride</i> & <i>Trichophyton mentagrophytes</i>	El Keltawi et al. 1980, Janssen et al. 1989
<b>Anti-inflammatory</b>	Fixed oil & linolenic acid	In vivo: rats with experimentally-induced paw edema	Active; mechanism seems to involve linolenic acid's ability to block cyclooxygenase & lipoxygenase pathways of arachidonate metabolism	Singh 1998
<b>Antimicrobial</b>	Essential oil	In vitro: agar overlay technique	Antimicrobial against gram + & gram - bacteria	Janssen 1986
<b>Antimicrobial</b>	Essential oil	In vitro: against multidrug resistant <i>Staphylococcus</i> , <i>Enterococcus</i> & <i>Pseudomonas</i> spp.	Active; showed strong inhibition; minimum inhibitory concentrations: 0.0030% and 0.0007% (v/v)	Opalchenova & Obreshkova 2003
<b>Antioxidant</b>	Water & ethanol extracts	In vitro: a variety of assays	Active; showed potent radical scavenging & antioxidant activity	Gulcin et al. 2007
<b>Antispasmodic &amp; analgesic</b>	Leaf and flower	In vitro: isolated ileum of guinea pig; carrageenan-induced inflammation	Demonstrated antispasmodic & analgesic properties	Queiroz & Reiss 1989
<b>Antitumor</b>	Leaf	Carcinogen-induced tumor model	Strongly active; inhibited tumor growth & incidence	Dasgupta et al. 2004
<b>Antiulcer</b>	Aqueous extract of aerial parts	In vivo: rat	Activity is comparable to Ranitidina (standard drug); prevented ulcerogenesis	Akhtar, Akhtar & Khan 1992
<b>Antiulcer</b>	Aqueous extract of aerial parts; 4.0 g/kg (400 mg concentration)	In vivo: rat; administered intragastrically	Active; inhibited secretion of peptic-acid induced by aspirin; potently neutralized secretion of acid in the stomach	Akhtar & Munir 1989
<b>Antiulcer &amp; anti-inflammatory</b>	Fixed oil	In vivo: animal models with experimentally-induced gastric ulceration	Active; showed antisecretory, lipoxygenase inhibiting & histamine antagonistic effects	Singh 1999
<b>Antiviral</b>	Crude aqueous & ethanolic plant extracts & Isolated active constituents	In vitro against DNA & RNA viruses	Active; showed strong antiviral activity against a variety of viruses	Chiang et al. 2005

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Ear infection treatment</b>	Essential oil & active constituents (thymol, carvacrol & salicylaldehyde) applied to ear canal	In vivo: rats w/experimentally-induced acute otitis media caused by pneumococci or <i>Haemophilus influenzae</i>	Active; healed 58%-81% of animals infected with <i>H. influenzae</i> & 6%-75% of those with pneumococci (by comparison, only 5.6%-6% of placebo group were cured); recommended as effective treatment	Kristinsson et al. 2005
<b>Glutathione S-transferase inhibition</b>	Essential oil; dosage: 30 mg/animal	In vivo: mouse	Effective in inhibiting enzyme transfer in the small intestine and liver, but not in the stomach	Lam & Zheng 1991
<b>Hypolipidemic &amp; antioxidant</b>	Aqueous plant extract (0.5 g/100 g body weight)	In vivo: rats with experimentally-induced hyperlipidemia	Active; lowered plasma cholesterol (50%), triglycerides (83%) & LDL-cholesterol (79%); higher HDL-cholesterol (129%); stronger effect than fenofibrate; showed very high antioxidant activity	Amrani et al. 2006
<b>Smooth muscle relaxant</b>	Essential oil	In vitro: tracheal & ileal smooth muscle tissues isolated from guinea pig	Active	Reiter & Brandt 1985

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# Alcanfor

## OTHER COMMON NAMES

*Canfor* (Spanish); camphor (English).

## SCIENTIFIC NAME

*Cinnamomum camphora* (L.) J. Presl. [Lauraceae (Laurel Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Arthritis
- Asthma
- Backache
- Bronchitis
- Flatulence and intestinal gas
- Gastrointestinal pain
- Headache
- Indigestion
- Muscle ache
- Phlegm in the lungs
- Sinus congestion
- Sinusitis
- Upper or lower respiratory tract infections

**Plant Part Used:** Camphor oil (the essential oil of *alcanfor*), which is the most commonly used part of this plant, is present in all parts of this tree. Industrially it is extracted by steam distillation of the roots, branches or wood chips. The solid, crystallized essential oil is sold in commerce as flattened cubes or tablets, called *tabletas* in Spanish.

**Traditional Preparation:** This remedy is primarily used externally by applying tablets of the crystallized oil to the affected area. In some cases, a very small amount of the essential oil is dissolved in water and taken internally.

**Traditional Uses:** This highly aromatic plant has several medicinal uses. In cases of indigestion, gastrointestinal pain and gas, a very small amount of the essential oil is dissolved in water and taken internally to dispel gas that has accumulated in the stomach or intestines. To treat upper or lower respiratory tract infections, asthma, bronchitis, difficulty breathing or conditions of phlegm in the lungs, the essential oil is applied topically as an ointment to the chest area and is said to open up the lungs, loosen phlegm and make it easier to breathe.



For treating sinusitis and headache due to sinus congestion, white cubes (*tabletas*) of crystallized *alcanfor* essential oil are melted by leaving them in a covered pot in the sun for two days, and the liquid oil is applied externally to the forehead, scalp, neck and face. Some recommend doing this during the hottest time of the day, around 2 PM, so that the heat causes more of the vapor of the essential oil to be released. A salve or pomade of the essential oil is also used for treating backache, muscle pain and arthritic conditions, applied topically to the affected area. For spiritual and physical health, the essential oil is added to a glass of water and set in the corner of a room or living space to release its fragrant vapor which is said to keep away insects and infectious agents, to cleanse the air of contamination and to absorb negative energy.

**Availability:** *Alcanfor* is sometimes sold at *botánicas* or pharmacies as semi-translucent white tablets or cubes of the crystallized oil and may be pre-packaged in clear plastic or unwrapped in bins.

## BOTANICAL DESCRIPTION

*Alcanfor* (*Cinnamomum camphora*) is an evergreen tree that is closely related to cinnamon and grows to 50 m in height with a trunk diameter of 5 m. Leaves are alternate with long, reddish leaf-stems and oval-lanceolate shape. Flowers are small and pale greenish-white to yellow. Fruits are dark-blue to black, small, round drupes (Bailey Hortorium Staff 1976).

**Distribution:** Native to East Asia (Vietnam, southern China and Japan), it is cultivated in tropical and subtropical areas and is an invasive species in non-native areas in that region (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Although no adverse effects were observed in a clinical trial of the oil applied topically (El-Shazly et al. 2004), external application may cause skin irritation, such as contact eczema, when used topically as a camphor-containing salve or oil. The lethal dose of camphor taken internally for adults is approximately 20 g, although signs of toxicity have been observed after taking as little as 2 g. For children, the lethal dosage can be less than 1 g. Symptoms of overdose include the following: intoxicated states, delirium, spasms and irregular respiration or difficulties with breathing (Gruenwald et al. 2004). Camphor is listed as a medication that can be fatal to a toddler (10 kg body weight; < 2 yrs) if one standard dose unit (1 tablet or teaspoon) is ingested (Koren 1993).

**Contraindications:** *Alcanfor* should not be used internally during pregnancy due to emmenagogue, uterine stimulant and fetocidal effects of isolated camphor. Externally, this plant should not be used on broken skin or open wounds due to rubefacient effects of the essential oil constituents. Prolonged topical use should be avoided because of potential CNS toxicity from dermal absorption and storage of active constituents in fatty tissue. Caution is advised in individuals with gastrointestinal infection due to the potential irritating effects of camphor bark preparations on the digestive tract (Brinker 1998). Due to the highly toxic nature of the essential oil, internal use is not recommended.

**Pediatrics Warning:** Oils or salve preparations containing camphor as a main ingredient should not be administered to infants because of their potential for skin irritation, especially when applied to the nasal area or near mucous membranes (Gruenwald et al. 2004). Small children and infants (under 2 years of age) should not be administered camphor near the nose or via inhalation because absorption of small amounts can potentially lead to seizures and nervous system over stimulation (Brinker 1998).

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

Clinical trials have demonstrated the following pharmacological effects of the essential oil: antiplatelet, central nervous system stimulant, increased nasal sensation of cold and treatment of *Demodex rosacea* and ophthalmic disorders (see “Clinical Data” table below). Laboratory and/or animal studies have shown anti-inflammatory, antioxidant, biosurfactant, carcinogenesis inhibition, positively inotropic, ribosome inactivating and superoxide dismutase activity (see “Laboratory and Preclinical Data” tables below). Major chemical constituents include the essential oil: D(+)-camphor ((1R,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-on; Gruenwald et al. 2004).

**Indications and Usage:** Camphor is approved by the German *Commission E* for the following health conditions: arrhythmia, cough/bronchitis, hypotension, nervous heart disorders and rheumatism (Blumenthal et al. 1998). This remedy can be taken as a liquid (camphor spirit), administered by inhalation or used as a topical application such as an oil, salve or liniment. It is typically sold as a commercial pharmaceutical preparation in the form of a cream, salve or gel.

Typical administration and dosage: camphor spirit containing 9.5-10.5% camphor administered externally by rubbing on the affected area several times daily. Concentrations of camphor in preparations should not be more than 25% for adults and 5% for children, and it is recommended that ointments and liniments contain 10-20% camphor but no more than 25% (Gruenwald et al. 2004).

### Clinical Data: *Cinnamonum camphora*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiplatelet &amp; central nervous system stimulant</b>	2.0 mL racemic camphor, given subcutaneously; monobromated camphor orally 0.5 g 3 × daily	Clinical study: 20 patients with acute cerebrovascular disease; aggregatogram automatic recording & electroencephalograph examination	Active; both preparations inhibited platelet aggregation & stimulated brain bioelectric activity	Natiashkina et al. 1980
<b><i>Demodex rosacea</i> treatment</b>	1/3 diluted camphor oil with glycerol; also treated with 500 mg metronidazole, orally; duration: 15 days	Randomized controlled clinical trial: 15 women suffering from erythematotelangiectatic rosacea & 12 women free from skin lesions; <i>Demodex folliculorum</i> confirmed by biopsy	Demonstrated significant therapeutic effect; recommended as a treatment; no clinical side effects observed	El-Shazly et al. 2004
<b>Nasal sensation</b>	Vapor of essential oil, inhaled	Human clinical trial	Active; induced nasal sensation of cold but no resistance to airflow	Burrow et al. 1983
<b>Ophthalmic disorders treatment</b>	Ingredient in Ophthacare® eye drops	Multicenter clinical trail; patients with various ophthalmic disorders	Improved the condition of infective, degenerative & inflammatory ophthalmic disorders; no side effects	Biswas et al. 2001

## Laboratory and Preclinical Data: *Cinnamomum camphora*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory &amp; antioxidant</b>	Total crude extract, 80% ethanol extract & its fractions; concentrations of less than 100 µg/mL	In vitro: macrophage RAW264.7 cells stimulated by lipopolysaccharide & interferon-gamma; DPPH & xanthine oxide radical scavenging assays	Significantly modulated cytokines associated with inflammation & protected against oxidative stress; inhibited production of interleukin (IL)-1 beta, IL-6 & tumor necrosis factor-alpha, nitric oxide & prostaglandin E(2)	Lee et al. 2006
<b>Biosurfactant effects</b>	Volatile oil	In vivo: rabbits; inhaled oils	Active; lung compliance values improved due to decrease in surface tension between water & air (surfactance)	Zanker et al. 1980
<b>Positively inotropic</b>	Essential oil	In vitro: isolated rat diaphragm & guinea-pig ileum	Increased the size of twitch response tested	Lis-Balchin & Hart 1997
<b>Ribosome-inactivation &amp; superoxide dismutase</b>	Cinnamomin & camphorin, two proteins isolated from the seeds	In vitro	Both compounds showed RNA N-glycosidase & supercoil-dependent endonuclease activities; camphorin showed superoxide dismutase activity	Li et al. 1997

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# Algodón

## OTHER COMMON NAMES

*Algodón blanco*, *algodón morado*, *algodón mora'o* (Spanish); cotton, Creole cotton (English).

## SCIENTIFIC NAME

*Gossypium barbadense* L. [Malvaceae (Mallow Family)].

**Note:** *Algodón morado* typically refers to the species *Gossypium hirsutum* var. *punctatum* (Schum.) J.B. Hurchison in the Dominican Republic (Liogier 2000).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Excess or abnormal vaginal discharge
- Genitourinary tract inflammation
- Infections
- Inflammation
- *Limpiar el sistema*
- Vaginal infections

**Plant Part Used:** Leaf, flower and root. When *algodón morado* or *algodón mora'o* is specified, this name may refer to the plant (*mata*) itself, especially its purple-tinted leaves, whereas the use of the common name *algodón blanco* may indicate that the flowers of this plant are used.

**Traditional Preparation:** The leaves are boiled in water to make a tea for internal use or a wash for external use.

**Traditional Uses:** The leaf is used for treating vaginal infections, genitourinary inflammation and excess vaginal discharge, prepared as a decoction with cornsilk (*barba de maíz*) and taken orally. This plant functions by removing the heat (*quita el calor*) caused by inflammation and cleansing the body internally. The flower is also used to treat vaginal infections and excess vaginal discharge (*flujo vaginal*), prepared as a decoction and administered as a vaginal wash or douche. A remedy for infections in general (especially those that are considered pre-cancerous) is prepared by boiling the leaves of *algodón morado* with cinchona (*quina*) and black nightshade (*hierba mora*), taken orally.

**Availability:** The dried herb is sometimes sold at *botánicas* specializing in Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Algodón* (*Gossypium barbadense*) is a shrub that typically grows 1-3 m tall, and much of its surface is dotted with dark glands that look like small, dark spots. Leaves have 3-7 pointed lobes arranged so that they resemble a maple leaf or star in general shape with smooth leaf edges (5-20 cm × 9-20 cm). Flowers grow singly or in small branching clusters with large yellow petals (to 8 cm long) that have a dark red spot at the base. Fruits are capsules (3.5-6 cm long), usually narrowly oval with three compartments each containing several seeds attached to white, fluffy hairs, thickly bunched together (Acevedo-Rodríguez 1996).

**Distribution:** Native to South America, this plant is widely cultivated for the production of cotton fiber, grows in the Caribbean and can be found in open, dry areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

In human clinical studies of the isolated constituent gossypol as a male antifertility agent, the following adverse effects were reported: hypokalemia, irreversible anti-fertility effects (in males), fatigue, decreased libido and gastrointestinal disorders. More research needs to be done to determine the mechanism and potential toxicity of this constituent (Aitken 1983, Qian & Wang 1984, Ye et al. 1983). In mammalian cell cultures (including human lymph and hamster ovary cells), gossypol was shown to be cytotoxic.

**Animal Toxicity Studies:** In adult male rats, an aqueous extract of cotton seed administered intraperitoneally (0.1 mL) resulted in damage to tissues of the kidney, liver, muscles and testicles (Thomas et al. 1991).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

This plant has demonstrated hypotensive and blood-pressure-lowering effects in laboratory studies. Gossypol isolated from the plant has shown strong antifertility effects as a male contraceptive agent due to its antispermatogenic effects (reducing sperm count and motility). It has reportedly been used in clinical trials with thousands of human volunteers in China during the 1970s.

The active constituent gossypol has been isolated from the seeds of both *G. barbadense* and *G. hirsutum* and is found in other parts of the plant (Zhou & Lin 1988), including the root bark (Cui et al. 2002). The chief constituents (>1000 ppm) of the essential oil of the plant include: 1-trans-alpha-bergamotene, alpha-humulene, cadinene, caryophyllene, copaene and guaiene. Primary compounds in the

seed include: gossypol, inositol, linoleic acid, myristic acid, oleic acid, palmitic acid and stearic acid. The root contains salicylic acid, and the stem is high in tannins (Duke & Beckstrom-Sternberg 2007).

**Indications and Usage:** Insufficient information is available to determine standard indications and usage.

### Clinical Data: *Gossypium barbadense*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifertility</b>	Gossypol (20 mg daily for 60 day loading period; 1/3 original dose for maintenance period)	Clinical trial: 172 healthy male volunteers (under age 50, married with at least 1 child)	Reduced sperm count & caused immotility; adverse effects reported: decreased libido, decreased appetite & fatigue; induced hypokalemia (probably renal); discontinuing treatment for 3 mo reversed these adverse effects	Liu 1981

### Laboratory and Preclinical Data: *Gossypium barbadense*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hypotensive</b>	Decoction of leaves	In vivo: rats	Confirmed dose-dependent hypotensive & blood-pressure-lowering effects	Hasrat, Pieters & Vlietinck 2004
<b>Antifertility</b>	Gossypol (small doses)	In vitro: sperm cells in human cervical mucus	Active; reduced sperm motility; suggest use as a topical preparation for women	Poso et al. 1980

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# Alquitira

## OTHER COMMON NAMES

*Nopal*, *tuna*, *tuna de españa* (Spanish); prickly pear (English).

## SCIENTIFIC NAME

*Opuntia ficus-indica* (L.) Miller. [Cactaceae (Cactus Family)].

**Note:** In the Dominican Republic, the common name *tuna de españa* typically refers to *Nopalea cochenillifera* (L.) Salm.-Dick. (synonym: *Opuntia cochenillifera* (L.) Mill.) which is the species most frequently used medicinally. Additionally, the common name *tuna* can be used for any species of the genus *Opuntia* (Liogier 2000). However, *O. ficus-indica* appears to be the species most widely available in New York City.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this edible food plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Burns
- Diabetes
- Gastrointestinal disorders
- Heart disease
- High blood pressure
- Kidney disorders
- Liver disorders
- Skin abrasions
- Stomach disorders
- Wounds

**Plant Part Used:** Fleshy cactus pads (technically called cladophylls, meaning leaf-like stems). Although not reported as a medicinal use, the fruits are also consumed as food in Latin American culinary traditions.

**Traditional Preparation:** This remedy can be prepared by eating or liquefying the cladophyll (cactus pad), taken orally. The gel inside the leaf-like stem can be applied externally for skin conditions.

**Traditional Uses:** This plant is used to treat diabetes, high blood pressure, liver disorders and heart problems, taken as a drink prepared by liquefying the fresh cactus pads in a blender. For kidney disorders, the cactus pads of *alquitira* are combined with fresh coconut milk and liquefied in a blender to prepare a drink. For stomach or digestive disorders, the cactus pads are peeled and grated or crushed and used to make an “intestinal wash” (*lavado intestinal*). For skin conditions, the cactus pads are used in a manner similar to that of *Aloe vera*; the mucilaginous gel inside the leaf is applied externally for cuts, burns and abrasions to facilitate wound-healing.

**Availability:** Fresh cactus pads can be purchased from select *botánicas*, grocery stores and food markets, particularly in Latino/Caribbean neighborhoods; fresh fruits can be purchased in season from some fruit stands and grocery stores in New York City.

## BOTANICAL DESCRIPTION

*Alquitira* (*Opuntia ficus-indica*) is a bushy cactus that can reach a height of 5.5 m. Cactus pads (called cladodes or cladophylls because they are stems with a leaf-like appearance) are fleshy, spatula-shaped and succulent with a waxy coating and are covered with sharp, yellow, spine-like hairs called glochids. True leaves on the cladodes are oval-shaped and very small. Flowers are yellow to orangish-yellow. Fruits are dark red to purple, juicy (sometimes white or yellow) containing numerous seeds (Bailey Hortorium Staff 1976).

**Distribution:** Although this plant’s origin is difficult to determine, its ancestral species are native to tropical America, most likely Mexico. It is cultivated extensively in tropical, subtropical and arid climates throughout the Americas, the Mediterranean, Africa and Australia and is often naturalized in these areas (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Since the pads and fruits of this plant are commonly used for food, they are generally considered safe for human consumption (provided that the sharp spine-like hairs called glochids which cover this cactus are properly removed before ingestion). Caution is advised during handling due to sharp spines and glochids which cover the surface; these spiny projections should be removed before use. There have been reports of rectal perforation due to the accumulation of indigestible fibers (bezoar) due to consuming the fruit (Steinberg and Eitan 2003). Cases of contact dermatitis have been reported.

**Contraindications:** Contraindicated in cases of allergy or hypersensitivity to *Opuntia* and other cactus species. Due to lack of available data, avoid use during pregnancy or breastfeeding and in small children.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In clinical studies, this plant has shown the following effects: anti-hangover, anti-inflammatory, anti-lipid peroxidation and antioxidant (see “Clinical Data” table below). In laboratory and preclinical studies, this plant has shown the following effects: analgesic, anti-inflammatory, antioxidant, antiulcer, chondroprotective, gastroprotective, hypoglycemic, immuno-modulatory, neuroprotective, radical



scavenging and wound healing (see “Laboratory and Preclinical Data” table below). This plant has also demonstrated antimicrobial activity (Ho et al. 2004). The fruit contains the following compounds and nutrients: ascorbic acid, calcium, citric acid, malic acid and potassium.

**Indications and Usage:** Unknown; insufficient information available in the literature.

### **Clinical Data: *Opuntia ficus-indica***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-hangover &amp; anti-inflammatory</b>	Plant extract (1600 IU) vs. identical placebo, given orally 5 hrs before consuming alcohol	Clinical trial, double-blind placebo-controlled, crossover; n=64 healthy volunteers	Significantly reduced symptoms of hangover: dry mouth, nausea & anorexia; mechanism due to inhibition of production of inflammatory mediators	Wiese et al. 2004
<b>Antioxidant &amp; anti-lipid peroxidation</b>	Cactus fruit, 250 g fresh pulp, administered orally vs. 75 mg vitamin C; 2 × daily for 2 wks; 6 wks washout	Clinical study, randomized, crossover, double-blind; n=18 healthy volunteers	Showed positive effects on redox balance: decreased lipid oxidative damage & improved antioxidant status, as compared with vitamin C	Tesoriere et al. 2004

### **Laboratory and Preclinical Data: *Opuntia ficus-indica***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory</b>	Beta-sitosterol	In vivo: mice with adjuvant-induced chronic inflammation	Active	Park et al. 2001
<b>Anti-inflammatory &amp; analgesic</b>	Fruit & stem ethanolic extracts; oral administration	In vivo: rats with acetic-acid induced writhing response & carrageenan-induced paw edema tests	Active; showed potent inhibition in the leukocyte migration of rat CMC-pouch model; suppressed the release of beta-glucuronidase, a lysosomal enzyme in rat neutrophils; protective effects against gastric lesions	Park et al. 1998
<b>Antioxidant &amp; radical scavenging</b>	Prickly pear betalain pigments	In vitro: endothelial cells	Showed protective effects on endothelium from cytokine-induced redox state alteration, through ICAM-1 inhibition	Gentile et al. 2004
<b>Antiulcer</b>	Juice, administered orally	In vivo: rats with ethanol-induced ulcers	Active; protected against experimentally-induced ulcers	Galati et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Chondroprotective</b>	Freeze-dried extracts from cladodes (photosynthetic stem w/reduced leaves), especially polyphenol & polysaccharide-rich extracts	In vitro: human chondrocytes stimulated with proinflammatory cytokine interleukin-1 beta & radical scavenging assay	Active; showed protective effects against experimentally-induced inflammation; effects were greater than those of hyaluronic acid (positive control) in preventing cartilage alteration	Panico et al. 2007
<b>Gastroprotective</b>	Mucilage & pectin from cladodes	In vivo: rats with ethanol-induced ulcers	Active; mucilage showed greater cytoprotective effect on gastric mucosa than pectin	Galati et al. 2007
<b>Gastroprotective &amp; anti-inflammatory</b>	Mucilage from cladodes (5 mg/kg per day)	In vivo: rats with ethanol-induced gastritis	Active; reversed experimentally-induced histological disturbances by stabilizing damaged plasma membranes of gastric mucosa; mechanism may involve membrane phospholipids phosphatidylcholine & phosphatidylethanolamine	Vázquez-Ramírez et al. 2006
<b>Hypoglycemic</b>	Isolated polysaccharides	Unspecified	Active	Alarcon-Aguilar et al. 2003
<b>Immuno-modulatory</b>	Polyphenols	In vitro: human Jurkat T-cell lines	Showed modulation of intracellular calcium concentrations & T-cell activation	Aires et al. 2004
<b>Neuroprotective</b>	Stem: butanol fraction from 50% ethanol extract & its hydrolysis product	In vitro: microglia (LPS-activated)	Showed dose-dependent effect; inhibited nitric oxide production, peroxynitrite scavenging & degradation of I-kappaB-alpha; IC <sub>50</sub> 15.9 & 4.2 µg/mL, respectively	Lee et al. 2006
<b>Neuroprotective &amp; antioxidant</b>	Active antioxidant constituents from fruit & stem (flavonoids: quercetin, (+)-dihydroquercetin, & quercetin 3-methyl ether)	In vitro: cortical cell cultures with induced oxidative injuries	Active; most potent compound: quercetin 3-methyl ether	Dok-Go et al. 2003
<b>Wound healing</b>	Methanolic extracts from stem & organic fractions	In vivo: rats with experimentally-induced wounds	Active; the extract and fractions with low polarity showed significant effects	Park & Chun 2001

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# Altamisa

## OTHER COMMON NAMES

*Artemisia* (Spanish); ragweed, common ragweed (English).

## SCIENTIFIC NAME

*Ambrosia artemisiifolia* L. and *A. peruviana* Willd. [Asteraceae (Daisy or Aster Family)]

**Note:** The European wormwood species *Artemisia absinthium*, called *ajenjo* or *artemisia* in Spanish, is sometimes substituted for *Ambrosia* spp. due to its similar appearance and bitter taste.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Delayed menses
- Diarrhea
- Infections
- Kidney disorders
- Kidney stones
- *Limpiar el sistema*
- Menstrual cramps (dysmenorrhea)
- Menstrual disorders
- Postpartum recovery
- Stomach ache and abdominal pain
- Vaginal infections

**Plant Part Used:** Leaves and aerial parts.

**Traditional Preparation:** The dried leaves are prepared as a tea by decoction or infusion; the fresh leaves are crushed or liquefied to yield a juice for internal use; the fresh or dried leaves are crushed and heated to make a poultice, applied topically to the affected area; the dried leaves are added to complex plant

mixtures and decocted or tinctured in alcohol; the dried plant may be boiled in water as a bath or external wash.

**Traditional Uses:** For stomach ache, abdominal pain and kidney disorders, including kidney stones, the leaves are prepared as a tea. If the fresh leaves are available, they are crushed to extract their juice (*zum*o). To treat infections anywhere in the body, *altamisa* leaves are prepared as a tea and sometimes combined with false buttonweed (*juana la blanca*). For diarrhea in adults and children, the leaf is prepared as an infusion with lemongrass (*limoncillo*) and taken internally to cleanse the intestines and stop diarrhea.

To alleviate menstrual cramps, a poultice is made using slightly heated and crushed leaves, applied externally to the painful area. A tea of the leaves is also administered orally to relieve menstrual cramps and other menstrual disorders. This herb is attributed hot and bitter properties and is said to “go straight to the belly/womb” (*se va directamente al vientre*) to treat menstrual disorders and gynecological problems. For other women’s health conditions, including as an emmenagogue (*para bajar la menstruación*) for delayed menses, to cleanse the reproductive system (*limpiar el sistema*) after childbirth or to treat vaginal infections, *altamisa* leaves are added to multi-herb preparations (*botellas* or *bebedizos*).

A *botella* is also prepared using *altamisa* and several other herbs for treating arthritis, taken orally. In spiritual healing practices, the leaves are used to dispel “negative energy” as part of a *limpieza* ritual for spiritual cleansing. For attracting good luck, a bath is prepared using a decoction of *altamisa*, rue (*ruda*) and soursop (*guanábana*) leaves. *Altamisa* is also associated with imparting psychological and spiritual protection.

**Availability:** This dried herb is sometimes sold at *botánicas*.

## BOTANICAL DESCRIPTION

*Altamisa* (*Ambrosia artemisiifolia*) is a common annual herbaceous plant with erect, hairy stems that typically grows to 0.2 to 2.5 m tall. Leaves are once or twice compound with deep, irregular lobes and narrow segments; leaves are hairy along the upper surface and edges. Flower heads are very small and green to yellowish- or whitish-green, arranged in slender, terminal racemes or spikes. Fruits are small, dry and indehiscent, somewhat resembling a crown; each fruit contains a single seed. All parts of the plant are aromatic and have a strong, bitter taste (Gleason & Cronquist 1991). *Ambrosia peruviana* is very similar in appearance to the above botanical description.

**Distribution:** *Ambrosia artemisiifolia* is a cosmopolitan weed found throughout the United States and Europe whereas *A. peruviana* is widespread throughout tropical America, including the Caribbean.

## SAFETY & PRECAUTIONS

*Ambrosia artemisiifolia* pollen is a known allergen. The major allergenic protein from the pollen has been identified as Amb a 1, an acidic 38-kDa nonglycosylated protein. Pollen from this species also contains profilin and calcium-binding proteins which are pan-allergens that can cause cross-reactivity in pollen-hypersensitive individuals (Wopfner et al. 2005). Symptoms of hypersensitivity, also known as ragweed hayfever, can include: allergic rhinitis, atopic dermatitis, allergic conjunctivitis, coughing, sneezing, fatigue, headache, itching, sore throat and serious allergy-induced asthma symptoms, such as wheezing and difficulty breathing. Results from in vitro and animal studies show that reactive oxygen species produced by pollen hydration may exacerbate allergic reaction and inflammation independent of adaptive immunity (Bacsi et al. 2005). Cases of contact allergy, dermatitis, chronic hand eczema and pompholyx have been reported in sesquiterpene lactone-sensitive patients who tested positive to patch tests of *A. artemisiifolia* (Möller et al. 2002).

**Animal Toxicity Studies:** No signs of toxicity were detected in mice after administration of a single oral dose (up to 5 g/kg) of the crude hydroalcoholic extract (70%) of the dried and comminuted leaf (100 g) of

*Ambrosia peruviana* during an observation period of 14 days. Parameters measured included incidence of diarrhea, weight loss and changes in skin, mucosa or nervous system function (i.e. convulsions; Souza Brito 1995).

**Contraindications:** Contraindicated for use in children under 5 years of age, during pregnancy and during lactation due to lack of available information on the safety of this herb in these populations and conditions (Germosén-Robineau 2007).

**Drug Interactions:** Interactions may occur with medications that share similar biological activities to those demonstrated by this herb (see “Clinical Data” and “Laboratory & Preclinical Data” below). No information has been identified in the available literature on herb-drug interactions for specific therapeutic agents.

## SCIENTIFIC LITERATURE

In clinical studies, allergenic and irritant effects of *Ambrosia artemisiifolia* have been reported, and use of the pollen extract as an immunotherapy for ragweed hayfever has demonstrated clinical efficacy (see “Clinical Data” section below). The following biological activities have been shown in laboratory and/or animal studies: analgesic, anti-inflammatory, antimycobacterial and cytotoxic (see “Laboratory and Preclinical Data” table below). Several studies in the biomedical literature have documented the allergenic effects of *Ambrosia artemisiifolia* pollen and potential immunotherapies using extracts of this plant to reduce symptoms of hypersensitivity.

**Indications and Usage:** According to TRAMIL, the following uses of the species *Ambrosia peruviana* are designated “REC” meaning “RECommended” due to their significant traditional use as documented in ethnopharmacological surveys conducted in the Caribbean (Honduras, Panama and the Dominican Republic): the leaf and stem prepared as an infusion for colic, administered orally; the leaf prepared as an infusion for stomach pain, administered orally; the fresh leaf or the alcohol maceration of the leaf for headache, applied topically. Before using, wash the plant material thoroughly to remove allergenic pollen from the leaves and stem (Germosén-Robineau 2007).

### Clinical Data: *Ambrosia artemisiifolia*

Activity/Effect	Preparation	Design & Model	Results	Reference
Allergenic	<i>A. artemisiifolia</i> ; acetone extract	Human adult	Active; applied topically; showed positive results of contact dermatitis in patch test	Mitchell et al. 1970
Immuno-therapeutic	<i>A. artemisiifolia</i> ; biologically standardized extract of the pollen; administered as an injection (7.2 µg of Amb a 1)	Double blind placebo-controlled clinical trial; duration: 1 year; injective therapy administered at 4-wk intervals (n=23 patients with sensitivity to <i>Ambrosia</i> spp.)	Results showed significant clinical efficacy & safety; no severe adverse effects were reported; parameters of clinical efficacy included skin reactivity & symptom & medication scores, such as asthmatic & rhinitis symptoms	Mirone et al. 2004
Irritant	<i>A. artemisiifolia</i> ; pollen via inhalation	Human adult	Showed irritant activity	Inayama et al. 1975

### Laboratory and Preclinical Data: *Ambrosia artemisiifolia* and *A. peruviana*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic</b>	<i>A. peruviana</i> : dried leaf decoction (1, 5 & 30 g in 100 mL water) administered orally (0.01 mL/g b.w.)	In vivo: rats & mice	Active; showed peripheral analgesic activity	Buznego et al. 1998
<b>Analgesic &amp; Anti-inflammatory</b>	<i>A. peruviana</i> : hydroalcoholic extract (70%) & fractions of 100 g of the dried & comminuted leaf; administered orally (1 g/kg)	In vivo: mice; in acetic-acid induced abdominal contortion model	Active; the crude extract & nonpolar fraction showed significant analgesic effect (49 & 42%) while the polar fraction did not significantly reduce the pain response (15%)	Souza Brito 1995
<b>Anti-inflammatory</b>	<i>A. artemisiifolia</i> ; ethanolic extract (80%) of the fresh leaf	In vivo: in rats, administered: intraperitoneally (25.0 mg/kg) vs. formaldehyde-induced arthritis; topically (150 mg/kg) vs. croton oil-induced edema; intragastrically (100.0 mg/kg) vs. cotton pellet induced granuloma	Active; showed anti-inflammatory activity in all cases	Perez 1996
<b>Anti-inflammatory</b>	<i>A. artemisiifolia</i> ; ethanolic extract (80%)	In vivo: in mice, applied topically (25.0 mg/kg) in carrageenan-induced paw edema model	Active	Perez 1996
<b>Antimycobacterial</b>	<i>A. artemisiifolia</i> ; dichloromethane, hexane & aqueous extracts of dried aerial parts; concentration: 1.0 mg/mL	In vitro: agar plate; <i>Mycobacterium tuberculosis</i> strain H37RV	Active; the hexane & dichloromethane extracts showed significant activity; the aqueous extract showed weak activity	Cantrell et al. 1998

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimycobacterial</b>	<i>A. artemisiifolia</i> ; hot water & cold water extract of fresh leaf (1 part fresh weight of plant: 3 parts solvent)	In vitro: agar plate; <i>Mycobacterium tuberculosis</i>	Both extracts showed weak activity	Frisbey et al. 1953
<b>Cytotoxic</b>	<i>A. artemisiifolia</i> ; ethanolic extract (95%) of the entire plant	In vitro: cell culture (CA-9KB)	Active; ED <sub>50</sub> = 11.0 µg/mL	Bianchi et al. 1968

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiviral</b>	<i>A. peruviana</i> ; aqueous extract of the leaf & stem	In vitro: cell culture of MT-2 T-lymphoblastoid cells infected with HIV	Inactive; did not show antiviral activity against HIV-virus in cultured cells	Abdel-Malek et al. 1996

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# Alucema

## OTHER COMMON NAMES

*Albucema*, *algucema*, *alhucema* (Spanish); lavender (English).

## SCIENTIFIC NAME

*Lavandula angustifolia* Mill. [Lamiaceae (Mint Family)].

**Note:** Although *L. angustifolia* (also known as true lavender or English lavender) is one of the most commonly used species for lavender essential oil, other species are widely used as well, including: *L. latifolia*, *L. stoechas* and *Lavandula* × *intermedia* (a sterile cross between *L. latifolia* and *L. angustifolia*). While the major chemical constituents of these species are similar, the relative amounts of these compounds may vary depending on the species or cultivar (Cavanagh and Wilkinson 2002).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Common cold
- Flatulence and intestinal gas
- Flu
- Indigestion
- Menopausal symptoms
- *Nervios*
- Stomach ache and abdominal pain

**Plant Part Used:** Dried flowers and flower buds or the essential oil (extracted from the fresh flowers and/or inflorescences); fresh flowers are also used when available.

**Traditional Preparation:** The flowers and flower buds are typically prepared as a tea by infusion or decoction.

**Traditional Uses:** *Alucema* flower buds are added to a variety of herbal preparations because of their sweet, floral flavor. When prepared as a tea for the common cold and flu symptoms, the flowers are sometimes combined with other medicinal plants such as cinnamon (*canela*), star anise (*anis de estrella*) and lime (*limón*) or lemon (*limón agrío*). Often *alucema* flowers are added to *botellas* or *bebedizos* (multi-herb decoctions) for women's health conditions to cover up the strong, bitter taste of many of the roots and other herbs. These flowers are added during the last stage of preparation. Unlike roots or woody stems which are boiled for a long time (sometimes several hours) to extract their medicinal properties, these flowers are only infused for a short while in boiling water to retain their volatile oils, so they are added only at the very end of the preparation of a *botella* or *bebedizo*. For spiritual healing, these flowers are often added to aromatic baths for attracting good luck due to their pleasant fragrance.

**Availability:** Dried flower buds can be purchased from *botánicas* and from some health food and natural body care stores in New York City.

## BOTANICAL DESCRIPTION

*Alucema* (*Lavandula angustifolia*) is a heavily branched subshrub that grows up to 60 cm in height. Leaves are narrow and grey-green and grow in opposite pairs. Flowers occur in terminal spikes and are small, tubular and pale plum to amethyst or periwinkle blue in color. Fruits are tiny, glossy nutlets. Flowers and leaves have a distinct aromatic fragrance, especially when crushed (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to the Mediterranean but is common in Europe and cultivated extensively for its fragrant flowers and essential oil (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

The flowers are generally considered safe; however, caution is advised when ingesting the essential oil. Possible adverse effects include drowsiness, gastrointestinal disturbance and skin irritation. Symptoms of overdose include CNS depression, constipation, respiratory depression, headache, meiosis, vomiting and convulsions (Gruenwald et al. 2004).

Body care products containing lavender essential oil (among other ingredients) have been associated with gynecomastia; however, this association appears to be based on clinical case reports in three individuals and minimal in vitro studies (Henley et al. 2007). This research has been critiqued as lacking rigor: since no causality has been established between the use of lavender essential oil and gynecomastia, no definitive scientific conclusions can be drawn. Some constituents of the essential oil (namely terpenes and related compounds) have been shown to weakly interact with estrogen receptors under certain conditions (Howes et al 2002), but there is insufficient evidence to demonstrate the connection between these weak effects and the incidence of gynecomastia.

**Contraindications:** Excessive internal use of the plant or essential oil is contraindicated during early pregnancy due to its emmenagogue effect (Brinker 1998). Due to lack of sufficient data on safety, avoid use during lactation and in small children.

**Drug Interactions:** The effects of sedative or tranquilizing drugs, such as pentobarbital, may be potentiated by concomitant use of lavender (Brinker 1998), as shown in animal studies in which sleeping time and sedative effects in mice increased significantly due to synergistic interaction (Guillemain et al. 1989). Additional herb-drug interactions may occur in medications with effects similar to those demonstrated by this plant (see “Clinical Data” and “Laboratory and Preclinical Data” below).

## SCIENTIFIC LITERATURE

Clinical studies of lavender have primarily evaluated the use of the essential oil as an aromatherapeutic agent (typically via inhalation of the volatile oil or through massage using a carrier oil) and the following effects have been demonstrated: antianxiety, antidepressant, hypnotic, sedative, sensory and pain discrimination and treatment of dysmenorrhea and mild insomnia. Preclinical and laboratory studies have shown the following activity: antibacterial, anticonvulsant, antifungal, anti-inflammatory, sedative and spasmolytic (see “Clinical Data” and “Laboratory and Preclinical Data” tables below).

Due to inconsistencies in reporting of the species or variety of lavender used in essential oil preparations investigated and because of the potential variability in chemical composition depending on distillation techniques and species used, it is difficult to interpret the available data and make comparisons between studies (Cavanagh & Wilkinson 2002). Major chemical constituents of the essential oil include: linalool, linalyl acetate; 1,8-cineole,  $\beta$ -ocimene, terpinen-4-ol and camphor (Cavanagh and Wilkinson 2002). Primary biologically active compounds in the plant include: bornyl acetate, coumarins, linalyl acetate, rosmarinic acid, tannin and ursolic acid (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** Lavender flowers are approved by the German *Commission E* for treating mood disturbances, insomnia, nervous stomach irritation or intestinal discomfort and for treating functional circulatory disorders (Blumenthal et al. 1998). This plant can be administered internally as a tea or externally as a bath additive, using the dried or fresh flowers and flower buds. A standard infusion is prepared by adding 5-10 mL of the medicinal parts to 1 cup of hot water (150 mL), infused for 10 minutes and then strained. For a lavender bath, 100 g of the herb are combined with 2 liters of water (either boiled or infused) and then added to the bath. The dosage is 1 cup taken three times daily (Gruenwald et al. 2004).

### Clinical Data: *Lavandula angustifolia*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Study design</b>	<b>Results</b>	<b>Reference</b>
<b>Antidepressant</b>	Group A: Tincture (1:5 in 50% alcohol) 60 drops/day & placebo tablet; B: imipramine (100 mg/day) & placebo drops; or imipramine & <i>Lavandula</i> tincture; 4 wks duration	Double-blind, randomized, placebo-controlled clinical trial; 45 adults with mild to moderate depression	Although <i>Lavandula</i> tincture was less effective than imipramine, a combination of imipramine plus <i>Lavandula</i> tincture was more effective than imipramine alone	Akhondzadeh et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Study design</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-stress</b>	Essential oil odor	Randomized controlled clinical trial; experimental group (n=15) placed in a sound-proof room for 20 minutes with lavender odor; analogous group without odor (n=14); nonstressful conditions (n=13)	Results showed lavender odorants reduced mental stress & increased arousal state; evaluated using Cox & Mackay's stress/arousal adjective checklist	Motomura et al. 2001
<b>Anxiolytic</b>	1% essential oil aromatherapy (either inhalation or skin application)	Clinical trial; 36 patients in intensive care unit	Significant but brief difference in anxiety reduction; no change in mood or coping variables	Dunn et al. 1995
<b>Dysmenorrhea treatment</b>	Essential oil (2 drops) combined with along 1 drop clary sage & 1 drop rose essential oil in almond oil applied topically by abdominal massage (placebo: almond oil)	Randomized placebo-controlled clinical trial; 67 healthy women with painful menstrual cramps; groups: experimental: n=25; placebo: n=20; control: n=22	Significantly reduced severity of pain from cramps & symptoms of dysmenorrhea based on evaluation using a visual analogue scale & verbal multidimensional scoring system	Han et al. 2006
<b>Insomnia treatment</b>	Essential oil aroma (sweet almond oil as placebo/control)	Single-blinded, randomized cross-over study; 10 volunteers with mild insomnia (4 wks study)	Showed improvement on Pittsburgh Sleep Quality Index; no carry-over effect observed	Lewith et al. 2005
<b>Retrospective pain perception</b>	Essential oil inhalation as aromatherapy	Randomized, controlled crossover study; 13 men & 13 women	Affected retrospective evaluation of treatment-related pain; reduced degree of pain intensity & unpleasantness based on the subjects' recollection of the experience, although no immediate analgesic effects were observed	Gedney et al. 2004
<b>Sedative &amp; hypnotic</b>	Essential oil as aromatherapy	Human & animal subjects	Showed EEG changes equivalent to drowsiness	Diego et al. 1998

### **Laboratory and Preclinical Data: *Lavandula angustifolia* and related species**

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Study design</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Essential oil of both spike & true lavender species	In vitro: disk diffusion assay method	Active against respiratory pathogens	Inouye et al. 2001

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Study design</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Essential oil	In vitro	Active against oral bacteria; showed bacteriostatic effects	Takarada et al. 2004
<b>Antibacterial</b>	Essential oil of <i>Lavandula stoechas</i> subspecies <i>stoechas</i>	In vitro: <i>Escherichia coli</i> , <i>Listeria monocytogenes</i> , <i>Salmonella typhimurium</i> , <i>Staphylococcus aureus</i>	Showed very strong activity against tested foodborne pathogens	Dadalioglu & Evrendilek 2004
<b>Anticonvulsant</b>	Essential oil	In vivo: mice & rats	Effective against induced seizures	Schulz et al. 1998
<b>Antifungal</b>	Essential oil & main constituents	In vitro: <i>Candida albicans</i> strains	Active; showed fungistatic & fungicidal activity	D'Auria et al. 2005
<b>Anti-inflammatory</b>	Essential oil (1:500, 1:100, 1:10, 1:1, 1:0); topical & intradermal application	In vivo & in vitro: experimentally-induced allergic reactions in mice & rats	Showed significant & dose-dependent inhibition of immediate-type allergic reactions; mechanism involved inhibition of mast cell degranulation	Kim & Cho 1999
<b>Antispasmodic</b>	Essential oil	In vitro: ileum smooth muscle of guinea-pig	Active; mechanism of action was postsynaptic & appears linked to cAMP (not cGMP & not atropine-like), similar to geranium & peppermint oils; may explain carminative, antifatulent & anticolic properties	Lis-Balchin & Hart 1999
<b>Sedative</b>	Essential oil & main constituents; inhaled	In vivo: mouse, male & female	Active; reduced motility in an exposure time-dependent manner	Buchbauer et al. 1993

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# Anamú

## OTHER COMMON NAMES

*Ipacina* (Spanish); guinea hen-weed (English).

## SCIENTIFIC NAME

*Petiveria alliacea* L. [Phytolaccaceae (Pokeweed Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Backache
- Childbirth – labor pain
- Headache
- Menopausal symptoms
- Menorrhagia (excessive menstrual bleeding)
- Menstrual cramps (dysmenorrhea)
- Muscle ache
- Nausea
- Ovarian cysts
- Postpartum recovery
- *Purificar la sangre*
- Skin infections
- Stomach disorders
- Uterine fibroids
- Wounds

**Plant Part Used:** Roots and leaves (fresh or dried).

**Traditional Preparation:** The root, leaves or aerial parts have been prepared in a variety of ways, depending on the health condition: as a tea by decoction or infusion; as a tincture or liniment extracted in alcohol; as a poultice, crushed, heated and applied topically to the affected area; as a wash or bath boiled in water and used externally; or as an aromatic essence released by crushing the leaves or roots and inhaling the volatile oils.

**Traditional Uses:** *Anamú* is considered a potent medicinal plant, renowned for its powerful therapeutic and strongly bitter properties. The root is said to be very hot (*caliente*) and to heal ailments caused by excess cold in the body by bringing heat to the affected area, especially for arthritis, *resfriado* and *frialdad*. For treating arthritis, backache and muscle pain, the root of *anamú* is extracted in gin (*ginebra*) or red wine (*vino tinto*). A small amount of this alcohol tincture is taken 2-3 times daily and can also be applied topically as a liniment. Other ingredients are sometimes added to this preparation, including minnieroot (*guauci*) roots, cinnamon (*canela*) bark and coffee (*café*) roasted seeds.

For skin conditions including fungal infections, wounds and boils (*nacíos*), the leaf is heated or crushed and applied externally to the affected area or steeped in boiling water and administered as a bath or wash. For nausea and stomach ailments, the leaf and root are prepared as a tea. For headache, the leaves are taken as a tea and/or applied to the forehead. The leaves and root of this plant are also a remedy for conditions associated with contaminated blood (*mala sangre, sangre sucia*) because of its purported depurative (blood purifying) properties.

*Anamú* is one of the most frequently cited plants for women's health conditions and is often added as a key ingredient in herbal preparations (*bebedizos* or *botellas*) for this purpose. It is used as a treatment for dysmenorrhea, excessive menstrual bleeding, menopausal symptoms (including hot flashes), ovarian cysts, labor pain during childbirth, postpartum recovery and uterine fibroids.

When taken internally, this plant is said to change the smell of one's urine such that it resembles the characteristic garlic-like odor of the leaves and root of this plant. For spiritual healing, *anamú* is used to dispel negative energy.

**Availability:** Dried roots and leaves are sold at some *botánicas* in New York City.

## BOTANICAL DESCRIPTION

*Anamú* (*Petiveria alliacea*) is an herbaceous plant that grows to 1 m tall, with dark green, leathery, narrowly oval leaves (6-19 cm long) that are sharply pointed at both ends. Flowers are small, white to greenish in color, star-shaped and grow along elongated slender spikes. Fruits are small, dry and tipped with twisted bristles, each fruit containing a single seed. One remarkable identifying characteristic of this plant is the strong garlic-like odor of the leaves and especially the roots (Acevedo-Rodríguez 1996).

**Distribution:** This plant grows in tropical regions, both wild and cultivated and is native to tropical America (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

No data on the safety of this plant in humans has been identified in the available literature. According to TRAMIL, the leaves of this plant have shown relatively low toxicity based on animal studies (Germosén-Robineau 1995).

**Animal Toxicity Studies:** No signs of toxicity or death were observed in mice when administered the aqueous, lyophilized leaf extract at dosages of 1 and 2 g/kg daily, given orally 5 days a week for 70 days with 2 additional weeks of observation (García et al. 1996). A decoction of the leaves given orally to mice as a single dose of 10 g/kg did not show evident signs of toxicity during 7 days of post-treatment observation (Del Carmen Rivas et al. 1988).



**Contraindications:** Internal use is contraindicated during pregnancy (due to potential abortifacient effects), during lactation and in children less than 12 years of age (Germosén-Robineau 2005).

**Drug Interactions:** Caution advised when administering the decoction of the leaves to diabetic patients undergoing treatment including insulin or hypoglycemic medications because this herb may potentiate the effects of these drugs when administered concomitantly (Germosén-Robineau 2005).

## SCIENTIFIC LITERATURE

No clinical trials of this plant have been identified in the available literature; however, laboratory and preclinical data have shown analgesic, antifungal, anti-inflammatory, chemopreventive and hypoglycemic effects (see “Laboratory and Preclinical Data” table below). *Petiveria alliacea* has demonstrated the following biological activity in laboratory studies: analgesic, antiangiogenic, antimicrobial (*Epidermophyton floccosum*), hypoglycemic and stimulant of smooth muscle contractions (Germosén-Robineau 2005). Major chemical constituents include coumarins, allantoin and triterpenes (Germosén-Robineau 2005). Other biologically active constituents include polysulphides (Benevides et al. 2001).

**Indications and Usage:** According to TRAMIL, *anamú* is classified as recommended for the following conditions (based on both documented traditional uses and supporting evidence from the scientific literature): leaf decoction taken orally for digestive disorders (stomach ache, abdominal pain, indigestion, weak digestion, flatulence); leaf maceration as a mouthwash for toothache; leaf decoction as a bath for muscle ache; leaf decoction as an external wash for skin diseases; leaf and root decoction taken orally for arthritis; leaf and root decoction taken orally for common cold; crushed root inhaled for flu; crushed or pulverized root inhaled or as a bath for headache; root decoction taken orally for flatulence; crushed or pulverized root and stem inhaled for sinusitis (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Petiveria alliacea*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Study design</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Isolated constituents from root	In vitro: yeast & fungal strains	Active	Benevides et al. 2001
<b>Anti-inflammatory &amp; analgesic</b>	Crude freeze-dried root extract; 43.9 mg/kg body wt.	In vivo: rats with pleurisy; oral administration	Active; significantly reduced the number of migrating neutrophils, mononuclear cells & eosinophils & showed analgesic effect	Lopes-Martins et al. 2002
<b>Antinociceptive</b>	Organic root extracts; 100 & 200 mg/kg intraperitoneally	In vivo: mice; acetic acid, hot-plate, rota rod & formalin tests	Active; different fractions showed different anti-nociceptive effects	Gomes et al. 2005
<b>Antiviral</b>	Ethyl acetate & dichloromethane extracts (leaves & stems)	In vitro: plaque assay; against bovine viral diarrhea virus	Active; showed promising inhibition values; possible implications for hepatitis C as bovine viral diarrhea is a model for this virus	Ruffa, Perusina et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Study design</b>	<b>Results</b>	<b>Reference</b>
<b>Chemomodulatory</b>	Methanolic plant extract	In vitro: human hepatocellular carcinoma cell lines (Hep G2)	Active against cancer cells	Ruffa, Ferraro et al. 2002
<b>Chemopreventive</b>	Isolated constituents	In vitro: HL-60 promyelocytic cells	Showed potent activity (ED <sub>50</sub> <8 mg/mL); induced cellular differentiation	Mata-Greenwood et al. 2001
<b>Hypoglycemic</b>	Leaf, dry branch & root aqueous ethanolic extract; 1 g/animal, orally	In vivo: mice	Active; leaf & branch extracts lowered blood glucose levels by 60%; dry root extract was inactive	Lores & Pujol 1990

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# Anís chiquito

## OTHER COMMON NAMES

*Anís*, *anís de comer*, *anís de cocinar*, *anís pequeño*, *aniscito* (Spanish); anise, aniseed (English).

## SCIENTIFIC NAME

*Pimpinella anisum* L. Synonym: *Anisum vulgare* Gaertn. [Apiaceae (Carrot Family)].

**Note:** Several different types of *anís* are recognized in Dominican herbal medicine. Please consult the appropriate entry for the type of *anís* specified. For a list of these species and their distinguishing features, see the entry for *Anís* in the “Quick Guide” section.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Colic
- Common cold
- *Empacho*
- Flatulence and intestinal gas
- Flu
- Gastrointestinal disorders
- Headache
- Indigestion
- *Pasmo*

**Plant Part Used:** Seeds, essential oil.

**Traditional Preparation:** Approximately 1 teaspoon of seeds are added to 1 cup of boiling water to make an infusion. There are at least five different types of anise-like medicinal plants that are recognized in Dominican healing traditions, but this is the classic *anís*. The common names of the seed anise include the

following: *anís chiquito* (*Pimpinella anisum*), *anís comino* or *comino* (*Cuminum cyminum*) and *anís hinojo* (*Foeniculum vulgare*). These seeds are easily confused and sometimes used interchangeably because their appearance, taste and medicinal properties are relatively similar. All three of these plants can be prepared together to make anise tea (*té de anís*) which is a common remedy for treating flatulence and intestinal gas (*gases*), colic (*cólicos*), indigestion, *pasmo* and gastrointestinal disorders. Sometimes *anís de estrella* (Chinese star anise) is also used to make this tea, although the star-shaped fruits of this plant may be adulterated with those of a poisonous look-alike, Japanese star anise and therefore should not be given to young children (for more details, refer to the plant entry for “*Anís de estrella*”).

To make the classic *té de anís*, take a small spoonful (teaspoon-sized) of each of the above anise-like seeds that will be used, lightly grind or powder them with a mortar and pestle and boil this mixture in a liter of water for 5-10 minutes to make a decoction. Once the water has begun to boil for a few minutes, it is covered to trap the aromatic vapors of the seeds and allow the tea to “sweat” (*sudar*). As the water cools down, the seeds are strained out and the tea is ready to be served. One small cup (6-8 oz) is taken in the morning and in the evening before going to bed, when the stomach is not full, to improve digestion, reduce inflammation and treat “*los gases*” (meaning both flatulence and displaced air that can occur anywhere in the body resulting in muscle spasms). For children, a few teaspoonfuls (depending on the child’s age and size) of the tea are administered as needed to relieve colic symptoms. Sometimes other carminative (anti-flatulent) herbs or pleasant-tasting spices are added to this remedy, such as chamomile (*manzanilla*) and lavender (*alucema*) flowers.

**Traditional Uses:** For the common cold or flu (*gripe*), the seeds are prepared as a tea and combined with cinnamon (*canela*) bark, lemongrass (*limoncillo*) leaves and mint (*hierbabuena*) leaves. Also, for headaches, a tea can be prepared using both *anís* seeds and orange (*naranja*) leaves. For insomnia, the seeds of this plant are prepared as a tea and often combined with chamomile (*manzanilla*) flowers. For digestive disorders and to cleanse the intestines (*limpiar los intestinos*), seeds of *anís* are boiled as a tea with wild privet senna (*sen*) leaves and star anise (*anís de estrella*) fruits/seeds.

**Availability:** Dried seeds can typically be purchased from grocery stores as a culinary spice as well as from *botánicas*, *bodegas* or *farmacias* and are often sold in plastic bags from major distributors.

## BOTANICAL DESCRIPTION

*Anís* (*Pimpinella anisum*) is an herbaceous annual plant that typically grows to 50 cm to 1 m in height. Leaves are alternate; older leaves are finely divided, narrow and arranged in a fan-like shape. Flowers are small, white and fragrant. Fruits are round (5 mm) and covered with tiny soft hairs. The leaves and seeds have a characteristic sweet taste and odor and are popular as a culinary spice (Bailey Hortorium Staff 1976).

**Distribution:** Although the exact origin of this plant is unknown, it is most likely from the Near East and is widely cultivated throughout Mediterranean Europe, Central Asia, India, China, Japan and Central and South America (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

The seeds/fruits of this plant and its essential oils are categorized as GRAS (Generally Recognized as Safe) for use as a food additive or flavoring agent by the United States Food and Drug Administration and are widely consumed as a culinary spice (Newberne et al. 1999). According to the *PDR for Herbal Medicines*, no health hazards or negative side effects have been reported when *anís* is used properly. However, excessive amounts of the herb and essential oil can be toxic. Caution is recommended because of the potential mutagenic activity of the fruit (Germosén-Robineau 1995). No systematic studies of the potential toxicity of anise have been conducted in humans.

Adverse effects in infants have been reported associated with mothers' ingestion of a tea for lactation containing *anis* along with the other herbs and was linked to symptoms such as drowsiness, hypotonia, lethargy, emesis and poor suckling in two breast-fed newborns (Rosti et al. 1994). However, according to Fugh-Berman (2003), these adverse effects were most likely due to other ingredients in the herbal combination used, such as licorice or goat's rue rather than *anis*.

**Contraindications:** *Anis* is contraindicated for those with a history of hypersensitivity to the plant due to possible allergic reaction. The seeds may also be contraindicated during pregnancy due to their estrogenic effects (Brinker 1998). However, according to Fugh-Berman (2003): "This herb is safe for use in pregnancy and lactation and is reputed to increase milk production" (p. 13). Caution is advised in patients with estrogen-dependent cancers or endometriosis due to potential complications arising from the estrogenic effects of the seed constituents (Kassi et al. 2004, Albert-Puleo 1980).

**Drug Interactions:** Avoid use if taking anticoagulant medications, NSAIDS and antiplatelet drugs due to potential for excessive bleeding as a result of interaction with coumarin derivatives. Warfarin: anise may potentiate the effects of this drug and could potentially lead to increased risk of bleeding (Heck et al. 2000).

## SCIENTIFIC LITERATURE

*Anis* (*Pimpinella anisum*) or aniseed is considered "a very safe herb used as a flavoring agent and medicinally in children and adults for coughs and gastrointestinal disorders" although few clinical trials of its use have been identified in the literature (Fugh-Berman 2003). One open clinical trial has confirmed its use as a topical pediculicidal treatment for head lice (Mumcuoglu 2002). Laboratory and preclinical studies have shown the following effects: anticonvulsant, antidiuretic, antifungal, antimicrobial, antispasmodic, estrogenic, expectorant, iron absorption increased, morphine effect reduction, mutagenic, pediculicidal, pharmacokinetic, phase II enzyme induction and smooth muscle relaxant (see "Laboratory and Preclinical Data" table below). Secondary references indicate that the following additional effects have been demonstrated in preclinical laboratory and/or animal studies: antifatulent, hypotensive, liver regenerative, muscle stimulant and insecticidal (Gruenwald et al. 2004).

Active constituents responsible for the estrogenic effects of the seed have been identified as polymers of anethole (i.e. dianethole and photoanethole; Albert-Puleo 1980). The seeds are rich in iron and calcium (Brinker 1998). In an elimination study of the pharmacokinetics of the primary active constituent of the essential oil, *E*-anethole, 70-85% of this compound was absorbed after oral administration, and it was shown to be excreted via the kidneys and lungs and metabolized by an oxidative pathway to 4-methoxyhippuric acid (ESCOP 1997).

**Indications and Usage:** Approved by the German *Commission E* for the following health conditions: common cold, cough/bronchitis, fevers, inflammation of the mouth and pharynx, dyspeptic disorders and loss of appetite (Blumenthal et al. 1998). For gastrointestinal disorders, the plant is taken internally, whereas for upper or lower respiratory tract infections it is used both internally and externally. The TRAMIL classification for internal use of the seed decoction is "INV" meaning that more studies are needed before recommending it for clinical use (Germosén-Robineau 1995).

Typical dosage for internal administration as a tea is 1 teaspoon seeds per 1 cup boiling water, up to three times daily. For infants, 1 teaspoon seeds added to bottle. This herb is also used externally via inhalation of the essential oil (Gruenwald et al. 2004). Common dosage forms as reported in Fugh-Berman (2003) are as follows: dried fruit - 0.5 to 1 g three times daily; infusion - made from 0.5 to 5 g crushed or coarsely powdered fruit 1-3 times daily. For children, 1 to 2 g daily may be administered as an infusion or 1 tsp of the infusion may be added to the child's bottle.

### **Clinical Data: *Pimpinella anisum***

<i>Activity</i>	<i>Preparation</i>	<i>Study design</i>	<i>Results</i>	<i>Reference</i>
<b>Pediculicidal</b>	Mixture: anise, coconut, ylang ylang oils; applied to the hair 3 × daily, 15 mins each time, at 5 day intervals	Open clinical study: children infested with head lice (n=119)	Successful treatment (92.3%) equal to that of positive control (92.2%); no serious side effects were observed	Mumcuoglu et al. 2002

### **Laboratory and Preclinical Data: *Pimpinella anisum***

<i>Activity</i>	<i>Preparation</i>	<i>Study design</i>	<i>Results</i>	<i>Reference</i>
<b>Anticonvulsant</b>	Essential oil of the fruit	In vivo: mice	Active; suppressed tonic convulsions & elevated the threshold of clonic convulsions	Pourgholami et al. 1999
<b>Antidiuretic</b>	Essential oil extracted from seeds	In vivo: rats	Active; increased glucose absorption and reduced the volume of urine produced and increased the activity of the renal Na <sup>+</sup> -K <sup>+</sup> ATPase	Kreydiyyeh et al. 2003
<b>Antifungal</b>	Fluid extract of the fruit & essential oil	In vitro: clinical isolates of 7 yeast & 4 dermatophyte species	Active; fluid extract: MIC between 17-20% (v/v) for 6 <i>Candida</i> spp.; essential oil: MIC between 0.10 & 1.56% (v/v) for yeasts & dermatophytes, respectively	Kosalec et al. 2005
<b>Antimicrobial &amp; antifungal</b>	Essential oil of fruit	In vitro	Demonstrated pharmacological activity	Cited in Fugh-Berman 2003
<b>Antispasmodic &amp; smooth muscle relaxant</b>	Aqueous and ethanol extracts and essential oil	In vitro: isolated guinea pig tracheal chains	Showed a bronchodilatory effect due to inhibition of muscarinic receptors	Boskabady & Ramazani-Assari 2001
<b>Estrogenic</b>	Essential oil & isolated compounds	Unspecified (historical review)	Pharmacologically active estrogenic agents identified: dianethole & photoanethole (polymers of anethole)	Albert-Puleo 1980

<b>Activity</b>	<b>Preparation</b>	<b>Study design</b>	<b>Results</b>	<b>Reference</b>
<b>Estrogenic</b>	Aqueous extract	In vitro: cell lines; 10-100 µg/mL concentration	Showed selective estrogen receptor modulator (SERM)-like properties; had antiestrogenic effect on breast cancer cells	Kassi et al. 2004
<b>Expectorant</b>	Two drops of essential oil in an emulsion	In vivo: cats; administered by gavage	Reversed the inhibitory effects of opium on expectoration	ESCOP 1997
<b>Expectorant</b>	Essential oil	In vivo: guinea pigs & rats; administered orally & by vapor inhalation	Increased respiratory secretions by 19% to 82% in a dose-dependent manner; high doses of inhaled vapor caused tissue damage and were lethal in 20% of rabbits	ESCOP 1997
<b>Iron absorption increased</b>	Beverage extract of seed	Tied-off intestinal segments of rats	Increased iron absorption due to tannins, phytic or ascorbic acids; recommended for prevention of iron-deficiency anemia	el-Shobaki et al. 1990
<b>Morphine effect reduction</b>	Fruit essential oil (0.125-.5 mg/kg administered intraperitoneally) & morphine (2-5 mg/kg injected subcutaneously)	In vivo: mice; measured morphine-induced conditioned place preference	Active; works via a GABAergic mechanism; may have implications for treating drug dependence	Sahraei et al. 2002
<b>Mutagenic</b>	5-20 mg/disc	In vitro: against <i>Salmonella typhimurium</i>	Demonstrated mutagenic activity	Shashikanth & Hosono 1986
<b>Pediculicidal</b>	Essential oil (effect attributed to phenols, phenolic esters, ketones & oxides)	In vitro: <i>Pediculus humanus capitis</i> ; essential oil applied as an alcohol-based solution	Active; found to be effective after applied and followed by an essential oil, vinegar & water rinse the next day	Veal 1996
<b>Phase II enzyme induction</b>	Eugenol & trans-anethole; 125 or 250 mg/kg b.w. administered by gavage daily for 10 days	In vivo: Wistar rats	Treated liver microsomes did not show any effect on total cytochrome P-450 content; induced phase II biotransformation enzymes	Rompelberg et al. 1993

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# Anís de Estrella

## OTHER COMMON NAMES

*Anís estrellada*, *anís grande* (Spanish); Chinese star anise, true star anise (English).

## SCIENTIFIC NAME

*Illicium verum* Hook. [Illiciaceae (Star Anise Family)].

**Note:** Caution is advised as supplies of the fruit of this plant can be adulterated by a poisonous look-alike, Japanese star anise (*Illicium anisatum* L.), which is a known neurotoxin. Due to potential contamination, this herb should not be administered to small children. See cautionary statement below under the “Safety and Adverse Reactions” section.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this edible food plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Flatulence and intestinal gas
- Gastrointestinal disorders
- Headache
- Indigestion
- Stomach ache and abdominal pain
- Upper or lower respiratory tract infections

**Plant Part Used:** The seeds, the whole dried fruit and the essential oil extracted from the fruit.

**Traditional Preparation:** A tea (decoction) is prepared from the freshly ground seeds and/or fruits.

**Traditional Uses:** *Anís de estrella* is prepared as a tea along with other anise-flavored medicinal plants and taken for relief from flatulence, gastrointestinal disorders, headache, indigestion, stomach ache, abdominal pain, upset stomach and upper or lower respiratory tract infections. One remedy for “cleansing the intestines” (*limpiar los intestinos*) is made with *anís* seeds/fruits, star anise (*anís de estrella*) seeds/fruits and wild privet senna (*sen*) leaves prepared as a tea.

**Availability:** Dried seeds or whole dried fruit can be purchased from some *botánicas* and major grocery stores, supermarkets or ethnic markets in Latino and Caribbean neighborhoods where they are sold as a culinary spice.

## BOTANICAL DESCRIPTION

*Anís de estrella* (*Illicium verum*) or Chinese star anise is an evergreen tree that typically reaches a height of 10-15 m. Leaves grow in an alternate pattern and are narrow to elliptic, shiny, leathery and dark green. Flowers grow singly and are greenish-yellow or reddish-white. Fruits are glossy brown seeds inside boat-shaped seed pods or follicles, each arranged around a central axis in the shape of a star; each star-shaped fruit typically has 8 points but can be 6-13 points. All parts of this tree are highly aromatic with a pleasant, sweet fragrance (Bailey Hortorium Staff 1976).

**Distribution:** Native to southern China and northern Vietnam, this plant grows in cooler tropical and subtropical areas and is cultivated extensively as a culinary spice and for its essential oil (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Extreme caution is advised when using this plant, especially in young children, due to potential contamination of *anís de estrella* (Chinese star anise, *Illicium verum*) with highly toxic Japanese star anise (*Illicium anisatum*) which can have fatal consequences (see below). The unadulterated fruits of Chinese star anise (*I. verum*) are generally regarded as safe for human consumption as a food additive and flavoring agent. No health hazards have been identified in the published literature associated with the appropriate use of Chinese star anise (*I. verum*) as long as it is not adulterated with Japanese star anise (*I. anisatum*). Allergic reactions occur rarely, resulting from long-term, repeated exposure (Gruenwald et al. 2004).

**Caution! Poisonous Look-Alike:** *Anís de estrella* (*Illicium verum*) is easily confused with Japanese star anise (*Illicium anisatum* L.; botanical synonyms: *I. religiosum* Siebold and *I. lanceolatum* A.C.Sm.) which has poisonous seeds that can cause neurologic and gastrointestinal toxicities. Highly toxic, Japanese star anise seeds contain spasmogenic sesquiterpene lactones including anisatin, neoanisatin and pseudoanisatin which can cause severe adverse effects. Recent case reports of adverse reactions in infants due to administration of star anise tea have alerted the medical community to the potential adulteration of Chinese star anise with the poisonous Japanese star anise; therefore, it is recommended that star anise tea not be administered to infants or young children due to their particular vulnerability. Symptoms of toxicity from Japanese star anise in infants include vomiting, seizures and unusual irritability (Ize-Ludlow et al. 2004).

Cases of confirmed adulteration of Chinese star anise with Japanese star anise have been reported in the literature. In one case, the tea was administered to an infant (< 6 months of age) and resulted in symptoms of excessive crying and excitability, hypertonia, nystagmus, spasms or tremors and vomiting (Minodier et al. 2003). Several infants presented with acute neurologic and gastrointestinal symptoms that were associated (in a case-controlled study) with consumption of star anise infusion; laboratory tests confirmed that the source of the star anise used was adulterated with other star anise species besides *Illicium verum* (Garzo Fernandez et al. 2002). An epidemic of epileptic, tonic-clonic seizures (16 persons) associated with ingestion of a star anise tea was reported with 63 individuals exhibiting symptoms of nausea and vomiting within 2-4 hours of drinking the infusion. The presence of anisatin in the tea was confirmed by nuclear magnetic resonance (NMR) analysis and identified as the compound responsible for these adverse effects (Johanns et al. 2002). Another incident of a newborn who was administered large amounts of star anise tea resulted in convulsions which required three doses of diazepam to control (Gil Campos et al. 2002).

## Distinguishing Characteristics of Chinese and Japanese Star Anise Fruits

Characteristics	Chinese star anise ( <i>Illicium verum</i> )	Japanese star anise ( <i>Illicium anisatum</i> )
Toxicity	- Generally considered safe	- Toxic
Size	- Slightly larger	- Slightly smaller
Texture	- Softer and more plump	- Harder, more woody and shriveled
Beak shape	- Somewhat straight beak	- Thin, mostly curved beak
Smell	- Faint anise-like scent	- Faint clove- or cardamom-like scent
Taste	- Sweet, spicy, pleasant taste	- Unpleasant, slightly bitter, acrid taste
Plant fragrance	- All parts are highly aromatic	- Leaves and flowers have no fragrance

Because both Chinese and Japanese star anise fruits can vary considerably in size and shape, it is difficult to distinguish between these two species based only on their appearance to the naked eye. Laboratory protocols for analyzing these species have been proposed to detect adulteration and improve quality control. These species can be differentiated by their unique flavonoid patterns using thin-layer chromatography (TLC), and low concentrations of adulteration with toxic *Illicium* spp. can be detected by their marker anisatin (a sesquiterpene lactone) using selective high performance liquid chromatography (HPLC)/ESI-MS/MS methods (Lederer et al. 2006). A simpler and quicker method to determine possible adulteration is performed by using gas chromatography and/or fluorescent or scanning electron microscopy to examine distinguishing anatomical features in the epicarp cells of the fruits (Joshi et al. 2005).

**Animal Toxicity Studies:** Oral administration of isolated sesquiterpenoids from Chinese star anise (*Illicium verum*; compounds: veranisatins A, B and C; Okuyama et al. 1993) caused convulsions and lethal toxicity in mice at a dose of 3 mg/kg, resulting in hypothermia at lower doses and decreased locomotion at oral doses of 0.1 mg/kg (Nakamura et al. 1996).

**Contraindications:** Avoid use in children due to potentially toxic effects from possible contamination with Japanese star anise seeds (Ize-Ludlow et al. 2004). Do not use in patients with a history of epilepsy or other convulsive disorders due to case reports of seizures associated with internal use of the tea (Nakamura et al. 1996, Johanns et al. 2002). Due to potential risk of increased bleeding, caution is advised in patients prior to surgery.

**Drug Interactions:** Based on evidence from animal studies in mice, *Illicium verum* increases cytochrome P450 dependent 7-ethoxycoumarin O-deethylase activity which may affect the metabolism of anticoagulant or antiplatelet medications and NSAIDS (Hendrich et al. 1986; Hendrich et al. 1983).

## SCIENTIFIC LITERATURE

Although no human clinical trials of this plant have been identified in the available literature, laboratory and preclinical studies have shown the following effects: antiangiogenic, antibacterial, antimicrobial, insecticidal, neurotropic and sepsis prevention (see “Laboratory and Preclinical Data” Table). *Anís de*

*estrella*'s therapeutic properties (concentrated in the essential oil and flavonoids) include bronchial expectorant (affecting the mucous membrane of the respiratory tract) and antispasmodic (affecting the smooth muscle of the gastrointestinal tract; Gruenwald et al. 2004).

Star anise fruit was originally the main source of shikimic acid for the pharmaceutical industry as a key ingredient in the synthesis of the antiviral drug Tamiflu (oseltamivir, neuramidase inhibitor GS4104), and when demand for this drug increased due to stockpiling in anticipation of a potential avian influenza epidemic, commercial supplies of the plant were limited. However, the recent development of microbial production of shikimic acid has reduced the need for star anise fruit in the manufacture of this drug (Johansson & Liden 2006, Kramer et al. 2003).

The fruit contains a high concentration of essential oil, and its most notable constituent is shikimic acid. Other major chemical constituents include: 1,8-cineole, allo-aromadendrene, alpha-copaene, alpha-pinene, caryophyllene, essential oil, estragole, feniculin, limonene, linalool, methylchavicol and trans-anethole (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** Chinese star anise seed is approved by the *Commission E* for the following health conditions: upper or lower respiratory tract infections or colds and gastrointestinal disorders (Blumenthal et al. 1998). Recommended daily dosage of the freshly-ground seeds is 3 g ingested, prepared as a tea (0.5-1 g ground seeds per cup of water) or taken as an essential oil (0.3 g; Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Illicium verum*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiangiogenic</b>	Fruits & stem	In vitro: human umbilical venous endothelial cell assay	Exhibited moderate to strong activity; inhibited tube-like formation indicative of angiogenesis	Nam et al. 2003
<b>Antibacterial</b>	Methanol extract of fruits	In vitro: against anaerobic and facultative aerobic periodontal bacteria	Effective against <i>Eikenella corrodens</i>	Iauk et al. 2003
<b>Antimicrobial</b>	Active constituent of the dried fruit: anethole	In vitro	Active against bacteria, yeast and fungal strains	De et al. 2002
<b>Carcinogen metabolism</b>	Ethanol extract, added to diet	In vivo: adult male & female mice fed semi-purified basal diet for 14 and 10 days, respectively	Active; increased 7-ethoxycoumarin O-deethylase activity; in males: induced microsomal epoxide hydratase & increased cytosolic epoxide hydratase	Hendrich & Bjeldanes 1986
<b>Insecticidal</b>	Essential oil; applied topically	In vivo: adult laboratory & field strains of <i>Aedes aegypti</i>	Effective; lethal concentration of 50% of mosquitoes was 6.21 µg/mg (lab) & 8.83 µg/mg (field); suggested for use in eradicating disease vector	Chaiyasit et al. 2006

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Neurotropic: analgesic &amp; locomotor activity decrease</b>	Isolated sesquiterpenoids: veranisatins A, B & C; administered orally	In vivo: mice	Caused convulsions at a dose of 3 mg/kg, resulting in hypothermia at lower doses; veranisatin A decreased locomotion at oral doses of 0.1 mg/kg & demonstrated analgesia	Nakamura et al. 1996
<b>Sepsis prevention</b>	Fruits & isolated compounds (phenylpropanoid glucosides); 10 mg/kg	In vivo: tumor necrosis factor-alpha-induced shock assay	Active; reduced plasma alanine aminotransferase values & reduced lethality by 100%; dose-dependent effect	Lee et al. 2003

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# Aniseto

## OTHER COMMON NAMES

*Anís, aniseto, anisillo, cirio, guayuyo anisillo, higuillo oloroso* (Spanish); cake bush (English).

## SCIENTIFIC NAME

*Piper marginatum* Jacq. [Piperaceae (Pepper Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Flatulence and intestinal gas
- Gastrointestinal pain

- Stomach disorders

**Plant Part Used:** Leaves, roots or entire plant.

**Traditional Preparation:** A tea is prepared by boiling the leaves or infusing the leaves in hot water.

**Traditional Uses:** Perhaps because the leaves of this plant have a sweet, spicy, anise-like scent, they are sometimes used in a manner similar to *anis* and may be combined with Chinese star anise and anise to make an herbal mixture prepared as a tea.

**Availability:** Dried plant material is sometime sold at *botánicas* specializing in medicinal plants from the Caribbean.

## BOTANICAL DESCRIPTION

*Aniseto* (*Piper marginatum*) is a bushy shrub that grows 1-3 m tall in moist, shady, tropical regions. The trunk is rough and ridged with prominent nodes, branching from the base in a perpendicular pattern. Leaves grow in an alternate pattern on winged leafstalks and are large and heart-shaped with prominent veins. Leaves are thin and papery to the touch which distinguishes it from other *Piper* species with a similar appearance. Flower spikes are composed of slightly curved inflorescences of miniscule flowers. The entire plant exudes a distinct anise- or licorice-like odor (Liogier 1990).

**Distribution:** This plant can be found in tropical America and the Caribbean and is widespread, growing along forest edges (Liogier 1990).

## SAFETY & PRECAUTIONS

Unknown; insufficient information is available in the literature on the potential toxicity, contraindications, herb-drug interactions and indications and usage of this plant.

## SCIENTIFIC LITERATURE

Although no clinical trials have been conducted to evaluate the safety and efficacy of this herb, in vitro studies have demonstrated antimicrobial and cercaricidal effects of this plant (see “Laboratory and Preclinical Data” table below).

Active compounds include essential oils, tannins, alkaloids, phenyl alkaloids, phenylpropanoids, phenyloctanoids and flavonoids (Diaz and Gottlieb 1979, Tillequin et al. 1978). The following compounds have been isolated from the hexane extract of the dried fruits: 1-(1Z-propenyl)-2,4,6-trimethoxybenzene, 3-farnesyl-4-hydroxybenzoic acid and caryophyllene oxide (de Oliveira Chaves & de Oliveira Santos 2002). The isoquinoline alkaloid (E,E)-N-isobutyl-2,4-octadienamamide has also been identified in this plant (de Oliveira Santos & de Oliveira Chaves 1999). As a side note, scientists have observed capuchin monkeys in Costa Rica using this plant as a form of self-medication by breaking up the leaves and rubbing them on their fur, apparently to deter insects and improve the health of their skin (DeJoseph et al. 2002).

### Laboratory and Preclinical Data: *Piper marginatum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
Antimicrobial	Hexane plant extract	In vitro	Antibacterial against <i>Staphylococcus aureus</i> & anti-fungal effects against <i>Candida albicans</i>	Bispo et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Cercaricidal</b>	Essential oil	In vitro: larvae of the parasitic human blood fluke <i>Schistosoma mansoni</i>	Active; showed potential as a preventive agent against schistosomiasis	Frischkorn et al. 1978

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# Apasote

## OTHER COMMON NAMES

*Epazote* (Spanish); American wormseed, wormseed (English).

## SCIENTIFIC NAME

*Chenopodium ambrosioides* L. [Chenopodiaceae (Beet or Goosefoot Family)].

## DOMINICAN MEDICINAL USES



In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Colic
- Common cold
- Diarrhea
- Flu
- Intestinal parasites
- Intestinal worms
- Menstrual disorders
- *Paño*
- Skin infections
- Stomach ache and abdominal pain

**Plant Part Used:** Leaves, fruits, entire plant and essential oil.

**Traditional Preparation:** The leaves or aerial parts are prepared as a tea by infusion or decoction and administered orally. For skin conditions, the crushed and heated leaves are applied externally to the affected area.

**Traditional Uses:** This plant is attributed strong, bitter properties. For intestinal parasites and other gastrointestinal disorders, the fresh juice of the leaves (*zumo*) can be combined with coconut (*coco*) milk and taken internally. This plant also has culinary uses as a condiment and is considered a medicinal food because of its anti-flatulent effects, especially when used as a flavoring agent in the preparation of beans (*habichuelas*). Spiritual applications of this herb can have health-related implications, especially for illnesses associated with spiritual origins, as the leaves are used for dispelling negative energy and evil spirits. In the Dominican Republic the leaves are used as an antiseptic for treating wounds or skin ulcers (*llagas*), and a tea of the leaves is used for treating asthma, colic, conjunctivitis and stomach ache (Liogier 2000).

**Availability:** Commonly sold at corner shops, markets, grocery stores and *botánicas* in Latino neighborhoods, *apasote* can also be found growing as a weed in parks and along streets in New York City.

## BOTANICAL DESCRIPTION

*Apasote* (*Chenopodium ambrosioides*) is an annual or short-lived perennial herbaceous plant that grows to 120 cm tall. Stems are branched and reddish. Leaves are arranged in an alternate pattern and are spear-shaped, deeply toothed and strongly pungent. Flowers are inconspicuous, yellowish-green and grow in small, slightly rounded spikes. Fruits are small and dry, each containing a single smooth, black seed (Liogier 2000).

**Distribution:** This plant is native to Central and South America and is now cosmopolitan in range, grows in the Dominican Republic and can often be found in open, disturbed areas (Liogier 2000).

## SAFETY & PRECAUTIONS

Although the leaves and aerial parts of this plant are commonly used in moderate amounts as a culinary seasoning, the essential oil can be highly toxic and should be avoided or only used with extreme caution. Adverse reactions from using the oil include damage to the Nervus cochlearis which results in a persistent buzzing sound in the ears and/or hearing impairment. Even small amounts can cause problems with the central nervous system, such as spasms, paralysis and Pachymeningitis haemorrhagica. Also, the oil is

dangerously explosive (Gruenwald et al. 2004). Skin contact with the fresh plant can result in contact dermatitis (Brinker 1998). Overdosage: Fatalities have been reported due to ingestion of 10 mg of the oil by adults and much smaller amounts in children (Gruenwald et al. 2004). Possible genotoxic effects of the leaf decoction have been shown in vitro using human lymphocyte cell cultures (Gadano et al. 2002).

**Animal Toxicity Studies:** The LD<sub>50</sub> of the essential oil administered orally was 0.38 mL/kg in mouse and 0.255 g/kg in rat (Opdyke 1976). Studies carried out by TRAMIL researchers have shown that the essential oil applied externally to rabbits did not show signs of toxicity after clinical evaluation (Gonzalez 1990). Aqueous extracts, such as traditional preparations of this herb as a tea or infusion, are much safer than alcohol-based extracts. The LD<sub>50</sub> of the aqueous leaf extract in mice was shown to be 4.0 g/kg (Amole & Yusuf 2002). A general acute toxicity study of the hydroalcoholic whole plant extract administered intraperitoneally was shown to have an LD<sub>50</sub> of 1 g/kg (Bhakuni et al. 1969). The water extract and ascaridole-free hexane-extracted aqueous extract, applied to rat gastrointestinal smooth muscle; concentrations required to kill *Caenorhabditis elegans* showed no observable effect on smooth muscle contraction (unlike ascaridole), and this research supports the safety of traditional use of this herb as an infusion (MacDonald et al. 2004).

**Contraindications:** Due to its potential toxicity, the seed oil should not be used in large amounts or frequently during a short period of time; nor should it be administered to undernourished or weak individuals or to very young children (less than 4 years old). Wormseed oil should not be used by patients with the following conditions: pregnancy (due to the oil's demonstrated emmenagogue and abortifacient effects); stomach or intestinal disease (due to its irritation of the digestive tract); heart disease (due to its cardiac depressive activity); liver disease (due to its hepatotoxic effects); and kidney disease (due to its renotoxic effects; Brinker 1998).

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

Clinical trials have confirmed the use of this plant as an antiparasitic and ascariasis treatment (see "Clinical Data" table). Laboratory and preclinical studies have demonstrated the following effects: analgesic, anthelmintic, antibacterial, antifungal, antioxidant, anti-leishmaniasis, antimalarial, antimicrobial, antiulcerogenic, fungitoxic, immunomodulatory, insecticidal, nematocidal and trypanocidal (see "Laboratory and Preclinical Data" table). *Apasote* oil is a potent anthelmintic; however, the active constituent of the essential oil, ascaridole (a monoterpene found throughout the plant and especially in the fruits) is highly toxic (Gruenwald et al. 2004).

**Indications and Usage:** According to TRAMIL, the therapeutic use of *apasote* (*Chenopodium ambrosioides*) is classified as recommended specifically for treating diarrhea, stomach ache, abdominal pain and intestinal parasites when caused by roundworm, pinworm or hookworm infections. TRAMIL also classifies the topical use of the plant as recommended for the treatment of cutaneous ulcers (Germosén-Robineau 2005). For internal use in the treatment of diarrhea, stomach ache or intestinal parasites as described above, the recommended usage is an infusion or decoction of the leaf and/or aerial parts (7 g in 300 mL water) taken orally with a dosage of 1 cup for adults and ½ cup to 1/3 cup for children older than 5 years of age. Take 1 time per day for only 3 consecutive days and do not repeat treatment for 6 months. After taking the treatment on the third day, use of a saline laxative such as magnesium sulfate (not an oil-based purgative) is recommended. For external use in the treatment of cutaneous ulcers, the recommended preparation is the fresh juice squeezed from the aerial parts of the plant, applied topically after washing the affected area thoroughly with boiled water and soap. The poultice can be covered with a clean cloth and changed twice daily (Germosén-Robineau 2005).

### Clinical Data: *Chenopodium ambrosioides*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiparasitic</b>	Leaf extract	Clinical trial; 72 patients (adults & children) with parasitic infections of the intestines	Showed 100% efficacy against <i>Ancilostoma</i> & <i>Trichuris</i> ; 50% against <i>Ascaris</i> spp.; based on stool analyses 8 days before & after treatment	Giove Nakazawa 1996
<b>Antiascariasis</b>	Plant juice: 1 mL/kg for less than 10 kg; 2 mL/kg for > 10 kg b.w.; one dose before breakfast, 3 days in a row	Randomized controlled clinical trial; 60 children, 30 per group (age 3-14 yrs w/ <i>Ascaris lumbricoides</i> in feces); compared with positive control Albendazole (1 dose of 400 mg for children > 5 yrs or 200 mg for < 5 yrs of age)	Both plant juice & positive control were 86.7% effective based on qualitative examination of ascaris egg disappearance in feces; plant juice was 59.5% effective (vs. 58.3% for Albendazole) in quantitative measure of decrease in parasitic burden; extract was also 100% effective in treating <i>Hymenolepsis nana</i> (although Albendazole was not effective); both drugs showed adverse effects in 23.3% of cases	Lopez de Guimaraes et al. 2001

### Laboratory and Preclinical Data: *Chenopodium ambrosioides*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic</b>	Aqueous leaf extract	In vivo: mice; thermal hot plate pain threshold test	Effective at doses of 0.4 g/kg and 0.8 g/kg; protected against sensation of pain	Amole & Yusuf 2002
<b>Analgesic &amp; sedative</b>	Isolated plant compounds	In vitro & in vivo: male mice	Ascaridole identified as pharmacologically active principle	Okuyama et al. 1993
<b>Anthelmintic</b>	Essential oil and dried plant tissue, administered orally	In vivo: lambs infected with gastrointestinal nematodes	Significant reduction in <i>Trichostrongyle</i> eggs per gram feces in treated lambs as compared with control; the oil produced no significant toxic effects	Kato et al. 2000
<b>Antibacterial</b>	Acetone extract at 0.5 mg/mL	In vitro; methods: agar plate and rapid radiometric	Active against resistant strain of <i>Mycobacterium tuberculosis</i> at 0.1 mg/mL	Lall & Meyer 1999

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antifungal</b>	Essential oil of leaves and an oil-containing ointment	In vitro & in vivo: guinea-pigs, applied topically	Antimycotic against dermatophytes: <i>Trichophyton mentagrophytes</i> and <i>Microsporium audouinii</i> at a concentration of 50 ppm; controlled established ringworm infection in animal model	Kishore et al. 1996
<b>Antifungal, antiaflatoxic &amp; antioxidant</b>	Leaf essential oil (concentration 100 µg/mL)	In vitro: tested against a broad range of fungal species	Showed significant fungitoxic, aflatoxin-inhibiting & antioxidant activity; suggest use as a natural food fungitoxicant	Kumar et al. 2006
<b>Antileishmaniasis</b>	Essential oil, administered intraperitoneally, orally or intralesionally	In vivo: BALB/c mice infected with <i>Leishmania amazonensis</i> ; positive control: amphotericin B (1 mg/kg)	Active; oral & intraperitoneal dosage of 30 mg/kg showed significant improvement (better than positive control); no resistance detected	Monzote et al. 2007
<b>Antimalarial</b>	Aerial parts	In vitro	Active against <i>Plasmodium falciparum</i>	Sauvain et al. 1990
<b>Antimalarial</b>	Ascaridole (terpene isolated from plant)	In vitro against <i>Plasmodium falciparum</i>	Active; strongly inhibited growth of plasmodial growth; 0.05 µmol concentration arrested growth after 3 days; eradicated visible parasites at 0.1 µmol	Pollack et al. 1990
<b>Antimalarial &amp; insecticidal</b>	Hydroalcoholic extract of dry aerial parts	In vivo (mice) & in vitro	Showed activity against <i>Plasmodium berghei</i> (100 µg/mL) in vivo & against <i>Lutzomyia longipalpis</i> (1 g/L) in vitro	Misra et al. 1991
<b>Antimicrobial</b>	Aqueous leaf extract (200 µL/disc)	In vitro	Active against <i>Klebsiella pneumoniae</i> , <i>Proteus vulgaris</i> & <i>Staphylococcus albus</i>	Desta 1993
<b>Antiulcer</b>	Aqueous extract (25 and 100 mg/kg) given orally	In vivo: rat with experimentally induced-ulcers	Significantly decreased the quantity & incidence of gastric ulcers without changing the volume of gastric liquid or free acid	Cambar 1988

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Cytotoxic &amp; genotoxic</b>	Aqueous decoction & infusion (concentrations: 1, 10, 100, 1000 µL extract/mL culture)	In vitro: human lymphocyte cell cultures; negative control: <i>Chenopodium album</i> extract (because does not contain essential oil)	Active; showed significant increase in chromosomal aberrations & frequency of sister chromatid exchanges; decreased mitotic index	Gadano et al. 2006
<b>Antifungal</b>	Essential oil & ointment made with essential oil	In vitro: against 12 dermatophyte species; in vivo: guinea pigs w/experimental ring worm	Strongly active in vitro against dermatophyte species & cured ringworm in animal model within 7-12 days	Kishore et al. 1993
<b>Immunomodulatory</b>	Hydroalcoholic crude leaf extract (5 mg/kg intraperitoneally)	In vivo: mice (C3H/HePas)	Active; increased phagocytosis, nitric oxide production & cellular recruitment to lymphoid organs (results similar to concanavalin A, positive control)	Cruz et al. 2006
<b>Antileishmanial</b>	Essential oil; 30 mg/kg/day administered intraperitoneally for 15 days	In vitro & in vivo: <i>Leishmania amazonensis</i> ; BALB/c mice infected experimentally	Active; 50% inhibition against promastigote & amastigote forms at 3.7 & 4.6 µg/mL; showed moderate toxicity on macrophages in mice; indicated dose was effective	Monzote et al. 2006
<b>Nematocidal</b>	Water extract & ascaridole-free hexane-extracted aqueous extract	In vitro: rat gastrointestinal smooth muscle; concentrations required to kill <i>Caenorhabditis elegans</i>	Showed no observable effect on smooth muscle contraction (unlike ascaridole); research supports safety of traditional use of this herb as an infusion	MacDonald et al. 2004
<b>Trypanocidal</b>	Ascaridole & monoterpene hydroperoxides isolated from aerial parts	In vitro: epimastigotes of <i>Trypanosoma cruzi</i>	Active; minimum inhibition concentrations were 23, 1.2, 1.6, 3.1 & 0.8 µmol depending on the constituent	Kiuchi et al. 2002

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
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<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anthelmintic</b>	6000 mg powdered, dried plant material per kg body weight	In vitro & clinical field studies	Had no effect on mature intestinal worms ( <i>Necator</i> , <i>Trichuris</i> or <i>Ascaris</i> spp.) despite presence of the active compound ascaridol in the samples	Kliks 1985

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# Apio

## OTHER COMMON NAMES

Celery, smallage (English).

## SCIENTIFIC NAME

*Apium graveolens* var. *dulce* L. [Apiaceae (Carrot Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant for the following health conditions (Yukes et al. 2002-2003; Vandebroek & Balick 2009):

- Arthritis
- Asthma
- Common cold
- Cough
- Diabetes
- Flu
- High blood pressure
- High cholesterol
- Kidney disorders
- Menopausal hot flashes
- Obesity

**Plant Part Used:** Stalks, leaves, roots and seeds (all edible).

**Traditional Preparation:** The stalks may be eaten raw, cooked or liquefied to make a juice of the fresh plant, taken orally.

**Traditional Uses:** *Apio* is used as a remedy for obesity, high blood pressure, high cholesterol and diabetes, and it is said to have sweet and cooling properties. Typically the stalk and/or leaves are eaten, either raw or cooked or liquefied to make a fresh juice and taken to help treat or prevent illness and as a source of dietary fiber. For diabetes, *apio* is sometimes combined with aloe vera (*sábila*) gel and liquefied in a blender, and this mixture is taken internally. For treating conditions caused by excessive heat in the body, such as menopausal hot flashes, the stalk is liquefied in a blender or grated and squeezed to extract its juice (*zumo*) and combined with other refreshing plants such as *perejil* (parsley) leaves and stalks or *chinola* (passion fruit) fruits (Yukes et al. 2002-2003). This plant can also be prepared as a tea for asthma, cold and flu, cough and kidney disorders or applied externally for arthritis (Vandebroek & Balick 2009).

**Availability:** As a common food plant, *apio* is available at most grocery stores and supermarkets in the fresh produce section. Seeds can be purchased from some health food or herb stores.

## BOTANICAL DESCRIPTION



*Apio* (*Apium graveolens*) is a biennial herbaceous plant that typically reaches a height of 30-100 cm. The stem is erect, grooved, often hollow, bulbous and branched, and the root is fleshy and tuberous. Leaves are light green, coarsely-toothed, palmate and composed of 3-5 segments with variation between upper and lower leaves. Flowers are 5-petaled, creamy-white to green. Fruits are spherical, aromatic, light-brown and seed-like (Liogier 2000).

**Distribution:** The entire plant has a characteristic strong, sweet odor. Native to Europe, this species grows wild in marshy areas and along coastlines, and the sweet variety is cultivated widely as a vegetable in diverse regions, including in the Dominican Republic (Liogier 2000).

## SAFETY & PRECAUTIONS

As a widely consumed vegetable, this plant is generally considered safe. No cases of toxicity have been identified in the published scientific literature. However, cases of allergic reaction to ingestion of celery root have been reported in pollen-sensitive individuals resulting in gastrointestinal disorders and other symptoms although in most cases celery sensitivity is not considered clinically significant (Jankiewicz et al. 1996). Caution is advised due to potential photosensitizing effects (Brinker 1998). External application of the seed ethanolic extract to the skin (25% concentration) in human volunteers did not show signs of dermal irritation or adverse effects during the 3 month study or follow-up periods (Choochote et al. 2004).

Fungal infection of the plant with *Sclerotinia sclerotiorum* can cause phototoxic dermatitis (due to high furanocoumarin content and caused by the chemical constituents xanthotoxin and bergapten) if the exudate of the infected plant comes into skin contact with sensitive individuals (Austad & Kavli 1983). Plants infected with this fungal pathogen generally have a pink appearance and a wilted, watery texture. Also, due to fungicidal application, the furanocoumarin content of the fresh plant or dried root can increase dramatically resulting in increased biological effects on human skin (Nigg et al. 1997), and ingestion of celeriac bulbs with high furanocoumarin content could lead to phototoxicoses (Gruenwald et al. 2004).

**Contraindications:** Seeds and essential oil are contraindicated for pregnant women due to demonstrated emmenagogue, abortifacient and uterine stimulating effects. Not to be taken by individuals with kidney infections or inflammation due to the potential kidney-irritating effect of the volatile oil (Brinker 1998).

**Drug Interactions:** Anticoagulants and Warfarin: potential interaction with anticoagulants such as warfarin due to increased risk of bleeding and potentiation of drug effects (Heck et al. 2000). Celery seed extract can potentially interact with thyroxine resulting in lowered T<sub>4</sub> levels; if co-administered, T<sub>4</sub> levels and thyroid function should be monitored (Moses 2001).

## SCIENTIFIC LITERATURE

In laboratory studies, the following effects of this plant have been demonstrated: antihyperlipidemic, anti-inflammatory, antimicrobial, antinociceptive, antioxidant, carcinogenesis inhibition, cercaricidal, hepatoprotective, insecticidal (anti-mosquito) and vasodilator (see “Laboratory and Preclinical Data” table below). According to the *Physicians’ Desk Reference for Herbal Medicines*, the seeds have demonstrated sedative and anticonvulsive effects in animal studies, although a diuretic effect could not be substantiated. The essential oil is slightly antifungal and antibacterial (Gruenwald et al. 2004).

The essential oil of this plant contains (+)-limonene, myrcene, carveol. The plant also contains flavonoids, including apiin, luteolin-7-O-apiosyl glucoside and chrysoeriol glucoside; and furocoumarins including bergapten and xanthotoxin (Gruenwald et al. 2004). The leaves of this plant are highly nutritious being rich in mineral salts and vitamins, and the whole plant is an excellent source of dietary fiber. The seeds are rich in calcium, magnesium and iron (Brinker 1998). The raw stalks are a significant source of calcium, folate, iron, manganese, molybdenum, phosphorus, potassium and vitamins A, B1, B2, B6, C and K (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Recommended daily dosage is 1.2-4 g of the seeds, either ingested or taken as a tea (1 g seeds, infused in boiling water for 5-10 minutes; ratio: 1 part herb to 5 parts water). The juice of the fresh plant can be taken three times daily in the amount of 23 g (Blumenthal et al. 1998).

### Laboratory and Preclinical Data: *Apium graveolens*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-hyperlipidemic</b>	Aqueous extract; ingested as part of diet	In vivo: rats fed high fat diet for 8 wks to induce hyperlipidemia; separate treatment & control groups	Significantly reduced serum total cholesterol, low density lipoprotein & triglyceride levels; hepatic triacylglycerol lipase activity was lowered and hepatic microsomal P450 levels were higher than control group	Tsi et al. 1995
<b>Anti-inflammatory</b>	80% ethanol extract, which is 1/10 of the intraperitoneal LD <sub>50</sub> dose	In vivo: rats with carrageenan-induced paw edema as compared with standard drug: acetylsalicylic acid	Demonstrated anti-inflammatory activity	Al-Hindawi et al. 1989
<b>Antimicrobial</b>	Methanol & aqueous plant extracts	In vitro: multi-drug resistant <i>Salmonella typhi</i>	Showed moderate antimicrobial activity & anti-enteric potential	Rani & Khullar 2004
<b>Anti-nociceptive</b>	Ethanollic extract	In vivo: mice; acetic-acid induced writhing and hot-plate test	Exhibited dose-dependent anti-nociceptive effects in both tests; suggest use for painful and inflammatory conditions	Atta & Alkofahi 1998
<b>Antioxidant</b>	Plant extract	In vitro: automated oxygen radical absorbance assay	Showed moderate antioxidant activity	Cao et al. 1996
<b>Antioxidant</b>	Leaf & root; organic & aqueous extracts	In vitro & in vivo: mice	Active; showed good radical scavenging ability & reduced liposomal peroxidation intensity	Popovic et al. 2006
<b>Carcinogenesis inhibition &amp; antioxidant</b>	Seed methanolic extract	In vivo: Wistar rats with experimentally induced hepatocarcinogenesis	Active; showed strong activity as a prophylactic against oxidative stress & cancer development	Sultana et al. 2005
<b>Cercaricidal</b>	Essential oil of fresh aerial parts in flowering stage (var. <i>secalinum</i> )	Cercariae bioassay (the larval & infective stage of the life cycle of the parasitic human blood fluke <i>Schistosoma mansoni</i> )	Demonstrated cercaricidal & chemotactic effects	Saleh et al. 1985

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hepatoprotective</b>	Seeds	In vivo: rats with paracetamol- and thioacetamide-induced intoxication	Demonstrated significant hepatoprotective activity	Singh & Handa 1995
<b>Insecticidal (anti-mosquito)</b>	Essential oil	In vivo: laboratory & field strains of <i>Aedes aegypti</i> (mosquito vector that can be the host of several diseases)	Active; showed strong adulticidal activity against mosquitoes; LC <sub>50</sub> =5.96 µg/mg for the lab strain & 6.14 for the field strain	Chaiyasit et al. 2006
<b>Insecticidal (anti-mosquito)</b>	Crude seed extract	In vivo: <i>Aedes aegypti</i> (dengue fever vector)	Active; showed larvicidal, adulticidal & repellent effects; when applied to skin, protected against biting for 3 hrs (25% concentration); no adverse effects observed	Choochote et al. 2004
<b>Vasodilator</b>	Apigenin (isolated compound from plant)	Rat thoracic aorta; contraction caused by cumulative concentrations of calcium in high potassium medium & induced by norepinephrine	Exhibited relaxation of rat thoracic aorta by inhibiting the contraction of aortic rings in a dose-dependent manner; mechanism determined to be suppression of Ca <sup>2+</sup> influx through voltage- & receptor-operated channels	Ko et al. 1991

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# Auyama

## OTHER COMMON NAMES

For the species *Cucurbita pepo*: *Calabaza* (Spanish); pumpkin; acorn or zucchini squash (English). For the species *C. moschata*: *ayuyama* (Spanish); squash, West Indian pumpkin, winter squash, butternut squash (English).

## SCIENTIFIC NAME

*Cucurbita pepo* L. and *C. moschata* Duchesne. Synonym: *C. pepo* var. *moschata* (Duch.) Poir. [Cucurbitaceae (Cucumber Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Common cold
- Diarrhea
- Flu
- Intestinal parasites
- Intestinal worms

**Plant Part Used:** Seeds and fruit pulp.

**Traditional Preparation:** When used as a remedy, the fresh or dried seeds are ground and boiled in milk or water and sometimes sweetened with sugar. Take 1 cup in the morning with breakfast. For culinary purposes, seeds can be eaten raw, roasted, ground to make a seed butter.

**Traditional Uses:** *Auyama* or *calabaza* seeds are used as a simple tea or in combination with other medicinal plants to treat intestinal parasites and diarrhea and to expel intestinal worms. Sometimes milk is substituted for water when preparing a decoction of the crushed seeds. For the common cold and flu, the fruit pulp is combined with the pulp of passion fruit (*chinola*) and boiled to make a tea or beverage.

**Availability:** Various squash varieties and pumpkin seeds can typically be purchased at grocery stores, supermarkets or neighborhood convenience stores that carry fresh produce (*bodegas*).

## BOTANICAL DESCRIPTION

*Calabaza* (*Cucurbita pepo*) is a creeping or climbing annual plant that can grow to varying heights (2 m long or longer) and has sprawling, prickly stems. Leaves typically 5-lobed with spiky margins. Flowers are bright orange-yellow and grow singly. Fruits are large and roundish with a tough rind; orange, yellow or white flesh; green, light-green orange, yellow or cream-colored skin. There are numerous different cultivars of this species with significant variations in fruit size, shape, texture and color (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to the Americas and is cultivated widely as a food plant (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As a widely consumed food, pumpkin and pumpkin seeds are generally regarded as safe. Very few allergic reactions to the consumption of this food plant have been reported (Reindl et al. 2000) and no undesirable side effects were reported in 98% of patients in a clinical trial involving 1,305 participants (Grups & Schiebal-Schlosser 1995). One case has been reported of intestinal impaction in a woman (aged 61 yrs) after eating 1 cup of roasted pumpkin seeds (Chandrasekhara 1983). Commonly consumed as a food, this plant is generally considered safe for internal use.

**Animal Toxicity Studies:** (for *Cucurbita moschata*) The LD<sub>50</sub> in rats of the leaf juice, fruit juice and aqueous maceration of the seeds taken internally is 25 g/kg. The LD<sub>50</sub> values of the intraperitoneal administration of the following preparations are summarized as follows: aqueous extract of the leaf: >25 g/kg; fresh juice of the leaf: 8.912 ± 0.563 g/kg; seed maceration: 8.769 ± 1.781 g/kg; and fresh juice of the fruit: 13.483 ± 0.762 g/kg. Additionally, the administration of 18.75 mL/kg of the plant extract to rats for 30 days did not cause any mortality as a result of the experiment (Herrera 1990). The ground seeds mixed with water to make an emulsion (50 g crushed seeds in enough water to yield a paste) administered to rats for two consecutive days initially and again at the end of the week of the experiment resulted in no detectable signs of toxicity or intolerance, although some patients considered the consistency of the preparation to be disagreeable (Caballo 1994). In other research studies, isolated cucurbitin, one of the pharmacological constituents of *Cucurbita moschata*, has demonstrated a low toxicity level in both humans and dogs (Chen et al. 1980, Gonzalez et al. 1974, Paris & Moyses 1981, Germosén-Robineau 2005).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** For patients who were taking Curbicin®, an herbal supplement containing pumpkin seed, saw palmetto and vitamin E, there have been two incidents reported of increased INR (clotting time of blood). One of the patients was also concurrently taking warfarin and the other was not taking any additional anticoagulant drugs. However, it is not clear whether pumpkin seed or another ingredient (possibly Vitamin E) in the supplement was responsible for this effect. In light of these cases, caution is advised (Yue & Jansson 2001).

## SCIENTIFIC LITERATURE

The use of pumpkin seed lipophilic extracts or oil has been substantially confirmed by clinical and experimental studies for the treatment of irritable bladder and micturation disorders associated with benign prostatic hyperplasia. Pumpkin also contains the amaroid cucurbitacin which has demonstrated antihelmintic properties. Other therapeutic effects of pumpkin include antiphlogistic and antioxidant properties (Gruenwald et al. 2004). *Cucurbita moschata* is recognized in the 1966 edition of the official Pharmacopeia of Holland (Penso 1980) and is included in the Soviet Pharmacopoea for treating chronic skin infections and burns, administered as an oil preparation in compresses and emulsions (Hurtado & Carballo 1990).

Cucurbitin, a component of the seeds of *ayuyama*, has demonstrated anthelmintic properties and therapeutic activity in the treatment of acute schistosomiasis (Rybaltofskii 1966, Chou and Ming 1960). Concentrations of cucurbitin may vary considerably between species or even among seeds of the same species (Foster & Tyler 1999). Other active constituents include fumaric acid which has demonstrated antipsoriatic and antioxidant activity and citric acid which is an anticoagulant. The high level of carotenes in the fruit and also the flowers makes this plant a valuable source of pro-vitamin A which is an important nutrient for health and wound-healing (Duke and Astchley 1986, Gonzalez et al. 2001, Vilenchik 1989). The seeds, due to their reported content of L-Tryptophan, may have therapeutic applications for the treatment of depression (Eagles 1990).

**Indications and Usage:** According to the German *Commission E*, pumpkin is approved for irritable bladder and prostate disorders (Blumenthal et al. 1998). However, it does not reduce enlargement of the prostate; it only alleviates some of the symptoms associated with it (Gruenwald et al. 2004).

TRAMIL has designated *Cucurbita moschata* as “REC” meaning that it is “RECommended” for the following conditions due to its high content of carotenes and other nutrients: use of the flower prepared as a decoction to treat jaundice and use of the cooked leaf for treating asthenia, weakness and jaundice. TRAMIL has classified the following therapeutic application of this plant as “INV” meaning

that more investigation is needed to confirm its traditional use: topical use of the fresh juice of the leaf to treat burns (Germosén-Robineau 1995). Typical dosage is 10 g ground seeds daily, on average; or 1 to 2 rounded teaspoons of the ground seeds in the mornings and evenings, taken with liquid. Like other nuts and grains, pumpkin seeds can go rancid because of their delicate oils; therefore, they should be used fresh and stored in such a way that they are protected from light and moisture to reduce oxidation (Gruenwald et al. 2004).

### Clinical Data: *Auyama (Cucurbita moschata)* and *Calabaza (Cucurbita pepo)*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiuroolithiasis</b>	Pumpkin seed (60 mg/kg body wt per day)	Controlled clinical trial; 20 boys age 2-7 y	Lowered calcium-oxalate crystal occurrence; potential agent in lowering bladder-stone risk	Suphakarn et al. 1987
<b>Antiuroolithiasis &amp; urolithiatic</b>	Prepared snack containing pumpkin seeds, milk powder, sesame seeds and sugar (= 1200 mg phosphorous/day)	Clinical study; 10 adolescents from a hyperendemic area of Thailand, aged 13-16 yrs; ingested snack for 2 days	Urinary pH was significantly lowered; increased urinary oxalate; decreased levels of magnesium & pyrophosphate (inhibitors of crystal formation) as compared to pre-treatment & control group	Suphiphat et al. 1993
<b>Benign prostatic hyperplasia (BPH) treatment</b>	Curbicin (from pumpkin seeds) combined with seeds of dwarf palm plants: <i>Sabal serrulata</i>	Randomized, double-blind, placebo-controlled study (53 patients, 3 mo)	Showed significant improvement of symptoms in assessment of urinary flow, micturition time, residual urine, frequency of micturition, & clinical exam; no negative side effects	Carbin 1990
<b>Benign prostatic hyperplasia (BPH) treatment (urinary symptoms)</b>	Combination preparation of pumpkin seed and sabal fruit (80 mg each); dosage determined by physician on an individual basis	Open, multicenter clinical trial; 1,305 male patients aged 50-82 yrs with BPH stage I and II; 3 mo duration	Significant symptomatic improvement: 68% patients reported reduction in daytime urination frequency, 82% reported reduction in nighttime urination, 86% had reduced dribbling and 86% reported alleviation of painful urination symptoms	Grups & Schiebel-Schlosser 1995

### Laboratory and Preclinical Data: *Auyama (Cucurbita moschata)* and *Calabaza (Cucurbita pepo)*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiallergenic</b>	Extract (var. <i>moschata</i> )	In vivo: mouse	Active; inhibited IgE antibody expression	Imaoka et al. 1994

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Chemical constituents of seeds (var. <i>moschata</i> )	In vitro	Active against <i>Botrytis cinerea</i> , <i>Fusarium oxysporum</i> & <i>Mycosphaerella oxysporum</i>	Wang & Ng 2003
<b>Antiproliferative</b>	Moschatin isolated from mature seeds (var. <i>moschata</i> )	In vitro: melanoma cells	Active; efficiently inhibited growth of cancer cells	Xia et al. 2003
<b>Hepatoprotective</b>	Pumpkin seed protein isolate	In vivo: male rats with CC14-induced acute liver injury & fed low-protein diet	Active; significant reduction in plasma enzyme levels; thus, shown to be effective in alleviating the detrimental effects of protein malnutrition	Nkosi et al. 2005

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-inflammatory</b>	Aqueous leaf extract & fresh leaf juice; topically (var. <i>moschata</i> )	In vivo: rabbit with first & second degree burns	Not active; same results as control group	Herrera 1992

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# Avena

## OTHER COMMON NAMES

Oats, oat straw, common oat (English).

## SCIENTIFIC NAME

*Avena sativa* L. [Poaceae (Grass Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant for the following health conditions or effects (Yukes et al. 2002-2003):

- High cholesterol
- Lactation stimulant
- Menopausal hot flashes
- Osteoporosis prevention
- Skin irritation

**Plant Part Used:** Grain (oats), typically rolled oats (oatmeal).

**Traditional Preparation:** Rolled oats are usually boiled in water and eaten or blended with water to prepare an emulsion. For external applications, rolled oats may be added to a bath or prepared as a wash.

**Traditional Uses:** For treating high cholesterol, *avena* is boiled in water and eaten or taken as a refreshing drink (prepared as an emulsion, similar to *horchata* or porridge). To encourage lactation (*para bajar la leche maternal*), *avena* is boiled in milk, liquefied in a blender and taken internally as a drink or porridge. Added to a bath or used externally as a wash, *avena* is useful for treating skin irritation. *Avena* is considered a highly nutritious and nourishing food and is recommended for menopausal women to prevent osteoporosis and to alleviate symptoms associated with “the change of life” (*el cambio de vida*), including hot flashes.

**Availability:** As a popular food, *avena* is sold as whole oats, oatmeal or cut oats at most grocery stores and supermarkets. Various commercial preparations and extracts are available at health food stores and pharmacies. The dried herb (oat straw) can be purchased from herb shops and health food stores carrying natural supplements.

## BOTANICAL DESCRIPTION

*Avena* (*Avena sativa*) is a stout, annual grass that grows to 100+ cm. Leaves are grass-like and rough to the touch (45 cm long, 3-10+ mm wide). Flowers are unbranched, open spikelets, each with 2-3 flowers.

Fruits are 7-12 mm long, narrowly oval and slightly hairy on the outer covering which surrounds the oat grain (Gleason & Cronquist 1991).

**Distribution:** Native to Europe and Asia, this species is derived from a wild ancestor, *Avena fatua* L.; it is cultivated widely and often grows adventitiously in disturbed areas (Gleason & Cronquist 1991).

## SAFETY & PRECAUTIONS

No health hazards are known when this plant is administered properly, although there is potential for allergic reaction in individuals who are allergic to gluten. When eating oat bran products, large amounts of water should also be taken to ensure that the fiber is well-dispersed in the bowel (Gruenwald et al. 2004).

**Contraindications:** Although some studies indicate that oats can cause gastrointestinal irritation or other adverse effects in individuals with celiac disease (Lindin et al. 2003, Peraaho et al. 2004), recent clinical trials show that oats are generally well-tolerated and preferred by celiac children (Hogberg et al. 2004) and adults when incorporated into a gluten-free diet (Storsrud, Olsson et al. 2003) and for safe long-term consumption (Janatuinen et al. 2002).

**Drug Interactions:** There have been 2 case reports of patients who were concomitantly taking lovastatin (80 mg) and oat bran (50-100 mg daily) and who experienced impaired absorption and effectiveness of HMG-CoA reductase inhibitors due to consumption of oat bran; therefore, caution is advised in patients taking both oat bran and statin drugs (Richter et al. 1991).

## SCIENTIFIC LITERATURE

Clinical data have shown the following activity for this plant: antiatherosclerotic, antidiabetic, antihypercholesterolemic, antihypoglycemic, antihyperinsulinemic, antihypertensive, antipruritic, bile acid excretion stimulation, bile acid synthesis stimulation, burn healing, celiac disease tolerance, hypocholesterolemic, nutritional value, skin irritation inhibition and ulcerative colitis treatment (see Clinical Data" table below).

The soluble polysaccharide beta glucan is one of the primary active compounds. Other biologically active constituents of the seed include: avenanthramides, benzaldehyde, beta-ionone, biotin, campesterol, caryophyllene, delta-5- and delta-7-avenasterol, ferulic acid, furfural, lignin, limonene, myrcene, p-coumaric acid, p-hydroxy-benzoic acid, sinapic acid, vanillic acid and vanillin (Duke & Beckstrom-Sternberg 1998). Cooked whole grain oats are a significant source of dietary fiber, magnesium, manganese, phosphorus, selenium, thiamin and tryptophan (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Oat straw is approved by the German *Commission E* for the following conditions: inflammatory skin conditions, particularly those that involve itching or over activity of the sebaceous glands (Blumenthal et al. 1998). The leaves, stalks and/or fruit can be taken as a tea (3 g boiled in 250 mL water, strained after cooling) taken 3-5 daily (Gruenwald et al. 2004). A bath (100 g oat straw consisting of leaves and stems for one full bath) can be used to relieve itching and inflammation from seborrheic skin disorders (Blumenthal 1998).

### Clinical Data: *Avena sativa*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiatherosclerotic</b>	Oatmeal containing 3 g beta-glucan; concomitantly ingested with a high fat meal	Randomized controlled clinical trial; healthy individuals (n=50); 25 postmenopausal women & 25 men; tested brachial artery reactivity	Active; prevented endothelial dysfunction caused by acute fat ingestion; results show “important implications for cardiovascular health”	Katz et al. 2001
<b>Antiatherosclerotic &amp; anti-hypercholesterolemic</b>	Oat bran enriched diet; other interventions: reduced fat & caloric intake	Controlled randomized lifestyle intervention study; 235 male hypercholesterolemic & overweight patients; 4 wks health program	In combination with a reduced fat diet, moderate oat bran intake reduced atherogenic lipid profiles & cholesterol levels; independent of other interventions (i.e. exercise, reduced fat or calorie diet)	Berg et al. 2003
<b>Antidiabetic</b>	Oat extracts containing 1% or 10% soluble beta-glucans	Crossover clinical trial: n=16 women & 7 men aged 38-61 yrs; oat diet vs. standard diet for 5 wks	Insulin scores were 15% lower after taking 1% beta-glucan diet and 24% lower with the 10% beta-glucan diet; insulin responses decreased, glucose responses to food intake were reduced	Hallfrisch et al. 1995
<b>Antidiabetic</b>	Oat bran (22.8% soluble fiber [beta-glucan] content) added to bread and ingested	Randomized controlled clinical trial; n=8 men with non-insulin-dependent diabetes; 24-wk crossover study with two 12-wk periods	Active; showed improvement in glycemic, insulinemic & lipidemic responses; oat bran bread products were well-accepted by subjects	Pick et al. 1996
<b>Antihypercholesterolemic</b>	Oat bran-enriched muffins (28 g/day of oat bran)	Randomized controlled clinical trial; 34 premenopausal women (aged 22-53 yrs); treatment group: n=18; control group: n=16; duration: 2 wks	Active; increase (11.2%) in plasma HDL-C levels & decrease (7.0%) in cholesterol/HDL-C ratio; showed beneficial effect on metabolism; may reduce risk of cardiovascular disease	Robitaille et al. 2005

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antihypercholesterolemic</b>	Oat fiber extract (with high beta-glucan content: 1% or 10% soluble beta-glucans by weight)	Clinical trial; 23 volunteer subjects with baseline cholesterol levels between the 50 <sup>th</sup> & 75 <sup>th</sup> percentile for age & gender; duration: 7 days	Active; total & LDL cholesterol levels were significantly lowered; HDL, HDL2 & VLDL cholesterol & triglyceride levels did not change significantly	Behall et al. 1997
<b>Antihypercholesterolemic</b>	Isolated purified fiber (oat gum, 80% beta-glucan) combined with maltodextrin to make a drink	Randomized crossover clinical trial; hypercholesterolemic male & female subjects (n=19); consumed oat gum drink (2.9 g beta-glucan) or placebo 2 × daily for 4 wks	Showed significant reduction in total and LDL cholesterol levels & no change in HDL cholesterol	Braaten et al. 1994
<b>Antihypertensive</b>	Whole-grain oat cereals	Randomized, controlled parallel-group clinical trial; duration: 12 wks; n=88 men & women with high blood pressure	Active; blood pressure substantially lowered & need for antihypertensive medication reduced; also, reduction in total cholesterol, low-density lipoprotein & plasma glucose levels; dietary intake of whole oats “may significantly reduce” risk of cardiovascular disease	Pins et al. 2002
<b>Antihypoglycemic &amp; antihyperinsulinemic</b>	Oat extract (with 1% or 10% soluble beta-glucans) added to normal diet	Clinical, n=7 men & 16 women (aged 38-61 yrs) with moderate hypercholesterolemia; 5-wk crossover design	Improved glucose tolerance & insulin responses to food intake	Hallfrisch et al. 1995
<b>Bile acid excretion stimulation</b>	Oat bran bread, with & without beta-glucanase supplementation	Randomized controlled clinical trial; ileostomy subjects; n=9; duration: 2 days	Substantial increase in bile acid excretion (53% higher); oat bran shown to excrete cholesterol via bile acid excretion explaining lowered serum lipid levels	Lia et al. 1995

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Bile acid synthesis stimulation</b>	Beta-glucan from oat bran	Randomized, single-blind, controlled crossover clinical study; 8 subjects; given oat diet for 2 periods of 3 days with 11 days washout time	Active; bile acid synthesis was dramatically increased as evidenced by a twofold increase in blood levels of alpha-HC (7-alpha-hydroxy-4-cholesten-3-one) concentration 8 hours after ingestion	Andersson et al. 2002
<b>Burn healing &amp; antipruritic</b>	Shower & bath oil containing liquid paraffin with 5% colloidal oatmeal vs. liquid paraffin oil without oats	Clinical trial, assessor-blind; 35 acute burns patients; rated discomfort from pain & itch twice daily; monitoring of requests for antihistamines; study conducted over a 10-mo time period	Active; results showed significant reduction in itch & fewer requests for antihistamines for patients using colloidal oatmeal bath oil vs. those using the oats-free oil	Matheson et al. 2001
<b>Celiac disease tolerance</b>	Oats; dietary intake; 93 g/day	Clinical nutrition study; 15 celiac adult patients	No evidence of adverse effects in clinical examination or nutritional status; dietary oats determined to be safe for celiac patients for prolonged periods of time	Storsrud, Olsson et al. 2003
<b>Celiac disease tolerance</b>	Oats; wheat-free oat products	Randomized double blind clinical trial; 116 children with celiac disease; 2 groups: standard gluten-free diet only & standard gluten-free diet plus oats; duration: 1 y	Ingestion of moderate amounts of oats was shown to be safely tolerated for celiac children; no negative effects on clinical healing of celiac disease were observed	Hogberg et al. 2004
<b>Celiac disease tolerance</b>	Oats as part of diet	Randomized controlled clinical trial; adult celiac patients; groups: treatment n=23, control: n=28; duration: 5 y	Oats added to gluten-free diet were shown to be safe in long-term consumption for celiac patients and are preferred by patients; no adverse gastrointestinal effects or antibodies detected	Janatuinen et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Celiac disease tolerance</b>	Oats added to diet (50 g daily)	Case report; 19 celiac patients; given oat diet for 12 wks; blood tests & gastro-duodenoscopy	Safely tolerated by most patients with no negative effects, although in one patient it caused partial villous atrophy and rash	Lindin et al. 2003
<b>Celiac disease tolerance</b>	Oats-containing gluten-free products (50 g daily)	Randomized clinical trial; 39 celiac patients; duration: 1 y	No difference in quality of life between groups; oats patients suffered significantly more diarrhea & more severe average constipation symptom score; oats-diet caused more intestinal symptoms than standard gluten-free diet although mucosal integrity was not affected	Peraaho et al. 2004
<b>Hypocholesterolemic</b>	Oat bran (40 g daily for 14 days); control group fed a low-fiber diet	Clinical study; 6 men with initially normal blood lipid levels	Increased plasma levels of free cholesterol, LDL cholesterol & HDL free cholesterol & decreased concentrations of plasma esterified cholesterol & HDL esterified cholesterol	Dubois et al. 1995
<b>Hypocholesterolemic</b>	Oat bran incorporated into diet	Clinical study; 9 normolipidemic men; duration: 2 mo of constant diet with oats added in 2 <sup>nd</sup> mo	Active; serum cholesterol levels reduced; decreased cholesterol synthesis; significant increase in fecal excretion of total bile acids & fat	Marlett et al. 1994
<b>Nutritional value</b>	Oats added to diet in large amounts (93 g/day)	Nutritional clinical study; 15 adult celiac patients for 2 yrs (+ 3 patients for 6 mo)	Increased intake of iron, thiamin, zinc & dietary fiber; temporary increased flatulence; no negative nutritional effects reported.	Storsrud et al. 2003
<b>Skin irritation inhibition</b>	Oatmeal extracts in petrolatum ointment applied topically	Randomized controlled clinical trial; sodium lauryl sulfate (1% solution) skin irritancy model; 12 healthy individuals	Showed significant counteraction on skin irritation as measured by chromametry & laser-Doppler	Vie et al. 2002

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Ulcerative colitis treatment</b>	Oat bran dietary intake; 60 g daily, primarily as bread	Controlled clinical trial; 22 ulcerative colitis patients; 3 mo	Increased fecal butyrate concentration by 36%; improved abdominal pain & reflux disorders; no negative effects on gastrointestinal symptoms	Hallert et al. 2003

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Smoking cessation</b>	Alcoholic plant extract	Double blind placebo controlled clinical trial; smokers (n=100; average: 20 cigarettes daily)	No significant effect compared with placebo (35% placebo effect); showed higher rate of disaccustoming for light smokers than for heavy smokers	Schmidt & Geckeler 1976

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# Batata

## OTHER COMMON NAMES

Sweet potato (English).

## SCIENTIFIC NAME

*Ipomoea batatas* (L.) Lam. Synonym: *Ipomea batatas* L. [Convulvulaceae (Morning Glory Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Burns
- Edema
- Women's health conditions

**Plant Part Used:** Roots (tubers), leaves and stems.

**Traditional Preparation:** This tuber is used primarily for its high nutrient content as a starchy, cooked food. The tuber or aerial parts may also be applied externally as a raw poultice.

**Traditional Uses:** To treat burns or swelling, the root is crushed or a preparation of the leaves and stems is macerated in water and applied locally. This medicinal plant is also used for women's health conditions and as a nutritious food source.

## BOTANICAL DESCRIPTION

*Batata* (*Ipomoea batatas*) is a perennial vine that has trailing, rooting stems which spread by means of runners and can grow to variable lengths. Roots are tuberous and edible. Leaves vary from rounded and roughly oval to deeply lobed and hand-shaped, with purplish veins, of medium size (15 cm long). Flowers are rose-violet or pale pink (5 cm long). Fruits are round seed pods with 1-4 seeds per pod. There are two different varieties: one with dry, yellowish flesh and the other with moist, sweet, orange flesh (Bailey Hortorium Staff 1976).

**Distribution:** This plant is most likely native to tropical America and cultivated extensively in tropical regions as a food crop (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

This tuber is widely consumed and generally considered safe. However, when *batata* tubers are mishandled or stored improperly, resulting in bruising and exposure to moisture, they become vulnerable to fungal contamination which may cause adverse effects. It is important to store *batata* tubers properly to

avoid bruising and exposure to moisture so that they do not become contaminated by fungi that produce toxins in the plant matter (Coxon et al. 1975). Insufficient information has been identified in the literature on the safety of the leaves and stems.

**Animal Toxicity Studies:** *Ipomoea batatas* infected by the fungus *Fusarium solani* has caused lung damage to albino rats after intraperitoneal administration of the crude extract of furanoterpenoids isolated from the fungus-infected plants in the amount of 1 mg/kg for 21 days (Parasakthy et al. 1993).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Clinical trials to evaluate the following biological activities of this plant have been conducted: antidiabetic, immunomodulatory and vitamin A concentration increase (see “Clinical Data” table below). Preparations of the tuber of *Ipomoea batatas* and/or its constituents have shown the following effects in laboratory and preclinical studies: aldose reductase inhibition, antidiabetic, antimicrobial, antioxidant, chemopreventive hypoglycemic and immunostimulant (see “Laboratory and Preclinical Data” table below).

Biologically active compounds in the tuber include anthocyanins, beta-carotene, vitamin C, caffeic acid, chlorogenic acid, quercetin and rutin (Guan et al. 2006). Chemical constituents present in the leaves include: ascorbic acid, beta-carotene, calcium, iron, magnesium, methionine, oxalate, phosphorus and potassium (Duke & Beckstrom-Sternberg 1998). The cooked tuber is rich in vitamin A and a significant source of copper, iron, manganese, pantothenic acid, phosphorus, riboflavin and vitamins B6 and C (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** This plant has been provisionally categorized by TRAMIL as “REC” meaning “RECommended” specifically for treating burns by using the fruit and root or a maceration of the leaves and stems and applying this preparation topically to the affected area (Germosén-Robineau 1995).

### Clinical Data: *Ipomoea batatas*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antidiabetic</b>	White sweet potato extract (Caiapo); 4 g extract daily & dietary treatment	Randomized controlled clinical trial; patients with type 2 diabetes (n=61); duration: 12 wks	Active; showed blood sugar & cholesterol lowering effects; no adverse effects observed	Ludvik et al. 2004
<b>Antidiabetic</b>	White sweet potato extract (Caiapo); 2 & 4 g daily	Randomized controlled clinical trial; n=18 male type 2 diabetes patients; duration: 6 wks	Active; high dose (4 g daily) decreased insulin resistance; no influence on body weight, glucose effectiveness or insulin dynamics observed	Ludvik et al. 2003

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Immuno-modulatory</b>	Purple sweet potato leaves (daily consumption of 200 g vs. control diet of low polyphenols but same amount of carotenoids)	Randomized controlled clinical trial; crossover study (2 periods of 2 wks duration); 16 healthy adults	Increased peripheral blood mononuclear cell proliferative responsiveness, secretion of immunoreactive cytokines IL-2 & IL-4 & natural killer (NK) cell lytic activity	Chen et al. 2005
<b>Vitamin A concentration increase</b>	Boiled and crushed tuber; 125 g daily (1031 retinol equivalents/day as beta-carotene)	Randomized controlled clinical trial; n=180; children 5-10 yrs; 53 school days; control = white-fleshed sweet potato (without beta-carotene)	Active; increase in proportions of children with normal vitamin A status; potential use in controlling vitamin A deficiency in children suggested	van Jaarsveld et al. 2005
<b>Vitamin A concentration increase</b>	Cooked, pureed sweet potatoes (750 µg retinol equivalents) daily vs. Indian spinach or synthetic vit A	Clinical study; n=14 men/group	Active; showed positive effect on vitamin A status in groups at risk of deficiency	Haskell et al. 2005

### **Laboratory and Preclinical Data: *Ipomoea batatas***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Aldose reductase inhibition</b>	Hot water extract (tuber)	In vitro	Active; showed potent inhibition of lens aldose reductase	Terashima et al. 1991
<b>Antidiabetic</b>	White skinned variety; oral administration	In vivo: rats w/induced diabetes; duration: 8 wks	Activity; reduced hyperinsulinemia; improved glucose & lipid metabolism	Kusano & Abe 2000
<b>Antimicrobial</b>	Alcohol (95%) and water extract of tuber (purple variety)	In vitro	Effective against numerous gram positive & negative agents	Bruckner et al. 1949
<b>Antimicrobial</b>	Ethanol extract (entire plant, tuber, & leaf, separately)	In vitro	Demonstrated activity against <i>Mycobacterium leprae</i> , <i>M. phlei</i> , <i>M. smegmatis</i> , <i>M. fortuitum</i> , <i>Neisseria. ovis</i> , <i>N. caviae</i> , <i>N. catharralis</i> , <i>Moraxella osloensis</i> , <i>Bacillus subtilis</i> , <i>B. megaterium</i> , <i>B. brevis</i> & <i>Candida albicans</i>	Le Grand 1985

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Isolated compound: recombinant thioredoxin h	In vitro	Active; results suggest antioxidant activity against hydroxyl & peroxy radicals	Huang et al. 2004
<b>Antioxidant</b>	Anthocyanins from mottled purple flesh variety	In vitro	Active; additive effect observed with hydroxycinnamic acids	Philpott et al. 2004
<b>Antioxidant</b>	Anthocyanins; tuber extract; purple variety	In vitro & in vivo: rats (given anthocyanins); human volunteers (given tuber beverage)	Active; protected low density lipoprotein from oxidation	Kano et al. 2005
<b>Chemopreventive</b>	Anthocyanins of purple sweet potato; 5% of diet	In vivo: rats with experimentally-induced colorectal adenomas & carcinomas	Active; inhibited lesion development & significantly reduced incidence of experimentally-induced aberrant crypt foci	Hagiwara et al. 2002
<b>Hypoglycemic</b>	Diacylated anthocyanin	In vivo: rats	Active; reduced serum insulin secretion & showed strong maltase inhibition	Matsui et al. 2002
<b>Immunostimulant</b>	Tuber extract; white skinned variety	In vitro: human leukocyte cells	Active; showed dose-dependent increase in phagocytic activity & phagosome-lysosome fusion	Miyazaki et al. 2005
<b>Immunostimulant</b>	Isolated & purified sweet potato polysaccharide from roots (50, 150 & 250 mg/kg body weight for 7 days)	In vivo: mice	Active; dose-dependent effects on hemolytic & phagocytic activity & serum IgG concentration; significant increase in lymphocyte proliferation & natural killer cell activity	Zhao et al. 2005

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# Batata de Burro

## OTHER COMMON NAMES

*Batata zandumbia*, *batata zambomba* (Spanish); Caribbean coralfruit (English).

## SCIENTIFIC NAME

*Doyerea emetocathartica* Grosourdy. Synonyms: *Corallocarpus emetocatharticus* Cogniaux; *Anguriopsis margaritensis* J. R. Johnson. [Cucurbitaceae (Cucumber Family)].

**Note:** In the Dominican Republic, an unrelated plant species, *Pachyrrhizus erosus* (L.) Urb., is referred to by the same common name, *batata de burro*, and the common names *batata zambomba* and *batata zandumbia* are also used for two other plant species (*Ipomoea desrousseauxii* Steud. and *Ipomoea mauritiana* Jacq.); however, these plant species do not appear to be known for their medicinal properties (Liogier 2000).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Diabetes
- Gastrointestinal disorders
- Menstrual disorders
- Ovarian cysts
- Sexually transmitted infections
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Leaves and roots.

**Traditional Preparation:** The root and/or leaves are used as a tea by infusion or decoction.

**Traditional Uses:** This plant, particularly the root, is used for treating sexually transmitted infections (in men and women), gastrointestinal disorders and women's health conditions including vaginal infections, ovarian cysts, uterine fibroids and dysmenorrhea. The leaves are also prepared as a tea for diabetes.

**Availability:** Dried leaves and roots can be purchased from select *botánicas*. As this plant can be difficult to find in New York City, healers and individuals sometimes ask friends or relatives in the Dominican Republic to collect plants for them and send them as a prepared remedy or *botella*.

## BOTANICAL DESCRIPTION

*Batata de burro* (*Doyerea emetocathartica*) is an herbaceous, perennial vine with curling tendrils, reaching a length of 10 m. The stem contains a copious amount of watery sap. Leaves are shiny, bright-

green, 3-lobed and roughly oval or arrow-shaped. Flowers are bell-shaped and white to yellowish-green in color. Fruits are shiny and light-green with dark green spots, turning orange when ripe, lightly covered with small prickly hairs and contain several small brown seeds (Acevedo-Rodríguez 1996).

**Distribution:** This plant grows in Central America, northern South America and the Caribbean, often in coastal woodland areas. This plant has been listed as a threatened species due to habitat loss and destruction (Acevedo-Rodríguez 1996).

## SCIENTIFIC LITERATURE

No information on the safety, efficacy, contraindications, herb-drug interactions, chemical constituents or indications and usage of this plant has been identified in the literature through Medline and internet searches of the common and botanical names for species, genus and synonyms of this plant. In ethnobotanical literature, documented traditional uses of this plant include its application in the Caribbean as an emetic and in the Yucatán peninsula by Mayan communities for various illnesses such as arthritis, ulcers and as an analgesic.

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# Bejuco Indio

## OTHER COMMON NAMES

*Cacheco, cacheo, jaboncillo, bejuco de indio, bejuco de mavi, bohuco de indio, bojuco de indio, mabi, mavi* (Spanish); whiteroot, chewstick, Jamaican chawstick (English).

## SCIENTIFIC NAME

***Gouania lupuloides*** (L.) Urb. Synonyms: *Gouania polygama* Urb., *Gouania domingensis* L. [Rhamnaceae (Buckthorn Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Anxiety
- Infections
- Kidney disorders



- *Limpiar la sangre*
- Menopausal hot flashes
- Menstrual disorders
- Reproductive disorders
- Sexually transmitted infections
- Uterine fibroids

**Plant Part Used:** Stem, leaf, root and water from inside the stem.

**Traditional Preparation:** The stem is the part most often used, and it is prepared as a complex herbal mixture with several other medicinal plants, either boiled in water as a decoction or extracted in alcohol as a tincture.

**Traditional Uses:** *Bejuco indio* is associated with cooling properties and is popularly used to make a refreshing fermented beverage (called *mavi*, *mabi*, *cacheco* or *cacheo*) which is attributed medicinal qualities. (A similar use for this plant is reported in Cuba in the preparation of the beverage *pru*; Volpato & Godínez 2004.) A piece of the stem (*palo*) of this woody vine is used in multi-herb preparations (*botellas* or *tizanas*) for treating infections, kidney disorders, reproductive disorders, sexually transmitted infections and cleansing the blood. It is also used for treating women's health conditions, prepared as a tea (infusion/decoction), *bebedizo* or *botella*. Gynecological conditions for which this plant is used include menstrual disorders, uterine fibroids and conditions associated with menopause (including hot flashes and anxiety or mood swings). Herbal medicine specialists are typically consulted for making complex preparations like the *botellas* for which this plant is used.

**Availability:** Dried pieces of the woody vine stem can be purchased from select *botánicas*.

## BOTANICAL DESCRIPTION

*Bejuco indio* (*Gouania lupuloides*) is a woody vine that has many branches and grows to 5-12 m long. Twigs are smooth and round in shape. Leaves are bright green, papery in texture and smooth to lightly hairy on the surface (4.5-7.5 cm long). The general outline of the leaf is egg-shaped to narrowly oval and slightly toothed on the edges. Flowers have yellowish petals. Fruits (5-7 mm long) are dry, 3-winged and split into 3 triangular segments that contain small seeds (Acevedo-Rodríguez 1996).

**Distribution:** This liana commonly grows in disturbed areas with a range that extends from northern South America to southern Mexico and Florida, including the Caribbean (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Some saponins from this plant have demonstrated spermicidal activity in rats and humans (Hiller 1987).

**Animal Toxicity Studies:** The LD<sub>50</sub> of the aqueous extract of the leaf and branches administered intraperitoneally in mice is 1 mL/animal (Feng et al. 1962). However, intraperitoneal administration does not reflect traditional use, and it is difficult to extrapolate the results from animal studies to potential toxicity in humans.

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In laboratory and preclinical studies, this plant has shown antimicrobial, muscle-relaxant and vasodilatory activities (see “Laboratory and Preclinical Data” table below). Triterpenoid saponins from this plant become foaming detergents when in contact with water and have demonstrated the following pharmacological actions: antibacterial, antifungal, molluscicidal, anti-inflammatory, stimulation of interferon synthesis and liberation and central nervous system (CNS) sedative (Hiller 1987). Additionally, these compounds have exhibited therapeutic activity in the treatment of kidney stones by increasing their solubility (Pashanbhedhi 1970).

Phytochemical research on the composition of this plant has yielded two novel triterpenoid saponins (16,17-seco-dammaranoid) designated gouanoside A and gouanoside B, with corresponding aglycones, gouanogenin A and gouanogenin B (Kennelly et al. 1993).

**Indications and Usage:** TRAMIL has classified this plant as needing more investigation before a clinical recommendation can be made, particularly for its use as a decoction in the treatment of gonorrhea (Germosén-Robineau 1995).

### Laboratory and Preclinical Data: *Gouania lupuloides*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Isolated saponins	In vitro: human gum, tooth & mouth pathogens	Exhibited antimicrobial activity against 10 pathogen specimens, including: <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> & <i>Candida albicans</i>	Elvin Lewis & Kennelly 1992
<b>Muscle relaxant</b>	Ethanol extract 95% of leaf & branches, given intraperitoneally	In vivo & in vitro: guinea pig & isolated ileum muscle tissue	Demonstrated relaxant effects on smooth muscle tissue at 3.3 mL/L	Feng et al. 1962
<b>Vasodilator</b>	Ethanol extract 95% of leaf and branches	In vitro: ventricle isolated from rats	Demonstrated vasodilatory effects at 3.3 mL/L	Feng et al. 1962

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# Berenjena

## OTHER COMMON NAMES

*Agua de berenjena* (Spanish); eggplant (English).

## SCIENTIFIC NAME

*Solanum melongena* L. [Solanaceae (Nightshade Family)].

**Note:** In the Dominican Republic, the common name *berenjena* may also be used to refer to other plant species of the genus *Solanum* with different medicinal properties and uses. When consulting the information in this plant monograph, be sure that the *berenjena* used by the patient is the common edible eggplant rather than a different species from the Caribbean. Other species typically have much smaller fruits and typically have spines along the stems.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant for the following health conditions or effects (Yukes et al. 2002-2003):

- Diabetes
- High blood pressure
- High cholesterol
- Obesity
- To lose weight

**Plant Part Used:** Fruit (eggplant).

**Traditional Preparation:** The raw fruit is cut into pieces and soaked in water to extract its medicinal properties, and this water is taken internally as a drink. When prepared as a remedy this way, the raw flesh of the eggplant itself is not eaten, although eggplant is commonly consumed as a cooked vegetable.

**Traditional Uses:** The raw fruit extracted in water—called “eggplant water” (*agua de berenjena*)—is said to speed up the body’s metabolism so that it can burn fat more efficiently. Sometimes chayote (*tayote*) fruit is added to this remedy.

**Availability:** As a commonly consumed food, *berenjena* can be found at most grocery stores and supermarkets which sell fresh vegetables and produce.

## BOTANICAL DESCRIPTION

*Berenjena* (*Solanum melongena*) is a tender perennial herb which is often cultivated as an annual and grows to 1 m tall with spiny, hairy stems. Leaves are alternate. Flowers usually grow singly with violet-purple petals that have 5-pointed lobes that together form the shape of a star. Fruits are oblong, elongate and/or round and have blackish-purple, shiny skin (to 15 cm long) enclosing beige to off-white, dry, spongy flesh and numerous kidney-shaped seeds (Bailey Hortorium Staff 1976).

**Distribution:** Native to Africa and Asia, this plant is cultivated widely with numerous varieties that differ in fruit size, shape and color (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As a widely consumed vegetable, eggplant is generally considered safe. Due to the oxalic acid content of the fruit (291 ppm, Duke & Beckstrom-Sternberg 1998), persons with kidney or gallbladder problems may want to avoid or minimize ingestion of this fruit to prevent the formation of calcium-oxalate crystals.

**Contraindications:** None identified in the available literature.

**Drug Interactions:** None identified in the available literature.

## SCIENTIFIC LITERATURE

In clinical trials, ingestion of *Solanum melongena* fruit showed potential as an anti-glaucoma treatment due to its intraocular pressure-lowering and increased visual perception effects; the fruit infusion showed slight, temporary hypocholesterolemic effects; the fruit as a supplement to a cholesterol-lowering diet showed a significant decrease in plasma lipid and cholesterol levels, comparable to that of first generation statin drugs; and the dried, powdered fruit capsules did not show significant hypocholesterolemic effects compared to placebo (see “Clinical Data” table below). The fruit and its constituents have demonstrated angiogenesis inhibition, antioxidant and hypocholesterolemic activities in animal studies, and the leaves have shown spasmogenic activity in vitro (see “Laboratory and Preclinical Data” tables below).

Biologically active constituents of the fruit include: 5-hydroxytryptamine, amino acids, ascorbic acid, aspartic acid, auberginone, caffeic acid, chlorogenic acid, choline, delphinidin, GABA, glutamic acid, histidine, linoleic acid, methionine, monounsaturated fatty acids, nasunin, neo-chlorogenic acid, oleic acid, oxalic acid, palmitic acid, phytosterols, polyunsaturated fatty acids, solamargine, solanidine, solanine, solasodine, solasonine and tannin trigonelline (Duke & Beckstrom-Sternberg 1998). In particular, the anthocyanin nasunin has shown potent antioxidant activity: delphinidin-3-(p-coumaroylrutinoside)-5-glucoside (Noda et al. 2000). The fruit is a significant source of copper, dietary fiber, folate, magnesium, niacin, potassium, manganese, thiamin and vitamin B6 (U.S. Dept. of Agriculture 2006). It also contains phytonutrients, including antioxidant flavonoids which are concentrated in the peel.

**Indications and Usage:** The only available dosage information is that based on nutritional or traditional use.

### Clinical Data: *Solanum melongena*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antihypercholesterolemic</b>	Fruit infusion ingested for 5 wks (compared with dietary orientation)	Randomized controlled clinical trial; 38 human volunteers with hypercholesterolemia	Significantly lowered LDL cholesterol & apolipoprotein blood levels based on intraindividual analysis; however, compared with the control group, no significant differences were observed	Guimaraes et al. 2000

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antihyperlipidemic &amp; antihypercholesterolemic</b>	Eggplant as part of dietary portfolio high in plant sterols, dietary fiber & soy plus okra & eggplant (10 g/1000 kcal)	Randomized controlled clinical trial: hyperlipidemic patients (n=34); each participant rotated between control low-saturated-fat diet, lovastatin treatment plus diet (20 mg) & portfolio diet; one mo duration for each protocol	Eggplant-supplemented diet was comparable to first-generation statin drugs in decreasing lipid levels & primary prevention; after 4 wks of the control, statin & portfolio diets, low-density lipoprotein cholesterol levels were lowered by $8.5 \pm 1.9\%$ , $33.3 \pm 1.9\%$ & $29.6 \pm 1.3\%$ , respectively	Jenkins et al. 2005
<b>Vision improvement &amp; interocular pressure-lowering</b>	Consumption of food; 10 g	Human trial with visually active male volunteers	Lowered interocular pressure (25%) & positively affected other visual activities; potential therapy for glaucoma & convergence insufficiency	Igwe et al. 2003

### Laboratory and Preclinical Data: *Solanum melongena*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Angiogenesis inhibitor</b>	Nasunin	In vitro & ex vivo: rat aortic ring & human umbilical vein endothelial cells	Active; showed inhibition of angiogenesis at concentrations > 10 $\mu\text{mol}$ ; suppressed microvessel outgrowth	Matsubara et al. 2005
<b>Anti-hypercholesterolemic</b>	Fruit juice; dosage: 10 mL/day, orally; treatment duration: 2 wks	In vivo: male rabbits (n=13) with experimentally induced hypercholesterolemia	Active; showed significant weight loss & decreased plasma cholesterol, low-density lipoprotein, triglyceride, aortic cholesterol levels & malondialdehyde content of arterial wall; reduced lipid peroxidation in arterial wall & increased endothelium-dependent relaxation	Jorge et al. 1998
<b>Antioxidant</b>	Nasunin (anthocyanin from fruit peels)	In vitro: electron spin resonance spectrometry & radical scavenging models	Active; showed potent activity; mechanism involves iron chelation & inhibition of hydroxyl radical generating system; protected against lipid peroxidation	Noda et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Flavonoids isolated from the fruit	In vitro & in vivo: normal & cholesterol-fed rats were administered 1 mg flavonoids /100 g body weight per day orally	Demonstrated potent antioxidant activity as evidenced by significant lowering of malondialdehyde, hydroperoxide & conjugated diene concentrations, enhanced catalase activity & raised glutathione levels	Sudheesh et al. 1999
<b>Antioxidant</b>	Nasunin (isolated from eggplant peel)	In vivo: rats with dietary paraquat-induced food reduction, body weight gain & increased lung weight	Active; prevented oxidative stress caused by dietary paraquat	Kimura et al. 1999
<b>Spasmogenic</b>	Methanol extract of fresh leaves; using serial dilutions of 0.0025 to 2.5 mg/mL	In vitro: isolated, pre-contracted guinea pig tracheal chains	Exhibited a dose-dependent increase in the force of muscle contraction; this bronchospasmogenic effect is probably due to muscarinic receptor stimulation	Mans et al. 2004

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antihyperlipidemic</b>	Capsules of dried powdered fruits; 450 mg twice daily, orally	Double-blind placebo-controlled study; 41 hyperlipidemic volunteers	No significant difference in serum cholesterol & lipid levels compared with placebo after 3 mo	Silva et al. 2004

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# Berro

## OTHER COMMON NAMES

Watercress (English).

## SCIENTIFIC NAME

*Nasturtium officinale* R. Br. Synonym: *Rorippa nasturtium-aquaticum* (L.) Hayek. [Brassicaceae (Mustard Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies in New York City, Dominican interview participants reported using this edible food plant as a remedy or preventive agent for the following health conditions (Vandebroek & Balick 2009, Yukes et al. 2002-2003):

- Anemia
- Asthma



- Bronchitis
- Common cold
- Cough
- Diabetes
- Flu
- Heart disease
- High blood pressure
- High cholesterol
- Sinusitis
- Tuberculosis
- Upper or lower respiratory tract infections

**Plant Part Used:** Aerial parts (leaves, stems and flowers).

**Traditional Preparation:** The fresh leaves may be eaten raw, liquefied as a juice or prepared as a syrup with honey.

**Traditional Uses:** *Berro* is considered a nutritious food plant with hot therapeutic properties and is used to prevent or treat several health conditions. To clear congestion and clean out the lungs in illnesses such as asthma, bronchitis, common cold or flu, cough, sinusitis, tuberculosis and upper or lower respiratory tract infections, fresh *berro* can be prepared as a syrup or juice. To make a medicinal syrup, the fresh plant is chopped and combined with honey or boiled in water and then thickened with honey and taken orally by the spoonful as needed. Sometimes fresh radish (*rábano*) or lemon/lime (*limón agrio*) pieces are added to this mixture. The raw plant can also be liquefied in a blender or crushed with a mortar and pestle to extract the juice (*zumo*) which is taken as a drink in small amounts. For nourishment and to strengthen the blood, it can be eaten raw as a salad or juiced and taken with other medicinal food plants as a remedy for chronic anemia. Other ingredients in this remedy can include carrot (*zanahoria*), beets (*remolacha*) and malt beverage (*malta alemana*).

**Availability:** *Berro* is typically sold as a fresh vegetable at grocery stores, supermarkets, farmers market and local convenience stores (*bodegas*) in New York City.

## BOTANICAL DESCRIPTION

*Berro* (*Nasturtium officinale*) is a perennial herb that has floating or ascending stems reaching 25-80 cm in height. Young leaves are oval- or heart-shaped and mature leaves are compound with 3-11 round to oblong leaflets. Flowers are small with white petals. Fruits are dry, elongated seed-pods that split in half lengthwise. The entire plant has a characteristic pungent flavor. This plant often hybridizes with a related species, *Nasturtium microphyllum* Boenn. ex Rchb (Bailey Hortorium Staff 1976).

**Distribution:** *Berro* grows near running water or in wet soil in temperate regions and is native to Europe and Southwest Asia (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As a widely consumed food plant, *berro* is generally regarded as safe. No information on adverse reactions has been identified in the literature. However, large amounts of the fresh plant may lead to gastrointestinal disorders due to the mucous membrane-irritating effects of the mustard oil it contains. Also, this plant may carry liver flukes, such as *Fasciola hepatica* or other parasites if grown in contaminated water.

**Contraindications:** Watercress is contraindicated for individuals with stomach or intestinal ulcers and kidney diseases involving inflammation. This plant is not to be given to children under four years old and should be avoided during pregnancy (Gruenwald et al. 2004).

**Drug Interactions:** None identified in the available literature.

## SCIENTIFIC LITERATURE

This plant has been studied in clinical trials for the following effects: antigenotoxic, antioxidant, chemopreventive, induction of phase II liver detoxification enzymes, modulation of acetaminophen metabolism and potential use as a treatment for bronchitis, sinusitis and urinary tract infections (see “Clinical Data” table below). In laboratory and preclinical studies, this plant has shown the following activities: antigenotoxic, antiproliferative, antitumor, chemopreventive and histamine release inhibition (see “Clinical Data” and “Laboratory and Preclinical Data” tables below).

This medicinal plant contains ascorbic acid, aspartic acid, biotin, essential oil, folacin, gluconasturtin, glutamic acid and histidine (Duke & Beckstrom-Sternberg 1998). Isothiocyanates, including phenethyl isothiocyanate, have shown promising chemopreventive activity (Chiao et al. 2004, Hecht et al. 1985, Rose et al. 2000). The raw leaves are rich in vitamin K and are a significant source of calcium, copper, folate, iodine, iron, magnesium, manganese, pantothenic acid, phosphorus, potassium, riboflavin, thiamin and vitamins A, C and E (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Approved by the German *Commission E* for upper respiratory catarrhal conditions (Blumenthal et al. 1998). Typical forms of administration include: capsules (500 mg) or as a tea (150 mL boiling water over 1-2 teaspoonfuls herb, covered for 10-15 minutes and strained or applied externally as compress or poultice). Common dosages are 2-3 cups of the tea before meals, 4-6 g of the dried herb, 20-30 g of the fresh herb or 60-150 g of freshly pressed juice.

### Clinical Data: *Nasturtium officinale*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant &amp; antigenotoxic</b>	Raw watercress (85 g) daily for 8 wks as supplementation to typical diet	Single-blind, randomized, crossover study; n=60 (30 men, 30 women; 30 smokers, 30 nonsmokers)	Showed reduction in DNA damage & oxidation; showed greater positive effects in smokers than in nonsmokers; increased plasma carotenoid levels (lutein & beta-carotene); results suggest that cancer preventive activity may be due to decreased DNA damage & antioxidant effects	Gill et al. 2007

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Bronchitis, sinusitis &amp; urinary tract infection (UTI) treatment</b>	Herbal drug containing nasturtium herb, horseradish root & Angocin Anti-Infeckt N vs. standard antibiotic therapy (duration: 7-14 days or end of disease)	Prospective cohort study: test group (n=1223), control group (n=426); 536 w/acute sinusitis; 634 w/acute bronchitis; 479 w/UTI	Based on quantified clinical assessment of symptom severity; relative reduction in symptoms (test vs. control): acute sinusitis: 81.3% vs. 84.6%; acute bronchitis: 78.3% vs. 80.3%; UTI: 81.2% vs. 87.9%; efficacy of herbal drug determined to be comparable to & safer than antibiotics	Goos et al. 2006
<b>Chemopreventive</b>	Fresh plant, 56.8 g consumed at each of 3 meals for 3 days	Clinical trial; 11 smokers; urine samples measured for metabolites	Phenethyl isothiocyanate from plant inhibited oxidative metabolism of tobacco-specific lung carcinogen	Hecht et al. 1995
<b>Metabolism of acetaminophen</b>	50 g plant homogenates ingested & followed by acetaminophen (1 g) taken orally 10 hours later	Clinical study; crossover trial with human volunteers	Little impact on the plasma pharmacokinetic processes & urinary excretions of the drug; however, resulted in decreased levels of oxidative metabolites of acetaminophen, probably due to inhibition of oxidative metabolism of this drug	Chen et al. 1996
<b>Phase II enzyme induction</b>	Watercress consumption	Clinical trial: smokers	Results suggest that active components of this plant affect nicotine metabolism by inducing phase II liver detoxification enzyme UDP-glucuronosyltransferase	Hecht et al. 1999

### **Laboratory and Preclinical Data: *Nasturtium officinale***

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antigenotoxic &amp; antiproliferative</b>	Crude watercress extract	In vitro: human colon cancer cells (HT29 & HT115)	Active: inhibited experimentally-induced DNA damage; delayed cell proliferation (caused accumulation of cells in the S phase); significantly inhibited invasion	Boyd et al. 2006
<b>Antitumor</b>	Plant extract	In vitro: experimental tumors	Active	Cruz 1970

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antitumor</b>	N-acetylcystein conjugate of phenethyl isothiocyanate (abundant in watercress); supplemented in diets (8 mcmmol/g) for 9 wks	In vivo: immunodeficient mice with xenografted tumors of human prostate cancer PC-3 cells	Active; inhibited tumorigenesis; showed significant reduction of tumor size; upregulated inhibitors of cyclin-dependent kinases, induced tumor cell apoptosis & modulated post-initiation by affecting cell cycle regulators	Chiao et al. 2004
<b>Chemopreventive</b>	Watercress extract & isolated compounds (isothiocyanates)	In vitro: murine hepatoma cell lines	Active; induced phase II enzymes (which are associated with increased excretion of carcinogens) as evidenced by induction of quinone reductase	Rose et al. 2000
<b>Histamine release inhibition</b>	Isolated constituents (flavonols & megastigmanes)	In vitro: antigen-stimulated RBL-2H3 cells	Identified active constituents; showed 60% inhibition of histamine release; mechanism did not affect calcium influx	Goda et al. 1999

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# Bija

## OTHER COMMON NAMES

*Achiote* (Spanish); annatto, lipstick tree (English).

## SCIENTIFIC NAME

*Bixa orellana* L. [Bixaceae (Annatto Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Balick et al. 2000, Vandebroek & Balick 2009, Yukes et al. 2002-2003):

- Anemia
- Bruises
- Burns
- Childbirth – labor pain

- Contusions and musculoskeletal trauma
- Cysts
- Excess or abnormal vaginal discharge
- Menstrual cramps (dysmenorrhea)
- Postpartum
- Skin inflammation
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Seeds and powdered seed-covering.

**Traditional Preparation:** The seed coat of this plant is ground to a powder and may be heated in oil, extracted in alcohol and/or added to herbal mixtures prepared as a tea by decoction or as a tincture.

**Traditional Uses:** The red seed coat (aril) of this plant is often thought of as a good source of iron and used as a remedy for anemia. Seeds are ground to a coarse powder and combined with beets and molasses to treat uterine fibroids, ovarian cysts, breast cysts, dysmenorrhea and anemia. Sometimes other ingredients are added to this mixture, such as powdered iron supplements (*hierro de polvo*), magnesium, beets (*remolacha*) or malt beverage (*malta alemana*, a non-alcoholic drink that is popular in the Dominican Republic).

For skin conditions, such as burns, the seeds are boiled with milk or heated in cooking oil to extract their therapeutic properties and then applied locally to the affected area. For recovering from injury, musculoskeletal trauma or contusions, the seeds are crushed, combined with red wine (*vino tinto*) and taken orally. For labor pain during childbirth and postpartum recovery, *bija* seed-coat is combined with the following plants to make a medicinal drink (*bebedizo*): guinea hen-weed (*anamú*), minnieroot (*guaucí*) root, passionflower (*caguazo*) herb and castor bean plant (*higuereta*) seed oil (Yukes et al. 2002-2003). For vaginal infections characterized by excessive vaginal discharge (*flujo vaginal*), the seeds are taken orally (Vandebroek & Balick 2009).

**Availability:** Dried *bija* seeds are commonly sold at grocery stores, supermarkets, neighborhood convenience stores, *bodegas* and *botánicas*.

## BOTANICAL DESCRIPTION

*Bija* (*Bixa orellana*) is a small tree that grows to 8 m in height. Leaves are arranged in an alternate pattern and are oval or heart-shaped with a pointed tip, long leaf-stalk and clearly defined veins. Flowers have pink, rose or white petals and yellow stamens. Fruit capsules are green to brown and densely covered with soft, pliable, reddish spines. Each capsule contains numerous small seeds that are covered with a scarlet aril and attached to the inside wall (Bailey Hortorium Staff 1976).

**Distribution:** Native to tropical America, this plant is widely cultivated as a dye and food plant and has become naturalized in tropical areas of the Old World (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

*Bija* is considered safe for human consumption as a food and flavoring agent. In a nutritional and toxicity study, annatto seeds were dried, powdered and analyzed for their chemical constituents and nutritional value. The toxicity level was found to be insignificant and the vitamin and mineral content as well as the fiber fractions were very similar to those of cereals but with a higher level of carotenoids. Results support the safe use of this resource as a food for human nutrition when combined with other foodstuffs (Wurts & Torreblanca 1983). Allergic reactions have been reported: in a human clinical trial, 56 patients suffering from chronic urticaria and/or angioneurotic edema were given annatto extract (dose equivalent to that in

25 g of butter) administered orally and within 4 hours of intake 26% of patients reacted with hypersensitivity symptoms (Mikkelsen et al. 1978).

**Animal Toxicity Studies:** Numerous animal studies have been conducted on the potential toxicity of this plant. Oral ingestion of *bija* was determined to be neither maternally toxic nor embryotoxic in rats with a no-observed-adverse-effect level (NOAEL) for maternal and developmental toxicity of 500 mg/kg body weight/day or greater (or  $>$  or  $=$  140 mg bixin/kg body weight/day; Paumgartten et al. 2002). A subchronic oral toxicity study of annatto extract (norbixin), a natural food color made from *bija*, was conducted. The No-Observed-Adverse-Effect-Level (NOAEL) in Sprague-Dawley rats was judged to be a dietary level of 0.1% (69 mg/kg body weight/day for males, 76 mg/kg body weight/day for females) of annatto extract (norbixin) under the present experimental conditions (Hagiwara et al. 2003).

In mice, the LD<sub>50</sub> of the seeds administered orally was determined to be 1092 ± 202 mg/kg body weight (Garcia & Saenz 1995) and of the root administered intraperitoneally was 700 mg/kg (Dunham & Allard 1959). For external use, the aqueous freeze-dried extract and an infusion of the freeze-dried petioles applied topically (0.5%) in rabbits (0.5 mL × 5 cm<sup>2</sup>) for 72 hours did not result in any observable changes in the skin. After ocular application (0.5%) of 0.1 mL, no observable changes in conjunctiva were induced except for initial tears (Solis et al. 2000).

**Contraindications:** Internal use should be avoided by those who might be hypersensitive or have an allergic reaction to the plant parts used.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Laboratory and preclinical studies have demonstrated the following biological actions of *bija* (*Bixa orellana*): analgesic, antibacterial, anticonvulsant, antidiarrheal, antifungal, anti-inflammatory, antimicrobial, antigonorrheal, chemopreventive, hyperglycemic, immunomodulatory and platelet antiaggregant activity (see “Laboratory and Preclinical Data” table below). *Bija* is a common condiment and coloring agent (known commercially as annatto) and is used to color red pill capsules. It is also widely utilized as a food-colorant and is considered a spice because of its numerous culinary uses even though it is nearly tasteless.

Major chemical constituents of the seed include carotenoids (including beta carotene) and terpenes, among other compounds (Germosén-Robineau 2005). Biologically active constituents of the fruit or seed include bixein, bixin, bixol, crocetin, cyanidin, ellagic acid, histidine, isobixin and norbixin (Duke & Beckstrom-Sternberg 1998). The seeds are a significant source of calcium, iron, phosphorus and protein.

**Indications and Usage:** TRAMIL has classified the external use of the crushed seeds (or seeds fried in oil), applied locally for the treatment of burns as “REC” meaning that it is “RECommended” for these particular applications. The following precautions are advised: limit use to superficial burns that cover less than 10% of the body’s surface and keep away from high risk areas like the face, hands, feet and genitals. This plant is recommended exclusively for external use, applied locally to the affected area and following strict standards of hygiene to avoid infection and contamination (Germosén-Robineau 2005). For external use in the treatment of burns, TRAMIL has determined the following therapeutic dosage: take 10 crushed seeds and fry in 40 mL of vegetable oil, allow to cool; wash the lesion with boiled water and soap and apply a sufficient quantity to cover the affected area; cover with a bandage or clean cloth; and change the dressing every 12 hours (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Bixa orellana*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic, anticonvulsant &amp; antidiarrheal</b>	Methanol leaf extract (doses of 125, 250 & 500 mg/kg body weight)	In vivo: mice; with strychnine-induced convulsions, acetic acid-induced writhing, castor oil-induced diarrhea	Active; showed strong antinociceptive activity; increased survival time in strychnine-induced anticonvulsant test; decreased total number of stools & motility time	Shilpi et al. 2006
<b>Antibacterial &amp; antioxidant</b>	Methanol leaf extract	In vitro: DPPH assay; diarrhea & dysentery-causing bacteria	Active; showed radical scavenging activity at $IC_{50}=22.36 \mu\text{g/mL}$ ; antibacterial activity against <i>Shigella dysenteriae</i> & other species	Shilpi et al. 2006
<b>Antibacterial</b>	Ethanol extracts of fruit and leaf	In vitro	Exhibited activity against <i>Staphylococcus aureus</i> and <i>Escherichia coli</i>	George & Petalai 1949
<b>Antifungal</b>	Dichloromethane & methanol extracts	In vitro: agar disk diffusion assay	Effective against several fungi	Freixa et al. 1998
<b>Antifungal</b>	Methanol extract	In vitro: against <i>Cryptococcus neoformans</i>	Active; MIC=0.078 mg/mL	Bruga et al. 2006
<b>Anti-inflammatory</b>	Crude aqueous extract of the seeds	In vitro: prostaglandin synthesis model & thrombocyte aggregation induced by collagen model	Inhibited 38% prostaglandin synthesis at 0.1 mg/mL; inhibited thrombocyte aggregation at 0.88 mg/mL in 24%	Serrano & Sandberg 1988
<b>Anti-inflammatory</b>	Crude aqueous extract of the seeds	In vitro: isolated guinea pig ileum stimulated by histamine (0.102 $\mu\text{g/mL}$ ) and electricity	Inhibited 17% of the motility at 0.2 mg/mL and 46% of electrical stimulation at 2 mg/mL	Serrano & Sandberg 1988
<b>Anti-inflammatory</b>	Aqueous crude extract of the seeds	In vivo: rat carrageenan-induced paw edema model	Reduced inflammatory response by 22% at 1 g/kg	Serrano & Sandberg 1988
<b>Antimicrobial</b>	Ethanol, hexane & water extracts	In vitro: agar well diffusion method; tested against 5 bacteria & 1 yeast	Active against <i>Escherichia coli</i> (MIC=0.8 $\mu\text{g/mL}$ ) & <i>Bacillus cereus</i> (MIC=0.2 $\mu\text{g/mL}$ ) & other spp.	Rojas et al. 2006



<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Ethanol extracts of leaves and seeds	In vitro	Demonstrated broad spectrum antimicrobial activity with the leaves being more effective than the seeds	Fleischer et al. 2003
<b>Antimicrobial</b>	Ethanol extracts of different plant parts	In vitro	Leaf extracts showed maximum activity against <i>Bacillus pumilus</i> , followed by root and stem	Castello et al. 2002
<b>Antimicrobial &amp; antigonorrheal</b>	Bark (50% alcohol tincture)	In vitro	Inhibited 5 strains of <i>Neisseria gonorrhoea</i>	Caceres et al. 1995
<b>Immuno-modulatory &amp; antitumor</b>	Aqueous and alcoholic (80%) extracts of seeds	In vitro: tumor growth (Molt-4) in human lymphoma cells, rat splenocytes & murine macrophage	Ethanol extract exhibited significant dose-dependent immunostimulant effects & aqueous extract showed slight inhibition of splenocyte proliferation	Weniger 1992
<b>Chemopreventive</b>	Annatto (natural food colorant from <i>Bixa orellana</i> )	In vivo: rat colon	Chemoprotective effects through modulation of cryptal cell proliferation but not at the initial stage of colon carcinogenesis; no antigenotoxic effect observed in colon cells	Agner et al. 2005
<b>Hyperglycemic</b>	Alcohol extract administered orally (2 g/mL)	In vivo: dogs	Exhibited hyperglycemic effects	Morrison & West 1982
<b>Hyperglycemic</b>	Methyl ester, trans-bixin (C <sub>24</sub> H <sub>30</sub> O <sub>4</sub> ) isolated from suspension of powdery seed arils in oil	In vivo: anaesthetized mongrel dogs	Exhibited hyperglycemic effects & damage to mitochondria & endoplasmic reticulum of liver & pancreas; however, fortifying subjects' diet with riboflavin counteracted these effects	Morrison et al. 1991
<b>Antiplatelet</b>	Aqueous extract	In vitro	Active; extract inhibited thrombin-induced aggregation of human platelets (0.075 U/mL)	Villar et al. 1997

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
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<b>Mutagenic &amp; antimutagenic</b>	Annatto (natural food colorant from <i>Bixa orellana</i> )	Mouse bone marrow cells	Neither mutagenic nor an inhibitor of induced mutations, although high doses may increase the effect of a mutagen so caution is advised	Alves de Lima et al. 2003
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# Brasil

## OTHER COMMON NAMES

*Palo de Brasil* (Spanish); Brazilwood caesalpinia (English).

## SCIENTIFIC NAME

*Caesalpinia brasiliensis* Sw. Synonyms: *Baryxylum brasiliense* (L.) Pierre, *Brasilettia brasiliensis* (L.) Kuntze, *Peltophorum brasiliense* (L.) Urb. [Caesalpinaceae (Senna Family)].

**Note:** Although the first species indicated above is most commonly used by Dominicans, the Spanish name *palo de brasil* can refer to more than one botanical tree species, most of which have similar orangish-reddish heartwood. These species, along with their distinguishing characteristics, are as follows: *Caesalpinia violacea* (Miller) Standley [Synonyms: *Brasilettia violacea* (Miller) Britton & Rose, *Caesalpinia cubensis* Greenman, *Peltophorum brasiliense* (L.) Urban, *Robinia violacea* Miller.] has no prickles and has compound, bipinnate leaves with 4-10 pinnae and 12-16 leaflets; *Haematoxylon brasiletto* is also sold at *botánicas* under the name *palo de brasil* (its common name in Mexico and Central America) and has prickly spines and compound, bipinnate leaves with 6-7 leaflets (this tree is called *palo de campeche* or Mexican logwood); *Caesalpinia echinata* has spiny prickles and compound, bipinnate leaves with 3-7(10) pinnae and 8-21 leaflets; *Haematoxylon campechianum* (also known as *palo campeche*) is grown in the Dominican Republic on plantations for export as lumber and for its red heartwood which is used as a dye, this tree is and has prickly spines and compound, bipinnate leaves with 4-8 leaflets.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Diabetes
- High blood pressure
- Kidney infections
- Menopausal symptoms
- Menstrual disorders
- Ovarian cysts
- Poor circulation
- *Purifica la sangre*
- Uterine fibroids

**Part Used:** Wood (small sticks or pieces of the tree trunk or branches).

**Traditional Preparation:** Pieces of the wood are typically infused in water. To prepare a cold infusion, a small piece of wood (*palo*) is immersed in lukewarm or room temperature water until the water turns red which indicates that the infusion is ready. This remedy is kept in a closed container in the refrigerator to prevent spoilage.

**Traditional Uses:** This tree is renowned for its depurative (blood purifying) properties. The wood is nearly without odor, has a slightly sweet taste and imparts red color to water if used to make a cold infusion or tea; it also turns saliva red if chewed.

**Availability:** In New York City, the dried wood of this plant is sold at some *botánicas* (Latino/Afro-Caribbean herb and spiritual shops).

## BOTANICAL DESCRIPTION

*Palo de brasil* (*Caesalpinia brasiliensis*) is a shrub or small tree that grows to 7 m with branches that are covered with spines (2 mm long). Wood is orangish to dark red in the center and valued for its hard, durable lumber. Leaves occur in an alternate pattern along branches and are twice-divided with 4-10 pinnae and 12-16 leaflets; leaflets are elliptical or oval in shape (2-3 cm). Flowers are arranged in small, branching clusters; petals are greenish-white and covered with glandular dots. Fruits are long, narrow, leguminous seed pods (7-8 cm long) that are pointed at the end and contain dark seeds (Liogier 1985).

**Distribution:** Endemic to the island of Hispaniola, this tree can be found in dry forest areas (Liogier 1985).

## SAFETY & PRECAUTIONS

Unknown; insufficient information available in the literature.

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Although no clinical or preclinical studies of *Caesalpinia brasiliensis* have been identified in the available literature, other closely-related species have demonstrated pharmacological properties: *Caesalpinia crista* has shown anti-malarial effects (Linn et al. 2005); *Caesalpinia bonducella* has exhibited antidiabetic (Chakrabarti et al. 2005), antioxidant, antibacterial and other properties (see table below). A US Patent has been issued for antihypertensive compounds from *Caesalpinia brasiliensis* (BYU 2003).

**Indications and Usage:** Unknown; insufficient information available in the literature.

### Laboratory and Preclinical Data: *Caesalpinia* and related species

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
Serine proteinase inhibition	Seeds of <i>Caesalpinia echinata</i>	In vitro	Inhibited blood coagulating & fibrinolytic enzymes; isolated CeKI compound	Cruz-Silva et al. 2004
Xanthine oxidase inhibition	MeOH extracts of <i>Caesalpinia sappan</i>	In vitro; 25 µg/mL	Showed strong xanthine oxidase inhibitory activity	Nguyen et al. 2004
Anticancer & anti-inflammatory	Methanol extract: <i>Caesalpinia sappan</i>	In vitro; cultured mouse macrophage cells	Active; inhibited nitric oxide formation; potential chemopreventive agent	Hong et al. 2002
Antibacterial	Crude extract: <i>Haematoxylum brasiletum</i>	In vitro; against <i>Escherichia coli</i> & <i>Staphylococcus aureus</i>	Highly active, especially against <i>Staphylococcus aureus</i>	Yasunaka et al. 2005

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
Antidiabetic & hypoglycemic	Seed kernel; water & alcohol extracts, extract fractions: <i>Caesalpinia bonducella</i>	In vivo (rats with type 2 chronic diabetes) & in vitro (isolated islets)	Active in both models; two fractions increased insulin secretion in isolated islets (in vitro)	Chakrabarti et al. 2005
Inhibition of nitric oxide formation	Methanol extract: <i>Caesalpinia sappan</i>	In vitro; lipopolysaccharide-induced mouse macrophage cell lines	Active; showed inhibition of iNOS activity (>70% at a concentration of 10 micro g/mL); potential anti-cancer or anti-inflammatory agent	Hong et al. 2002
Increased contractile force of skeletal muscle	Leaf extract, administered intravenously; <i>Caesalpinia bonducella</i>	In vivo; rats; twitch response test	Active; dose-dependent increase in twitch contractions; mechanism possibly due to cholinergic activation	Datte et al. 2004
Antitumor & antioxidant	Methanol extract: <i>Caesalpinia bonducella</i> ; dosage: 50, 100 & 200 mg/kg daily	In vitro; mice with Ehrlich ascites carcinoma; treated intraperitoneally for 14 days	Showed significant activity; no evident of short-term toxicity shown at all doses except at 300 mg/kg	Gupta et al. 2004

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# Bruja

## OTHER COMMON NAMES

*Tope-tope, hierba de bruja, hierba bruja, siempreviva de América, inmortal, prodigiosa* (Spanish); leaf of life, life plant (English).

## SCIENTIFIC NAME

*Kalanchoe pinnata* (Lam.) Pers. Synonyms: *Bryophyllum pinnatum* (Lam.) Oken and *Cotyledon pinnata* Lam. [Crassulaceae (Sedum Family)].

**Note:** The common name *Bruja* may also be used for another species, *Kalanchoe gastonis-bonnieri*; see entry for *Mala madre*. One distinguishing feature for differentiating between these two species is that the leaves of *Bruja* are slightly shorter than those of *Mala madre*.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Earache
- Gastroduodenal ulcers
- Headache
- Inflammation
- Sinusitis
- Stomach ache and abdominal pain

**Plant Part Used:** Leaves.

**Traditional Preparation:** For external application, the leaves are heated, crushed and applied topically to the affected area. For internal use, the leaves are eaten raw or crushed and taken as a juice.

**Traditional Uses:** The leaves of this plant are best known as a remedy for treating earache (*mal de oído* or *dolor de los oídos*), but they are also used for treating several other illnesses. For earache, a fresh leaf is used with all appendages removed (the kidney-like flowers and fruits are said to be harmful to the body), plunged into boiling water or heated over a flame briefly to steam or wilt (*marear*) the leaf, (care is taken

to avoid boiling/heating it for too long so that it will not lose its therapeutic qualities) and then the liquid inside the leaf is squeezed onto a cloth or small cotton-tipped swab that is placed inside the ear and kept there for a short period of time. Eventually the ear will release some water indicating that the ear has been sufficiently treated. For stomach ache, abdominal pain and gastroduodenal ulcers (including bleeding ulcers), the fresh leaves (with flowers and fruits removed) are eaten like a salad in the morning and at night. For headache or sinusitis, the fresh leaves are bruised and applied topically to the forehead.

Some say that this plant is called “*bruja*” because it grows so prodigiously, even if only a single leaf is planted, as long as it finds enough soil. Its other name, “*tope-tope*” is attributed to the sound that its balloon-like fruits and flowers make when they are squeezed until they explode, resulting in a small popping sound.

**Availability:** Fresh leaves are available at select *botánicas* in New York City. As this is a succulent plant, its leaves do not air-dry like those of other plants, making storage difficult. Because they decompose easily once cut, the leaves are challenging to maintain which affects their availability at stores. However, some individuals who use this plant as a remedy grow it at home because it is a hardy houseplant.

## BOTANICAL DESCRIPTION

*Bruja* (*Kalanchoe pinnata*) is a succulent herb that grows upright to a height of 1 m with a single primary, smooth stem. Leaves are thick and fleshy, grow in opposite pairs and can be either simple or deeply lobed (6-13 cm long), oblong to lance-shaped with scalloped, reddish edges. Flowers are slightly balloon-shaped, hanging down in large branching clusters with petals ranging in color from reddish green to red to salmon. Fruits are brown, dry, oblong follicles (1-1.5 cm long) with a beak-shaped tip each containing tiny dark brown seeds (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to Madagascar, grows in the Caribbean and is cultivated and naturalized throughout the neotropics, often growing in disturbed areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Based on a clinical report of one patient, *Kalanchoe pinnata* leaf extract (30 g fresh leaves/day for 14 days) administered orally did not show any evident signs of adverse effects or toxicity (Torres-Santos et al. 2003).

**Animal Toxicity Studies:** *Kalanchoe pinnata* orally administered to mice for 30 days did not show signs of toxicity to the liver, heart or kidney.

**Contraindications:** TRAMIL recommends that this herb not be administered to children or to pregnant or lactating women due to the lack of information on its safety in these populations (Germosén-Robineau 2005).

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In one clinical case report, the leaf showed antileishmanial activity, and in laboratory and preclinical studies, this plant has shown the following effects: antileishmanial, antitumor, antiviral, hepatoprotective, immunosuppressive and uterine contractility (see “Clinical Data” and “Laboratory and Preclinical Data” tables below).

Biologically active compounds in this plant include: acetic acid, alpha-amyrin, beta-amyrin, beta-sitosterol, bryophyllin, caffeic acid, citric acid, ferulic acid, friedelin, fumaric acid, isocitric acid, kaempferol, lactic acid, malic acid, mucilage, n-hentriacontane, oxalic acid, p-coumaric acid, p-hydroxy-



benzoic acid, p-hydroxycinnamic acid, patuletin, quercetin, succinic acid, syringic acid and taraxerol (Duke & Breckstrom-Sternberg 1998).

**Indications and Usage:** TRAMIL has classified this herb as “REC” meaning “RECommended” specifically for its use in treating headache and the common cold, administered according to traditional methods: for cough, the leaf is prepared as a decoction and taken orally; for the common cold, the fresh leaf juice is taken orally; and for headache, the crushed leaf is applied topically to the forehead (Germosén-Robineau 2005).

### Clinical Data: *Kalanchoe pinnata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antileishmanial</b>	Leaf extract, given orally; 30 g fresh leaves/day for 14 days	Clinical case report: one human patient (36 yrs) with active skin leishmaniasis lesions	Treatment halted growth & showed a slight decrease in lesion; no observed adverse reactions or toxicity	Torres-Santos et al. 2003

### Laboratory and Preclinical Data: *Kalanchoe pinnata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antileishmanial</b>	Quercitrin, a flavonoid glycoside from the aqueous leaf extract	In vitro: <i>Leishmania</i> spp.	Active; IC <sub>50</sub> is 1 µg/mL with low toxicity	Muzitano, Cruz et al. 2006
<b>Antileishmanial</b>	Aqueous leaf extract; kaempferol di-glycoside, flavonol & flavone glycosides	In vitro: <i>Leishmania amazonensis</i> amastigotes (leishmanial stage)	Active; an isolated quercetin aglycone & rhamnosyl unit showed promising activity	Muzitano, Tinoco et al. 2006
<b>Antileishmanial</b>	Leaf extract	In vitro & in vivo: <i>Leishmania amazonensis</i> & infected BALB/c mice	Dose-dependent decrease in amastigote intracellular growth; mechanism involves macrophage induction of nitric oxide production	Da Silva et al. 1999
<b>Antitumor &amp; immuno-suppressive</b>	Leaf extract	In vitro & in vivo	Inhibited lymphocyte proliferation in vitro & showed in vivo immunosuppressive activity; suggests that fatty acids may be responsible for its immunosuppressive effect	Almeida et al. 2000
<b>Antitumor</b>	Bufadienolides isolated from leaves ( <i>Kalanchoe pinnata</i> ; <i>K. daigremontiana</i> × <i>tubiflora</i> )	In vitro: Epstein-Barr virus early antigen (EBV-EA) activation in Raji cells	All bufadienolides showed inhibition of tumor growth; results suggest potential use as chemopreventive agents	Supratman et al. 2001

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiviral</b>	Plant juice	In vitro	Active; showed strong inhibition of virus activity at dilutions of 1-2 to 1-8000 & higher; viricidal factor was not destroyed by alcohol	Shirobokov et al. 1981
<b>Hepatoprotective</b>	Juice of the leaves and the ethanolic extract of the marc (residue) left after expressing the juice	In vivo: rats with carbon tetrachloride-induced hepatotoxicity	Showed significant hepatoprotective activity; the juice was more effective than the ethanolic extract	Yadav & Dixit 2003
<b>Uterine contractility</b>	Leaf extract ( <i>Bryophyllum pinnatum</i> = <i>Kalanchoe pinnata</i> )	In vitro: human myometrium	Showed tocolytic activity; inhibited spontaneous contraction in a concentration-dependent manner, increased contraction frequency at constant amplitude & inhibited oxytocin-stimulated contractions	Gwehenberger et al. 2004

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# Cacao

## OTHER COMMON NAMES

Chocolate, cocoa tree (English).

## SCIENTIFIC NAME

*Theobroma cacao* L. [Sterculiaceae (Cacao Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Fatigue
- Lack of energy
- Skin disorders
- Weakness

**Plant Part Used:** Roasted seeds, cocoa butter and leaves.

**Traditional Preparation:** The seeds are pulverized and prepared as a decoction to make hot chocolate and taken orally. Cocoa butter is used in creams and salves as a moisturizer.

**Traditional Uses:** In the Dominican Republic, the leaves are used for kidney and urinary tract disorders due to their diuretic effects (Liogier 2000).

## BOTANICAL DESCRIPTION

*Cacao* (*Theobroma cacao*) is a medium-sized evergreen tree that grows to 4-10 m in height. Leaves are long and narrow. Flowers are borne in clusters on short stalks with white, greenish or pale violet petals and no fragrance. Fruits are fleshy, variable in size and shape (10-20 cm long) and generally resemble a small, narrow football with longitudinal grooves or creases; skin turns bright yellow-orange to reddish when ripe. Seeds are numerous, small (1-2.5 mm long), brown and surrounded by a sweet, white, buttery pulp (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to Central and South America and is widely cultivated in the tropics (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

As a widely consumed food plant, the seeds of *Theobroma cacao* are classified as “Generally Recognized as Safe” (GRAS) by the Food and Drug Administration (Anon 1976). No negative side effects or health risks are known in association with the appropriate therapeutic use of this plant, except for the possibility of allergic reaction or the provocation of migraine headaches due to amine content. Large doses of the seeds can result in constipation due to their high tannin content. The acute lethal dosage of caffeine for humans is 5-10 g, and powdered seeds of cacao contain 5 mg caffeine and 250 mg theobromine per cup (Germosén-Robineau 2005). Due to the caffeine content of chocolate products (0.2%-0.4%), large quantities can lead to sleep disorders, overexcitability and racing pulse when administered to children (Gruenwald et al. 2004).

**Animal Toxicity Studies:** Several studies on the potential toxicity of this plant have been conducted. In immature rats whose diets were supplemented by *cacao* seeds (1.22%) for 3 months, no signs of hepatic or hematological toxicity were observed (Morrissey et al. 1984). Isolated xanthines, some of the key constituents of *cacao* (such as caffeine, theobromine and theophylline), have in rare cases led to fatal intoxication when ingested (Germosén-Robineau 2005).

**Contraindications:** In individuals with a history of allergy or hypersensitivity to *cacao* seeds, caution is advised due to demonstrated potential for skin reactions, headache and migraine. May also be contraindicated in patients with heart disorders due to the cardiac stimulant effects of the seed constituents theobromine and caffeine (Brinker 1998).

**Drug Interactions:** Phenelzine (monoamine oxidase inhibitor): concomitant use may lead to high blood pressure, although this association is speculative (Brinker 1998). Some drugs can inhibit the metabolism of caffeine or hinder its clearance from the body, thus exacerbating the stimulant effects of *cacao*'s considerable caffeine content. These drugs include: oral contraceptives, cimetidine, furafylline, verapamil, disulfiram, fluconazole, mexiletine, phenylpropanolamine, numerous quinolone antibiotics (i.e. enoxacin, piperidic acid, ciprofloxacin and norfloxacin) and in particular idrocilamide and methoxsalen (Brinker 1998).

## SCIENTIFIC LITERATURE

Clinical trials of the following effects of the seeds have been reported in the literature: antioxidant, antiulcer, platelet and primary hemostatic (see “Clinical Data” table below). The seeds, seed extracts and/or isolated compounds of this plant have demonstrated the following biological activities in preclinical studies: antibacterial, antioxidant, antiulcer, endocrine and nervous system effects, erythropoiesis stimulation and immunomodulatory (see “Laboratory and Preclinical Data” table below). The mechanism of the antiulcer effects of this plant is linked to its ability to modulate leukocyte function in addition to radical scavenging activity (Osakabe et al. 1998).

According to secondary references, *cacao* seeds and seed coats have demonstrated the following effects: diuretic, broncholytic and vasodilatory (due to methylxanthines, mainly theobromine); cardiac muscle stimulant and bronchial muscle relaxant. Cocoa butter is high in triglycerides but does not cause an increase of serum cholesterol and LDL when taken in high doses. Due to their caffeine and theobromine content, the seeds are also a central nervous stimulant (Gruenwald et al. 2004). The seeds are a significant source of calcium, copper, magnesium, phosphorus and potassium.

**Indications and Usage:** TRAMIL has designated this plant as “REC” meaning that it is “RECommended” specifically for treating weakness and prepared as a decoction of the seeds, taken

orally; this recommendation is based on extensive traditional use documented in TRAMIL ethnobotanical studies and published scientific information (Germosén-Robineau 2005). Typical preparation is a decoction of 7 seeds in 1 cup of water, boiled for at least 10 minutes in a covered container, cooled and administered orally, 1 cup 3 times daily for 7 days (Floripe & Altamirano 1998, Germosén-Robineau 2005).

### Clinical Data: *Theobroma cacao*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiulcer &amp; antioxidant</b>	Aqueous extract of dried seed; taken orally	Human clinical trial	Active; demonstrated antioxidant and gastric antiulcer activity	Osakabe et al. 1995
<b>Antihemostatic &amp; antioxidant bioavailability</b>	Cocoa flavanols & related procyanidin oligomers (234 mg per day ingested for 28 days)	Placebo-controlled, blinded parallel-designed clinical trial (32 healthy subjects)	Significantly increased plasma epicatechin & catechin concentrations; significantly decreased platelet function; raised levels of plasma ascorbic acid	Murphy et al. 2003

### Laboratory and Preclinical Data: *Theobroma cacao*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Dried seed husks, aqueous & methanol (95%) extracts	In vitro: against <i>Staphylococcus aureus</i> (50 µL/agar disk)	Active	Perez & Anesini 1994
<b>Antioxidant</b>	Flavonoids isolated from seeds (dimer & trimer procyanidins)	In vitro: phosphatidyl choline liposomes	Protected against oxidative reduction & other challenges to membrane integrity	Verstraeten et al. 2005
<b>Antiulcer</b>	Cacao liquor water-soluble crude polyphenols (500 mg/kg)	In vivo: male SD rats; ethanol-induced lesions in mucosa of the glandular stomach; also in vitro	Caused a reduction in hemorrhagic lesions comparable to that of sucralfate & cimetidine (typical antiulcer drugs)	Osakabe et al. 1998
<b>Dopaminergic</b>	Salsolinol (tetrahydroisoquinoline alkaloid which constitutes up to 25 µg/g of chocolate)	In vitro	Showed dopaminergic effect; inhibited the formation of cyclic AMP, release of beta-endorphin & ACTH in a pituitary cell system; may be linked to chocolate addiction	Melzig et al. 2000
<b>Erythropoiesis stimulation</b>	Seed added to diet (1.22%)	In vivo: immature rats; duration: 3 mo	Active; significantly stimulated red blood cell production (p<0.05)	Morrissey et al. 1984

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Immunomodulatory</b>	Flavonoids (-)-epicatechin and cocoa extract	In vitro: lymphoid cell line	Demonstrated significant activation of expression of IL-2 receptor alpha & IL-4 in a dose-dependent manner; down-modulated T lymphocyte activation thus requiring the acquired immune response; possible applications for immune system hyperactivity (i.e. autoimmune or chronic inflammatory diseases)	Ramiro et al. 2005

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# Cadillo de Gato

## OTHER COMMON NAMES

*Cadillo*, *gatico* (Spanish); cockleburr, noogoora burr, burweed (English).

## SCIENTIFIC NAME

*Xanthium strumarium* L. and *X. strumarium* var. *canadense* (Mill.) Torr. & Gray. Synonym: *Xanthium occidentale* Bertol. [Asteraceae (Aster and Daisy Family)].

**Note:** In the Dominican Republic, the name *cadillo de gato* sometimes refers to another species: *Achyranthes aspera* L. (more commonly known as *rabo de gato*) which belongs to the plant family Amaranthaceae (Liogier 2000). At least two different species of plants are referred to as “*cadillo*” by Dominicans in New York City, and they both have similar medicinal uses. However, this species is typically known as *cadillo de gato* whereas the other species is called *cadillo tres pies*. Due to its relatively low number of use reports in ethnobotanical studies, *cadillo tres pies* is not included in this guidebook.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Gallbladder problems
- Hepatitis C
- Kidney disorders
- Liver disorders

**Plant Part Used:** Roots or leaves.

**Traditional Preparation:** This herb is typically prepared as a tea by decoction (boiling in water) and administered orally.

**Traditional Uses:** In the Caribbean, *cadillo de gato* is considered a diuretic plant, and the roots are used for treating kidney and liver disorders. The leaves are used externally for skin discoloration, blotching or dark marks on the face. This plant is attributed bitter and astringent properties and has been used traditionally for goiter and scrofula (Liogier 1990).

**Availability:** This plant can be difficult to find in commerce and is typically purchased from *botánicas* that specialize in selling Caribbean medicinal plants. The fruits of this plant and a related species (*Xanthium sibiricum*) are used in Chinese medicine and are sometimes adulterated with the fruits of *Glycyrriza pallidiflora* (Wang et al. 1998).

## **BOTANICAL DESCRIPTION**

*Cadillo de gato* (*Xanthium strumarium* var. *canadense*) is an herbaceous plant that grows upright (2.5-4 m tall). Stems are green with purple streaks and a rough, hairy surface. Leaves grow in an alternate pattern and are 3-4 lobed, triangular to broadly egg-shaped in outline, somewhat resembling maple leaves in form, coarsely toothed along the edges, dark green on the upper surface and lighter green below, with three prominent purplish veins and long, reddish leaf-stalks. Flowers are numerous and grow in dense clusters. Fruits are yellow to brown burrs (7-25 mm long), each containing two brown, grey or black seeds and covered with hooked spines (Gleason and Cronquist 1991).

**Distribution:** This plant is native to the Americas, particularly tropical America and is a cosmopolitan weed that grows in fields and disturbed areas (Gleason and Cronquist 1991).

## **SAFETY & PRECAUTIONS**

TRAMIL has designated the specific use of the root as a decoction, taken orally, as “REC” meaning “RECommended” for kidney disorders when administered appropriately (Germosén-Robineau 2005).

**Animal Toxicity Studies:** No signs of clinical toxicity or mortality were detected in histopathological studies when rats and mice were orally administered the ethanolic (65%) plant extract at doses of 25, 200 and 2000 mg/kg for 14 days (Jimenez et al. 1999). In other animal studies, 1000 mg/kg of a 50% ethanolic leaf extract (*Xanthium strumarium*) administered intraperitoneally in mice was found to be toxic (Talalak et al. 1995), and a hydroalcoholic extract of the root (50%) administered intraperitoneally to mice showed a maximum tolerated dose of 100 mg/kg (Dhar et al. 1968). When this plant was fed to pigs, it was associated with subacute hepatotoxicosis (seedlings: 0.75% to 3% of body weight; ground burr: 20% to 30% body weight), and carboxyatractyloside was determined to be the primary constituent responsible for this effect (Stuart et al. 1981). Carboxyatractyloside, a biologically active compound isolated from the plant, was administered intraperitoneally to rats at an LD<sub>50</sub> calculated dosage (13.5 mg/kg) and signs of toxicity were observed. Results showed that this compound had both cytotoxic and lethal which were affected by its metabolism in the liver (Hatch et al. 1982). In vitro, pharmacologically active concentrations of an ethanolic extract of the aerial parts of this species were not found to be toxic in human and monkey liver cell lines (Badam et al. 1988).

**Case Reports of Toxicity:** The seed contains the glycoside carboxyatractyloside which is poisonous to humans and animals, and nine cases of poisoning in humans have been reported. Symptoms of poisoning include gastrointestinal disorders, nausea, vomiting, drowsiness, palpitations and in three cases, loss of consciousness and death; no antidote is available (Turgut et al. 2005).

**Allergic Reactions:** Individuals with allergies to plants of the family Asteraceae, including those who are allergic to ragweed, may be sensitive to this plant, and cases of contact dermatitis have been reported (Menz & Winkelmann 1987).



**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

No clinical trials of this plant have been identified in the available literature. Laboratory studies have shown the following pharmacological effects of *cadillo de gato*: analgesic, antidiabetic, anti-inflammatory, antimalarial, antimicrobial, antimitotic, antinociceptive, antitrypanosomal, antitumor, CNS depressant, cytotoxic, hypoglycemic and modulation of mesangial cell proliferation (see “Laboratory and Preclinical Data” table below).

The seed contains the glycoside carboxyatractyloside which is highly toxic to humans (Turgut et al. 2005). Isolated caffeoylquinic acids are associated with the plant’s antinociceptive activity (Han et al. 2007). Other major chemical constituents include: xanthanolide sesquiterpenes, xanthanolin, xantholide diol and dimeric xanthanolide (Ahmed et al. 1999); xanthan epoxide derivatives (Mahmoud 1998); thiazinedione (Qin et al. 2006); sesquiterpene lactones (Kim et al. 2003).

**Indications and Usage:** TRAMIL has designated this herb as “REC” meaning “RECommended” specifically for its traditional use in treating kidney pain, prepared as a decoction of the root and taken orally. For treating infections or kidney stones, this herb should be considered a complementary therapy due to its diuretic effects (Germosén-Robineau 2005). For kidney pain, typical administration and dosage is a decoction of 15-20 g of the root in 1 liter of water, boiled for at least 10 minutes in a covered container, allowed to cool and taken orally, 1 cup 3-4 times daily (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Xanthium strumarium*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antidiabetic</b>	Fruit extract	In vivo: diabetic rats; insulin- & streptozotocin-induced models	Active; dose dependent antihyperglycemic effect attributed to caffeic acid	Hsu et al. 2000
<b>Anti-inflammatory &amp; analgesic</b>	Plant ethanolic extract & fractions	In vivo: mice, croton-oil-induced edema & acetic-acid-induced writhing	Active; n-butanol fraction showed strongest dose-dependent anti-inflammatory, analgesic & antinociceptive effects	Han et al. 2007
<b>Anti-inflammatory &amp; antinociceptive</b>	Methanolic seed extract	In vitro & in vivo: rats with experimentally-induced paw edema; hot plate & acetic-acid induced abdominal constriction tests	Active; down-regulated inflammatory pathway; inhibited iNOS, COX-2 expression & TNF-alpha release; mechanism involves blocking NF-kappaB activation	Kim et al. 2005
<b>Antimalarial</b>	Ethanol extract of aerial parts	In vitro: strains of chloroquine sensitive & resistant <i>Plasmodium falciparum</i>	Active; minimum effective dose not toxic to human and monkey liver cell lines	Badam et al. 1988

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Extract of flowering twigs	In vitro: selected bacterial species	Strongly active against <i>Vibrio cholerae</i>	Mehta et al. 1983
<b>Antimitotic</b>	Active constituents & partially purified extracts	In vitro: isolated mammalian tissue microtubule-tubulin system	Active; inhibited tubulin polymerization	Menon et al. 2001
<b>Antitrypanosomal</b>	Leaves; 50% crude ethanolic extract (i.p.)	In vitro & in vivo: mice infected with <i>Trypanosoma evansi</i>	Showed antitrypanosomal activity at 5-1000 µg/mL (in vitro) & 100-300 mg/kg in vivo	Talakal et al. 1995
<b>Antitumor</b>	Xanthanolide sesquiterpene lactones	In vitro: human tumor cell lines	Active; inhibited farnesylation process in a dose-dependent manner	Kim et al. 2003
<b>Central nervous system depressant</b>	Plant extract	In vivo: rodent	Active; altered behavior, reduced motility, prolonged sleep, suppressed exploratory behavior & avoidance response	Mandal et al. 2001
<b>Cytotoxic</b>	Crude leaf extracts & isolated xanthatin	In vitro	Active	Roussakis et al. 1994
<b>Cytotoxic</b>	Sesquiterpene lactones isolated from leaves: 8-epi-xanthatin & 8-epi-xanthatin epoxide	In vitro: human tumor cell lines (non-small cell lung, ovary, melanoma, central nervous system & colon)	Active; inhibited proliferation of cancer cells & dose-dependent inhibition of farnesyltransferase farnesylation of human lamin-B (IC <sub>50</sub> =64 & 58 µmol, respectively)	Kim et al. 2003
<b>Hypoglycemic</b>	Isolated compound	Not specified	Active	Kupiecki et al. 1974
<b>Modulation of mesangial cell proliferation</b>	Crude methanol extracts	In vitro: human mesangial cell	Active; MIC=42.8 ± 1.3; decreased interleukin-1beta & tumor necrosis factor-alpha production	Kuo et al. 1998

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# Café

## OTHER COMMON NAMES

Coffee (English).

## SCIENTIFIC NAME

*Coffea arabica* L. [Rubiaceae (Bedstraw or Madder Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following conditions or effects (Yukes et al. 2002-2003):

- Arthritis
- Backache
- Diarrhea
- Inflamed gums
- Intestinal parasites
- *Limpiar la sangre*
- Sexually transmitted infections
- Skin disorders
- Toothache

**Plant Part Used:** Seeds, leaves and bark.

**Traditional Preparation:** Raw seeds are prepared by fermenting, drying, roasting, grinding and finally brewing them in hot water to make coffee. When the leaves or bark are used, they are prepared as a decoction or alcohol tincture and applied topically.

**Traditional Uses:** *Café* seeds are typically prepared as a coffee beverage and often used therapeutically as a stimulant, laxative or diuretic, sometimes combined with lemon or lime. For intestinal parasites and diarrhea, leaves of *café* are boiled with senna (*guajabo*) leaves or sometimes with wormseed (*apasote*) leaves and taken as a tea. For skin disorders such as *paño* (skin fungal infection), the leaves are prepared as a bath. For arthritis and back pain or muscle aches, the seeds of *café* are combined with ginger (*jengibre*) root and guinea hen-weed (*anamú*) root and prepared as a mixed-herb drink (*botella*) by tincturing them in gin (*jinebra*) for several days to weeks and applying externally to the affected area. For toothache or inflammation of the mouth or gums, a mouthrinse (*buche* or *enjuague*) is made of unsweetened coffee with a little bit of salt. Black coffee (*café negro* or *café puro*) is also said to cleanse the blood and is taken for treating sexually transmitted infections (i.e. gonorrhea and HIV), which are said to contaminate the blood with pathogens. Herbalists advise that drinking coffee too early in the morning or on an empty stomach is said to cause anxiety or nervousness.

**Availability:** Roasted seeds are typically bought from grocery stores, supermarkets, of local *bodegas* and sold as either whole or ground beans.

## BOTANICAL DESCRIPTION

*Café* (*Coffea arabica*) is an evergreen shrub or small tree that grows 1.5-3 m tall (sometimes up to 7 m) with many paired branches. Leaves are narrowly oval to oblong in shape and shiny dark green in color. Flowers grow from the leaf axils in tight clusters with short stalks and petals that are white, funnel-shaped and jasmine-scented. Fruits are fleshy berries (1.5-1.8 cm long) with skins that turn bright red, yellow or purple when mature. Each fruit contains two seeds which are fermented, dried and roasted to make coffee (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to Africa and the Middle East and is widely cultivated throughout the tropics, often persisting in the wild after cultivation (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

In general, no health hazards or negative side effects are associated with the appropriate therapeutic use of this plant. Even in large quantities (5 cups daily), no toxicity was observed in healthy adults accustomed to drinking coffee. Prolonged daily intake of large amounts (5.6 cups per day) can result in significant increases in LDL and overall cholesterol levels. Potential side effects are attributed to coffee's chlorogenic acid content and can include diarrhea, appetite suppression, hyperacidity and stomach irritation. Long-term intake of  $\geq 1.5$  g caffeine daily can result in nonspecific symptoms including dizziness, irritability, diarrhea, upset stomach, headache, restlessness, insomnia and heart palpitations and can also result in physical and psychological dependency with withdrawal symptoms of headache and sleeping disorders. Intake of extremely large quantities of coffee can result in caffeine overdose and potentially fatal poisoning ( $LD_{50}$  for an adult = 75 cups of coffee for 50 kg body weight). There has been one report of fatality in a child following intake of 5.3 g caffeine (Gruenwald et al. 2004).

**Contraindications:** Caffeine (including coffee) should be avoided during pregnancy (no more than 3 cups coffee daily = 300 mg caffeine). Lactating mothers who drink caffeinated beverages may lead to sleeping disorders for their nursing infants. For people with renal dysfunction, hyperthyroidism, sensitive cardiovascular systems or disposition to psychological disorders or convulsions, caution is advised (Gruenwald et al. 2004).

**Drug Interactions:** Coffee can interfere with the resorption of other drugs (Gruenwald et al. 2004). The following medications may inhibit caffeine metabolism or clearance: oral contraceptives, cimetidine, furafylline, verapamil, disulfiram, fluconazole, mexiletine, phenylpropanolamine, numerous quinolone

antibiotics (i.e. enoxacin, pipemidic acid, ciprofloxacin, norfloxacin), idrocilamide and methoxsalen (Brinker 1998).

## SCIENTIFIC LITERATURE

Coffee has been studied in clinical trials for the following effects: cognitive enhancement, common cold relief and laxative. Laboratory and preclinical studies have shown the following effects: antioxidant and hypercholesterolemic. The following additional pharmacological effects have been attributed to coffee (primarily due to its high caffeine content): inotropic, chronotropic (in high doses) on heart and CNS, relaxation of smooth muscles of blood vessels (except cerebral) and bronchial tubes, diuretic, catalysis of the release of catecholamines and stimulation of an increase in gastric secretions. The mechanism of caffeine involves the competitive blocking of adenosinal receptors. Other therapeutic applications include its use in treating hypotonia, flu, migraines and as an analeptic or additive analgesic agent (Gruenwald et al. 2004). Caffeine is present in the leaves and bark of this plant, not just the seeds.

**Indications and Usage:** Approved by the *Commission E* for treatment of diarrhea and inflammation of the mouth and throat (Blumenthal et al. 1998). Typical daily dosage is 15 g roasted coffee beans, single dose of 3 g ground beans, prepared according to various infusion methods (Gruenwald et al. 2004).

### Clinical Data: *Coffea arabica*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Cognitive enhancement</b>	Caffeine; 250 mg (vs. 2 mg nicotine)	Clinical trial, double-blind placebo-controlled, cross-over design;	Attenuated scopolamine-induced impairment of recall, long-term memory retrieval & cognitive measures; showed cholinergic cognition enhancing effects	Riedel et al. 1995
<b>Common cold relief</b>	Caffeinated coffee (1.5 mg/kg caffeine/b.w.); vs. decaffeinated coffee & fruit juice	Clinical trial, randomized controlled; n=46 healthy volunteers with common cold	Improved symptoms of colds; increased alertness & speed at performing psychomotor tasks to healthy levels	Smith et al. 1997
<b>Laxative</b>	Caffeinated coffee (240 mL; 150 mg caffeine) vs. same amounts of decaffeinated coffee, water or 1000 kcal meal	Clinical trial, randomized controlled; n=12 healthy subjects; duration: 10 hour period; measured by ambulatory colonic manometry	Active; stimulated colonic motor activity with a magnitude similar to that of a meal, 60% stronger than water & 23% stronger effect than decaffeinated coffee	Rao et al. 1998

## Laboratory and Preclinical Data: *Coffea arabica*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Green & roasted coffee ( <i>Coffea arabica</i> & <i>Coffea robusta</i> )	In vitro (beta-carotene-linoleic acid model) & ex vivo: rat liver cell microsome lipid peroxidation	Demonstrated very strong protective activity with acidified dark roasted coffee containing the most protective compounds whereas antioxidant activity was slightly higher in green coffee samples	Daglia 2000
<b>Hyper-cholesterolemic</b>	Coffee lipids, non-saponifiable matter, & diterpene alcohols; dissolved in olive oil or coconut oil	In vivo; adult male Syrian hamsters fed low & high saturated fat diets; 250 µL administered daily by gavage	Demonstrated hypercholesterolemic activity; effect may be due to diterpenes in coffee lipids	Ratnayake et al. 1995

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# Cajuil

## OTHER COMMON NAMES

*Cáscara de cajuil*, *cacajuil* (Spanish); cashew (English).

## SCIENTIFIC NAME

*Anacardium occidentale* L. [Anacardiaceae (Cashew Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health condition (Yukes et al. 2002-2003):

- Diarrhea (in both adults and children)

**Plant Part Used:** Dried bark.

**Traditional Preparation:** For diarrhea, a tea is prepared of the dried bark (*corteza*) and taken with salt.

**Availability:** As a popular food item, cashew nuts are commonly available at grocery stores and supermarkets. *Cajuil* dried bark can be purchased at *botánicas* that specialize in selling Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Cajuil* (*Anacardium occidentale*) is a small evergreen shade tree that grows 6-12 m tall and has grey bark which exudes a gummy resin. Leaves are alternate and oblong to oval. Flowers grow in long clusters, each flower bearing yellow to rosy-pink petals. Fruits are kidney-shaped nuts (2-3 cm long), each containing a single seed which protrudes like a rounded hook from an apple-shaped, swollen edible flower-stem that is fleshy and yellow to reddish in color (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to northern South America, grows in the semiarid tropics and is cultivated for its edible fruits (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

The fresh seed case of the nut contains alkyl phenols which are strong skin irritants and can cause erythemas with nodule and blister formation or rimose exanthemas after prolonged contact. Roasting neutralizes these alkyl phenols in the plant stalk and seeds so that they do not irritate the skin and can be consumed (Gruenwald et al. 2004).

**Animal Toxicity Studies:** Despite previous indications based on an in vivo (mouse) study that cashew (*cajuil*) shell kernel oil may exhibit a weak tumor-promoting effect (Banerjee & Rao 1992), recent studies have shown that the oil does not exhibit carcinogenic activity (Singh et al. 2004).

**Contraindications:** Unknown, insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.



## SCIENTIFIC LITERATURE

In laboratory studies, this plant has demonstrated the following effects: antiarthritic, antibacterial, antidiabetic, antifungal, anti-inflammatory, anti-leishmanial, antimutagenic, antioxidant, hypoglycemic, tyrosinase inhibition and vasorelaxant (see “Laboratory and Preclinical Data” table below). In other references, the dried ethanolic extract has reportedly demonstrated antibacterial properties against gram-positive bacteria *Bacillus subtilis* and *Staphylococcus aureus* in vitro. Due to its anacardic acid content, which is a phenolic skin stimulant, the dried seed case also acts as an astringent and cauterizing agent. Other laboratory studies have demonstrated the following pharmacological activities of the fruits: antimicrobial, molluscicidal, vermifugal and antitumor effects (Gruenwald et al. 2004).

Constituents identified in the bark include: cardol, ginkgol and a high quantity of tannins. Biologically active compounds in the seed include: alpha-linolenic acid, anacardic acid, aspartic acid, beta-sitosterol, cadmium, capric acid, caprylic acid, cardanol, folacin, gallic acid, glutamic acid, histidine, lauric acid, linoleic acid, myristic acid, naringenin, oxalic acid, palmitic acid, palmitoleic acid, pantothenic acid, phytosterols and squalene. Active compounds in the fruit include: ascorbic acid, benzaldehyde, hexanal, leucocyanidin, limonene, salicylic acid and tocopherol (Duke & Beckstrom-Sternberg 1998). Cashew nuts are a significant source of copper, magnesium, monounsaturated fatty acids and phosphorus (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** TRAMIL has approved the use of the fresh juice of the mature fruit (swollen fruit-stem) as REC meaning that it is recommended for the treatment of diarrhea (Germosén-Robineau 2005). The only available information on dosage is the traditional form of preparation using the fresh juice of the fruit-stem. Available commercial preparations of *cajuil* include acajou oil, cashew oil, oleum anacardiae, fatty oil extracted from the seeds and homeopathic preparations (Blumenthal et al. 1998).

### Laboratory and Preclinical Data: *Anacardium occidentale*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiarthritic &amp; antioxidant</b>	Milk extract of nuts (Semecarpus anacardium) at 150 mg/kg for 14 days	In vivo: rat with adjuvant arthritis	Showed significant antioxidant effects against lipid peroxidation which may explain antiarthritic effects	Vijayalakshmi et al. 1997
<b>Antibacterial</b>	60% methanolic extract of bark	In vitro	Exhibited activity against 13 out of 15 bacterial isolates at a concentration of 20 mg/mL	Akinpelu 2001
<b>Antibacterial</b>	Plant extract	In vitro	Showed activity against Gram-positive and Gram-negative bacteria including <i>Escherichia coli</i> and <i>Pseudomonas aeruginosa</i>	Kudi et al. 1999
<b>Antidiabetic</b>	Pretreated with 175 mg/kg aqueous extract, twice daily, beginning 2 days before streptozotocin (STZ) injection	In vivo: rats with STZ-induced diabetes	Exhibited significant protective effects against diabetes-promoting action of STZ; compared with control, pretreated animals showed a dramatically lower rise in blood glucose levels	Kamtchouing et al. 1998

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antifungal</b>	Supernatant of plant (R(f) 0.31)	In vitro: agar diffusion and broth dilution methods; 3 fungi tested	Exhibited significant antifungal activity, especially in the inhibition of <i>Cryptococcus neoformans</i> ; separating macromolecules from metabolites enhanced antifungal activity	Schmourlo et al. 2005
<b>Anti-inflammatory</b>	Stem bark methanol extract; pre-treatment with 25-200 mg/kg extract	In vivo: mice; evaluated against lipopolysaccharide (LPS)-induced septic shock and microvascular permeability	Resulted in a significant dose-dependent reduction in inflammation measures; highest dose produced 100% protection against death from sepsis	Olajide et al. 2004
<b>Anti-inflammatory</b>	Stem-bark aqueous extract (800 mg/kg orally); taken with & without grapefruit juice (5 mL/kg orally)	In vivo: male rats with fresh egg albumin-induced rat paw edema	Demonstrated significant anti-inflammatory activity; coadministration of grapefruit juice significantly potentiated anti-inflammatory effects; supports use in treatment of arthritis & other conditions	Ojewole 2004
<b>Anti-inflammatory</b>	Tannins isolated from bark (both hydrolysable and non-hydrolysable tannins); injected & orally administered	In vivo: rat: dextran- & carrageenan-induced paw edema; mouse: cotton pellet granuloma test & adjuvant-induced polyarthritis	Active in both models; mechanism possibly attributed to astringent properties of tannins on cell membranes and resulting effects on cell functions	Mota et al. 1985
<b>Anti-leishmanial</b>	Hydroalcoholic extract of bark	In vitro & in vivo against <i>Leishmania (Viannia) brasiliensis</i>	Showed high activity in vitro against leishmaniasis-causing promastigotes; however, no therapeutic activity observed in vivo	Franca et al. 1993
<b>Antimutagenic &amp; antioxidant</b>	Fresh juice of fruit-stem & processed juice ( <i>cajuina</i> )	In vitro: <i>Salmonella</i> microsome & total radical-trapping assays	Active; protected against oxidative mutagenesis; may stimulate repair of damage to DNA	Melo et al. 2003
<b>Antioxidant</b>	Nut shell oil; two doses (50 and 100 µL/animal/day) administered orally for 10 days	In vivo: Swiss albino mice	Demonstrated antioxidant activity by enhancing activities of SOD, catalase, methylglyoxalase I, GST & levels of GSH; decreased lipid peroxidation	Singh et al. 2004

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hypoglycemic</b>	Stem bark extracts: aqueous & methanolic (100-800 mg/kg p.o.)	In vivo: normal rats and those with streptozotocin (STZ)-induced diabetes	Both extracts demonstrated significant hypoglycemic activity & dose-dependent reduction in blood glucose concentrations of fasted normal & diabetic rats	Ojewole 2003
<b>Hypoglycemic</b>	Hexane extract of bark & isolated active constituents; administered intravenously	In vivo: normal, healthy dogs	Significant lowering of blood glucose levels; isolated active compounds: stigmast-4-en-3-ol and stigmast-4-en-3-one were effective at 1.3 mg/kg b.w.	Alexander-Lindo et al. 2004
<b>Tyrosinase inhibition</b>	Compounds isolated from fruit: anacardic acids, 2-methylcardols & cardols	In vitro	Phenolic compounds identified exhibit competitive inhibition of exudation of L-3,4-dihydroxyphenylalanine (L-DOPA) by mushroom tyrosinase	Kubo et al. 1994
<b>Vasorelaxant</b>	Leaf extract	In vitro: aortic ring preparations	Exhibited more than 50% relaxing effect; shown to be an endothelium-dependent effect, mediated by nitric oxide	Runnie et al. 2004

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# Cañafístula

## OTHER COMMON NAMES

Golden shower tree, Indian laburnum, pudding pipe tree, purging cassia (English).

## SCIENTIFIC NAME

*Cassia fistula* L. [Caesalpinaceae (Senna Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Constipation
- Intestinal parasites
- Intestinal worms
- Uterine fibroids

**Plant Part Used:** Dried seed pods.

**Traditional Preparation:** Break off a segment of the pod (about handwidth-size) and boil in 2 cups of water for 5-10 minutes, let cool and infuse until lukewarm, then drink as tea. A brew of either the leaves or the pods can be used as a laxative. Also, the pulp can be ingested or sucked on for expelling worms.

**Availability:** Dried seed pods can be purchased from select *botánicas* in New York City.

## BOTANICAL DESCRIPTION

*Cañafístula* (*Cassia fistula*) is a tree that grows to 10 m. Leaves are pinnately divided into 4-8 pairs of leaflets arranged along a central stem (up to 15 cm long). Flowers grow in long, pendulous clusters (30-45 cm long), are pale yellow in color with 5 petals each and bloom before leaves emerge in the spring. Fruits are long, cylindrical pods (40-60 cm), dark brown to black in color, enclosing numerous glossy, flattish-round seeds surrounded by a dark brown sweet pulp, smelling of prunes (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to India and is cultivated as an ornamental tree and for its medicinal properties (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Although no health risks or negative side effects have been identified in the scientific literature for the appropriate therapeutic use of this plant, long-term use of anthracene drugs (such as *cañafístula*) has been suspected as linked to increased possibility of colon carcinoma. However, recent studies have not supported this connection. When taken in excessive amounts, symptoms of overdose include gastrointestinal disorders and cramping due to the laxative effect of the herb which may result in loss of electrolytes with prolonged use. More severe symptoms occur rarely and may include edema, cardiac arrhythmia, nephropathy and accelerated osteoclasts (Gruenwald et al. 2004).

**Contraindications:** Persons with acute-inflammatory diseases of the intestine and appendicitis (ileum) should not take this herb. Also, it is contraindicated during pregnancy, lactation and for children younger than 12 years of age (Gruenwald et al. 2004).

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Laboratory and preclinical studies have been conducted to investigate the following effects: anti-Alzheimer's, antibacterial, antidiabetic, antidiarrheal, antifertility, anti-inflammatory, antineoplastic, antioxidant, antisecretory, antitumor, central nervous system depressant, hepatoprotective, hypocholesterolemic, lipid peroxide formation inhibition, radical scavenging and sedative (see "Laboratory and Preclinical Data" table below).

The primary active constituents, anthracene derivatives, have shown laxative effects and fruit extracts have demonstrated antimicrobial and antiviral activity in laboratory studies (Gruenwald et al. 2004). Sennoside content varies in leaves and pods depending on seasonality based on ecological surveys; peak content was observed in June when new leaves appeared and highest percentages in pods were found at the midstage of fruit maturation (Cano Asseleh et al. 1990).

**Indications and Usage:** Due to evidence of the laxative effects of the fruit constituents (anthracene derivatives) in laboratory studies, use of the fruit pods for treating constipation is plausible. A standard daily dosage is 4 to 6 g of the fruit pulp, typically administered as an aqueous extract (1:1) which is macerated and percolated exhaustively before filtering (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Cassia fistula*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-Alzheimer's</b>	Methanolic extract of roots	In vitro, using Ellman's colorimetric method in 96-welled microplates	Showed inhibitory activity on acetylcholinesterase at concentration of 0.1 mg/mL (50-65%)	Ingkaninan et al. 2003
<b>Antibacterial</b>	Not specified	In vitro: gram-negative bacteria	Showed significant antibacterial activity against: <i>Escherichia coli</i> , <i>Klebsiella aerogenes</i> , <i>Proteus vulgaris</i> & <i>Pseudomonas aeruginosa</i>	Perumal Samy et al. 1998
<b>Antidiabetic</b>	Aqueous fraction of leaves	In vivo: normoglycemic mice	Showed significant decrease in glycemia at doses of 300 and 500 mg/kg	Esposito Avella et al. 1991
<b>Antidiabetic</b>	Aqueous bark extract	Diabetic rats	Showed safe mild to moderate anti-diabetic activity	Ratnasooriya et al. 2004
<b>Antifertility</b>	Aqueous extract of seeds	In vivo: mated female rats	100% pregnancy inhibition at 500 mg/kg & lower but still significant rates at lower doses	Yadav and Jain 1999
<b>Anti-inflammatory</b>	Leaf extract	In vivo: rats with phenylbutazone, carrageenan-, histamine- & dextran-induced paw edema	Found potent anti-inflammatory activity against all phlogistic agents	Bhakta et al. 1999
<b>Antineoplastic</b>	Methanolic extract of fruit	In vivo: tumor-bearing mice	Showed antineoplastic activity (60% protection)	Gupta et al. 1997

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant, radical scavenging &amp; lipid peroxide formation inhibition</b>	Aqueous freeze-dried extracts	In vitro & in vivo	Showed some DPPH radical scavenging activity & activity against deoxyribose damage	J Munasinghe et al. 2001
<b>Antisecretory &amp; antidiarrheal</b>	Extract	In vivo: rabbits & guinea pig ileal loop models	Showed highly significant antisecretory activity against <i>Escherichia coli</i> enterotoxin-induced secretion	Gupta et al. 1993
<b>Antitumor</b>	Methanolic extract of seed	In vivo: mice	Showed a decrease in the tumor volume & tumor cell count; increased of life span	Gupta et al. 2000
<b>Central nervous system depressant &amp; sedative</b>	Methanol extract of seed	In vivo: mice; both pharmacological & behavioral models	Significantly potentiated sedative actions of sodium pentobarbitone, diazepam, meprobamate & chlorpromazine; potentiated analgesia induced by morphine & pethidine; depressant actions evident	Mazunder UK et al. 1998
<b>Hepatoprotective</b>	n-heptane extract of leaves; administered orally	In vivo: rats with hepatotoxicity induced by paracetamol	Showed significant protective effect against induced hepatotoxicity	Bhakta et al. 2001
<b>Hypo-cholesterolemic</b>	Not specified	In vivo: rats with experimentally-induced hypercholesterolemia	Significant correction of lipid metabolism exhibited	el-Saadany et al. 1991

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antidiabetic; insulin secretagogue activity</b>	Dried ethanol extracts dissolved in ethanol and DMSO	In vitro: INS-1 cells in the presence of 5.5 mM glucose; Glibenclamide used as a control	No activity detected at concentrations of 1, 10, 20 or 40 µg/mL	Hussain Z et al. 2004

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# Canela

## OTHER COMMON NAMES

Cinnamon (English).

## SCIENTIFIC NAME

*Cinnamomum verum* Presl. Synonym: *Cinnamomum zeylanicum* Blume. [Lauraceae (Laurel Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Yukes et al. 2002-2003):

- Allergies
- Anxiety
- Arthritis
- Common cold
- Flu
- Kidney disorders
- Low blood pressure
- Menopausal hot flashes
- Nasal congestion
- Sinusitis
- Stress
- Uterine fibroids
- Women's health conditions

**Plant Part Used:** Dried inner bark, which typically curls or rolls up while drying to form “sticks.”

**Traditional Preparation:** Typically prepared as a tea by infusion or decoction and often added to other teas or herbal mixtures for flavor and therapeutic value.

**Traditional Uses:** *Canela* is used both medicinally and as a flavoring agent in herbal teas because of its sweet, spicy taste. An infusion of *canela* is reported to help regulate blood pressure. For low blood pressure, a tea is prepared by boiling the dried inner bark in milk. For kidney disorders, *canela* is added to an infusion made of horsetail (*cola de caballo*). *Canela* is considered a hot (*caliente*) herb that warms the body and is used for treating conditions caused by excess cold in the body such as arthritis and the common cold or flu. As a remedy, a tea is prepared of cinnamon (*canela*) bark, lemon/lime (*limón*) fruit, lavender (*alucema*) flowers and Chinese star anise (*anis de estrella*) seeds. To treat sinusitis and nasal congestion due to allergies, the following herbs are boiled in water to make a steam bath for the face: cinnamon (*canela*) sticks, cumin (*anis comino* or *comino*) seeds, rose (*rosa*) petals and allspice (*malaqueta*) seeds. The patient inhales the vapor of these plants by leaning over the pot of water while covering his or her head with a sheet or towel.

For anxiety, stress and tension, *canela* is considered a relaxing herb (*relajante*), and a tea for calming the nervous system is prepared using cinnamon sticks and chamomile (*manzanilla*) flowers. For women's health conditions, including uterine fibroids and menopausal hot flashes, cinnamon (*canela*)

sticks are added to multi-herb decoctions or tinctures (*bebedizos* and *botellas*) to sweeten the bitter flavor of these preparations. Because this plant is considered a sweet herb, *la esencia de canela* or *el espíritu de canela* (essential oil or alcohol extract) is used as an ingredient in baths to attract good fortune and positive energy as part of spiritual healing traditions.

**Availability:** As a popular culinary seasoning, *canela* dried bark (powdered or in stick form) is sold at most grocery stores, supermarkets and *botánicas*. Canela spirit or essence is sold at *botánicas*.

## **BOTANICAL DESCRIPTION**

*Canela* (*Cinnamomum verum*) is an evergreen tree that reaches a height of 8-18 m and has reddish brown, soft bark. Leaves occur in opposite pairs. Flowers grow in clusters that are covered with short, silky hairs. Each small flower has 6-petal-like structures that are cream-to-yellowish in color with an unpleasant odor. Fruits are purple-skinned berries containing numerous seeds (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to Asia, particularly southern India and Sri Lanka and is widely cultivated in tropical regions for its inner bark which yields cinnamon. Currently this plant is primarily produced in Sri Lanka although it is also cultivated extensively in India, Malaysia, Madagascar and the Seychelles (Bailey Hortorium Staff 1976).

## **SAFETY & PRECAUTIONS**

As a popular spice, cinnamon is generally considered safe. Most cases of irritation or adverse reactions associated with its use are due to hypersensitivity or excessive exposure to the essential oil or active constituents which are common flavoring or perfume agents. Cases of dermal and mucosal irritation have been reported due to cinnamaldehyde (Fugh-Berman 2003). One case has been reported of squamous cell carcinoma of the tongue due to frequent and prolonged use of cinnamon-flavored gum (Westra et al. 1998).

**Contraindications:** Prolonged use of the essential oil is contraindicated during pregnancy as it has demonstrated teratogenic effects in chick embryos (Keller 1992).

**Drug Interactions:** Insufficient information is available in the literature, although cinnamon has been shown to interfere with tetracycline and methacycline dissolution in vitro.

## **SCIENTIFIC LITERATURE**

*Cinnamomum verum* has been studied in clinical trials to investigate the following effects: antidiabetic and hypocholesterolemic (see “Clinical Data” table below). Preclinical and laboratory studies of the bark or essential oil have demonstrated the following biological activities: antibacterial, antifungal, antioxidant, cytostatic and pediculicidal (see “Laboratory and Preclinical Data” table below). In other laboratory studies reported in secondary references, *canela* has demonstrated antifungal, antibacterial, motility-promoting (due to cinnamaldehyde content) and antioxidant pharmacological effects. Mildly estrogenic effects have been observed in laboratory tests on animal reproductive systems, and this herb has also been shown to promote gastric secretions (Gruenwald et al. 2004).

**Indications and Usage:** Approved by the German *Commission E* for the treatment of loss of appetite and dyspeptic conditions (Blumenthal et al. 1998). Strips of dried or powdered bark can be prepared as an infusion or used as an essential oil. For tea, add hot water to 0.5 to 1 g bark and strain after 10 minutes. Daily dosage of the bark is 2 to 4 g or one cup of tea/infusion 2-3 times daily with meals (Gruenwald et al. 2004).

### Clinical Data: *Cinnamomum verum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antidiabetic &amp; hypo-cholesterolemic</b>	1, 3 or 6 g of cinnamon consumed daily	Randomized placebo controlled clinical trial; n=60 w/type II diabetes; duration: 40 days w/20-day washout period	Active; lowered serum levels of glucose, triglyceride, total cholesterol & LDL levels; potential use in reducing risk factors for diabetes & heart disease	Khan et al. 2003

### Laboratory and Preclinical Data: *Cinnamomum verum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Essential oil of commercial origin	In vitro: locally prevalent pathogenic, drug resistant bacteria: 189 Gram (-) & 135 Gram (+) strains isolated from severely infected pediatric patients	Exhibited highest & broadest antibacterial activity	Hersch-Martinez 2005
<b>Antibacterial</b>	Essential oil & main constituents	In vitro: respiratory tract pathogens	Active; showed high antibacterial activity	Inouye et al. 2001
<b>Antifungal</b>	Essential oil & active components	In vitro: against <i>Candida albicans</i> using a semisolid agar antifungal susceptibility method	Demonstrated maximum inhibitory activity (MIC=500 ppm) after 7 days; most active constituents: cinnamaldehyde & beta-phellandrene (MIC=50 ppm)	Tampieri et al. 2005
<b>Antioxidant</b>	Bark	In vivo: rats fed a high fat diet; studied glutathione content & lipid conjugated dienes to determine effect on hepatic & cardiac antioxidant enzymes	Partially counteracted increase in lipid conjugated dienes and hydroperoxides (the primary products of lipid peroxidation); exhibited antioxidant protection by activating antioxidant enzymes	Dhuley 1999
<b>Cytostatic</b>	Essential oil	In vitro: HEP-2 cells	Active; showed strong effects	Saenz et al. 1996
<b>Pediculicidal</b>	Essential oil alcoholic solution & vinegar rinse	In vitro: against <i>Pediculus humanus capitis</i>	Active; showed potential for treatment of head lice	Veal 1996

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# Canelilla

## OTHER COMMON NAMES

*Bay run, malagueta, ozua, pimento* (Spanish); allspice, bay, bay rum tree, clove pepper, Jamaica pepper (English).

## SCIENTIFIC NAME

*Pimenta racemosa* (Mill.) J.W.Moore and *Pimenta racemosa* var. *ozua* (Urb. and Ekm.) Landrum.  
Synonym: *Pimenta acris* Kostel. [Myrtaceae (Myrtle Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Common cold
- Flu
- Impotence (in men)
- Infertility
- Joint pain
- Sexually transmitted infections

**Plant Part Used:** Leaves, berries and the oil extracted from the berries.

**Traditional Preparation:** The leaves and/or berries are prepared as a tea by infusion or decoction or combined with other herbs in an alcohol-based cordial or tincture for internal use. For external use, the leaves are crushed and applied topically or extracted in oil or alcohol to make a liniment.

**Traditional Uses:** The leaves are considered to be bitter (*amargo*) in taste and to have very hot properties (*muy caliente*). *Canelilla* leaves are used to treat cold and flu prepared as a tea. Also, the leaves or an oil extract of the leaves can be applied topically as a liniment for arthritis and joint pain. The leaves of this plant are a common ingredient in a complex, alcohol-based herbal mixture of roots and multiple herbs called *la botella mamajuana* which is used for treating sexually transmitted infections, impotence in men and infertility in women. According to study participants, this herb grows particularly in the southern, drier regions of the Hispaniola.

**Availability:** The dried leaves can be found at select *botánicas* (Latino and Afro-Caribbean stores selling herbs and religious items) specializing in medicinal plants in New York City.

## BOTANICAL DESCRIPTION

*Canelilla* (*Pimenta racemosa*) is an evergreen tree that grows to 7-12 m tall with smooth, tan, thin bark that peels off in irregular flakes. Leaves grow in opposite pairs and are narrowly oval to oblong in shape (3-15 cm long) with visible glands on the underside and are strongly aromatic when crushed. Flowers have white or lilac fragrant petals and grow in clusters. Fruits are nearly spherical berries (6-10 mm diameter), turning brown or black when ripe and each containing 1-4 seeds (Acevedo-Rodríguez 1996).

**Distribution:** Although the exact origin of this plant is not certain, it is most likely native to the Virgin Islands and the Caribbean and is widely cultivated in South America, Central America and Jamaica (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Allergic reactions to eugenol, the primary component of the essential oil (50-60%), have been reported, although they occur rarely. In an in vitro study, the aqueous extract did not show mutagenic effects using the rapid streak method for a rec-assay of *Bacillus subtilis* strains (Ungsurungsie et al. 1982).

**Animal Toxicity Studies:** According to animal studies using mice, this plant is moderately toxic (LD<sub>50</sub>: 287 ± 12.9 mg residue/kg; 1.854 ± 0.083 g plant/kg). However, it has demonstrated a lack of toxicity at standard doses (Garcia et al. 2004). In another toxicity study, the LD<sub>50</sub> in mice of the aqueous leaf extract administered intraperitoneally was 2.08 ± 0.27 g/kg. When administered orally to mice at 6.25, 12.5 and 18.75 g/kg each day for 30 days, no signs of toxicity were observed (Herrera 1988).

**Contraindications:** Not to be used during pregnancy, lactation or in children younger than 5 years of age due to lack of information on the effects of this plant in these populations (Germosén-Robineau 2005).

**Drug Interactions:** Unknown; none identified in the literature.

## SCIENTIFIC LITERATURE

According to secondary references, the berries have shown topical antiseptic and analgesic effects in preclinical studies (Gruenwald et al. 2004). Laboratory and preclinical studies have demonstrated the following activities: antibacterial and antifungal activity (in vitro) of the essential oil and the anti-inflammatory and anti-nociceptive (in vivo) effects of leaf extracts and isolated compounds of *Pimenta racemosa* (see “Laboratory and Preclinical Data” table below). The essential oil is used to make Bay rum and is an ingredient in the cosmetics and perfume industry.

**Indications and Usage:** TRAMIL has classified the following uses as “REC” meaning that they are “RECommended” for the following traditional uses: treating toothache and arthritis by applying the crushed leaves to the affected area (Germosén-Robineau 2005). Most information on the dosage and administration of this herb is based on external use of the berries in lotions or liniments. No information has been identified on the use of the leaves internally.

### Laboratory and Preclinical Data: *Pimenta racemosa*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Essential oil (plant varieties: <i>terebinthina</i> & <i>grisea</i> )	Activity determined against Gram (+) & Gram (-) bacteria	The <i>grisea</i> variety demonstrated stronger activity; data indicate potential use as a microbiostatic, antiseptic or disinfectant agent	Saenz et al. 2004
<b>Antibacterial</b>	Essential oil	In vitro	Demonstrated antibacterial activity against <i>Escherichia coli</i> , although not as effective as other essential oils	Burt & Reinders 2003
<b>Antifungal</b>	Essential oil (at concentrations of 100, 200 & 400 ppm)	In vitro	Active against <i>Microsporium canis</i> (100 ppm); <i>Trichophyton interdigitale</i> , <i>T. mentagrophytes</i> , <i>T. rubrum</i> , <i>Candida albicans</i> (200 ppm); <i>Aspergillus fumigatus</i> (400 pm)	Chaumont & Bardey 19889
<b>Anti-inflammatory</b>	An isolated diterpene: abietic acid (var. <i>grisea</i> )	In vivo (rat and mouse) & in vitro (macrophages)	Showed anti-inflammatory activity after oral or topical administration & showed moderate ability to prevent production of some inflammatory mediators	Fernandez et al. 2001
<b>Anti-inflammatory</b>	Methanol extract of leaves (var. <i>ozua</i> )	In vivo: rat paw edema & mouse edema models	Found to be effective against acute inflammation processes when administered orally or topically applied	Fernandez et al. 2001

<b>Antinociceptive &amp; anti-inflammatory</b>	Aqueous extract of leaves (var. <i>ozua</i> )	In vivo: rat and mouse	Showed antinociceptive activity with an associated anti-inflammatory effect	Garcia et al. 2004
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# Cardo Santo

## OTHER COMMON NAMES

*Caldo santo, cardosanto* (Spanish); Mexican prickly poppy (English).

## SCIENTIFIC NAME

*Argemone mexicana* L. [Papaveraceae (Poppy Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Cancer
- *Limpiar la sangre*
- Menopausal symptoms
- Menstrual disorders
- Ovarian cysts
- Tumors
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Leaf, stem, flower and root.

**Traditional Preparation:** Commonly prepared as a tea by infusion or decoction; also used as a wash.

**Traditional Uses:** *Cardo santo* is reputed to have strongly bitter properties and as such it is said to cleanse the blood. Recognized as a potent herb, it is used as a remedy for serious health conditions including cancer. Since it is also considered a cooling (*fresco*) herb, it is used for health conditions associated with excess heat in the body. For stomach ulcers, the leaves of *cardo santo* are prepared as a tea and taken internally.

For women's health conditions, particularly for abnormal growths of the womb (*matriz*) such as uterine or ovarian cysts, fibroids and tumors, this plant (leaf and/or root) is combined with other herbs to make a *botella* (a multi-herb strong infusion or alcohol-based mixture). For delayed menstruation, vaginal infections, to cleanse the vagina internally or to alleviate symptoms associated with menopause, a tea is prepared of the leaves of *cardo santo* with those of palm beach-bells (*mala madre*), or a *botella* is prepared using these and other herbs. A douche or vaginal wash is also prepared from the leaves of this herb in combination with other medicinal plants for treating vaginal infections or inflammation.

**Availability:** This herb can be purchased from select *botánicas* and is usually sold dried.

## BOTANICAL DESCRIPTION

*Cardo santo* (*Argemone mexicana*) is an erect herb that grows to 30-60 cm tall with a woody taproot and stems that are sparsely covered with spines and exude yellowish latex. Leaves have spines protruding from both upper and lower surfaces, prominent whitish venation and deeply angular, wavy, spine-tipped edges (7-25 cm long). Flowers grow singly and are subtended by spiny leaf-like bracts; petals are yellow surrounding a reddish stigma in the center. Fruits are nearly cylindrical capsules containing numerous brown seeds.

**Distribution:** This plant is native to the Americas, most likely originating in Mexico and is a common weed of open, disturbed areas in the tropics (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

According to TRAMIL, all parts of this plant are hepatotoxic due to their sanguinarine (Dalvi 1985) and alkaloid content and should not be taken internally. The seeds or oil made from the seeds of *Argemone mexicana* have been classified as "TOX" meaning too toxic for human use (Germosén-Robineau 2005). However, most studies on the toxicity of this plant appear to use preparations of the seeds or seed oil in large quantities whereas documented Dominican ethnomedical uses in New York City are based on preparations of the leaves, root or entire plant. In other traditions of herbal medicine, if the seeds are used medicinally, only a very small amount is taken internally. No studies have been identified investigating the potential toxicity of this plant when prepared according to traditional methods.



Signs of intoxication from ingesting the seed oil include the following: diarrhea, perianal itching, edema, erythema, fever and darkening of the skin (Singh et al. 1999). In rare cases intoxication can lead to heart problems and even death (Sharma et al. 1986). Epidemic outbreaks of dropsy have been reported in India due to contamination of mustard seed and seed oil with *Argemone mexicana* seeds. Clinical features of dropsy due to ingestion of these seeds include: gastro-enteric inflammation, swollen feet, scanty urination, skin pigmentation, cutaneous reddening and tenderness, severe anemia, right-sided heart failure and liver toxicity. Toxic alkaloids from the seed oil work by “induc[ing] widespread capillary dilation and permeability causing leakage of protein rich plasma into the interstitial tissues of various organs” (Sharma et al. 2002). This leakage results in edema, hypovolemia, respiratory symptoms and potentially cardiac failure. Treatment includes removal of the toxin, symptomatic treatment of symptoms and antioxidant and multivitamin therapies (Sharma et la. 1999).

**Distribution:** In animal toxicity studies, rats were fed a diet of *Argemone mexicana* seeds exclusively and observed for 10 days or until death; by the end of the study, 14 of the 16 rats died. Signs of poisoning included sedation, weakness, lack of physical activity, among others (Pahwa & Chatterjee 1989). Another study with a rat model determined that toxicity from the seed oil involved peroxidation of the microsomal and mitochondrial membrane of the liver (Upreti et al. 1988).

**Contraindications:** Not to be taken by children or during pregnancy or lactation due to presence of constituents known to be toxic.

**Drug Interactions:** Unknown; no information identified in the literature.

## SCIENTIFIC LITERATURE

*Argemone mexicana* has demonstrated the following biological activity in preclinical studies: antifungal, anti-HIV, antitumor, morphine withdrawal effects inhibition and uterine stimulant (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** TRAMIL has designated this herb as “TOX” meaning that it is considered too toxic for internal use (Germosén-Robineau 2005). See above section on “Safety and Precautions” for details on toxicity studies.

### Laboratory and Preclinical Data: *Argemone mexicana*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Extract	In vitro: isolated fungi from diseased skin samples	Active	Nanir & Kadu 1987
<b>Anti-HIV</b>	Methanol extract	In vitro: H9 lymphocytes	Isolated compound, acetonyldihydrochelerythrine, showed significant anti-HIV activity in H9 lymphocytes	Chang et al. 2003
<b>Antitumor</b>	Extract	In vitro: human breast cancer cell lines	Active on MCF7 cells, but exhibited low antiproliferative effects on MDA-MB-231 cells and found to induce the increase of ERalpha mRNA accumulation	Lambertini et al. 2004

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Narcotic withdrawal effects inhibition</b>	Methanol extract; partially purified fraction; isolated compounds	In vitro: guinea pig isolated ileum	All preparations significantly & in a concentration-dependent manner reduced the effects of morphine withdrawal	Capasso et al. 1997
<b>Uterine stimulant</b>	Leaf & stem (water-alcohol extract)	In vitro: hamster uterine smooth muscle cells	Showed strong activity	Goto et al. 1957

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# Cebolla

## OTHER COMMON NAMES

*Cebollín*, *cebolla roja* (Spanish); onion, red onion, yellow onion (English).

## SCIENTIFIC NAME

*Allium cepa* L. (common name: *cebolla*) or *Allium cepa* var. *aggregatum* G. Don (common name: *cebollín*). [Liliaceae (Lily Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Yukes et al. 2002-2003):

- Asthma
- Bronchitis
- Common cold
- Flu
- Upper or lower respiratory tract infections

**Plant Part Used:** Fresh bulbs.

**Traditional Preparation:** Eaten raw or prepared as a syrup with honey.

**Traditional Uses:** *Cebollín* and *cebolla roja* are used to treat respiratory ailments, such as symptoms of the common cold, bronchitis and flu as well as asthma. To make a syrup, the raw bulb is coarsely chopped, combined with honey or brown sugar, allowed to sit overnight at room temperature until a watery layer forms on top and taken by the spoonful a few times daily. This raw syrup is refrigerated and stored in a covered container. Its medicinal properties are attributed to the heat or spicy taste of the pungent raw onion.

**Availability:** Onions are sold at most grocery stores and super markets.

## BOTANICAL DESCRIPTION

*Cebolla* (*Allium cepa*) is a perennial herbaceous plant that is strongly odorous, especially when bruised, reaches a height of 1.2 m and grows from bulbs. In the *cebollín* variety (*Allium cepa* var. *aggregatum*), bulbs form tight clusters and are small, reddish-purple in color and membranous, covered by golden-brown, papery-thin skins, closely resembling shallots. Leaves are long, skinny, blue-green and hollow. Flowers are numerous, small and star-shaped with greenish-white petals arranged in dense, ball-like clusters. Fruits are thin-skinned capsules with black, angular seeds (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native primarily to Central Asia and is cultivated worldwide (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No health hazards or negative side effects are known associated with the proper use of *cebolla*. When taken in large quantities, it can lead to stomach irritation and frequent skin contact can on rare occasions result in allergic reactions (Gruenwald et al. 2004). Because allyl and related sulfoxides found in this plant inhibit thiol group enzymes, it has been advised that *cebolla* should only be used in limited quantities (August 1996).

**Contraindications:** None identified in the literature.

**Drug Interactions:** This herb is potentiated by platelet aggregation inhibitors (Brinker 1998).

## SCIENTIFIC LITERATURE

In laboratory studies, this plant has demonstrated the following biological activities: antiasthmatic, antiatherosclerotic, antibacterial, antifungal, antihyperlipidemic, antioxidant, antiplatelet and antitumor (see "Laboratory and Preclinical Data" table below). Studies reported in secondary references and review articles on this plant have shown the following effects: antimicrobial, antithrombotic, antitumor, hypolipidemic, antiarthritic and hypoglycemic with specific applications in the treatment and prevention of cardiovascular disease and cancer (Ali et al. 2000, Kendler 1987).

The active constituents responsible for antiplatelet activity in onion are primarily attributable to adenosine, but allicin and paraffinic polysulfide compounds are also active (Makheja & Bailey 1990). Biologically active compounds identified in this plant include: abscissic acid, acetic acid, allicin, alliin, allyl-propyl disulfide, alpha-amyrin, asparagines, benzyl isothiocyanate, caffeic acid, calcium oxalate, campesterol, catechol, cycloalliin, cycloartenol, cycloeucaenol, dimethyl disulfide, diphenylamine, ferulic acid, fumaric acid, glycolic acid, kaempferol, malic acid, methanol, oleanolic acid, oxalic acid, p-coumaric acid, p-hydroxybenzoic acid, phloroglucinol, prostaglandin-a-1, protocatechuic acid, pyrocatechol, quercetin, quinic acid, rutin, sinapic acid, spiraeoside, vanillic acid and xylitol. Essential oil: diallyl disulfide and diallyl trisulfide (Duke & Beckstrom-Sternberg 1998). Raw onions are a source of chromium, copper, folate, manganese, molybdenum, phosphorus, potassium, tryptophan and vitamins B6 and C (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Approved by the *Commission E* for the following health conditions: loss of appetite, arteriosclerosis, dyspeptic disorders, fevers and colds, cough/bronchitis, hypertension, tendency to infection, inflammation of the mouth and throat and common cold (Blumenthal et al. 1998). This herb can be administered as an oil maceration, as a juice pressed from the fresh bulbs (50 g daily), prepared as a syrup with honey or sugar (4-5 tablespoonfuls daily), tinctured in alcohol (4-5 teaspoonfuls daily), ingested raw (50 g daily) or dried (20 g daily) and applied externally as a juice or fresh poultice (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Allium cepa*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiasthmatic</b>	Crude ethanolic & chloroform extracts; water soluble fraction of crude ethanolic extract	In vivo: guinea pigs sensitized to ovalbumin via inhalation	Crude ethanolic and chloroform extracts demonstrated asthma-protective effects; water soluble fraction of ethanolic extract showed no activity; active constituents identified as isothiocyanates	Dorsch et al. 1984

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Aqueous extract	In vitro: screened against 3 strains of bacteria	Demonstrated significant activity against all bacteria tested: <i>Erwinia carotovora</i> , <i>Xanthomonas campestris</i> pv. <i>campestris</i> & <i>Pseudomonas solanacearum</i>	Lirio et al. 1998
<b>Antibacterial &amp; antifungal</b>	Oil; concentrations of 100, 200 & 500 ppm	In vitro: bacteria: 4 Gram (+) and Gram (-); fungi: 4 toxigenic & 9 dermatophytic	Highly active against all Gram (+) & 1 Gram (-) bacteria & most fungi	Zohri et al. 1995
<b>Antifungal</b>	Plant extract	In vitro: using pus samples collected from patients with fungal ear-disease	Showed significant activity against <i>Aspergillus flavus</i>	Vijayan et al. 2003
<b>Anti-hyperlipidemic &amp; anti-atherosclerotic</b>	Petroleum ether extract; administered orally	In vivo: albino rats with atherogenic diet-induced atherosclerosis	Significantly prevented rise in serum cholesterol & triglyceride levels; showed protective effects against atherosclerosis	Lata et al. 1991
<b>Antioxidant</b>	Oil; administered 100 mg oil/kg b.w. for 21 days (simultaneous with nicotine)	In vivo: rats with nicotine-induced lipid peroxidation (given 0.6 mg nicotine/kg for 21 days)	Increased: resistance to lipid peroxidation, antioxidant enzyme activity & concentrations of glutathione; concluded that onion oil is an effective antioxidant	Helen et al. 1999
<b>Antiplatelet</b>	Raw juice from crushed onion	In vitro: collagen-induced aggregation of human platelets	Demonstrated potent inhibitory effects of platelet aggregation; active compounds were isolated, all of which had a basic structure of 1-(methylsulphinyl)-propyl alkyl (or alkenyl) disulphide	Morimitsu & Kawakishi 1990
<b>Antitumor</b>	Aqueous extract of bulbs	In vivo: mice; 1 wks oral administration	Showed intermediate activity in augmentation of splenic natural killer cells	Aubharfeil et al. 2001

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# Cilantro

## OTHER COMMON NAMES

Coriander (English).

## SCIENTIFIC NAME

*Coriandrum sativum* L. [Apiaceae (Carrot Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Yukes et al. 2002-2003):

- Flatulence and intestinal gas
- Gastritis
- Gastrointestinal disorders
- Heartburn
- Indigestion
- Stomach ache and abdominal pain

**Plant Part Used:** Leaves, dried fruits.

**Traditional Preparation:** Eaten raw; boiled or infused in hot water to make tea.

**Traditional Uses:** The fresh leaves and dried fruits are used for gastrointestinal disorders (including *padrejón* and *frialdad en el estomago* or coldness in the stomach from eating something bad). A remedy for digestive disorders can be prepared with the leaves of *cilantro*, mint (*hierbabuena*) and bitter bush (*rompezaragüey*) infused in boiling water, taken orally as needed. Another remedy for gastritis and heartburn (including acid reflux) is a medicinal broth made by boiling a head of crushed garlic (*ajo*) bulb, oregano (*orégano*) leaves, *cilantro* and salt. A cup-full of this in the morning taken on an empty stomach is said to relieve and prevent such digestive upsets.

**Availability:** As a common culinary seasoning, the fresh herb and dried fruits (or “seeds”) are available at most grocery stores and super markets.

## BOTANICAL DESCRIPTION

*Cilantro* (*Coriandrum sativum*) is an annual herb that grows upright to 1 m tall and has a strong aroma. Stems are have slight vertical striations. Leaves are multiply-compound and finely divided, with feathery upper leaves and broad, fan-shaped, deeply segmented lower leaves. Flowers are tiny, white and arranged in umbrella-like compound clusters. Fruits are spherical, yellowish light brown, ribbed on the surface and highly aromatic with a sweet, pleasant smell when crushed (Bailey Hortorium Staff 1976).

**Distribution:** This plant is probably native to Southern Europe, West Asia and North Africa in the Mediterranean region and is cultivated widely as a food seasoning (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

When used appropriately for therapeutic purposes, no health risks or negative side effects have been reported except for the slight possibility of sensitization or allergic reaction (Gruenwald et al. 2004).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In preclinical studies, the fruits have shown the following effects: antioxidant, hypolipidemic and anticolitis (see “Laboratory and Preclinical Data” table below). Laboratory studies reported in secondary references have demonstrated the following effects of the essential oil: antibacterial, antifungal, carminative, spasmolytic and stimulation of gastric secretions (Gruenwald et al. 2004).

Biologically active compounds identified in the fruit include: 1,8-cineole, acetic acid, alpha-phellandrene, alpha-pinene, alpha-terpinene, alpha-terpineol, angelicin, apigenin, beta-phellandrene, beta-pinene, borneol, bornyl-acetate, caffeic acid, camphene, camphor, carvone, caryophyllene, cis-ocimene, citronellol, elemol, gamma-terpinene, geranial, geraniol, geranyl-acetate, homoeriodictyol, isoquercitrin, limonene, linalool, myrcene, myristicin, nerol, nerolidol, p-cymene, p-hydrobenzoic acid, petrocatechuic acid, psoralen, quercetin, rhamnetin, rutin, sabinene, scopoletin, terpinen-4-ol, terpinolene, triacontanol, umbelliferone and vanillic acid; and in the plant: chlorogenic acid, cinnamic acid, cis-p-coumaric acid; and in the leaves: decanal, dodecanal, oxalic acid and toluene (Duke & Beckstrom-Sternberg 1998). The leaves are a source of iron, magnesium and manganese (U.S. Dept. of Agriculture 2006) and are rich in calcium, potassium and vitamin C (Brinker 1998).

**Indications and Usage:** *Cilantro* has been approved by the German *Commission E* for the following health conditions: dyspeptic disorders and loss of appetite (Blumenthal et al. 1998). The crushed and powdered dried fruit can be taken internally and prepared as an infusion (2 teaspoons crushed fruits combined with 150 mL boiling water, strained after 15 minutes) or tincture (1:2 by weight percolated in 45% alcohol). Average daily dosages are as follows: dried fruits (crushed/powdered) - 3.0 g (1.0 g single dose taken 3 × daily); infusion – 1 fresh cup (3 × daily between meals); and tincture (10-20 drops after meals; Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Coriandrum sativum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant</b>	Seeds, aqueous extract	In vitro: compared with ascorbic acid & other umbelliferous seeds	For 50% activity: scavenging of superoxide radicals = 370 micro/g; lipid peroxide inhibition = 4500 micro/g; hydroxyl radical inhibition = 1250 micro/g	Satyanarayana et al. 2004
<b>Hypolipidemic</b>	Seeds; dose: 1 g/kg body weight	In vivo: rats with titron-induced hyperlipidemia	Active; reduced cholesterol & triglyceride levels; results comparable to Liponil (commercial herbal hypolipidemic drug)	Lal et al. 2004
<b>Anticolitis</b>	Aqueous extract of multi-herb formula containing seeds of <i>cilantro</i>	In vivo: mice w/ acetic acid-induced colitis & rats w/indomethacin-induced enterocolitis	Active; significant inhibition of inflammatory activity; results comparable to standard drug prednisolone	Jagtap et al. 2004

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# Coco

## OTHER COMMON NAMES

Coconut (English).

## SCIENTIFIC NAME

*Cocos nucifera* L. [Arecaceae (Palm Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Asthma
- Bronchitis
- Cough
- Intestinal parasites
- Kidney disorders
- Kidney stones
- Pulmonary infections

**Plant Part Used:** Fruit, milk from inside the fruit, oil.

**Traditional Preparation:** Fresh coconut milk or coconut oil is typically taken orally either alone or in combination with other medicinal plants.

**Traditional Uses:** *Coco* is a plant with many medicinal uses. The “*agua de coco*” or fresh coconut milk is taken as a remedy for kidney disorders or to expel kidney stones and can be combined with liquefied prickly pear cactus pads (*alquitira*). *Coco* can also be used with wild privet senna (*sen*) leaves and boiled as a tea for parasites. For asthma, “*leche de coco*” is taken with castor oil plant (*higuereta*) seed oil. Another remedy for asthma is made with coconut, gin (*ginebra*) and brown sugar. For asthma, cough, bronchitis and pulmonary infections, coconut oil is taken with salt by the spoonful.

**Availability:** Whole coconuts are typically available at some grocery stores and food markets. Shredded coconut, coconut milk and coconut oil are also sold at many supermarkets.

## **BOTANICAL DESCRIPTION**

*Coco* (*Cocos nucifera*) is a palm tree that grows to 30 m tall with a stout trunk that often leans slightly and is ringed with numerous visible leaf scars. Leaves are pinnately compound with numerous long segments. Each individual tree has both male and female flowers. Fruits hang down in heavy, branching clusters and are large (20-30 cm long) and oval with a thick, fibrous covering that is green or yellowish green. Seeds are round, 10-15 cm long, with a hard shell (Acevedo-Rodríguez 1996).

**Distribution:** This tree is native to the tropical coast of the Pacific Ocean and was introduced to the New World by European settlers. It is now found throughout tropical and subtropical areas, usually near the ocean and is cultivated widely as a food plant and for the use of its oil in soap and body care products (Acevedo-Rodríguez 1996).

## **SAFETY & PRECAUTIONS**

Coconut is generally considered safe for human consumption, and no health hazards are known in association with the use of the fruit of this plant for therapeutic purposes (Gruenwald et al. 2004). However, a few cases have been reported of severe systemic allergies following coconut consumption in patients who also had cross-reactivity with tree nuts and leguminous seed proteins (Teuber & Peterson 1999).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## **SCIENTIFIC LITERATURE**

*Coco* has been used primarily as a foodstuff, especially considering its short-chained fatty acid content, and it has demonstrated the following pharmacological actions in preclinical studies: immunomodulating (in vivo, animal studies), antitumor and inhibition of cancerous growth (in vitro with human colon carcinoma cells). The fruit’s fibrous husk is rich in catechins; these polyphenols have demonstrated antioxidant activity, and this part of the plant has also shown anti-bacterial and anti-viral activity (Kirszberg et al. 2003).

Biologically active compounds identified in the seed include: capric acid, caprylic acid, GABA, gamma-tocopherol, malic acid, phytosterols, quinic acid, squalene and tridecanoic acid. The endosperm has a high concentration of sorbitol (Duke & Beckstrom-Sternberg 1998). Coconut milk (raw) contains

the following nutrients: calcium, copper, folate, iron, magnesium, manganese, niacin, pantothenic acid, phosphorus, potassium, selenium, thiamin and vitamin C and zinc (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Preparations of the fruit and oil can be made for internal and external use. In diverse herbal medicine traditions, *coco* has been used for treating the following conditions: wound-healing, skin infections, colds, throat inflammation, tooth decay, dysuria, coughs and bronchitis (Gruenwald et al. 2004). However, more investigation is needed to substantiate these clinical applications.

### Laboratory and Preclinical Data: *Cocos nucifera*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Aqueous & methanolic extracts	In vitro: 8 species of enteropathogens that cause diarrhea & dysentery	Strongly active against most pathogens tested; methanol stronger than aqueous extracts	Alanis et al. 2005
<b>Antitumor</b>	Extract from fiber husk of fruit	In vitro: human peripheral blood lymphocytes & erythroleukemia cell lines	Active; dose-dependent inhibitory effect on lymphocyte proliferation; suggest polyphenolic catechins involved	Kirszberg et al. 2003
<b>Hypolipidemic</b>	Flavonoids (10 mg/kg body weight per day)	In vivo: rats	Active; lowered lipid levels	Koshy & Vijayalakshmi 2001

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# Cola de Caballo

## OTHER COMMON NAMES

Horsetail, scouring rush, puzzle grass (English).

## SCIENTIFIC NAME

*Equisetum* spp. including *Equisetum arvense* L. and *Equisetum hyemale* L. Many species in this genus have a similar appearance and properties [Equisetaceae (Horsetail and Scouring Rush Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Bladder infections
- Diabetes
- Excess or abnormal vaginal discharge
- *Frialdad*
- Inflammation
- Kidney infections
- Kidney stones
- *Limpiar la sangre*
- Menstrual cramps (dysmenorrhea)
- Painful urination
- Sexually transmitted infections
- Sore throat
- Tonsillitis
- Urinary tract infections
- Vaginal infections

**Plant Part Used:** Dried aerial parts.

**Traditional Preparation:** To prepare a simple tea, the dried herb is boiled as a decoction or steeped in hot water as an infusion, taken orally as needed.

**Traditional Uses:** *Cola de caballo* is renowned for its diuretic and cooling properties which allow it to remove excess heat and infection from the body and thus relieve inflammation. It is also reputed to strengthen and fortify the kidneys. For bladder infections, diabetes, kidney infections, kidney stones, urinary tract infections and symptoms of difficult or painful urination, the dried herb is boiled as a decoction and taken orally as a simple tea. Sometimes cinnamon (*canela*) bark is added for flavor. For menstrual cramps (*dolores menstruales*) and vaginal infections or excess discharge (*flujo vaginal*), a tea is prepared of this herb and false buttonweed (*juana la blanca*). This plant can also be combined with other plants to make a multi-herb preparation for treating various types of infections, including sore throat, tonsillitis, *mala sangre* (bad blood), sexually transmitted infections and *frialdad*.

**Availability:** Sold for therapeutic purposes as packets of dried herb at most *botánicas* that carry medicinal plants; also, various preparations of the medicinal parts are sold at health food stores and natural pharmacies.

## BOTANICAL DESCRIPTION

*Cola de caballo* (*Equisetum* spp.) is a non-flowering herb that typically grows to 60 cm tall (although the *Equisetum giganteum* species can reach an exceptional height of 12 m) with an erect, hollow, jointed stem and whorled, vertical branches that are inserted in furrows along the stem, encircled at each joint by a ring of tooth-like segments. Fertile leaves grow from the tips of the leaf axes and are whorled, pentagonal or hexagonal in shape and form an upright, oblong cone at the tip of the stem (Liogier 1990).

**Distribution:** This plant is cosmopolitan in distribution, often grows near fresh water and is most likely native to Eurasia and the Americas; in the Caribbean it can be found in mountainous and humid areas of Cuba and Hispaniola (Liogier 1990).

## SAFETY & PRECAUTIONS

In a clinical trial with 25 healthy human volunteers, no adverse effects were reported (Lemus et al. 1996). Cases of hyponatremia and hypokalemia have resulted from consumption of *Equisetum telmateia* (Miro et al. 1996), probably due to its diuretic effect and increased potassium excretion. Phytotherapeutic extracts of *Equisetum myriochaetum* showed no genotoxicity or acute toxicity in the *Drosophila* wing somatic assay (0.78 µg/mL to 3700 µg/mL) or in the in vitro human micronucleus test with cultured lymphocytes from healthy donors (12.5 µg/mL and 500 µg/mL; Tellez et al. 2006).

**Animal Toxicity Studies:** In animal studies, the hydroalcoholic extract of the stem of *Equisetum arvense* via chronic intraperitoneal administration (50 mg/kg) showed no observable signs of toxicity in an acute toxicity test (Guilherme dos Santos et al. 2005). Oral administration of *Equisetum hyemale* in rats showed no signs of toxicity in acute toxicity studies (Xu et al. 1992).

**Contraindications:** This herb should not be taken by patients who have edema associated with heart or kidney disorders (Gruenwald et al. 2004). Cases of toxicity from chewing on the stems have been reported in children due to the high silica content of this plant, so this herb is not recommended for children (Brinker 1998).

**Drug Interactions:** *Cardiac glycosides and digitalis:* the toxicity of these drugs may be enhanced due to potential potassium loss from the diuretic effect of this herb. *Thiamine (vitamin B1):* this herb has been shown to cause breakdown of thiamine in vitro and in horses resulting in vitamin-deficiency effects due to its thiaminase activity (Brinker 1998).

## SCIENTIFIC LITERATURE

Clinical studies have shown the following effects of *Equisetum* spp.: diuretic, hypoglycemic, pharmacokinetic and renal excretion (see “Clinical Data” table below). Laboratory and animal studies have demonstrated the following activities: anticonvulsant, anti-inflammatory, antimicrobial, antinociceptive, antioxidant, antiplatelet, clastogenic, cognitive enhancement, contractile response enhancement, diuretic, gastroprotective, hepatoprotective, hypolipidemic, hypoglycemic, radical scavenging, sedative, thiaminase and vasorelaxant (see “Laboratory and Preclinical Data” tables below). Research reported in a secondary reference indicate that this herb has demonstrated the following pharmacological effects: mild diuretic, spasmolytic, astringent (due to flavonoids and silicic acid content), diuretic (by increasing uric acid clearing and excretion rates) and improvement of plasma composition (Gruenwald et al. 2004).

Major chemical constituents of this plant include the following: silica; volatile oil: main compounds are hexahydrofarnesyl acetone, cis-geranyl acetone, thymol and trans-phytol (Radulovic et al. 2006); tannins and saponins (Dos Santos et al. 2005); phenolic petrosins and flavonoids: apigenin, luteolin, kaempferol-3-O-glucoside and quercetin-3-O-glucoside (Oh et al. 2004); sterols: beta-sitosterol, campesterol, isofucoesterol and trace amounts of cholesterol (D’Agostino et al. 1984). Historically this plant has been used for scrubbing and washing pans because of its high silica content, hence its English common name “scouring rush.”

**Indications and Usage:** *Cola de caballo* (*Equisetum arvense*) is approved by the *Commission E* for the following conditions: infections of the urinary tract, wounds, burns and kidney and bladder stones (Blumenthal et al. 1998). Standard typical daily dosage is 6 g dried herb, administered with plenty of fluids. The dried, cut and sifted herb can be prepared as a tea, infusion or tincture for internal use and as a decoction for external use. To prepare a tea, pour 200 mL boiling water over 2-3 g herb, boil for 5 minutes and strain after 10-15 minutes; drink 1 cup between meals 3-4 × daily. To prepare an infusion, add 1.5 g herb per 1 cup boiling water and infuse until cool, then strain; drink 1 cup between meals 2-3 × daily. To prepare a tincture, combine herbs in 25% alcohol in a 1:1 ratio by volume; take 1-4 mL 3 × daily. To prepare a decoction, boil 10 g herb in 1 liter water; when cool, soak in a cloth and apply externally as needed (Gruenwald et al. 2004).

### Clinical Data: *Equisetum* spp.

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Diuretic</b>	Water extract (infusion; 10%) <i>E. bogotense</i> (single dose administered daily for two consecutive days equal to 0.75 g of the plant per person)	Controlled clinical trial: healthy volunteers	Showed significant diuretic effect based on water balance assessment; no adverse reactions were presented; significant increase in urinary electrolyte excretion of sodium, potassium & chloride; daily diuretic dose for mild effects = 10.7 mg/kg body weight	Lemus et al. 1996
<b>Hypoglycemic</b>	Water extract of aerial parts of <i>E. myriochaetum</i> (0.33 g/kg)	Placebo controlled clinical trial: 11 type 2 diabetic patients; administered single dose	Active; significantly reduced blood glucose levels; no significant changes in insulin levels were observed	Revilla et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Metabolism &amp; renal excretion</b>	Standardized extract ( <i>E. arvense</i> )	Human clinical study: 11 volunteers	Pharmacokinetics involve degradation of flavonoids & hydroxycinnamic acids (polyphenols) to benzoic acid	Graefe & Veit 1999

### **Laboratory and Preclinical Data: *Equisetum* spp.**

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory &amp; antinociceptive</b>	Hydroalcoholic stem extract: 10, 25, 50 & 100 mg/kg given intraperitoneally	In vivo: mice; acetic acid-induced writhing, formalin tail flick & carrageenan-induced paw edema tests	Active; showed anti-inflammatory & antinociceptive effects via a non-opioid mechanism	Do Monte et al. 2004
<b>Antimicrobial</b>	Petroleum ether extract ( <i>E. telmateia</i> )	In vitro: pathogenic bacteria species	Active against <i>Staphylococcus epidermidis</i>	Uzun et al. 2004
<b>Antimicrobial</b>	Essential oil (diluted 1:10)	In vitro: <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Klebsiella pneumoniae</i> , <i>Pseudomonas aeruginosa</i> , <i>Salmonella enteritidis</i> , <i>Aspergillus niger</i> & <i>Candida albicans</i>	Showed strong activity against all tested strains	Radulovic et al. 2006
<b>Antioxidant</b>	Aerial parts phosphate buffer extracts: <i>E. arvense</i> , <i>E. ramosissimum</i> & <i>E. telmateia</i>	In vitro: assays: DPPH, ESR & NO radical inhibition	Showed strong radical scavenging activities; <i>E. telmateia</i> was most potent (reduced to 98.9%)	Stajner et al. 2006
<b>Antioxidant &amp; anti-inflammatory</b>	Eviprostat, a phytotherapeutic agent consisting of extracts from <i>Equisetum arvense</i> , <i>Chimaphila umbellata</i> , <i>Populus tremula</i> , <i>Pulsatilla pratensis</i> & germ oil of <i>Triticum aestivum</i>	In vivo: rats with carrageenan-induced paw edema; in vitro: reactive oxygen species, superoxide anion & hydroxyl anion, in human neutrophils & cell-free systems	Active; <i>Equisetum</i> suppressed radical oxygen species which may contribute to this product's anti-inflammatory activity & its therapeutic effects on benign-prostatic hyperplasia; herbal extracts in combination reduced swelling in edema model	Oka et al. 2007

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiplatelet</b>	Plant extract <i>E. arvense</i>	In vitro: thrombin & ADP-induced aggregation	Active; dose-dependent inhibition of platelet aggregation	Mekhfi et al. 2004
<b>Clastogenic</b>	Plant extract	In vitro: irradiated & unirradiated samples of cultured blood lymphocytes	Exhibited weak clastogenic properties; reduced the level of radiation-induced micronuclei & increased unirradiated micronuclei in a dose-dependent manner	Joksic et al. 2003
<b>Cognitive enhancement &amp; antioxidant</b>	Hydroalcoholic stem extract of <i>Equisetum arvense</i> ; chronic intraperitoneal administration: 50 mg/kg	In vivo: aged rats; in vitro: antioxidant assays	Improved short- & long-term retention of inhibitory avoidance task & enhanced cognitive performance in Morris Water Maze test; no signs of toxicity were observed; showed antioxidant activity	Guilherme dos Santos et al. 2005
<b>Contractile response enhancement</b>	Plant extract <i>E. giganteum</i>	In vitro: rabbit aorta & guinea pig left atrium; KCl-induced contractile response	Active; significantly enhanced contractile response	Matsunaga et al. 1997
<b>Diuretic</b>	Chloroform extracts of Mexican <i>Equisetum</i> spp.	In vivo: mice; compared with standard drugs	Active; effect similar to hydrochlorothiazide; in decreasing order of activity: <i>E. hiemale</i> var. <i>affine</i> , <i>E. fluviatile</i> , <i>E. giganteum</i> , & <i>E. myriochaetum</i>	Perez et al. 1985
<b>Gastroprotective</b>	Water or methanol extract; <i>E. palustre</i> herb	In vivo: rat with ethanol-induced gastric ulcers	Active; exhibited significant stomach protection against ulcerogenesis	Gurbuz et al. 2002
<b>Hepatoprotective &amp; free radical scavenging</b>	Isolated MeOH extracts of phenolic petrosins & flavonoids from <i>E. arvense</i>	In vitro: human liver-derived Hep G2 cells; positive control: silybin	Active; results support use of <i>E. arvense</i> in hepatitis treatment	Oh et al. 2004
<b>Hypoglycemic</b>	Aqueous & butanolic extracts of aerial parts ( <i>E. myriochaetum</i> )	In vivo: rats with streptozotocin-induced diabetes	Active; single oral dose of 7 & 13 mg/kg aqueous or 8 & 16 mg/kg butanol extracts significantly lowered blood glucose levels	Andrade Cetto et al. 2000
<b>Hypolipidemic</b>	Dietary <i>Equisetum hyemale</i> & hyperlipid food	In vivo: rats	Active; inhibited elevation of triglyceride & cholesterol levels; antagonized hyperlipidemia; showed low toxicity acute toxicity test	Xu et al. 1993
<b>Radical scavenging</b>	Aqueous extract	In vitro & ex vivo	Showed low radical scavenging activity	Myagmar & Aniya 2000



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Sedative &amp; anticonvulsant</b>	Hydroalcoholic extract of <i>E. arvense</i> ; doses of 200 & 400 mg/kg	In vivo: rats in open-field & barbiturate-induced sleeping time tests; response to experimentally-induced seizures	Showed sedative & anticonvulsant effects; increased sleeping time (46% & 74%); reduced incidence & severity of convulsions & protected against death	Dos Santos et al. 2005
<b>Thiaminase</b>	<i>Equisetum ramosissimum</i>	In vitro	Showed strong thiaminase type 1& 2 activities & low thiamine content	Meyer 1989
<b>Vasorelaxant</b>	Caffeic acid derivative dicaffeoyl-meso-tartaric acid	In vitro: isolated rat aorta strips	Showed relaxation against norepinephrine (NE)-induced contraction of rat aorta; inhibited NE-induced vasoconstriction in the presence of nicardipine; mechanism involves decrease in calcium influx	Sakurai et al. 2003

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# Cranberry

## OTHER COMMON NAMES

Cranberry, large cranberry, American cranberry (English).

## SCIENTIFIC NAME

*Vaccinium macrocarpon* Aiton. [Ericaceae (Heath and Blueberry Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- High cholesterol
- Kidney disorders
- Urinary tract infections
- Uterine fibroids

**Plant Part Used:** Fruits, juice from fruits.

**Traditional Preparation:** Typically prepared as a juice, often diluted with water.

**Traditional Uses:** The juice is sometimes combined with other diuretic herbs such as celery (*apio*) stalks (prepared as a juice by liquefying in a blender or juicer) or cornsilk (*maíz, barba de maíz*; boiled in water to prepare a tea by decoction).

**Availability:** Cranberry fruit juice and frozen cranberries are sold at most grocery stores.

## BOTANICAL DESCRIPTION

*Cranberry (Vaccinium macrocarpon)* is an evergreen shrub that grows to 1 m across with creeping stems (10-20 cm tall). Leaves are simple, alternate, narrowly oval to oblong in shape, shiny green on top, whitish underneath. Flowers grow in clusters and are pink or white with 4 petals that curve back, away from the center where the male and female reproductive parts are fused together in a cone-like shape. Fruits are dark red, round berries (2 cm in diameter) with a tart flavor, containing numerous seeds (Bailey Hortorium Staff 1976).

**Distribution:** These plants grow in acid bogs and swamps and are native to North America, from Newfoundland to Minnesota (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As a widely consumed fruit juice, cranberry is generally considered safe. In a study with five volunteers, ingestion of cranberry tablets resulted in increased urinary oxalate levels which hypothetically indicate potential risk for nephrolithiasis (Terris et al. 2001).

**Contraindications:** None reported in the literature.

**Drug Interactions:** *Warfarin* - In one case report, a patient with a prosthetic mitral valve exhibited persistently elevated INR (International Normalized Ratio, a measure of blood coagulation based on laboratory tests) and subsequent symptoms of postoperative bleeding problems possibly due to an interaction between warfarin and cranberry juice; consequently, patients taking warfarin are advised to limit their consumption of cranberry juice (Grant 2004, Suvarna et al. 2003).

## SCIENTIFIC LITERATURE

In clinical trials, cranberry extracts have demonstrated the following effects: adherence inhibition (of bacteria to host cells), antiatherosclerotic, antihyperlipidemic, anti-inflammatory, antioxidant, renoprotective, antiurolithiasis, urinary tract infection prevention and urolithiatic (see “Clinical Data” table below). In laboratory and preclinical studies, this plant has shown the following effects: antibacterial, antifungal, antiproliferative, antioxidant, antitumor and antiviral (see “Laboratory and Preclinical Data” table below).

The mechanism of cranberry’s pharmacological effect is basically known: it reduces urinary pH most likely because it provides an acid load, and research suggests that it decreases urinary uric acid by retarding urate synthesis (Gettman et al. 2005). In a review article, it was concluded that the therapeutic effects of cranberry are primarily due to the antioxidant activity of constituent phenolic phytochemicals. In addition, use of the whole plant as opposed to its isolated phenolic phytochemicals was shown to be more therapeutic. The authors suggest enriching cranberry products with functional phytochemicals (Vattem et al. 2005).

Biologically active compounds that have been identified in the fruit include the following: alpha-terpineol, anisaldehyde, anthocyanosides, benzaldehyde, benzoic acid, benzyl alcohol, benzyl benzoate, catechins, chlorogenic acid, eugenol, lutein, malic acid, oxalic acid, quercetin and quinic acid (Duke & Beckstrom-Sternberg 1998). The fruits are a source of manganese and vitamins C and K (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** According to *The 5-Minute Herb & Dietary Supplement Consult*: “Cranberry products are harmless and have antibacterial and antiadherence qualities that may be useful in preventing bacteriuria and urinary tract infections” (Fugh-Berman 2003). Although insufficient information is available in the literature to make a general clinical recommendation, most commercial preparations and extracts list their own dosage recommendations.

### Clinical Data: *Vaccinium macrocarpon*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Adherence inhibition</b>	A-linked proanthocyanidins from cranberry juice cocktail vs. B-linked proanthocyanidins from commercial grape & apple juices, green tea & dark chocolate	In vitro & human clinical trial; test urine for anti-adhesion activity after consuming single servings of food product	Cranberry exhibited in vitro adherence inhibition (of bacteria to host cell) at 60 µg/mL & in human urine following ingestion; recommended for maintaining urinary tract health	Howell et al. 2005
<b>Anti-inflammatory</b>	Cranberry juice (250 mL three times daily for 2 wks)	Placebo-controlled clinical trial; two groups of healthy female subjects (11 per group)	Significant increase in salicyluric & salicylic acids in urine and plasma; anti-inflammatory effect attributed to increased absorption of salicylic acid	Duthie et al. 2005
<b>Antioxidant, antiatherosclerotic &amp; anti-hyperlipidemic</b>	Flavonoid-rich cranberry juice supplements; 7 mL/kg body weight of cranberry juice daily, administered orally	Clinical study; 21 men, 14-day intervention	Significant increase in plasma antioxidant capacity & reduction in circulating oxidized LDL concentrations, supporting the potential use of cranberry in preventing heart disease	Ruel et al. 2005
<b>Antiuroolithiasis</b>	Cranberry juice (330 mL) 3 × daily; consumed in place of mineral water in a standardized diet	Controlled, clinical trial: 12 healthy male subjects aged 18-38 yrs	Decreased urinary pH, increased excretion of oxalic acid & relative supersaturation for uric acid; recommended for treatment of UTIs & brushite & struvite stones because of its acidifying effect on the urine	Kessler et al. 2002
<b>Urinary tract infection (UTI) prevention</b>	Cranberry juice (300 mL ingested daily)	Randomized, placebo-controlled, double-blind trial; 376 older patients in hospital	No significant difference in incidence of UTIs in the placebo vs. treatment group; however, there were significantly fewer infections with <i>Escherichia coli</i> in the cranberry group	McMurdo et al. 2005

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Urinary tract infection (UTI) prevention</b>	Cranberry juice (250 mL 3 × daily) and tablets (2 × daily)	Randomized, placebo-controlled, clinical trial (150 sexually active women, aged 21-72 yrs; duration: 1 yrs)	Both juice & tablets resulted in significant decrease in the number of patients experiencing at least 1 lower UTI/y (to 20% & 18% respectively) compared with placebo (to 32%)	Stothers 2002
<b>Urinary tract infection (UTI) prevention &amp; renoprotective</b>	Cranberry products (varied)	Anonymous, cross-sectional, self-administered survey of parents in pediatric nephrology clinic (n=117; average patient age = 10.3 yrs; 15% reported recurrent UTI)	29% all parents surveyed (vs. 65% of parents whose children had recurrent UTI) gave cranberry products therapeutically to children; overall perceived to be beneficial; only 1 reported side effect (nausea)	Super et al. 2005
<b>Urolithiatic &amp; antiurolithiasis</b>	1 L cranberry juice daily in one phase; 1 L deionized water in another phase	Randomized controlled clinical trial (24 subjects: 12 normal, 12 with oxalate stones)	Significant increase in urinary calcium & urinary oxalate, resulting in an 18% increase in urinary saturation of calcium oxalate; overall increased risk of calcium oxalate & uric acid stone formation but decrease in risk of brushite stones	Gettman et al. 2005

### Laboratory and Preclinical Data: *Vaccinium macrocarpon*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Anthocyanin- & proanthocyanidin-rich fractions isolated from cranberry juice	In vitro: agar diffusion assay with 9 bacterial strains	Active; <i>Staphylococcus aureus</i> exhibited the most susceptibility; mixed results	Leitao et al. 2005
<b>Antibacterial &amp; antifungal</b>	Cranberry cordial (100% fruit) and fresh berries	In vitro: 12 strains of bacteria & <i>Candida albicans</i>	Inhibited the growth of <i>Mycobacterium phlei</i> as well as gram-positive & gram-negative bacteria	Cavanagh et al. 2003
<b>Antioxidant &amp; antitumor</b>	Total phenolics, both soluble free and bound forms in common fruits	In vitro: antioxidant activity measured using TOSC assay; antiproliferation studied using human liver-cancer cells	Cranberry had highest total phenolic content, highest antioxidant activity ( $\approx 177.0 \mu\text{M}$ of vitamin C equivalent/g of fruit) & highest inhibitory effect ( $\text{EC}_{50} \approx 14.5$ ).	Sun et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant &amp; antitumor</b>	Whole fruit extracts in methanol and isolated phytochemicals of cranberry	In vitro: seven tumor cell lines	Radical-scavenging activity was greatest in an extract high in flavonol glycosides (antioxidant activity comparable or superior to that of vitamin E); cyanidin 3-galactoside demonstrated highest antioxidant activity	Yan et al. 2002
<b>Antiproliferative &amp; antitumor</b>	Warm-water extract of cranberry presscake fractionated to isolate flavonoids in an acidified methanol eluate	In vitro: 8 human tumor cell lines of multiple origins	Inhibited proliferation of tumors & induced some tumor cells to undergo apoptosis in a dose-dependent manner	Ferguson et al. 2004
<b>Antitumor</b>	Whole cranberry fruit, fractionated to determine active components	In vitro: tumor cell lines (breast, cervical & prostate)	Major components: <i>cis</i> - & <i>trans</i> -isomers of 3-O-p-hydroxycinnamoyl ursolic acid (triterpenoid esters); both showed activity	Murphy et al. 2003
<b>Antitumor</b>	Total cranberry extract (200 µg/mL) vs. its fractionated phytochemical constituents (including anthocyanins, proanthocyanidins & flavonol glycosides)	In vitro: human tumor cell lines (including oral, colon & prostate)	Total polyphenol extract was most active (up to 96.1% inhibition); hypothesized that multiple constituents together exert synergistic or additive antiproliferative effects	Seeram et al. 2004
<b>Antiviral</b>	Cranberry juice constituents: high molecular weight materials (NDM)	In vitro: virus tissue culture with influenza virus A subtypes (H1N1 & H3N2) & type B	NDM inhibited virus at concentrations of 125 µg/mL or lower in a dose-dependent manner; significantly reduced infectivity & adhesion	Weiss et al. 2005

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Genitourinary</b>	Cranberry juice vs. apple juice (354 mL daily)	Randomized trial of cranberry; 112 men with urinary symptoms during radiation therapy for prostate cancer	No significant difference in urinary symptoms as measured by using the International Prostate Symptom Score	Campbell et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Urinary tract infection (UTI) prevention</b>	2 g concentrated cranberry juice extract or placebo in capsule from daily for 6 mo	Randomized, double-blind, placebo-controlled study (25 received extract & 22 received placebo)	No differences or trends detected between participants & controls in number of urine specimens with bacterial counts of at least 10 <sup>4</sup> colonies per mL, types & number of bacterial species, numbers of urinary leukocytes, urinary pH or episodes of UTI	Waites et al. 2004
<b>Urinary tract infection (UTI) prevention</b>	Standardized cranberry supplement, 400 mg tablets vs. placebo 3 × daily for 4 wks	Double-blinded, placebo-controlled, crossover study; 21 individuals with spinal cord injury & symptoms of UTI	No statistically significant effect in urinary pH, bacterial count, white blood cell count or reduction in UTIs	Linsenmeyer et al. 2004

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# Cuaba

## OTHER COMMON NAMES

*Cuava*, *ocote* (Spanish); Caribbean pine, pine, heart pine (English).

## SCIENTIFIC NAME

*Pinus caribaea* Morelet. Synonyms: *Pinus bahamensis* Griseb., *Pinus cubensis* var. *anomala* Rowlee and *Pinus hondurensis* Loock. or *Pinus occidentalis* Sw. [Pinaceae (Pine Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Contraception
- Joint pain
- Menopausal hot flashes
- Menstrual disorders
- Muscle ache
- Pain
- Sore throat
- Tonsillitis
- Uterine fibroids

**Plant Part Used:** Wood, essential oil and pine needles.

**Traditional Preparation:** Typically a piece of the wood is boiled in water to prepare a decoction that can be used as a gargle, taken orally as a tea or combined with other plants to make a *botella*.

**Traditional Uses:** *Cuaba* wood can be used as a gargle for sore throat, prepared as a decoction in combination with divi divi (*guatapanál*) and baking soda (*bicarbonato*). For arthritis, joint pain and muscle ache, use a small stick (*palito*) of *cuaba* wood and boil in water with guinea hen-weed (*anamú*) leaf, wormwood or ragweed (*altamisa*) leaf and *tartago* (*piñon ancho*) wood with a stick of cinnamon (*canela*) for flavor. Typical dosage of this *botella* is 1-2 ounces three times for pain relief.

The wood of is also good for cleansing the blood, especially during menopause, and to prevent hot flashes (*calores*). To prepare this remedy, use a stick of *cuaba* wood along with cinchona (*quina*) bark, prepared as a decoction by boiling in water, taken orally. *Cuaba* is considered a bitter (*amarga*) plant that can be used for contraception, prepared as a decoction and taken internally. This plant, prepared by decoction, is said to induce abortion when combined with malt beverage (*malta alemana*), palm-beach-bells (*mala madre*) and pharmaceutical pills (*pastillas*) for ulcers, taken orally.

**Availability:** Typically the wood of this tree is used medicinally and sold in chunks or long, fist-sized pieces at *botánicas*. This wood has a slightly coarse texture with a straight grain; the heartwood is generally golden brown to a deep orange-reddish hue whereas the sapwood is lighter, the color of pale straw. This wood is characterized by a strong resinous odor.

## BOTANICAL DESCRIPTION

*Cuaba* (*Pinus caribaea*) is a tree that grows to 30 m tall and has thick bark that is grey to reddish brown with wide fissures and separate male and female flowers; the trunk is often branchless to a considerable height. Leaves are needlelike and usually grow in bundles of 3, bunched together at the ends of branches. Male flowers are numerous, yellow and grow in oval catkins. Female cones occur near the ends of branches with tan or reddish brown scales, each with a small prickle at the tip. Seeds are usually grey or light brown and narrowly oval with a persistent wing (Stanley and Ross 1989).

**Distribution:** This tree is native to the Caribbean and Central America and is cultivated in plantations for lumber and the production of turpentine and rosin in other regions of the world.

## SCIENTIFIC LITERATURE

Although no clinical or laboratory studies evaluating the biological activity of this particular species have been identified in the available literature, several closely-related species of the genus *Pinus* have shown the following effects: anticancer, antimicrobial, antioxidant, antitumor and antiviral (see “Laboratory and Preclinical Data” table below). According to a secondary reference, pine species have demonstrated the following activities in laboratory studies (using the shoots and volatile oils of these plants): secretolytic, mildly antiseptic and hyperemic; also, shown to stimulate peripheral circulation and bronchial secretion (Gruenwald et al. 2004).

Biologically active compounds identified in a closely related species, *Pinus strobus*, include the following: resin: abietic acid, dehydroabietic acid, elliotic acid, isopimaric acid, laevopimaric acid, sandaracopimaric acid; wood: chrysin, pinocembrin, pinostrobin; plant: leucocyanidin, mucilage; bark: coniferin, coniferyl alcohol, dihydropinosylvin, pinoresinol and pinosylvin (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** Pine shoots (of a closely related species) are approved by the German *Commission E* for the following health conditions: high or low blood pressure, common cold, cough, bronchitis, fever, inflammation of the mouth and throat, neuralgias and tendency to infection. In addition to the above ailments, pine needle oil is also approved for rheumatism (applied externally) and purified turpentine oil is approved for cough, bronchitis, inflammation of the mouth and throat and rheumatism (Blumenthal et al. 1998).

## SAFETY & PRECAUTIONS

No safety or toxicity data was identified in the available literature for *Pinus caribaea* or *Pinus occidentalis*. For a closely related pine species, when appropriately administered (internally and externally), no health hazards or negative side effects are known in association with the use of the pine needles or essential oil. However, little information is available on the internal use of aqueous extracts of the wood which is the most commonly reported traditional Dominican use of this plant.

Caution is advised in the external use of pine needle oil because it can lead to irritation of the skin or mucous membranes and worsening of bronchial spasms. When applying purified turpentine oil to a large area of the body, resorptive poisoning can occur resulting in kidney and central nervous system damage. Internal administration can potentially cause kidney damage at therapeutic dosages (Gruenwald et al. 2004).

**Contraindications:** Pine needle oil or shoots: should not be taken by patients with bronchial asthma and whooping cough. Patients with acute dermatological conditions, cardiac insufficiency, high fevers, infectious diseases or hypertonia should not use this herb as a bath additive. Patients with acute inflammation of the breathing passages should not inhale the volatile oil or purified turpentine oil (Gruenwald et al. 2004).

**Drug Interactions:** Unknown; insufficient information available in the literature.

### Laboratory and Preclinical Data: *Pinus* spp.

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Pitch preparations: <i>Pinus contorta</i>	In vitro	Showed significant antimicrobial activity	Ritch-Krc et al. 1996
<b>Antimicrobial</b>	Crude & organic extracts of tar from roots and stems: <i>Pinus brutia</i>	In vitro: <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> , <i>E. coli</i> and <i>Candida albicans</i>	Crude extract was shown to be highly effective; organic extracts had similar but more moderate activity	Kizil et al. 2002
<b>Antioxidant</b>	Methanolic extract: <i>Pinus densiflora</i>	In vitro: kidney homogenates	Showed strong antioxidant activity	Jung et al. 2003
<b>Antioxidant</b>	Volitale gas extracts: <i>Pinus sylvestris</i>	In vitro: tested inhibition of oxidation	Increased cell viabilities against hexanal oxidation	Ka et al. 2005
<b>Antioxidant &amp; anticancer</b>	Bark extract: <i>Pinus massoniana</i>	In vitro: human carcinoma cells	Antioxidant & radical scavenging activity increased (concentration-dependent); inhibited carcinoma cell growth	Cui et al. 2005
<b>Antitumor</b>	Diterpenes isolated from cones: <i>Pinus luchuensis</i>	In vitro	Some compounds showed potent inhibitory effects on Epstein-Barr virus early antigen (EBV-EA) activation	Minami et al. 2002
<b>Antiviral</b>	Pine cone extract: <i>Pinus parviflora</i>	In vitro: MDCK cells	Suppressed the growth of influenza virus	Nagata et al. 1990
<b>Antiviral</b>	Extract (water or alcoholic): <i>Pinus massoniana</i>	In vitro: type 1 herpes simplex virus	Shown to be highly effective	Zheng 1990
<b>Antiviral</b>	Methanol extract: <i>Pinus halepensis</i>	In vitro: herpes simplex virus, Sindbis virus & poliovirus	Shown to be active against the Sindbis virus and poliovirus	Mouhajib et al. 2001

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# Cundeamor

## OTHER COMMON NAMES

*Sorosí* (Spanish); bitter melon (English).

## SCIENTIFIC NAME

*Momordica charantia* L. [Cucurbitaceae (Cucumber Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Cancer
- Diabetes
- Fever
- Insect bites
- Itching
- Measles
- Menopausal hot flashes
- Menstrual cramps (dysmenorrhea)
- Rash
- Sexually transmitted infections
- Skin infections
- Stomach ailments
- Vaginal infections

**Plant Part Used:** Leaves, stems, flowers and fruits.

**Traditional Preparation:** The aerial parts of this plant are typically prepared as a tea by infusion or decoction. This plant is also applied topically as a wash or a poultice.

**Traditional Uses:** *Cundeamor* is a strongly bitter and cooling (*fresco*) herb that is well known for its use in treating diabetes, prepared as a tea or infusion of the aerial parts. This medicinal plant is often used as part of a popular remedy called “*tres golpes para la diabetes*” (three blows to diabetes) which also includes the herb *insulina* (*Costus* spp.) and wormwood (*agenjo*) or ragweed (*altamisa*). *Cundeamor* is also used for conditions of severe fever (*paludismo* or *fiebre verde*), prepared as a decoction with wild privet senna (*sen*) leaves.

For stomach problems, menstrual disorders, dysmenorrhea, vaginal infections, excess vaginal discharge, sexually transmitted infections, menopausal hot flashes and cancer, this plant is prepared as a decoction and taken orally. To treat skin conditions including rash (*rasquiña*, *ñañara*), measles, insect bites, boils (*nacios*), skin infection and itching, the aerial parts or leaves of this plant are applied topically as a wash prepared as a decoction or as a poultice of the fresh plant juice and baking soda.

**Availability:** The dried herb can be purchased from select *botánicas*.

## BOTANICAL DESCRIPTION

*Cundeamor* (*Momordica charantia*) is an herbaceous vine that grows to 8 m long with striated stems and curling tendrils. Leaves are simple, palmate and deeply lobed with fine, short hairs and slightly toothed

leaf-edges. Flowers grow singly and have 5 bright yellow, spreading petals. Fruits are gourd- or cucumber-like capsules (3-5 cm long), turning orange-yellow when ripe and peeling back from the tip into three parts, revealing bright-red fleshy seed-coverings attached to the inside of the fruit wall (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to the Old World tropics but is now pantropical in distribution and is commonly found in open, moist areas of the Caribbean (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

In humans, a decoction of the fruit given orally at a dosage of 500 mg/person did not result in any signs of toxicity (Khan & Burney 1962); however, in pregnant women given 15 mL/person/day of an aqueous extract of the whole plant administered orally, the plant extract inhibited fetal development (West et al. 1971). In a human clinical trial of bitter melon capsules, few adverse effects were observed, and those that occurred were considered mild overall (Dans et al. 2007).

**Animal Toxicity Studies:** Numerous animal toxicity studies have been conducted on this species, and results indicate that most parts of this plant are relatively non-toxic. In dermal toxicity studies, the fresh juice of the leaf applied to the skin of hairless rabbits and guinea pigs resulted in an irritation index of less than 5, indicating that the leaves are not irritating or allergenic (Gonzalez & Alfonso 1990a, Gonzalez & Alfonso 1990b). The LD<sub>50</sub> of the mature fruit administered orally to mice was determined to be 3 g/kg body weight. When the whole plant extract (including the fruit and fresh leaves) was administered to mice orally and intraperitoneally (25 g/kg), it did not result in any fatalities (Mokkhasmit et al. 1971).

**Contraindications:** Due to demonstrated inhibition of fetal development (West et al. 1971) and potential risk of provoking abortion (Ng 1998, Yeung 1988), this herb should not be taken internally during pregnancy due to potential risk of provoking abortion. Not to be taken orally during lactation or administered to children under 3 years of age (Germosén-Robineau 2005).

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Antidiabetic potential of the fruit and active constituents has been investigated in human clinical trials or reported in case series studies (see “Clinical Data” table below). In preclinical studies, this plant has demonstrated antibacterial, antidiabetic, antifungal, antimicrobial and anthelmintic effects (see “Laboratory and Preclinical Data” table below). Biologically active compounds identified in the fruit include: 5-hydroxy tryptamine, alkaloids, beta-sitosterol-d-glucoside, charantin, citrulline, cryptoxanthin, fluoride, GABA, lanosterol, lutein, lycopene, momordicoside, oxalate, oxalic acid, pipercolic acid and zeaxanthin (Duke & Beckstrom-Sternberg 1998). All parts of this plant are very bitter.

**Indications and Usage:** TRAMIL has classified *Momordica charantia* as “REC” indicating that it is recommended for the following traditional Caribbean uses: treatment of the common cold (*resfriado*); dry, irritated or itchy skin conditions; boils; and pediculosis (Germosén-Robineau 2005).

### Clinical Data: *Momordica charantia*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antidiabetic</b>	Bitter melon capsules (Charantia®; extract of active constituents from the fruits & seeds)	Randomized, double-blind, placebo controlled trial; n=40 patients with poorly controlled or recently diagnosed Type II diabetes	Lowered mean glycosylated hemoglobin (A1c) levels (0.22%); total cholesterol, weight & mean fasting blood sugar showed no significant difference	Dans et al. 2007
<b>Antidiabetic</b>	Bitter melon extract, administered subcutaneously	Controlled clinical trial (n=19)	Showed 21% decrease in mean blood glucose levels 30 mins post-treatment; peak drop at 4 hrs (49%)	Baldwa et al. 1977

### Laboratory and Preclinical Data: *Momordica charantia*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anthelmintic</b>	Fresh fruit juice dissolved in ethanol (100 mg/mL)	In vitro	Active against <i>Ascaridia galli</i>	Lal et al. 1976
<b>Antimicrobial</b>	Methanolic extract of dried leaf (2 mg/mL)	In vitro: pathogenic bacterial & fungal species	Active against <i>Corynebacterium diphtheriae</i> , <i>Neisseria</i> spp., <i>Streptobacillus</i> spp., <i>Streptococcus</i> spp. & <i>Staphylococcus aureus</i>	Hussain & Deeni 1991
<b>Antimicrobial</b>	Aqueous, chloroform, ether, & methanolic fruit extracts	In vitro: pathogenic bacterial & fungal species	Aqueous extract most active against <i>Bacillus subtilis</i> & <i>Candida albicans</i> ; extracts also active against <i>Pseudomonas aeruginosa</i> , <i>Salmonella typhi</i> & <i>Shigella dysenteriae</i>	Maneelt & Saththampongsa 1978

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# Diente de león

## OTHER COMMON NAMES

*Hoja de león* (Spanish); dandelion (English).

## SCIENTIFIC NAME

*Taraxacum officinale* Weber. [Asteraceae (Aster or Daisy Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003).

- *Limpiar la sangre*
- Liver disorders
- Menstrual disorders
- Uterine fibroids

**Plant Part Used:** Leaves and roots.

**Traditional Preparation:** Leaves can be eaten fresh or liquefied in a blender to make a juice. Dried roots are prepared in boiling water by decoction and taken internally as a tea.

**Traditional Uses:** In general, this plant is used to support, cleanse and heal inflammation of the liver. Impaired liver function can also affect women's reproductive disorders, and this plant is often used for both types of health conditions. The leaves are sometimes also combined with other food plants which are prepared as a juice or eaten raw for improving liver function: parsley (*perejil*) leaves and cucumber (*pepino*) fruit.

**Availability:** Fresh leaves are sold at many grocery stores and super markets. Dried roots and root preparations can be purchased from health food or nutritional supplement stores.

## BOTANICAL DESCRIPTION

*Diente de león* (*Taraxacum officinale*) is a perennial herbaceous plant that can grow to 46 cm tall. Leaves emerge from the base of the stem in a dense, radiating cluster and are lance-shaped with wavy margins and a milky sap. Flower heads grow singly atop a long, hollow stem and are golden-yellow with numerous tiny petals. Seeds are cylindrical, ribbed and grey-brown, attached to fluffy, white filaments for wind-dispersal; numerous seeds are arranged in a tight, spherical cluster such that their filaments collectively resemble a snowball (Bailey Hortorium Staff 1976).

**Distribution:** This plant is most likely native to Eurasia, cosmopolitan in range, commonly grows in disturbed open areas and is sometimes cultivated for its edible greens (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No adverse effects have been reported in association with the use of the root, leaves and flowers—the most commonly used medicinal parts of this plant. However, one report indicates that children who consumed the milky latex from the flower stem have experienced nausea, diarrhea, vomiting and cardiac arrhythmia (DeSmet 1993). In a survey conducted in Italy of women who visited outpatient hospital

facilities, some respondents reported adverse gastrointestinal effects from taking dandelion (Cuzzolin et al. 2006).

**Animal Toxicity Studies:** Acute toxicity is extremely low. The LD<sub>50</sub> in mice (administered intraperitoneally) was 36.6 g/kg for the root and 28.8 g/kg for the entire plant (Racz-Kotilla et al. 1974). In a chronic toxicity study in rabbits, no toxic effects were observed when they were given 6 g/kg orally for up to 7 days (Akhtar et al. 1995).

**Contraindications:** This herb is contraindicated for those with the following conditions: occlusion of the bile ducts, cholecystitis or small bowel obstruction (Fugh-Berman 2003, Weiss 1988). The root may be contraindicated in patients with acute stomach inflammation or irritable bowel conditions due to potential hyperacidity from stimulation of gastric secretions. For individuals with digestive weakness, the root may provoke gastrointestinal upset, gas and loose stools. In patients with gallstones, bile duct obstruction and biliary or gall bladder inflammation (with pus), caution is advised due to the demonstrated cholagogue activity of the root. As this herb is a laxative, use in individuals with intestinal obstruction may also be contraindicated (Brinker 1998).

**Drug Interactions:** Lithium toxicity may be exacerbated as a result of sodium depletion from the diuretic effects of the leaves and root and the sodium excretion that accompanies this effect; however, this herb-drug interaction is hypothetical and has not been substantiated by clinical data (Brinker 1998). A related species (*Taraxacum mongolicum* Hand-Mazz), which is used in Chinese medicine (common name: *Pu gong ying*) for its antibacterial and hepatoprotective effects, has been shown to interact with a fluoroquinolone by decreasing maximum plasma concentrations of ciprofloxacin by 73% in rats when both the herb (an aqueous extract of 2 g whole herb/kg) and drug (20 mg/kg ciprofloxacin) were administered concomitantly (Zhu et al. 1999).

## SCIENTIFIC LITERATURE

In laboratory and preclinical studies, this plant has shown the following effects: analgesic, antidiabetic, anti-inflammatory, antioxidant, antitumor, bile secretion increase, cytotoxic, diuretic, hypoglycemic, insulin release stimulation and nitric oxide synthesis stimulation (see “Laboratory and Preclinical Data” table below). In animal studies, the root did not show diuretic effects and the herb did not show hypoglycemic effects (see “Effect Not Demonstrated” table below).

According to *The 5-Minute Herb & Dietary Supplement Consult*, “Dandelion leaf is a benign vegetable and medicinal herb with poorly documented but easily demonstrable diuretic effects” (Fugh-Berman 2003). The exceptionally high potassium content of the leaves (4.51% by wet weight) suggests possible applications of this plant for preventing potassium depletion, although no clinical trials of this effect have been identified (Hook et al. 1993). The antioxidant activity of the flowers may have applications for cardiovascular health considering the demonstrated association between increased dietary intake of flavonoids and reduced incidence of ischemic heart disease. This effect is possibly due to the antioxidant effects of flavonoids (Halliwell 1995; Hu and Kitts 2005; Hollman and Katan 1999; Geleijnse et al. 2002).

Biologically active constituents of this plant include: caffeic acid, coumestrol, cycloartenol, faradiol, p-coumaric acid, taraxasterol and xanthophylls. The leaf contains luteolin-7-glucoside. The root is high in inulin and contains mannitol, mucilage, nicotinic acid, pectins, taraxerol and tyrosinase (Duke & Beckstrom-Sternberg 1998). Raw dandelion greens are a significant source of calcium, folate, iron, magnesium, manganese, potassium, riboflavin, thiamin, vitamin A, B6, C, E and K (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Typical dosage amounts provided in Fugh-Berman (2003) are as follows: Leaf - Adults: 4-10 g dried herb in capsules or by infusion 3 times daily; 2-5 mL tincture (1:5, ethanol 25%)

V/V) three times daily; or 5-10 mL juice from fresh leaf twice daily; Root - Adults: 3-5 g dried root in capsules or by infusion three times daily; 5-10 mL tincture (1:5, ethanol 25%) three times daily.

### Laboratory and Preclinical Data: *Taraxacum officinale*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic &amp; anti-inflammatory</b>	Ethanol root extract: 100 mg/kg, administered intraperitoneally	In vivo: mice in tests of nociception & inflammation	Active; reduced writhing response to phenylquinone & briefly improved reaction time in the hot plate test (+38% at 180 degrees F)	Tita et al. 1993
<b>Antidiabetic</b>	Aqueous extract	In vitro	Showed potent alpha-glucosidase inhibitory activity	Onal et al. 2005
<b>Anti-inflammatory</b>	100 mg/kg ethanol root extract	In vivo: rats; intraperitoneal administration	Active; inhibited carrageenan-induced paw edema (-42% at 3 hours)	Tita et al. 1993
<b>Anti-inflammatory</b>	100 and 1000 µg/mL	In vitro: rat astrocyte cultures	May inhibit TNF-alpha production by inhibiting IL-1 production; anti-inflammatory in the central nervous system	Kim et al. 2000
<b>Antioxidant</b>	Flowers: freeze-dried, extracted in ethanol, filtered, dried	In vitro: radical scavenging activity tested chemically; inhibition of nitric oxide production tested with biological assay	Active; demonstrated radical scavenging activity & inhibition of nitric oxide production; both properties attributed to phenolic content	Hu and Kitts 2005
<b>Antitumor</b>	Aqueous extract	In vivo; mice; given intraperitoneally	Active; demonstrated antitumor effects	DeSmet 1993
<b>Antitumor &amp; cytotoxic</b>	Aqueous extract, freeze-dried, dissolved in saline	In vitro: human hepatoma cell line, Hep G2	Induced cytotoxicity through tumor necrosis factor-alpha & interleukin-1alpha secretion at 2 – 0.02 mg/mL concentration	Koo et al. 2004
<b>Bile secretion increase</b>	Herb extract	In vivo: rats & dogs	Increased bile flow (3 studies--1931-1959)	ESCOP 1996
<b>Diuretic</b>	4% aqueous extract (leaves)	In vivo: mice; administered for 30 days	Demonstrated diuretic effects: activity was equivalent to that of furosemide; herb extract was superior to root extract	Racz-Kotilla et al. 1974
<b>Hypoglycemic</b>	1-2 g/kg herb	In vivo; normal rabbits, given orally	Produced hypoglycemic response at 8 & 12 hours (at 4 hrs with 2 g dose)	Akhtar et al. 1995
<b>Insulin release stimulation</b>	Ethanol extract	In vitro	Showed promotion of insulin secretion	Hussain et al. 2004

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Nitric oxide synthesis stimulation</b>	Aqueous extract of dried leaves	In vitro: mouse peritoneal macrophages; dose-dependent administration combined with rIFN gamma	Synergistic effect observed; extract did increase nitric oxide production in mouse peritoneal macrophages after treated with rIFN-gamma via herb-induced TNF-alpha secretion	Kim et al. 1999

#### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Diuretic</b>	Fractionated extracts of oven-dried root	In vivo: mice; saline-loaded; results checked at 5 hrs	No significant diuretic activity	Hook et al. 1993
<b>Diuretic</b>	Ethanol root extract	In vivo: rodents; oral or intraperitoneal administration	No diuretic or natriuretic activity, although potassium excretion doubled	Tita et al. 1993
<b>Hypoglycemic</b>	1-2 g/kg herb	In vivo: rabbits with alloxan-induced diabetes	No hypoglycemic effect	Akhtar et al. 1995
<b>Hypoglycemic</b>	Dried herb	In vivo: mice; administered orally as part of diet	No effect on glucose levels in diabetic or streptozotocin-diabetic animals	Swanston-Flatt et al. 1989

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# Eucalipto

## OTHER COMMON NAMES

Eucalyptus (English).

## SCIENTIFIC NAME

*Eucalyptus globulus* Labill. and other species of the genus *Eucalyptus*. [Myrtaceae (Myrtle Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Asthma
- Common cold
- Cough
- Flu
- Sinus congestion
- Upper or lower respiratory tract infections
- Uterine fibroids

**Plant Part Used:** Leaves (fresh or dried) and essential oil.

**Traditional Preparation:** The leaves are typically prepared as a tea or boiled to release their volatile oils for steam inhalation.

**Traditional Uses:** This highly aromatic plant is often combined with other medicinal plants, including lemongrass (*limoncillo*) leaves and soursop (*guanábana*) leaves. Also, steam inhalation of the vapor from the boiled leaves is used to relieve sinus congestion, cough and pulmonary infections.

**Availability:** Can be purchased from select *botánicas* and from some health food, herbal supplement or drug stores.

## BOTANICAL DESCRIPTION

*Eucalipto* (*Eucalyptus globulus*) is a tall deciduous tree that grows to 40 m in height and has silver-grey, warty bark. Leaves are lance-shaped (7-16 cm long), elongate and narrow but slightly curved towards the tip with a clear central vein and dark bluish-green color. Flowers grow singly and have white petals with numerous red stamens. Fruits are dry, rounded, cone-shaped, 4-sided capsules. All parts of this plant are highly aromatic (Bailey Hortorium Staff 1976).

**Distribution:** This tree is native to Australia and is an invasive plant in other temperate regions, and it is cultivated extensively in subtropical regions for use in the paper industry (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Potential adverse effects of this herb, especially in concentrated preparations, include the following (reported occasionally in the literature): nausea, vomiting, epigastric pain (heartburn), esophagitis and diarrhea. Uncommon side effects include: erythema, contact urticaria, pruritus and micropapular rash (Gruenwald et al. 2004). Inhalation of eucalyptus vapors has been reported to transmit *Aspergillus* fungal spores (Whitman & Ghazizadeh 1994). Hypersensitivity and systemic symptoms may result from topical

administration. One pediatric case of severe adverse effects from excessive and prolonged topical administration of a preparation containing 7.7% eucalyptus oils has been reported; symptoms included slurred speech, ataxia, muscle weakness and eventual unconsciousness (Darben et al. 1998).

Life-threatening poisonings can result from overdose of eucalyptus oil. Doses of 4-5 mL in adults (a few drops in children) of the oil can lead to severe poisoning. Symptoms of overdose include drop in blood pressure, circulatory disorders, collapse and asphyxiation. In such cases, therapy includes activated charcoal administration, diazepam for spasms, atropine for colic, electrolyte replenishment and sodium bicarbonate infusions for possible acidosis. Vomiting should not be induced due to danger of aspiration (Gruenwald et al. 2004).

**Contraindications:** Contraindicated for those with inflammatory conditions of the gastrointestinal tract or bile ducts, serious liver disease or hypersensitivity to eugenol (one of the main constituents of the essential oil). **Pediatrics:** Infants and young children should not be administered this herb or its oil on the face or nose as this may lead to laryngeal spasms and consequent respiratory arrest (Gruenwald et al. 2004).

**Drug Interactions:** Therapeutic efficacy of drugs metabolized by hepatic microsomal enzymes may be hindered by concomitant use of eucalyptus oil. **Antidiabetic drugs** – potential interaction due to hypoglycemic effects demonstrated in animal studies, so blood glucose levels and signs of hypoglycemia should be monitored closely in patients taking both simultaneously; **Barbiturates** – herb may decrease desired therapeutic effects of barbiturates so concomitant administration is to be avoided pending further investigation; **Pyrolizidine-containing herbs** – the hepatotoxic effects of plants containing pyrolizidine alkaloids (i.e. borage, coltsfoot and others) may be potentiated by eucalyptus potentially resulting in liver damage and concomitant use should be avoided (White et al. 1983, Gruenwald et al. 2004).

## SCIENTIFIC LITERATURE

In preclinical studies, the essential oil of this plant has demonstrated the following effects: antibacterial, anti-inflammatory, antioxidant and antisecretory (see “Laboratory and Preclinical Data” table below). According to a secondary reference, the essential oil of this plant has shown the following additional pharmacological activities: anti-inflammatory, antineoplastic, expectorant and wound-healing. Euglobulin from the leaf exhibited anti-inflammatory and antiproliferative effects in animal studies and inhibited TPA-induced EBV-EA activity in vitro (Gruenwald et al. 2004).

Biologically active compounds identified in the leaves include: 1,8-cineole, alpha-phellandrene, alpha-pinene, aromadendrene, beta-eudesmol, beta-pinene, butyraldehyde, caffeic acid, camphene, carvone, citriodorol, cuminaldehyde, ellagic acid, ferulic acid, gallic acid, gentisic acid, hyperoside, isoamyl-alcohol, p-cymene, paraffin, pinene, protocatechuic acid, quercetin, quercetol, quercitrin, rutin, trans-pinocarveol and viridiflorol (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** The leaves of *eucalipto* (*Eucalyptus globulus*) have been approved by the German *Commission E* for the treatment of cough and bronchitis (used internally and externally), and eucalyptus oil has been approved for rheumatism (applied externally; Blumenthal et al. 1998).

Standard dosages and forms of administration include the following: Essential oil - average daily dose of eucalyptus essential oil is 0.3 to 0.6 g taken internally; for inhalation, 2-3 (or 3-6) drops in boiling water (150 mL) used several times daily; for external use, prepare in concentrations of 5-20% essential oil in an oil, salve or cream base or 5-10% essential oil in aqueous-alcoholic preparations; essential oil by itself can be applied directly to the skin in small quantities (few to several drops). Leaf – can be prepared as a powder, tincture or tea with an average daily dose of 4-6 g herb in single doses of 1.5 g every 3-4 hours; for powder, take 1-4 g up to 4 × daily; for tincture, prepare 1:5 herb/ethanol (70%) by volume, taken 1 g 3-4 × daily; for tea, pour 1 cup boiling water over 1.5-2 g finely cut herb, cover and infuse for 5-10 minutes, then strain and take 1 cup up to 3 × daily (Gruenwald et al. 2004).



## Laboratory and Preclinical Data: *Eucalyptus globulus*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-inflammatory &amp; antisecretory</b>	Oil	In vivo: rat; lipo-polysaccharide-induced chronic bronchitis	Exhibited anti-inflammatory effects & inhibited hypersecretion of airway mucins	Lu et al. 2004
<b>Antibacterial</b>	Essential oil; leaf (multiple species of <i>Eucalyptus</i> )	In vitro	Active; most active: <i>E. camadulensis</i> , <i>E. tertiornis</i> , <i>E. robusta</i> , <i>E. alba</i> and 7 other <i>Eucalyptus</i> spp.	Cimanga et al. 2002
<b>Antioxidant</b>	Essential oil	In vitro: linoleic acid autoxidation	Active; showed lipid peroxidation activity	Dessi et al. 2001

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# Guácima

## OTHER COMMON NAME

*Guazuma* (Spanish); bastard cedar, jackass calalu, West Indian elm (English).

## SCIENTIFIC NAME

*Guazuma ulmifolia* Lam. [Sterculiaceae (Cacao Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Common cold
- Cough
- Flu
- Menopausal hot flashes
- Menstrual disorders
- Ovarian cysts
- Uterine fibroids

**Plant Part Used:** Bark, leaves, roots and wood.

**Traditional Preparation:** Typically prepared as a tea of the leaves or bark by infusion or decoction.

**Traditional Uses:** For cough and symptoms of the common cold or flu symptoms, the leaf is prepared as a decoction, sweetened with sugar and taken orally. For women's health conditions (including menstrual disorders, fibroids, ovarian cysts and menopausal symptoms), a multi-herb decoction (*tizana*) is prepared using the bark (*cáscara* or *corteza*) along with other plants. This plant is attributed cooling (*fresca*) properties, and in the Dominican Republic, it is harvested from *conucos* (ecologically diverse small-scale agricultural plots) in the countryside.

**Availability:** Dried plant material can sometimes be purchased from *botánicas* that specialize in Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Guácima* (*Guazuma ulmifolia*) is a tree that grows from 5-10 (or up to 20) m tall with rough, grayish-brown bark and slightly hairy branches. Leaves are oblong to oval, covered with tiny, fine hairs on the underside and with scalloped or toothed margins. Flowers grow in clusters with yellow petals and have small, purple appendages. Fruits are warty, oblong capsules that turn black when mature, each containing numerous seeds (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to tropical America, grows throughout the Caribbean, has been introduced to Asia, Africa and Hawaii and is commonly found in disturbed areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

TRAMIL has designated this herb as safe for internal use for specific conditions when properly administered (see “Indications and Usage” below). Ingestion of large quantities of the plant can cause nausea and vomiting (Hoehne 1939). In a clinical study of patients diagnosed with the common cold, no signs of toxicity were shown when the dried leaf decoction (12 g/L) was administered at a dosage of 720 mL/day for 7 consecutive days (Carballo 1995A).

**Animal Toxicity Studies:** No signs of toxicity were evident in an animal study of the aqueous dry leaf extract administered orally to mice at 25 g/kg. The LD<sub>50</sub> of this extract administered intraperitoneally was determined to be 5.975 ± 0.193 g/kg. In another animal study, no observable signs of mortality or toxicity were shown when the dry leaf decoction (1 g plant matter/mL extract) was given orally to mice (18.75 g/kg) every 12 hours for 28 days (Herrera 1990).

**Contraindications:** No information is available on the safety of this plant in children and pregnant or lactating women (Germosén-Robineau 2005).

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Laboratory studies have shown the following biological activity of *guácima*: angiotensin II receptor binding inhibition, antibacterial, antidiabetic, antioxidant, antisecretory, antiviral and hypoglycemic (see “Laboratory and Preclinical Data” table below).

Major chemical constituents of this plant include the following: proanthocyanidins (Caballero-George et al. 2002), friedelin-3alpha-acetate and friedelin-3beta-ol. The leaves contain caffeine (Duke & Beckstrom-Sternberg 1998), and the bark contains flavonoids: epicatechin and procyanidin derivatives (Hör et al. 1996).

**Indications and Usage:** TRAMIL has categorized this plant as “recommended” specifically for its traditional use in treating flu, cold and cough (Germosén-Robineau 2005). The recommended dosage is a decoction of 12 g crushed leaves in 1 liter (4 cups) of water, boiled for at least 10 minutes in a covered container, strained, cooled and taken orally in the amount of 3-4 cups daily (Carballo 1995B, Caceres 1996, Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Guazuma ulmifolia*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Angiotensin II receptor binding inhibition</b>	Methanol: dichloromethane extracts of bark	In vitro: radioligand-receptor-binding assay	Inhibited the [3H]-AT II binding (angiotensin II to AT1 receptor) by more than 50%	Caballero-George et al. 2001
<b>Angiotensin II receptor binding inhibition</b>	Acetone extract (70%) of bark & proanthocyanidins	In vitro	Active; showed dose-dependent inhibition of angiotensin II binding to the AT1 receptor	Caballero-George et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Hexane, chloroform & methanol extracts of bark	In vitro: against strains of 4 types of aerobic bacteria	Hexane extract showed activity against <i>E. coli</i> & the methanol extract showed activity against <i>Pseudomonas aeruginosa</i>	Camporese et al. 2003
<b>Antibacterial</b>	Plant extract	Screened in vitro against 5 enterobacteria pathogenic to humans	Exhibited antibacterial activity against gastrointestinal pathogens	Caceres et al. 1990
<b>Antidiabetic &amp; hypoglycemic</b>	Bark decoction (water extract)	In vivo; rabbit model	Significantly decreased the hyperglycemic peak & the area under the glucose tolerance curve; results suggest effectiveness in diabetes mellitus control	Alarcon-Aguilar et al. 1998
<b>Antioxidant</b>	Methanol & aqueous extract	In vitro	Showed radical scavenging activity	Navarro et al. 2003
<b>Antisecretory</b>	Bark extract	In vitro: rabbit distal colon mounted in an Ussing chamber	Completely inhibited cholera toxin-induced chloride secretion if given prior to the toxin; adding after administration of the toxin had no effect on secretion; effect due to procyanidins	Hor et al. 1995
<b>Antiviral</b>	Crude extract & fractions: aqueous & ethyl acetate	In vitro: poliovirus 1 & bovine herpes virus 1; HEp-2 cultured cells	Showed significant activity; ethyl acetate fraction inhibited replication by at least 99%; blocked the synthesis of viral antigens	Felipe et al. 2006

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# Guajabo

## OTHER COMMON NAMES

*Guajaba, guajava, guajavo* (Spanish); ringworm bush, senna (English).

## SCIENTIFIC NAME

*Senna alata* (L.) Roxb. Synonym: *Cassia alata* L. [Caesalpiniaceae (Senna Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Diarrhea
- Intestinal parasites
- *Limpiar la sangre*
- Skin fungal infections

**Plant Part Used:** Leaves.

**Traditional Preparation:** Typically prepared as a tea by decoction or infusion and often combined with other plants.

**Traditional Uses:** The leaves of this tree are considered cooling (*fresco*). For infections (in general), contaminated blood (*mala sangre*) and to cleanse the blood, *guajabo* leaves are combined with coffee (*café*) leaves and boiled in water to make a decoction that is taken orally as a tea. This remedy may be prepared with golden shower tree (*cañafistula*) bean pods and pineapple (*piña*) fruit rind. For diarrhea and intestinal parasites, a tea is prepared with *guajabo* leaves and/or flowers combined with the leaves of coffee (*café*), wild privet senna (*sen*) and wormseed (*apazote*). To treat skin disorders (including *paño*), the leaves are prepared as a decoction and used externally as a wash.

**Availability:** Dried leaves can be purchased from select *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) in New York City.

## BOTANICAL DESCRIPTION

*Guajabo* (*Senna alata*) is a shrub that grows to 3 m tall and has many branches emerging from the base of the plant. Leaves are pinnately compound with 5-12 pairs of opposite leaflets which are oblong to oval in shape, thin and papery in texture, fuzzy on the underside and rounded at the tip with a strongly asymmetric base and smooth leaf-edges. Flowers are clustered at the leaf bases and have yellow petals. Fruits are leguminous seeds pods (10-17 cm long), oblong in shape with a longitudinal wing along the side of the opening and contain wedge-shaped, brown seeds (Acevedo-Rodríguez 1996).

**Distribution:** This plant is most likely native to the South America, particularly the Orinoco and Amazon basins, but is naturalized throughout the tropics, including the Caribbean. It grows in moist, open areas, is somewhat uncommon and is sometimes cultivated in gardens (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

In one human clinical trial conducted in Thailand, the aqueous leaf extract (120 mL) administered as a single oral dose showed minimal self-limited side effects in 16-25% of patients. These side-effects included abdominal pain, diarrhea, dyspepsia and nausea (Thamlikitkul et al. 1990). For topical use, one clinical trial conducted in India reported that no negative side-effects were observed when the aqueous leaf extract was administered as a single application for the treatment of skin fungal infection (Domadaran & Venkataraman 1994).

**Animal Toxicity Studies:** Animal studies have shown that this plant is relatively safe and non-irritating when applied topically and has not shown toxic effects when administered orally. No evident clinical signs of adverse effects were observed in rabbits when an aqueous extract of the fresh leaf (20%; macerated for 1 hour) was applied (0.6 mL dose) topically to hairless skin for 4, 24, 48 and 72 hours with observations made at each interval (Martinez, Morejon, Boucourt et al. 2003). In mice, no signs of toxicity were observed when the hydroalcoholic leaf extract (10 g dry plant/kg body weight) was administered orally and subcutaneously (Mokkhasmit et al. 1971). No mortality or evident clinical signs of adverse effects were observed when the fresh leaf decoction (30%) was administered orally (6154 mg/kg) in rats and observed continuously for 14 days. Results of histopathology studies did not reveal any organic damage, so this extract was determined to be nontoxic in this study (Martinez, Morejon, Lopez et al. 2003).

**Contraindications:** Contraindicated in patients with: intestinal obstruction (due to stimulation of peristalsis), gastrointestinal inflammatory disease (due to potential irritation), anal prolapse (due to aggravation of bowel's actions), hemorrhoids (due to potential induction of prolapse, stenosis and thrombosis), pregnancy (may cause endometrial stimulation although shown to be safe during pregnancy in human clinical trial), lactation (due to potentially genotoxic and mutagenic constituents), children under age 12 (due to potential dehydration), extended use (due to damage) and abdominal pain or appendicitis of unknown origin (due to the possibility of rupturing by contracting an inflamed organ; Brinker 1998).

**Drug Interactions:** Diuretics (may aggravate potassium loss if co-administered), cardiac glycosides (if herb is over-used or misused, may increase the toxicity of these drugs; Brinker 1998).

## SCIENTIFIC LITERATURE

The following effects of the leaf have been investigated in human clinical trials: constipation treatment and *Pityriasis versicolor* treatment (see "Clinical Data" table below). Leaves and leaf extracts of this plant have demonstrated the following pharmacological effects in laboratory and animal studies: adherence inhibition, anti-inflammatory, antimicrobial, antiplatelet and dermatophilosis improvement (see "Laboratory and Preclinical Data" table below). Much scientific research has been conducted on related *Senna* spp. (see plant profile for *cañafistula* [*Cassia alata*] for more information), particularly on their laxative effects due to the presence of anthraquinones. Biologically active compounds identified in this plant include: aloe emodin, chrysophanol, emodin and rhein; and in the leaf include: chrysarobin, dihydroxymetholantraquinone, rhein glycoside and tannin.

**Indications and Usage:** TRAMIL has designated this herb as "REC" meaning that it is recommended for the following conditions: *paño* (pityriasis versicolor), bumps on the skin, tinea and fungal infections of the skin (*hongos* or interdigital mycosis). For skin infections, pimples or bumps (*granos*) on the skin, chop 50 grams of the leaf (15-20 small leaves) and add them to 1 liter (4 cups) of boiled water; let it sit for 12 hours to infuse; and use this decoction to wash the affected area 2-3 times per day (note: this preparation will not keep for more than 24 hours and should be prepared fresh daily). For skin fungal infections: wash the affected area with soap and water, wash the leaves, crush them to make a poultice and apply 1 spoonful

(5 grams) of this vegetal matter topically on the affected area; cover with a bandage or clean cloth and change 3-4 times daily (Germosén-Robineau 2005, Girón 1988).

### Clinical Data: *Senna alata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Constipation treatment</b>	Leaf infusion (120 mL) administered at bed time; evaluation 24 hrs post-treatment	Multicenter randomized placebo-controlled trial; n=80 adult patients w/ constipation for 72 hrs	Showed significant laxative effect (P < 0.001) w/minimal, self-limited side effects, such as nausea, dyspepsia, abdominal pain & diarrhea in 16-25% of patients	Thamlikitkul et al. 1990
<b>Pityriasis versicolor treatment</b>	Crude aqueous extract of the leaves at varying concentrations	Human clinical trial (n=200 patients w/ <i>Pityriasis versicolor</i> ); single application of treatment w/follow up observation for 9 mos	Cured skin fungal infection & prevented recurrence for up to 1 yr; no negative side effects were observed	Damodaran & Venkataraman 1994

### Laboratory and Preclinical Data: *Senna alata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Adherence inhibition</b>	Crude extract (50 or 95% ethanol & dried); 0.5% (w/v) concentration tested	In vitro: adherence of <i>Streptococcus mutans</i> ATCC 25175 & TPF-1 to glass surface	Active; showed significant effect	Limsong et al. 2004
<b>Anti-inflammatory</b>	Leaf extract from heat-treated laves	In vitro: rat peritoneal exudates cells	Showed strong inhibition of Concanavalin A-induced histamine release, 5-lipoxygenase inhibition & cyclooxygenase inhibition (1 & 2)	Moriyama et al. 2003b
<b>Antimicrobial</b>	Leaf & bark; ethanol & water extracts; compared to standard antifungal drug Tioconazole at equivalent concentration	In vitro: against <i>Aspergillus fumigatus</i> , <i>Microsporium canis</i> , <i>Candida albicans</i> , <i>Staphylococcus aureus</i> & <i>Escherichia coli</i>	Active; water extracts from the bark showed stronger inhibition than ethanol extracts; leaf extract was stronger than bark against <i>S. aureus</i> ; bark extract as potent as standard drug against <i>C. albicans</i> ; no effect on <i>E. coli</i>	Somchit et al. 2003



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiplatelet</b>	Adenine isolated from leaves (1.0 µg/mL final concentration)	In vitro: platelet aggregation induced by collagen or adenosine diphosphate (ADP)	Active in collagen-induced platelet aggregation but not ADP-induced	Moriyama et al. 2003a
<b>Dermatophilosis improvement</b>	Ethanollic leaf extract prepared as an ointment; applied once daily for 8-15 days	In vivo: bovine dermatophilosis in 9 animals with chronic or acute lesions (for which standard antibiotic therapies had failed to work)	Complete recovery & elimination of the infection which did not recur for more than 3 yrs	Ali-Emmanuel et al. 2003

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# Guanábana

## OTHER COMMON NAMES

Custard apple, soursop, sweet apple (English).

## SCIENTIFIC NAME

*Annona muricata* L. [Annonaceae (Custard-apple Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Anxiety
- Bruises
- Common cold
- Contusions and musculoskeletal trauma
- Fever
- Flu
- *Nervios*
- Stress

**Plant Part Used:** Leaves and fruits.

**Traditional Preparation:** Typically the leaves are prepared as a tea by infusion or decoction for a short period of time. The leaves are also used to prepare a bath.

**Traditional Uses:** For the common cold or flu, a tea is prepared using the leaves of *guanábana* combined with cinnamon (*canela*) bark, acerola cherry (*cereza*) leaves and bitter orange (*naranja agria*) leaves. *Guanábana* leaves are used to support recovery from musculoskeletal injury, typically prepared as a tea in combination with lemongrass (*limoncillo*) leaves, sweet orange (*naranja*) leaves and lime/lemon (*limón*) fruit. For menopausal hot flashes, a tea is prepared of the leaves and is considered a relaxant, often combined with the leaves/stalk of lemongrass (*limoncillo*). To calm down anxiety and “nerves” (*los*

*nervios*), a sedative tea is prepared of the leaves along with lemon/lime (*limón*) or sweet orange (*naranja*) leaves and taken internally. For children with fever, a bath is prepared using the leaves of this plant. The fruit is thought to be cold (*frío*) or cooling (*fresco*) and is used as a diuretic and to lower fever.

Healers consider the leaves of this plant to be potentially toxic if taken in large doses, so caution is advised and only small to moderate amounts of the tea should be taken internally. This herb should not be taken for an extended period of time. To avoid extracting too many toxins from this potent plant, herbalists advise that the leaves be boiled only for a very short period of time when preparing a tea/decoction. Herbalists contraindicate eating the fruit during pregnancy or menstruation because it is attributed very cold properties which could cause complications such as menstrual cramps, the accumulation of phlegm and *mucha frialdad en la matriz* (lots of “coldness” in the womb).

**Availability:** Fruits are available in season on a limited basis (as they are highly perishable) at ethnic grocery stores, food markets and fruit stands in Latino/Caribbean neighborhoods. Dried leaves can be purchased from *botánicas* that specialize in selling Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

This tree grows on average 3-8 m in height and has cylindrical stems covered with small, whitish, raised bumps or lenticels. Leaves are alternate and narrowly oval (6-17 cm long) with a thin, papery texture, shiny surface and smooth leaf edges that curl up slightly. Flowers have greenish-yellow, heart-shaped petals. Fruits are fleshy and shaped like a rounded or elongated heart (15-30 cm long) with green skin and covered with small bumps or lumpy spine-like projections. Seeds are numerous, dark brown and surrounded by a tart, white pulp (Acevedo-Rodríguez 1996).

**Distribution:** Native to tropical America, this plant grows in the Caribbean and is often found in disturbed areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

An epidemiological case control study has suggested a possible connection between the ingestion of *Annona* fruits or leaf teas and the incidence of atypical Parkinsonism in the Caribbean (Caparros-Lefebvre & Elbaz 1999). Potentially neurotoxic compounds have been identified in the leaves and other parts of *Annona muricata* and other members of the plant family Annonaceae; however, these compounds were not detected in the fruit pulp or seeds. Compounds detected were reticuline and N-methylcoculaurine which were shown to be toxic to SH-SY5Y neuroblastoma cells and inhibited mitochondrial respiratory complex I. Uptake and accumulation of these benzyloquinoline derivatives in the brain may be related to the high incidence of atypical levodopa-resistant Parkinsonism and progressive supranuclear palsy in Guadeloupe in the French West Indies (Kotake et al. 2004).

**Animal and Laboratory Toxicity Studies:** No mortality was observed in mice given 1-5 g/kg of the aqueous decoction orally (Saravia 1992). No mortality or evidence of toxicity was observed in mice given the leaves at doses of 100 and 2000 mg/kg administered intraperitoneally for 14 days consecutively, resulting in an LD<sub>1</sub> >2000 mg/kg (Rolland et al. 1988). The leaves administered orally to rats resulted in fibrosarcomas, and the topical application in hamsters caused skin cancer development (O’Gara et al. 1971; Dunham et al. 1974).

Plants in the family Annonaceae have been shown to contain annonaceous acetogenins which are powerful, lipophilic complex I inhibitors. Annonacin has been shown to be toxic to mesencephalic dopaminergic neurons by impairing energy metabolism (Lannuzel et al. 2003). In an in vivo study with rats which were intravenously administered annonacin (3.8 and 7.6 mg/kg per day for 28 days), researchers observed neuropathological abnormalities in the basal ganglia and brainstem nuclei, decreased brain ATP levels, inhibition of complex I in brain homogenates, significant loss of dopaminergic neurons in the substantia nigra and a distribution of lesions comparable to that in patients with atypical

Parkinsonism. These results suggests that ingestion of Annonaceae plants may play a role in the development of Guadeloupean Parkinsonism (Champy et al. 2004).

Another related in vitro study has been conducted investigating the potential toxicity of the root bark and two of the most abundant subfractions, coreximine and reticuline, which negatively affected dopaminergic neurons and GABAergic neurons. Results suggest that alkaloids from *Annona muricata* can modulate the function and survival of dopaminergic nerve cells and could conceivably cause neuronal dysfunction and degeneration after repeated consumption (Lannuzel et al. 2002).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

*Guanábana* has demonstrated the following effects in laboratory studies: antiherpetic, antioxidant, antischistosomal, antiviral, cytotoxic, molluscicidal and serotonin antagonist (see “Laboratory and Preclinical Data” table below). Biologically active constituents identified in this plant include: caffeic acid, campesterol, citrulline, coclaurine, coreximine, GABA, HCN, malic acid, methanol, p-coumaric acid, paraffin, procyanidin and reticuline (Duke & Beckstrom-Sternberg 1998). The edible portion of the fruit (the white pulp) is a source of potassium and vitamins B1, B2 and C (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Pending additional research on the potential toxicity and therapeutic effects of this plant in humans, it has been classified as “INV” by TRAMIL meaning that further investigation is needed (Germosén-Robineau 1995).

### Laboratory and Preclinical Data: *Annona muricata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant</b>	Ethanol extract of stem bark	In vivo: albino rats	Inhibited cold immobilization stress-induced increase in lipid peroxidation in the liver & brain of rats	Padma et al. 1997
<b>Antischistosomal &amp; molluscicidal</b>	Ethanol extracts from 6 species of Annonaceae family, including <i>Annona muricata</i> leaves	Evaluated against adult forms & egg masses of <i>Biomphalaria glabrata</i>	Most extracts were shown to be lethal to mollusk; <i>Annona muricata</i> LD <sub>90</sub> (< 20 ppm) values were 8.75 against vector for schistosomiasis; also toxic to snail egg masses	dos Santos & Sant’Ana 2001
<b>Antischistosomal &amp; molluscicidal</b>	27 crude extracts from 26 plant species	Molluscicidal bioassays; <i>Biomphalaria glabrata</i> adults & egg masses	<i>Annona muricata</i> was highly active: LD <sub>50</sub> =11.86 ppm against adults & LD <sub>50</sub> =49.62 ppm against egg masses	dos Santos & Sant’Ana 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiviral</b>	Ethanollic extract	In vitro: Herpes simplex virus-1 (HSV-1) & clinical isolate obtained from human keratitis lesion	Exhibited cytopathic effect of HSV-1 on cells; minimum inhibitory concentration of ethanolic extract: 1 mg/mL	Padma et al. 1998
<b>Antiviral &amp; antiherpetic</b>	Extracts from <i>Annona muricata</i> used as a positive control due to known cytotoxicity and numerous species tested	In vitro: HEp-2 cells; MTT (Tetrazolium blue) & Neutral Red colorimetric assays	Methanolic extract of <i>Annona</i> spp. showed significant antiherpetic activity at therapeutic levels	Betancur-Galvis L et al. 1999
<b>Cytotoxic</b>	5 new compounds isolated from the seeds	In vitro: bioassays using human solid tumor cell lines	Cis-annonacin was selectively cytotoxic to colon adenocarcinoma cells (HT-29) and demonstrated potency 10,000 × stronger than adriamycin, an anti-cancer drug	Rieser et al. 1996
<b>Cytotoxic</b>	Acetogenins isolated from the seeds and leaves of <i>Annona muricata</i>	In vitro: human hepatoma cell lines, Hep G2 & 2,2,15	Showed significant activity	Chang et al. 2003
<b>Cytotoxic</b>	Acetogenins isolated from the seeds of this plant	In vitro: two human hepatoma cell lines, Hep G(2) & 2,2,15	Exhibited significant cytotoxic activity	Liaw et al. 2002
<b>Cytotoxic</b>	Acetogenin compounds isolated from the leaves: muricoreacin and murihexocin C	In vitro: 6 human tumor cell lines with selectivities to the prostate adenocarcinoma & pancreatic carcinoma cell lines	Exhibited significant cytotoxic activity suggesting possible use as an antitumor agent	Kim et al. 1998
<b>Serotonin antagonist</b>	Fruit and leaf extracts & isolated isoquinoline derivatives	In vitro: NIH-3T3 cells stably transfected with the 5-HT1A human receptor	Demonstrated inhibition of the binding of the radioligand to the 5-HT1A receptor; results imply antidepressive effects	Hasrat et al. 1997

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# Guandul

## OTHER COMMON NAMES

*Gandul*, *gandules*, *guandules* (Spanish); pigeon pea (English).

## SCIENTIFIC NAME

*Cajanus cajan* (L.) Mills. Synonym: *Cajanus bicolor* D.C. [Fabaceae (Bean or Pea Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant for the following health conditions (Yukes et al. 2002-2003):

- Abortifacient
- Arthritis
- Inflammation
- Joint pain

**Plant Part Used:** Leaves, roots and seeds (beans).

**Traditional Preparation:** The beans are cooked and ingested. The leaves are applied topically as a poultice. The root is prepared as a tea by decoction and taken orally.

**Traditional Uses:** The beans (pigeon peas) of this plant are used for nutrition and nourishment and prepared as a part of Dominican culinary traditions. For arthritis and joint pain, the leaf is applied locally to the affected area to relieve pain and inflammation. To induce abortion, the root of this plant is boiled to make a strong decoction and taken internally as a tea. In the Caribbean, this plant is used to treat toothache and conjunctivitis (Germosén-Robineau 1995).

**Availability:** Dried roots can be purchased from select *botánicas* in New York City. Beans can be purchased from grocery stores and supermarkets, especially in Latino and Caribbean neighborhoods.

## BOTANICAL DESCRIPTION

*Guandul* (*Cajanus cajan*) is a shrub that typically grows to 3 m tall. Leaves are alternate and pinnately compound, each with 3 leaflets (2.5-10 cm long). On the underside, leaves have yellow spots, resinous dots and are covered with whitish, woolly hairs. Flowers are yellow and red, grow in loose clusters at the

tip of the stem and have bracts and sepals covered with short, rust-colored, wooly hairs. Fruits are oblong bean pods covered with short, soft, gland-bearing hairs and are slightly constricted around the seeds which are green, turning light brown as they mature (Acevedo-Rodríguez 1996).

**Distribution:** Thought to be native to Africa, this plant is an important grain legume that is widely cultivated throughout the tropics and primarily produced in India (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

The seeds (pigeon peas) are cooked as beans and widely consumed as a common foodstuff. No data on the safety of the leaves or root in humans has been identified in the available literature.

**Animal Toxicity Studies:** In rats, the whole plant administered intraperitoneally resulted in toxic effects at 100 mg/kg and at 112.5 mg/kg of the ethanolic (95%) plant extract (Suffness et al. 1988).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

No human clinical trials of this plant have been identified in the available literature. *Guandul* has shown the following effects in preclinical studies: antimalarial (Yarnell et al. 2004), antidiabetic (Grover et al. 2001) and antisickling activity. Cajanone, an isoflavone from the seed and root, has demonstrated antimicrobial and antifungal properties (Dhar et al. 1968, Preston 1977; see “Laboratory and Preclinical Data” table below). Phenylalanine is the active constituent responsible for the antisickling effects of the seed extract (Ekeke & Shode 1990). In addition to hypoglycemic properties, the seed has demonstrated activity in restoring erythrocyte morphology in blood samples from individuals with sickle-cell anemia (Iwu et al. 1988). *Cajanus cajan* is recognized by the Pharmacopeia of Oriental Medicine, 1968 edition (Penso 1980).

Compounds identified in the plant include: 2'-hydroxygenistein, cajanone and ferreirin; root: 2'-O'-methylcajanone, alpha-amyrin, cajaflavanone, cajoisoflavone, cajaquinone, geinstein, isogenistein-7-O-glucoside, lupeol; and seed: cajanin and concajanin (Duke & Beckstrom-Sternberg 1998). The cooked beans are high in potassium and phosphorus, contain moderate amounts of calcium and magnesium and have a low content of iron, zinc, copper and manganese (Nwokolo 1987). The raw beans also contain significant amounts of vitamins B1, B2, B3, B5 and B6 (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** TRAMIL has categorized this plant as “INV” meaning that more investigation is needed before making a clinical recommendation for the use of the leaf decoction in treating toothache and arthritis. To validate the efficacy of traditional use, more research is needed on the antiinflammatory and analgesic effects of the leaf (Germosén-Robineau 1995).

### Laboratory and Preclinical Data: *Cajanus cajan*

Activity/Effect	Preparation	Design & Model	Results	Reference
Antibacterial & antituberculosis	Dry leaf extract; 50 mg/mL dose	In vitro	Active against <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i> & <i>Mycobacterium smegmatis</i>	Boily & Van Puyvele 1986
Antimicrobial	Leaf decoction	In vitro	Active against strains of <i>Shigella flexneri</i> and <i>Staphylococcus aureus</i>	Kambu et al. 1989



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antimicrobial &amp; antigonorrheal</b>	Leaf tincture	In vitro	Active against <i>Neisseria gonorrhoeae</i> , <i>Candida albicans</i> & <i>Staphylococcus aureus</i>	Caceres et al. 1992
<b>Antimalarial</b>	Compounds isolated from roots and leaves: 2 stilbenes (longistylin A & C) & betulinic acid	In vitro	Showed moderately high activity against the chloroquine-sensitive <i>Plasmodium falciparum</i> strain 3D7	Duker-Eshun et al. 2004
<b>Antisickling</b>	Aqueous methanol extract (3:1, v/v) of seeds; 0.5, 1.0, 1.5, 2.0, & 2.5 mg/mL	In vitro: presickled erythrocyte (HbSS) cells	Demonstrated significant, concentration-dependent antisickling activity; due to reversal of presickled erythrocyte cells, results suggest potential use in the management of painful episodes of sickle cell disease	Ogoda Onah et al. 2002

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# Guatapanál

## OTHER COMMON NAMES

*Divi-divi*, *guatapaná*, *cascalote* (Spanish); *Divi divi* (English).

## SCIENTIFIC NAME

*Caesalpinia coriaria* (Jacq.) Willd. Synonyms: *Caesalpinia thomaea* Spreng., *Poinciana coriaria* Jacq. [Caesalpinaceae (Senna Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Cleansing the reproductive system
- Fever
- Inflammation
- Reproductive disorders
- Sexually transmitted infections
- Sore throat
- Tonsillitis
- Toothache

- Vaginal infections

**Plant Part Used:** Dried seeds and seed pods.

**Traditional Preparation:** The seed pods are typically prepared as a gargle or mouth rinse by decoction and are also used as a tea, mouth rinse and vaginal wash.

**Traditional Uses:** *Guatapanál* is most popularly known as a remedy for sore throat and tonsillitis. A decoction of the dried fruits, seeds or fruit husk is prepared by boiling in water and taken as a gargle a few times daily while symptoms persist. Sometimes this gargle preparation is also made with additional ingredients, such as Caribbean pine (*cuaba*) and *bicarbonato* (sodium bicarbonate or baking soda). Oral administration of the fruit decoction is said to lower fever and decrease inflammation and infection. For toothache, mouth and gum inflammation or oral infections, the fruit is boiled with coffee (*café*) and salt to prepare a mouth rinse.

The fruits are also used to make a douche (*lavado vaginal*) for vaginal or ovarian infections, inflammation and swelling; pain in the reproductive organs; menstrual disorders; sexually transmitted infections; and to cleanse the reproductive system. This vaginal wash is sometimes prepared with powdered Massengill, an over-the-counter drug from the pharmacy, together with *guatapanál*; when combined, this pharmaceutical product is said to get rid of the bacteria while the herb works by removing the infection and inflammation..

**Availability:** Dried seed pods can be purchased from select *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) in New York City.

## BOTANICAL DESCRIPTION

*Guatapanál* (*Caesalpinia coriaria*) is a small deciduous tree that typically grows to 7-8 m tall with a trunk diameter of 30 cm. Leaves are feathery and twice divided with 9-17 secondary leaf axes each with 16-24 pairs of tiny, rounded leaflets. Flowers are light yellow to whitish with 5 petals and grow in short clusters at the leaf bases. Fruits are light brown, hard bean pods (3-6 cm long) turning dark reddish brown when mature; they are often concave, curved in a circular form or S-shaped (Little et al. 1974).

**Distribution:** This plant grows in the Caribbean and Central America and is cultivated in tropical regions of the world (Little et al. 1974).

## SCIENTIFIC LITERATURE

No clinical or laboratory data was found by conducting a literature search on Medline and BIOSIS databases using the species name. Phytochemistry studies have shown the fruits of this plant to contain gallic- and ellagen-tannic acids which decompose upon hydrolysis into water and ellagic acid (Loewe 1875 in Felter & Lloyd 1898). These compounds are known to have astringent properties suggesting their therapeutic potential in treating conditions such as diarrhea, sore throat and mucous membrane inflammation. No information has been found on the safety, adverse effects, contraindications, herb-drug interactions or indications and usage of this plant.

A closely related species, *Caesalpinia bonducella* (also commonly called divi-divi) is used in a similar manner: the roasted seeds are taken as a febrifuge and anti-inflammatory agent in India and South America. See medicinal plant entry for “*Brasil*” for information on this and other species of the plant genus *Caesalpinia* (Gruenwald et al. 2004). This plant is important commercially because of the high concentration of tannin and gallic acid in the pods which are used for tanning leather.

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# Guaucí

## OTHER COMMON NAMES

*Guaucil*, *periquito*, *tiquitaque* (Spanish); wild petunia, minnieroot, many roots, Christmas pride (English).

## SCIENTIFIC NAME

*Ruellia tuberosa* L. [Acanthaceae (Acanthus Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Childbirth complications
- Kidney disorders
- *Limpiar el sistema*
- Menstrual disorders
- Pregnancy
- Urinary tract infections
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Roots.

**Traditional Preparation:** Typically prepared as a tea by decoction or infusion and taken internally; may also be added to complex herbal mixtures and prepared as a decoction or tincture, extracted in alcohol.

**Traditional Uses:** *Guaucí* is an important plant for women's health. The root is a common ingredient in herbal remedies prepared with mixtures of multiple plants (*bebedizos* and *botellas*) for women's reproductive health conditions. It is often used for complications associated with childbirth and pregnancy

and can be taken as a remedy for labor pain and to support postpartum recovery. For vaginal or urinary tract infections, a tea is made of the root of *guaucí* and is sometimes combined with Spanish clover (*amor seco*) to cleanse the reproductive system and to treat kidney disorders.

**Availability:** Dried roots can be purchased from *botánicas* that specialize in supplying Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Guaucí* (*Ruellia tuberosa*) is an herbaceous plant that grows to 50 cm tall and has many branches and quadrangular stems emerging from a short woody base. Leaves are clustered at nodes and narrowly oval to oblong in shape. Flowers have lilac-colored to mauve petals with 5 rounded lobes. Fruits are cylindrical brown capsules (Acevedo-Rodríguez 1996).

**Distribution:** This plant grows in open and disturbed areas in the Caribbean and is widely distributed throughout tropical and subtropical America (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Insufficient information is available in the literature on the safety, contraindications, drug interactions and indications and usage of this plant.

## SCIENTIFIC LITERATURE

Laboratory studies have shown the following effects of this plant: analgesic, antibacterial, antioxidant and gastroprotective (see “Laboratory and Preclinical Data” table below.) Major chemical constituents of this plant include flavonoids (Wagner et al. 1971) and the triterpenoid 21-methyl-dammara-22-en-3 $\beta$ ,18,27-triol 1 (Singh et al. 2002). Other plant constituents include: beta-sitosterol, campesterol, hentriacontane, nonacosane and stigmasterol (Duke & Beckstrom-Sternberg 1998).

### Laboratory and Preclinical Data: *Ruellia tuberosa*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Fractions: hexane, dichloromethane, ethyl acetate & methanol (100 mg/mL)	In vitro: Gram positive & Gram negative bacteria	Active; methanol & ethyl acetate fractions showed most potent antibacterial activity; showed particularly strong inhibition of <i>Staphylococcus aureus</i> & <i>Pseudomonas aeruginosa</i>	Wiert et al. 2005
<b>Antioxidant</b>	Methanolic extract & n-hexane, chloroform, ethyl acetate & water fractions	In vitro: DPPH free-radical scavenging & hydrogen peroxide-induced luminal chemiluminescence assays	Active; the ethyl acetate fraction exhibited the strongest activity	Chen et al. 2005
<b>Gastroprotective &amp; analgesic</b>	Crude aqueous extract of the roots (470, 940 & 1880 mg/kg)	In vivo: rats with alcohol-induced gastric lesions	Active; strong dose-dependent effects in reducing size of gastric lesions; also showed mild erythropoietic & moderate analgesic activities	Arambewela et al. 2003

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# Guayacán

## OTHER COMMON NAMES

*Palo santo, palo vencedor* (Spanish); guaiac, guaiacum, lignum vitae, pockwood (English).

## SCIENTIFIC NAME

*Guaiacum officinale* L. [Zygophyllaceae (Creosote-bush Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Alopecia, baldness
- Arthritis
- Sexually transmitted infections

- Skin disorders
- Upper or lower respiratory tract infections

**Plant Part Used:** Wood and resin of heart wood; sold powdered or as sticks.

**Traditional Preparation:** This plant is typically prepared as a tincture, extracted in alcohol or boiled in water as a decoction and applied externally.

**Traditional Uses:** The sticks (*los palos*), branches and wood (*madera*) of this plant are prepared as a tincture in gin (*ginebra*) and used for the treatment of upper or lower respiratory tract infections, skin disorders, arthritis and sexually transmitted infections. For arthritis (*reumatismo*), rub the tincture externally on the affected area and take 1-2 spoonfuls per day internally. To prevent hair loss, the wood is boiled in water to prepare a decoction that is then applied topically to the scalp.

**Availability:** Can be purchased from some *botánicas* that specialize in selling medicinal plants.

## BOTANICAL DESCRIPTION

*Guayacán (Guaiacum officinale)* is a small tree that typically grows 5-10 m tall and has dark brown, shaggy bark that peels off in thick plates. Leaves grow in opposite pairs along branches and are pinnately compound with 1-3 pairs of opposite, oval to oblong leaflets. Flowers are small and pale violet to periwinkle-blue and grow at the branch tips. Fruits are yellowish-orange, flattened capsules which open to reveal hanging seeds surrounded by a bright, scarlet red, fleshy aril (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to tropical America and grows in the Caribbean. It can occasionally be found in dry coastal forests and is sometimes cultivated (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

When appropriate therapeutic doses are used, no health risks or side effects have been identified in the literature associated with this herb. However, cases of skin rashes subsequent to herb intake have been reported and potential adverse reactions of excess use or high dosages include diarrhea, gastrointestinal inflammation (gastroenteritis) and intestinal colic (Gruenwald et al. 2004).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

This plant has shown ant-inflammatory activity in animal studies (see “Laboratory and Preclinical Data” table below). The following additional effects of *Guaiacum* spp. have been demonstrated in laboratory studies (according to a secondary reference): hypotensive and fungistatic (due to saponin content; Gruenwald et al. 2004).

Aqueous extracts of a closely related species, *Guaiacum coulteri*, have shown significant hypoglycemic activity in vivo in rabbits with experimentally-induced diabetes and hyperglycemia (Roman Ramos, Lara Lemus et al. 1992, Roman Ramos, Alarcon-Aguilar et al. 1992). Major chemical constituents that have been identified in species of the *Guaiacum* genus include the following: cresol, essential oil, furoguaiacidin, furoguaiacin, furoguaiaoxidic acid, guaiacene, guaiacol, guaiacetic acid, guaiagutin, guaiaretic acid, guaiasaponin, guaiazulene, guaiene, guaiguttin, guaiol, guaioxide, hydroguaiaretic acid, meso-dihydroguaiaretic acid, officigenin, resin, saponin, tannin and vanillin (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** Approved by the German *Commission E* for the treatment of rheumatism (Blumenthal et al. 1998). *Guaiacum* can be administered as an infusion, decoction, tincture or various commercial preparations including ointments and drops. Average daily dosage is 4-5 g of the powdered wood or 20-40 drops of the tincture. To prepare an infusion or decoction, use 1.5 g of the pulverized wood in 1 cup cold water (150 mL), bring to a boil, remove from heat, infuse for 15 minutes and strain (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Guaiacum officinale*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-inflammatory</b>	Aqueous ethanolic extract	In vivo: rats with carrageenan-induced paw edema	Active at 200 mg/kg in chronic phase of inflammation	Duwiejua et al. 1994

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# Hierba Mora

## OTHER COMMON NAMES

*Yerba mora, mata gallina* (Spanish); black nightshade (English).

## SCIENTIFIC NAME

*Solanum americanum* Miller var. *nodiflorum* (Jacq.) Edmonds. Synonyms: *Solanum nigrum* sensu Britton & P. Wilson, *Solanum nodiflorum* Jacq. [Solanaceae (Nightshade Family)].

**Note:** In New York City, the common name *hierba mora* may also be used for other species in the genus *Solanum*, including *Solanum dulcamara* L. In the Dominican Republic, an additional species used under the same common name is *Solanum nigrescens* M. Martens & Galeotti (Germosén-Robineau 2005).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Allergies
- Cancer
- Childbirth - labor pain
- Cysts
- Infections
- *Limpiar la sangre*
- Postpartum
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Whole herb, usually collected in flower.

**Traditional Preparation:** This plant is typically prepared as a tea by decoction and taken orally.

**Traditional Uses:** This remedy can be prepared in combination with the leaves of the cotton plant (*algodón morado*) and sticks of cinchona (*quina*) wood. *Hierba mora* is also used for cleansing or purifying the blood and for treating allergies and women's health conditions. For labor pain during childbirth and to support postpartum recovery, the leaves are prepared as a multi-herb decoction (*botella* or *bebedizo*) and combined with other ingredients including minnieroot (*guaucí*) root.

**Availability:** This herb is sometimes sold at *botánicas* that specialize in supplying medicinal plants and may be found growing in parks and open, disturbed areas in New York City.

## BOTANICAL DESCRIPTION

*Hierba mora* (*Solanum americanum*) is an herbaceous plant that grows upright to a height of 30-80 cm. Leaves are oval to lance-shaped in general outline (5-17 cm × 2-10 cm). Flowers grow in short, umbrella-like clusters along the sides of branches; petals are white and fused together at the base in a tube-like shape, opening at the end with 5 lobes, surrounding yellow anthers in the center. Fruits are round, fleshy berries turning from yellowish green to purplish black as they mature and containing numerous beige seeds (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to North America and grows in the Caribbean; commonly found along roadsides and in disturbed, moist areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

When administered appropriately, no adverse effects or health hazards have been identified in the literature associated with this herb. However, when taken in excess, cases of overdose have been reported from internal use of large quantities of the fresh leaves due to their high alkaloid content. Symptoms include gastrointestinal irritation, queasiness, vomiting, headache and rarely mydriasis (Gruenwald et al. 2004).

**Animal Toxicity Studies:** TRAMIL investigations of a closely related species, *Solanum nigrescens*: an aqueous extract of the dried leaf (5 g/kg) administered orally to mice did not show signs of acute toxicity (Girón 1992). The fresh fruits of *Solanum americanum* contain alpha-solamargine which was isolated and administered intraperitoneally to rats in lethality studies which determined the LD<sub>50</sub> to be 42 mg/kg body weight and in subchronic toxicity investigations, no significant toxic effects were observed at doses below 35 mg/kg body weight (Al Chami et al. 2003).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In one clinical trial, an extract of this plant has shown anticandidal and vaginal yeast infection improvement effects (see “Clinical Data” table below). In laboratory and preclinical studies, this plant has demonstrated the following activity: anticandidal, antidermatophytic, antifungal, antimicrobial, antitrypanosomal, immunomodulatory and vaginal yeast infection improvement (see “Laboratory and Preclinical Data” table below).

The isolated steroid alkaloid glycosides from this plant have shown the following pharmacological effects in laboratory and animal studies: local anesthetic, sedative and antiulcer (may be due to inhibition of pepsin and hydrochloric acid secretion; Gruenwald et al. 2004). Other major chemical constituents that have been identified in this plant include the following: alkaloids, alpha-solamargine, ascorbic acid, beta-sitosterol, beta-solamargine, chaconine, citric acid, diosgenin, glycoalkaloids, linoleic acid, oleic acid, palmitic acid, saccharopine, saponin, solamargine, solanine, solansodamine, solasodine, solasonine, stearic acid, tannin, titogenin, uttronin, uttrosides and xi-solaninigrin (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** According to TRAMIL, the leaves of the closely related species *Solanum nigrescens* are categorized as “REC” meaning that they are recommended for use in the treatment of excess vaginal discharge or infection, administered as a douche or vaginal wash, prepared from the leaves as a decoction (Germosén-Robineau 2005). According to Gruenwald et al. (2004), *Solanum americanum* can be administered as a powder, tincture, infusion or compress. Average daily dose is 10 drops of liquid extract 2-3 × daily or 5-10 g tincture daily. For external use, a rinse or moist compress can be administered as needed. To prepare a tincture, combine 1 part herb to 1 part alcohol (95% ethanol) by volume. To prepare a compress or rinse, add a handful of herb to 1 liter water and boil for 10 minutes (Gruenwald et al. 2004).

### Clinical Data: *Solanum americanum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anticandidal &amp; vaginal yeast infection improvement</b>	Preparation of ethanolic extract of aerial parts ( <i>Solanum nigrescens</i> ); compared to Nystatin treatment	Clinical trial; 2 groups of 50 women with <i>Candida albicans</i> vaginal infection; treated intravaginally 2 times daily for 15 days	Active; plant preparation cured 90% of patients (determined by negative culture) whereas Nystatin cured 94%	Aguilar 1985

### Laboratory and Preclinical Data: *Solanum americanum*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anticandidal</b>	Hydromethanolic extract (50%) of dry plant; ( <i>Solanum nigrescens</i> )	In vitro: concentration of 0.15 mL/disc	Active against <i>Candida albicans</i>	Girón et al. 1988
<b>Anticandidal &amp; vaginal yeast infection improvement</b>	Preparation of ethanolic extract of aerial parts ( <i>Solanum nigrescens</i> ); compared to Nystatin treatment	Clinical trial; 2 groups of 50 women with <i>Candida albicans</i> vaginal infection; treated intravaginally 2x daily for 15 days	Active; plant preparation cured (negative culture) 90% of patients whereas Nystatin cured 94% (not a significant difference)	Aguilar 1985
<b>Antidermatophytic</b>	Plant extracts ( <i>Solanum americanum</i> )	In vitro: against 5 dermatophyte species	Active	Caceres et al. 1991
<b>Antifungal</b>	Hydroalcoholic (45%) extract of dry leaf; ( <i>Solanum nigrescens</i> )	In vitro	Active against <i>Cryptococcus neoformans</i> , <i>Candida albicans</i> , but not against <i>Aspergillus fumigatus</i>	Cooney et al. 1991
<b>Antimicrobial</b>	Ethanolic extract of the dried leaf (1:10); ( <i>Solanum nigrescens</i> )	In vitro	Active against <i>Bacillus subtilis</i> (0.1 mL/disc); <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i> , <i>Candida albicans</i> (30 µL/disc)	Caceres et al. 1987
<b>Antitrypanosomal &amp; antifungal</b>	Whole dried plant extracted in ethanol, water & dichloromethane ( <i>Solanum americanum</i> )	In vitro & in vivo: mice inoculated with parasite	Active in vitro against yeast <i>Cryptococcus neoformans</i> & in vivo against <i>Trypanosoma cruzi</i> trypomastigotes	Caceres et al. 1998
<b>Immunomodulatory</b>	Leaf decoction; ( <i>Solanum nigrescens</i> )	In vivo: mice	Active; increased lymphocyte population & serum antibody levels	Lara et al. 1991

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# Hierbabuena

## OTHER COMMON NAMES

*Hierba buena, mentha, menta, toronjil, yerba buena* (Spanish); mint, peppermint, spearmint (English)

## SCIENTIFIC NAME

*Mentha* spp.; various species in this genus are used, most commonly *Mentha spicata* (called *hierbabuena* or spearmint) and *Mentha* × *piperita* (*toronjil* or peppermint). [Lamiaceae (Mint Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Anxiety
- Burns
- Diabetes
- Indigestion
- Menstrual cramps (dysmenorrhea)
- Minor skin abrasions
- Stomach ache and abdominal pain
- Stress
- Uterine fibroids

**Plant Part Used:** Leaves, stems, flowers and volatile oil distilled from the fresh aerial parts of the herb in flower.

**Traditional Preparation:** Typically the leaves are prepared as a tea by infusion or decoction.

**Traditional Uses:** *Hierbabuena* leaves and stems (either fresh or dried) make a delicious tea for easing stomach ache, abdominal pain or indigestion. As a tea for the relief of stress and anxiety, this herb is sometimes combined with chamomile (*manzanilla*). They can be prepared as either a hot or cold tea. For diabetes, a tea of the leaves is prepared without sugar or sweetener. For burns or minor abrasions, a poultice is made by crushing or liquefying the fresh leaves so that they exude a small amount of green juice (*zumo*), and this *zumo* is applied to the affected area. For menstrual cramps (*dolores menstruales*), *hierbabuena* is boiled with eggshells (*cáscaras de huevos*) and cinnamon (*canela*) to make a tea.

**Availability:** In New York City, this plant can often be purchased from supermarkets, grocery stores and sometimes at *botánicas* where they may be sold either fresh or dried. Also, this plant can be cultivated in home gardens or occasionally found growing wild in parks.

## BOTANICAL DESCRIPTION

*Hierbabuena* (*Mentha* spp.) is a perennial herb that grows from 30-100 cm. Leaves are narrowly oval to ovate (3-7 cm × 0.8-2.5 cm), have toothed edges and are often hairy on the underside along the main veins. Flowers are densely clustered along slender, terminal spikes from the axils of the leaf bracts; petals are pale lilac, pink or whitish. Fruits are small nutlets. The entire plant is highly aromatic (Bailey Hortorium Staff 1976).

**Distribution:** Native to the Mediterranean region, this plant is now established in Europe and North America, growing along stream banks and moist places and is widely cultivated (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Because negative side effects associated with the appropriate use of this plant occur rarely, *Mentha spicata* can be considered a relatively safe herb when administered properly. Due to the menthol and L-carvone content of the essential oil, it may have a weak potential for sensitization and allergic reaction (Gruenwald et al. 2004). Although negative side effects are rare, oral administration of peppermint oil is associated with the following adverse reactions: abdominal pain, bradycardia, contact dermatitis, dyspepsia, heartburn, hypersensitivity, muscle tremor and perianal burning (McKay & Blumberg 2006; Liu et al. 1997; Lawson et al. 1988; Rees et al. 1979; Pittler & Ernst 1998; Wilkinson & Beck 1994; Morton et al. 1995; Nash et al. 1986; Weston 1987). Ingestion of the essential oil has been linked to abdominal distension and increased flatulence reported in one patient in a clinical trial (Hiki et al. 2003). These effects may be due to the smooth muscle relaxant activity of the essential oil. Menthol vapor resulted in temporary respiratory arrest or lowered respiratory rate and tachycardia in premature infants (n=44; Javorka et al. 1980).

High levels of pesticide residues have been detected in several samples of peppermint through gas chromatography and spectroscopy. Pesticides identified include residues of chlorpyrifos, terbacil, dithiocarbamates and diazinon, and the concentration of these pesticides exceeded the European Union Maximum Residue Levels for tea in 14% of analyzed samples (Sadlo et al. 2006).

**Animal Toxicity Studies:** When an infusion of *M. piperita* (20 g/L) was administered to male Wistar albino rats (n=48) instead of drinking water for 30 days, no signs of nephrotoxicity were observed (Akdogan et al. 2003; Akdogan et al. 2004).

**Contraindications:** Oral administration of this herb, especially the essential oil, is contraindicated in cases of gastroesophageal reflux disease and hiatal hernia because of its relaxing effect on the esophageal sphincter (Lawson et al. 1988). Caution advised in cases of kidney or gallbladder disorders. The essential oil should not be applied topically to the chest or face area of young children, especially near the nose or mouth, due to potential respiratory distress, spasms of the bronchi or larynx, apnea or other adverse effects attributed to menthol, one of the primary constituents (Javorka et al. 1980). Insufficient information is available on the use of this plant during pregnancy or lactation.

**Drug Interactions:** The following potential drug interactions associated with the use of peppermint oil have been identified in the available literature: 5-fluorouracil (administered topically, may increase skin absorption of this drug, based on animal studies; Abdullah et al. 1996); antibacterial medication (may potentiate effects or interact synergistically based on in vitro data; Schelz et al. 2006); benzoic acid (may decrease “percutaneous penetration” of benzoic acid based on an in vitro study; Nielsen JB. 2006);

calcium channel blockers and antihypertensives (may have an additive effect due to calcium channel-blocking activity of the oil shown in animal studies; Beesley et al. 1996); cyclosporine (potential increased oral bioavailability due to CYP 450 3A4 inhibition; Wacher et al. 2002); cytochrome P450 metabolized drugs (may inhibit CYP 450 3A4; Wacher et al. 2002, Dresser et al. 2002; Dresser, Wacher, Wong et al. 2002); and oxytetracycline (may potentiate effects based on in vitro research; Schelz et al. 2006).

## SCIENTIFIC LITERATURE

Pharmacological effects of *Mentha spicata*: essential oil has a high concentration of carvone which imparts the herb with its unique spearmint scent and has demonstrated antispasmodic, carminative, stimulant, antimicrobial and sedative effects (Gruenwald et al. 2004).

Major chemical constituents identified in *Mentha spicata* include: (+)-pulegone, 1,8-cineole, beta-pinene, carvone, caryophyllene, limonene, linalool, menthone, myrcene, rosmarinic acid and viridiflorol (concentration is greater than 1000 ppm; Duke & Beckstrom-Sternberg 1998). Compounds identified in *Mentha* spp. Include hesperidin, limonene, menthofuran, menthol, menthone and menthyl acetate (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** Typical forms of administration include use as an essential oil, tea or concentrate (Gruenwald et al. 2004).

### Clinical Data: *Mentha* spp.

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Tuberculosis supplemental therapy</b>	Essential oil ( <i>Mentha piperita</i> ) inhalation (via 20-min heat evaporation into room atmosphere)	Patients with disseminated & infiltrative pulmonary tuberculosis; duration: 2 months	Showed significant positive effect (26.8% & 58.5% abacillation at doses of 0.01 & 0.005 mL/m <sup>3</sup> , respectively); results suggest use of essential oil as a supplement to combined multidrug therapy	Shkurupii et al. 2002

### Laboratory and Preclinical Data: *Mentha* spp.

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant</b>	<i>M. piperita</i> , <i>M. aquatica</i> & <i>M. spicata</i> leaves (previously frozen) aqueous solution; 2.0 g homogenized in 15 mL buffer	In vitro: Oxygen radical absorbance capacity (ORAC) value	ORAC values: <i>M. piperita</i> = 15.84 ± 0.42 micromol Trolox equivalents (TE)/g fresh weight; <i>M. aquatica</i> = 19.80 ± 0.43 micromol TE/g; <i>M. spicata</i> = 8.10 ± 0.26 micromol TE/g	Zheng & Wang 2001
<b>Antioxidant</b>	<i>M. piperita</i> dried herb	In vitro: Ferric reducing ability of plasma (FRAP) assay	Showed high antioxidant activity with a relative value of 78.5 mmol/g	Dragland et al. 2003

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	<i>M. piperita</i> & <i>M. aquatica</i> essential oil	In vitro: Ability to reduce the radical generator DPPH (2,2-diphenyl-1-picrylhydrazyl) & inhibit OH radical generation in Fenton reaction	<i>M. piperita</i> IC <sub>50</sub> = 2.53 µg/mL in DPPH model & inhibited OH formation in Fenton reaction by 24%; showed greater activity than <i>M. aquatica</i>	Mimica-Dukic et al. 2003
<b>Antitumor</b>	<i>M. piperita</i>	In vitro: Non-12-O-tetradecanoylphorbol-13-acetate (TPA)-type tumor promoter, okadaic acid (OA), which inhibits protein phosphatase-2A	Showed potent inhibition of tumor promoter (86-100%)	Ohara & Matsuhisa 2002
<b>Antitumor</b>	<i>M. piperita</i> aqueous extract	In vitro: 3-amino-1-methyl-5H-pyrido[4,3-b]indole (Trp-P-2), a human carcinogen from cooked meat, in <i>Salmonella typhimurium</i> assay	Strongly inhibited the mutagenicity of this human carcinogen in the Ames test	Natake et al. 1989
<b>Immuno-modulatory</b>	<i>M. piperita</i> ethanol extract	In vitro: Human intestinal epithelial Caco-2 cells	Showed increased secretion of interleukin (IL)-8, probably due to presence of constituent monocyclic sesquiterpene $\alpha$ -humulene	Satsu et al. 2004
<b>Antiviral</b>	Aqueous extracts of peppermint leaves	In vitro: Influenza A, Newcastle disease virus, Herpes simplex virus & Vaccinia virus in egg & cell-culture systems	Showed significant antiviral activity	Herrmann & Kucera 1967
<b>Antiviral</b>	Aqueous extract of <i>M. piperita</i> & water-soluble polar substances	In vitro: human immunodeficiency virus (HIV)-1 in MT-4 cells	Showed strong anti-HIV-1 activity; effective dose = 16 µg/mL; hydrophilic polar compounds inhibited HIV-reverse transcriptase	Yamasaki et al. 1998
<b>Antimicrobial</b>	Essential oils of <i>M. piperita</i>	In vitro: 21 human & plant pathogenic microorganisms; microdilution, agar diffusion & bioautography assays	Moderately inhibited human pathogens; menthol was identified as the primary antimicrobial constituent	Işcan et al. 2002



<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Essential oils of <i>M. piperita</i> , <i>M. spicata</i> & <i>M. arvensis</i> & constituents	In vitro: <i>Helicobacter pylori</i> , <i>Salmonella enteritidis</i> , <i>Escherichia coli</i> O157:H7, methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) & methicillin sensitive <i>S. aureus</i> (MSSA)	Showed dose-dependent inhibition of bacterial proliferation in each strain; also showed bactericidal activity in phosphate-buffered saline	Imai et al. 2001
<b>Antimicrobial</b>	<i>M. aquatica</i> , <i>M. longifolia</i> & <i>M. piperita</i> essential oils	In vitro: pathogenic bacterial & fungi species	All essential oils showed strong antibacterial activity, especially against <i>Escherichia coli</i> strains, & significant fungistatic & fungicidal activity; <i>M. piperita</i> showed the most potent activity	Mimica-Dukić et al. 2003
<b>Antifungal</b>	Peppermint oil	In vitro: 12 pathogenic fungi, including <i>Candida albicans</i> , <i>Trichophyton mentagrophytes</i> , <i>Aspergillus fumigatus</i> & <i>Cryptococcus neoformans</i>	Showed fungicidal activity against 11 of 12 fungi tested with a MIC range of 0.25-10 µL/mL	Pattnaik et al. 1996
<b>Gastrointestinal actions</b>	Aqueous extracts of <i>M. piperita</i> fresh or dried leaf	Animal model: isolated rabbit duodenum with acetylcholine- & barium chloride-induced muscle contraction	Smooth muscle relaxant effect; exhibited decrease in spontaneous activity; dried leaf extract showed more activity than fresh leaf; results suggest mechanism does not involve cholinergic antagonism or adrenergic agonism	Mahmood et al. 2003
<b>Gastrointestinal effects</b>	Peppermint oil (78 µg/mL) & menthol	Animal models: isolated muscle & gastrointestinal preparations, including guinea-pig ileum	Smooth muscle relaxation via calcium channel antagonism; competitively inhibited binding of calcium channel blockers	Hawthorn et al. 1988

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Bile flow (choloretic) stimulant</b>	Peppermint oil & menthol; 25-50 mg/kg administered intravenously	In vivo: anesthetized rats	Active; significantly increased & stimulated bile flow; showed dose- & time-dependent effects	Trabace et al. 1993
<b>Hepatic phase I metabolizing enzyme inhibition</b>	Pretreatment with peppermint tea (2% solution) for 4 wks	In vivo: female Wistar rats (n=5)	Active; significantly decreased cytochrome P450 isoforms	Maliakal & Wanwimolruk 2001

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# Higuereta

## OTHER COMMON NAMES

*Higuera, ricino* (Spanish); castor bean, palma Christi, castor oil plant (English).

## SCIENTIFIC NAME

*Ricinus communis* L. [Euphorbiaceae (Spurge Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Asthma
- Bronchitis
- Childbirth – labor pain
- Postpartum recovery
- Pulmonary infections

**Plant Part Used:** Seeds and the oil made from the seeds.

**Traditional Preparation:** Seed oil.

**Traditional Uses:** The oil made from the seeds of *higuereta* has many reported medicinal uses, most notably for asthma (*pecho apretado*) and bronchitis, often in combination with honey and animal-derived oils such as snake oil (*aceite de culebra*), turtle oil (*aceite de tortuga*), shark oil (*aceite de tiburón*) and/or cod fish oil (*aceite de bacalao*). This combination of oils is sometimes called a *botella*, and different versions of this remedy are traditionally administered to children with asthma.

For bronchitis and pulmonary infections, *higuereta* oil is combined with coffee (*café*) and administered orally. This plant is also used for women's health conditions. For labor pain during childbirth and to support postpartum recovery, *higuereta* oil is combined with the following plants to make a medicinal drink (*bebedizo*): guinea hen-weed (*anamú*), minnieroot (*guaucí*), passionflower (*caguazo*) and annatto (*bija*).

**Availability:** In New York City, castor oil (*aceite de higuereta*) can be purchased from botánicas (Latino/Afro-Caribbean herb and spiritual shops) in glass or plastic bottles.

## SAFETY & PRECAUTIONS

The seeds are strongly emetic and highly toxic when administered orally. In one clinical trial of the seeds administered as a single oral dose, the following adverse effects were observed: dysmenorrhea, headache, loss of appetite, nausea, raised blood pressure, vomiting and weight gain. However, no changes in renal or liver function were detected in laboratory tests (Isichei et al. 2000).

**Animal Toxicity Studies:** Brown Hisex chicks fed a diet containing 0.5% castor oil plant seeds resulted in high mortality, toxic symptoms, lesions and growth changes; the authors advise that "caution should be observed in tropical countries where people are accustomed to chewing castor bean when in need of a laxative" (el Badwi et al. 1995).

**Contraindications:** Castor oil is contraindicated for internal use in the following conditions: intestinal obstruction (due to purgative effects), abdominal pain of unknown cause (due to potential irritation of the stomach) and pregnancy (due to its abortifacient and emmenagogue effects). Because of the risk of severe electrolyte loss due to extended use, the oil should not be taken for more than 8-10 days (Brinker 1998).

**Drug Interactions:** This herb may have negative interactions with the following drugs: cardiac glycosides (possible potentiation of drug effects due to electrolyte loss from frequent use of castor oil) and oil-soluble anthelmintics with potential toxicity (i.e. *Dryopteris filix-mas*) because of increased absorption (Brinker 1998).

## BOTANICAL DESCRIPTION

*Ricino* (*Ricinus communis*) is a shrub or small tree that grows to 1-2.5 m tall and produces abundant clear watery latex. Leaves are alternate and 7-9-palmately lobed. Flowers grow in numerous small, rounded clusters. Fruits are rounded-egg-shaped capsules each containing 3 seeds and covered with soft, spine-like projections. Seeds are rounded-oval in shape (1-1.8 cm long) with a brown, black mottled surface (Acevedo-Rodríguez 1996).

**Distribution:** Native to Africa, this plant is widely cultivated and grows throughout tropical America, including the Caribbean, and is frequently found in disturbed areas (Acevedo-Rodríguez 1996).

## SCIENTIFIC LITERATURE

The following effects of the seed or oil have been investigated in clinical trials: labor induction in post-term pregnancy and contraceptive (see “Clinical Data” table below). In one in vitro study, a lectin from the bean exhibited tumor cell growth inhibition effects (see “Laboratory and Preclinical Data” table below).

### Clinical Data: *Ricinus communis*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
Induce labor in post-term pregnancy	Single oral dose of castor oil (60 mL) vs. no treatment	Clinical: 103 singleton post-term pregnancies with intact membranes at 40-42 wks	30 of 52 women (57.7%) began active labor vs. 2 of 48 (4.2%) receiving no treatment; 83.3% successful births delivered vaginally	Garry et al. 2000
Contraceptive & pathological chemical	Seeds (var. <i>minor</i> ) RICOM-1013-J; single oral dose 2.3-2.5 once per 12 mo	Clinical trial; 50 women volunteers	Showed antifertility & contraceptive efficacy; protected against pregnancy in all subjects for 1 yr; minimal clinical side effects observed & no renal or liver function effects shown in lab tests	Isichei et al. 2000

### Laboratory and Preclinical Data: *Ricinus communis*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
Inhibition of tumor cell growth	Lectin from bean	In vitro	Active	Gurtler & Steinhoff 1972

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# Higüero

## OTHER COMMON NAMES

Calabash (English).

## SCIENTIFIC NAME

*Crescentia cujete* L. [Bignoniaceae (Trumpet-creeper Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Childbirth – labor pain
- Cleansing the reproductive system
- Infertility
- Menopausal hot flashes
- Ovarian cysts
- Postpartum
- Tumors in the reproductive system
- Uterine fibroids

**Plant Part Used:** Fruits and the fresh pulp from inside the fruits.

**Traditional Preparation:** The fruit (ideally fresh) is added to herbal preparations (*bebedizos*) made of several medicinal plants.

**Traditional Uses:** The fruit of *higüero* is reputed to be a particularly cooling plant (*bien fresco*) that is used for treating all types of infections in the body but is particularly used in preparations for women's health. For gynecological conditions, specifically for "cleansing the [reproductive] system" (*limpiar el sistema* or *limpiar la mujer*). In the Dominican Republic, the fresh leaf is heated slightly and the freshly squeezed juice of the leaf is applied to the ear to treat ear infections (Germosén-Robineau 2005).

**Availability:** This medicinal plant is not commonly found in New York City as it is difficult to import the whole, fresh fruit, which is the part that is most often used medicinally. However, the dried shell of the fruit casing is often sold as a bowl for mixing herbs in *botánicas* (Latino herb shops).

## BOTANICAL DESCRIPTION

*Higüero* or calabash (*Crescentia cujete*) is a small tree that grows to 10 m tall. Leaves are tightly bundled along side branches and have an oblong to oval general shape and covered with several dotlike scales. Flowers grow singly or in pairs with yellow- to greenish petals, tinged red along the nerves. Fruits are round to rounded-oval (10-20 cm long) changing color as they mature from green to brown, contain whitish seeds (1 cm long) and hang from trunks or branches (Acevedo-Rodríguez 1997).

**Distribution:** Native to Central America, this plant is widely cultivated in tropical America and common throughout the Caribbean (Acevedo-Rodríguez 1997).

## SAFETY & PRECAUTIONS

No data on the safety of this plant in humans has been identified in the available literature; however, the toxic compound prussic acid (hydrogen cyanide) has been identified in the fruit pulp (Contreras & Zolla 1982).

**Animal Toxicity Studies:** The fruit pulp induced nausea, vomiting and upset stomach and signs of toxicity in birds (Standley 1938). Fruit pulp toxicity has been attributed to the presence of hydrogen cyanide (prussic acid) and in cattle, the fruit pulp induced abortion due to the presence of oxytocic substances that have not yet been identified (Contreras & Zolla 1982).

**Contraindications:** Should not be used by pregnant women due to risk of abortion. Contraindicated for external use in treating ear infections in the following cases: if ear secretions are present and/or perforation of the ear drum is a concern (Germosén-Robineau 2005).

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

No clinical trials of the effects of this plant in humans have been identified in the available literature. *Crescentia cujete* has demonstrated antibacterial, antifungal, anti-inflammatory and antimicrobial in laboratory studies (see “Laboratory and Preclinical Data” table below).

Significant chemical constituents identified in this plant include the following furanonaphthoquinones isolated from the MeCOEt extract: 2S,3S)-3-hydroxy-5,6-dimethoxydehydroiso-alpha-lapachone, (2R)-5,6-dimethoxydehydroiso-alpha-lapachone, (2R)-5-methoxydehydroiso-alpha-lapachone, 2-(1-hydroxyethyl)naphtho[2,3-b]furan-4,9-dione, 5-hydroxy-2-(1-hydroxyethyl)naphtho[2,3-b]furan-4,9-dione, 2-isopropenyl naphtho[2,3-b]furan-4,9-dione and 5-hydroxydehydroiso-alpha-lapachone (Hetzl et al. 1993). The following additional compounds have been identified: triterpenoids, steroids, flavonoid heterosides, phenolics, polyphenols and quaternary alkaloids (Germosén-Robineau 2005).

**Indications and Usage:** TRAMIL has classified this plant as “Recommended” for the external treatment of earache using the fresh juice of the heated leaf applied to the affected area following strict standards of hygiene to avoid contamination or additional infection (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Crescentia cujete*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Ethanol extract of leaf & stem	In vitro	Active against <i>Bacillus subtilis</i> , <i>Pseudomonas aeruginosa</i> , <i>Escherichia coli</i> & <i>Staphylococcus aureus</i>	Contreras & Zolla 1982
<b>Antibacterial</b>	Fruit pulp	In vitro	Inhibited strains of <i>Streptococcus pneumoniae</i>	Caceres 1992
<b>Anti-inflammatory</b>	Hydroalcoholic extract (80%) of leaf; oral dosage: $\geq$ 1200 mg/kg	In vivo: rat; paw inflammation induced by formaldehyde injection	Active in a dose-dependent manner, equivalent or superior to sodium diclofenac 100 mg/kg	Gupta & Esposito Avella 1988



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antimicrobial</b>	Methanol extracts of the leaves & stem bark	In vitro: Gram-positive and Gram-negative bacteria and fungi	Showed broad spectrum of antimicrobial activity	Binutu & Lajubutu 1994
<b>Antimicrobial</b>	Crude extract (related species: <i>Crescentia alata</i> ); concentrations of 5 mg/mL or less	In vitro	Strongly active against <i>Staphylococcus aureus</i> , <i>Enterococcus faecalis</i> , <i>Streptococcus pneumoniae</i> , <i>Streptococcus pyogenes</i> , <i>Escherichia coli</i> & <i>Candida albicans</i>	Rojas et al. 2001
<b>Antimicrobial</b>	Hydroalcoholic extract (95%) of leaf (5 mg/mL)	In vitro	Active against <i>Bacillus subtilis</i> & <i>Staphylococcus aureus</i>	Verpoorte & Dihal 1987
<b>Antimicrobial</b>	Hydroalcoholic maceration of leaf	In vitro	Inhibited growth of <i>Salmonella typhi</i>	Caceres & Samayoa 1989

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antimicrobial</b>	Hydroalcoholic extract (95%) of the fruit pulp	In vitro: against bacteria & fungi	No activity against <i>Bacillus subtilis</i> , <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Pseudomonas aeruginosa</i> , <i>Aspergillus niger</i> & <i>Candida albicans</i>	Le Grand & Wondergem 1986

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# Hinojo

## OTHER COMMON NAMES

*Anís comino*, *anís hinojo* (Spanish); fennel, sweet fennel (English).

## SCIENTIFIC NAME

***Foeniculum vulgare*** Miller. Synonym: *Foeniculum officinale* L. (Note: Botanists dispute the synonymy of these species.) [Apiaceae (Carrot Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Allergies
- Colic
- Digestive disorders
- Flatulence and intestinal gas
- Indigestion
- Inflammation
- Sinusitis
- Stomach ache and abdominal pain
- Women's health conditions

**Plant Part Used:** Seeds and the essential oil extracted from the fresh or dried fruits.

**Traditional Preparation:** Seeds are primarily taken as a tea, often in combination with other anise-like medicinal plants.

**Traditional Uses:** *Hinojo* is associated with other anise-like seeds due to its similarity to the closely related species anise (*anis chiquito*, *Pimpinella anisum*) in appearance, taste and medicinal properties; hence, one of *hinojo*'s common names is *anis hinojo*. The sweet and warming seeds of this plant are prepared as a tea (decoction) for digestive disorders, inflammation, allergies, sinusitis and women's health conditions.

*Hinojo* seeds are also used for stomach ache and abdominal pain, indigestion and gas, prepared as a tea. For a description of the preparation of *té de anís* or *té de los tres anises*, see the medicinal plant entry for *Anís*.

This plant is considered a type of small anise (*anis* or *anis chiquito*) or *anis de semilla* (seed anise) because of its small seeds, as opposed to large anise (*anis grande*) or star anise (*anis de estrella*) which has large, star-shaped dried fruits that contain seeds. Distinguishing between anise and star anise is important because of the potential for contamination of Chinese star anise (*Illicium verum*) by its poisonous look-alike, Japanese star anise (*Illicium anisatum*) which has neurotoxic effects. Typically, children are given seed anise teas (especially for colic), and star anise (*anis de estrella*) is only added to teas for adults.

**Availability:** As a common culinary spice, the dried fruits or seeds can be purchased from most grocery stores and supermarkets and are sometimes sold at *botánicas*.

## BOTANICAL DESCRIPTION

*Hinojo* (*Foeniculum vulgare*) is an erect, multistem, perennial herb that grows to 2 m tall. Stem is smooth, light bluish-green, succulent, becoming hollow with age and bulbous at the leaf base. Roots are stout, woody and carrot-shaped. Leaves are narrow, finely divided and feathery. Flowers are small, yellow and grow in umbrella-like clusters. Fruits are curved, ribbed, seed-like and brown to greenish-grey in color. Entire plant has a characteristic sweet-spicy, hay-like aroma (Bailey Hortorium Staff 1976).

**Distribution:** Native to Europe and the Mediterranean, it is considered an invasive weed and often grows in disturbed areas in temperate regions, particularly along coastal areas (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As the entire plant is edible and is consumed widely, it is generally considered safe. No adverse effects or health risks have been reported when therapeutic dosages are followed, and allergic reactions have rarely been documented, except possibly with patients who are allergic to celery (Gruenwald et al. 2004).

Animal toxicity studies in mice of ethanol extracts of the fruit (seed) with an acute dose of 0.5, 1.0 and 3 g/kg and a chronic dosage of 100 mg/kg per day of the extract did not cause mortality or spermatotoxic effects as administered (Shah et al. 1991). This plant should only be harvested in the wild by a specialist who can identify and distinguish it from poisonous look-alikes of the same botanical family.

**Contraindications:** The oil is contraindicated for epileptics and young children. Strong preparations, such as the essential oil and tincture, are contraindicated during pregnancy. However, the herb itself or infusions of the herb are considered safe for children and pregnant women (Gruenwald et al. 2004).

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

The seeds have been investigated in clinical trials for their use as a treatment for infant colic (see "Clinical Data" table below). According to a secondary reference, the therapeutic effects of the essential oil and the seeds include antispasmodic and antimicrobial activity; in addition, they have been shown experimentally to stimulate gastrointestinal motility and respiratory tract secretions, and the aqueous extract has been shown to raise the mucociliary activity of the ciliary epithelium (Gruenwald et al. 2004).

Biologically active compounds identified in the fruit contain the following compounds: 1,8-cineole, alpha-phellandrene, alpha-pinene, anisaldehyde, anisic acid, apiole, benzoic acid, bergapten, beta-phellandrene, beta-pinene, caffeic acid, camphene, camphor, cinnamic acid, cis-anethole, d-limonene, estragole, fenchone, ferulic acid, fumaric acid, gamma-gamma-tocotrienol, gentisic acid, isoquercitrin, l-limonene, linalool, malic acid, methyl chavicol, myrcene, myristicin, p-hydroxy benzoic acid, p-hydroxycinnamic acid, petroselinic acid, protocatechuic acid, rutin, scoparone, scopoletin, seselin, sinapic acid, trans-anethole, trigonelline, umbelliferone, vanillic acid, vanillin and xanthotoxin (Duke & Beckstrom-Sternberg 1998). Although the bulb is not the part of this plant that is primarily used for medicinal purposes, it is widely consumed as a vegetable and is a significant source of the following nutrients: calcium, copper, dietary fiber, folate, iron, magnesium, manganese, molybdenum, niacin, phosphorus, potassium and especially vitamin C (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Fennel seed and oil have been approved by the *Commission E* for the following health conditions: upper or lower respiratory tract infections (cough, bronchitis, catarrh) and gastrointestinal disorders (flatulence, indigestion, spastic disorders of the gastrointestinal tract, feelings of fullness; Blumenthal et al. 1998). The suggested administration is 0.1 to 0.6 mL of the essential oil after meals, taken internally, for up to 2 weeks. The seed can be crushed or ground for teas or tinctures, administered daily in the following amount: 5-7 g herb per cup of water in an infusion or 5-7.5 g of tincture per day.

### Clinical Data: *Foeniculum vulgare*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Infant colic treatment</b>	Standardized extract: seeds plus chamomile ( <i>Matricaria recutita</i> ) & lemon balm ( <i>Melissa officinalis</i> )	Clinical trial, randomized double-blind placebo-controlled; 93 breastfed colicky infants; 2 × daily for 1 wks	Active; reduced crying time in 85.4% subjects in the treatment group vs. 48.9% reduction in placebo group; no side effects reported	Savino et al. 2005
<b>Infant colic treatment</b>	Seed oil emulsion	Clinical trial, randomized placebo-controlled; 125 colicky infants, 2-12 wks old	Active; fennel oil emulsion eliminated colic (according to Wessel criteria) in 65% (40/62) infants treated (vs. 23.7% in placebo group); no side effects reported	Alexandrovich et al. 2003

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# Jagua

## OTHER COMMON NAMES

*Genipa, caruto* (Spanish); genipap, marmalade box (English).

## SCIENTIFIC NAME

*Genipa americana* L. [Rubiaceae (Madder or Bedstraw Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Common cold
- Cough
- Flu
- Headache
- High blood pressure
- Infections
- Inflammation
- Intestinal parasites
- Kidney disorders
- *Limpiar la sangre*
- Menopausal hot flashes
- Menstrual disorders
- Ovarian cysts
- Sore throat
- Tumors
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Fruit.

**Traditional Preparation:** Typically a drink is prepared by cutting the fresh fruit into pieces, removing the seeds, letting the chunks of fruit sit in water for a period of time (several hours to a few days) and then drinking the water.

**Traditional Uses:** *Jagua* is considered a particularly refreshing fruit, and it is attributed cooling properties. For health conditions that are associated with excess heat in the body, including infection, inflammation, high blood pressure, headache, kidney disorders, “bad blood” (*mala sangre*) and menopausal hot flashes, the fruits are prepared as a drink by soaking them in water. This fruit is also used for cleansing the blood and as a diuretic and is often combined with the juice of other refreshing fruits such as passion fruit (*chinola*), cucumber (*pepino*), pineapple (*piña*), papaya (*lechosa*), large passion fruit (*granadillo*) and watermelon (*sandía*). Sometimes *jagua* is taken along with wild privet senna (*sen*) leaves for a particularly cleansing remedy that is especially good for treating intestinal parasites. For the common cold and flu symptoms (*gripe*), the fruit is prepared as a tea and combined with lemon/lime (*limón*) fruit, lemongrass (*limoncillo*) leaves and bitter orange (*naranja agria*) leaves.

For women’s health, the fruit drink is said to break down clotted or coagulated blood (*coágulo*) in the uterus so that it can pass with the menstrual blood and thus prevent the formation of cysts, uterine fibroids or tumors. This is thought to be particularly important as a woman approaches menopause (*el cambio de vida*) because these blood clots can accumulate in the uterus once menstruation ceases. A refreshing drink for menopausal symptoms and hot flashes is prepared by adding water to fresh pieces of *jagua* fruit and pineapple (*piña*) rind and allowing the fruit to ferment and impart its flavor to the water for a week. This remedy can be taken daily as needed.

**Availability:** In New York City, fresh *jagua* fruit can sometimes be purchased from fruit stands in Latino/Dominican neighborhoods, at select markets or grocery stores and occasionally at *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) but are often quite expensive (up to \$10 per fruit).

## BOTANICAL DESCRIPTION

*Jagua* (*Genipa americana*) is a tree that typically grows 10-15 m tall and has dark gray, smooth bark and cylindrical, rough twigs. Leaves are simple and narrowly oval to oblong-lance-shaped. Flowers grow in small, round clusters with cream-colored petals. Fruits are round to oblong (7-10 × 6-7 cm) and brown, containing numerous circular, flattened seeds (Acevedo-Rodríguez 1996).

**Distribution:** Widespread throughout the Caribbean and Central and South America, it is found in secondary moist forests (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

The fruit, which is the part that is used for medicine, is widely consumed and commonly prepared as a beverage in areas where it grows.

**Animal Toxicity Studies:** Toxicity studies have shown that the LD<sub>50</sub> of the hydromethanolic extract (1:1) of the leaves and branches administered intraperitoneally to mice is 1 g/kg body weight (Nakanishi et al. 1965).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Compounds from the fruit and leaf have demonstrated antitumor-promoting effects (see “Laboratory and Preclinical Data” table below). The following pharmacological activities of this plant’s constituents have been demonstrated in laboratory experiments: antimicrobial (monoterpenes: genipic and genipinic acid; Tallent 1964), osmotic diuretic (manitol; Negwer 1987) and antitumor (iridoid glucosides: geniposide and geniposidic acid; Ueda et al. 1991).

The following additional chemical constituents have been identified in this plant: iridoids: gardendiol, genipin, deacetyl asperulosidic acid methyl ester and shanzhiside; iridoid glucosides: genamesides A-D, geniposidic acid, geniposide, gardenoside and genipin-gentiobioside; monoterpenoids: genipacetal, genipamide and genipaol (Ono et al. 2007, Ono et al. 2005). Nutritional studies have shown the fruit to be a rich source of iron, riboflavin and tannins; it also contains amino acids, manitol and vitamin C (Fihlo et al. 1962, Guedes & Oria 1978). This fruit is notorious for its ability to stain the skin and was historically used by the Taino in the Caribbean as a black or blue pigment and body paint (Morton 1987).

**Indications and Usage:** TRAMIL has provisionally classified the use of the fruit for the treatment of arterial hypertension as “recommended” (Germosén-Robineau 1995). Caution is advised as this is a provisional recommendation, pending further research on its therapeutic properties and is only recommended as a complementary or adjunct therapy.

### Laboratory and Preclinical Data: *Genipa americana*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antitumor</b>	Fruits & leaves	Phytochemical analysis	Identified antitumor-promoting iridoid glucosides in plant: geniposide & geniposidic acid	Ueda et al. 1991

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# Jengibre

## OTHER COMMON NAMES

*Gengibre* (Spanish); ginger, common ginger, true ginger, Canton ginger (English).

## SCIENTIFIC NAME

*Zingiber officinale* Roscoe [Zingiberaceae (Ginger Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis



- Childbirth – labor pain
- Fever
- Flatulence and intestinal gas
- Indigestion
- Joint pain
- Morning sickness
- Nausea
- Postpartum recovery

**Plant Part Used:** Root-stem (rhizome)—ideally fresh but also dried and powdered. Although ginger is often referred to as a root, technically the part of this plant that is most often used for medicine is the rhizome or underground stem of the plant.

**Traditional Preparation:** Typically prepared as a tea by decoction or infusion and may also be tinctured in alcohol for topical application.

**Traditional Uses:** It has been used as a tea to treat indigestion, flatulence, intestinal gas, morning sickness (in small doses), labor pain during childbirth, postpartum recovery and to reduce fever. For arthritis and joint pain, it is combined with *malagueta* seeds, tinctured in alcohol and applied externally by rubbing it on the affected area.

**Availability:** As a popular culinary seasoning, *jengibre* fresh and/or dried rhizomes can be found at many grocery stores and super markets and are also sold at some *botánicas* (Latino/Afro-Caribbean herbal and spiritual shops).

## BOTANICAL DESCRIPTION

*Jengibre (Zingiber officinale)* is an herbaceous plant that can grow to 50 cm tall with aromatic, tuberous rhizomes and erect, leafy, cane-like stems. Leaves are elongate and occur in two vertical rows along stems with parallel venation. Flowers are arranged in dense terminal spikes with 3-lobed, yellow-green petals. Fruits are 3-valved capsules; however, most cultivars are sterile (Bailey Hortorium Staff 1976).

**Distribution:** Native to tropical Southeast Asia, this plant is widely cultivated in tropical, subtropical and warm temperate regions (Bailey Hortorium Staff 1976).

## SAFETY AND PRECAUTIONS

Widely used as a culinary seasoning, the root (rhizome) is generally considered safe for human consumption and has been designated as GRAS (“Generally Recognized as Safe”) for use as a flavoring agent by the US FDA in 1976 (Section 582.10; Anon 1976).

In a randomized, multiple crossover human clinical trial, 9 healthy women and 9 men ingested 40 g/day of the rhizome for two weeks, and venous blood samples showed no significant thromboxane B2 production compared to placebo at the end of the treatment period (Vaes & Chyka 2000). Allergenic activity of the juice has been reported in human adults based on reactions to patch tests when applied topically to individuals who had already been exposed regularly to this substance whereas those who had not been exposed previously showed few reactions of hypersensitivity (Seetharam & Pasricha 1987).

**Animal Toxicity Studies:** The LD<sub>50</sub> in mice of the hydroalcoholic extract (1:1) of the dried aerial parts administered intraperitoneally was 178.0 mg/kg (Aswal et al. 1984). Toxic effects were observed in mice when administered a dose of 3.00 g/kg of the ethanolic extract of the rhizome intragastrically (Mascolo et al. 1989). Embryotoxic effects of the infusion of the dried rhizome (20.0 g/L) administered in drinking water have been shown in pregnant rats on days 6-16 of gestation; results of the treatment group showed

twice the embryonic loss as that of the control group (Wilkinson 2000). No teratogenic activity was observed in pregnant rats administered the ethanolic extract (95%) of the dried rhizome intragastrically (Weidner & Sigwart 2001). No toxic effects were observed in rabbits when administered an extract of the rhizome via gastric intubation at a dose of 1-118 g/animal (Emig 1931).

Death occurred in rabbits after intravenous administration of the ethanolic extract (95%) of the dried rhizome at a dose of 1.5 mL (Emig 1931). However, no toxic effects (i.e. no change in respiration, blood pressure or heart rate) were observed in dogs when intravenously administered the ethanolic extract (95%) at a rate of 1 mL/per minute to achieve a dose of up to 50 mL/animal (Emig 1931). The LD<sub>50</sub> in mice of the benzene extract of the dried rhizome administered intraperitoneally was shown to be 1000 mg/kg (Vishwakarma et al. 2002). The LD<sub>50</sub> of the ethanolic (90%) extract administered intraperitoneally in mice was 1.0 g/kg (Woo et al. 1979). The LD<sub>50</sub> of the aqueous low speed supernatant of the dried rhizome administered intravenously to mice was 1500 mg/kg (Hantrakul & Tejason 1976).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Preparations of the rhizome have shown synergistic effects with nifedipine on anti-platelet aggregation when administered orally to adult human volunteers and patients with hypertension (Young et al. 2006). The aqueous-methanolic extract (1:1) showed significant barbiturate potentiation (P < 0.01) in mice when 10.0 g/kg was administered subcutaneously (Kasahara et al. 1983).

## SCIENTIFIC LITERATURE

In human clinical trials, the following effects have been evaluated: antiarrhythmic, antiemetic, anti-inflammatory, antimigraine, anti-motion sickness, antinauseant, antiplatelet, antivertigo, fibrinolytic, gastric motility stimulant, gastric mucosal exfoliant and platelet aggregation inhibition (see “Clinical Data” table below).

In laboratory and preclinical studies, this plant has shown the following effects: analgesic, anesthetic, anthelmintic, antiatherosclerotic, antibacterial, anticonvulsant, antidiabetic, antiedema, antiemetic, antifungal, antihepatotoxic, antihypercholesterolemic, antihypothermic, anti-inflammatory, antimalarial, antinauseant, antinematodal, antiobesity, antioxidant, antipyretic, antisecretory, antispasmodic, antitumor-promoting, antiulcer, antiviral, anxiolytic, arachidonate metabolism inhibition, carcinogenesis inhibition, central nervous system stimulant, chemokine expression, choloretic, cholesterol level decrease, cholesterol synthesis inhibition, cyclooxygenase 2 inhibition, cytokinin antagonist, diuretic, Epstein-Barr virus early antigen activation inhibition, gastric emptying time, gastric motility stimulant, HIV-1 integrase inhibition, hypocholesterolemic, hypoglycemic, hypolipidemic, hypotensive, hypotriglyceridemic, immunoglobulin production inhibition, immunostimulant, interleukin-1-alpha release inhibition, interleukin-1-beta release inhibition, lipid peroxidase inhibition, monoamine oxidase activity increase, platelet aggregation inhibition, positively inotropic, prostaglandin inhibition, protease inhibition, respiratory stimulant, serotonin (5-HT) antagonist, smooth muscle relaxant, thermogenic, tyrosinase inhibition, white blood cell stimulant (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** TRAMIL (Germosén Robineau 2005) classified this species as “recommend” for the treatment of asthma, cough, cold, influenza, fever, nausea, diarrhea, stomach ache, intestinal gas and indigestion. However, medical attention is mandated if the symptoms do not improve within 2 days, and in general, in the case of a serious cold, this is considered a complementary rather than a primary treatment with initial medical evaluation recommended. This plant should not be used during lactation nor if the patient is a child younger than 6 years of age

### Clinical Data: *Zingiber officinale*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiarrhythmic</b>	Fresh rhizome methanol-insoluble fraction; dose: 1.0 g given orally; compared with prostaglandin E1 analog misoprostol (400 µg)	Double-blind placebo controlled human clinical trial; healthy adult volunteers (n=22) with hyperglycemia-induced gastric slow wave dysrhythmias via endogenous prostaglandins	Active; showed statistically significant results ( $P < 0.05$ ) in preventing gastric slow wave dysrhythmias caused by acute hyperglycemia but did not affect dysrhythmias due to prostaglandin E1 analog; results suggest that ginger's mechanism involves a reduction of the production of prostaglandins instead of hindering their action	Gonlachanvit et al. 2003
<b>Antiemetic</b>	Rhizome; dose: 1.0 g/person, administered orally	Double-blind, randomized cross-over clinical trial; pregnant women with hyperemesis gravidarum during pregnancy	Active; ginger was more effective than placebo in reducing emesis	Fischer-Rasmussen et al. 1990
<b>Antiemetic</b>	Rhizome powder; dose: 1.0 g/person	Double-blind, randomized placebo-controlled clinical trial; patients with nausea who were undergoing same-day gynecological laparoscopic surgery (n=120)	Showed antiemetic activity	Phillips et al. 1993
<b>Antiemetic</b>	Dried rhizome; dose: 2.0 g/day, given orally; 3. cycles of treatment (vs. metoclopramide & ondansetron)	Double-blind, randomized placebo-controlled clinical trial; human adult patients (male & female) taking cyclophosphamide	Active; ginger decreased nausea by 62% & vomiting by 68%; results showed that ginger was less effective than ondansetron & more effective than metoclopramide	Sontakke et al. 2003
<b>Antiemetic</b>	Dried rhizome; dose: 1.0 g/day	Double-blind placebo-controlled clinical trial; patients with nausea & vomiting induced by chemotherapy	Active	Sontakke et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiemetic &amp; anti-nauseant</b>	Rhizome administered orally (1.0 g/day) vs. identical placebo; administered for 4 days	Randomized, double-blind, placebo-controlled human clinical trial; women with nausea & vomiting due to pregnancy at or before 17 wks' gestation (n=70)	Showed significant decrease in number of vomiting episodes, severity of vomiting (based on visual analogue-scales) & symptom Likert scale of symptom severity pre- & post-therapy vs. placebo group; no adverse effects on pregnancy outcomes were observed	Vutyavanich et al. 2001
<b>Anti-inflammatory</b>	Rhizome extract; dose: 510.0 mg/day; duration: three weeks; vs. ibuprofen & placebo	Randomized, controlled, double-blind, cross-over study with one-week washout period; human adults with osteoarthritis of the hip or knee	Did not show significant activity compared to placebo although did show improvement during initial explorative tests during first treatment	Bliddal et al. 2000
<b>Anti-inflammatory</b>	Fresh rhizome powder	Human clinical trial: rheumatoid arthritis patients (n=28) with osteoarthritis (n=18) or muscular discomfort (n=10)	Active; results showed relief of pain & swelling in 75% of arthritis patients; all patients with muscular discomfort reported relief in pain; proposed mechanism involves inhibition of prostaglandin & leukotriene biosynthesis	Srivastava & Mustafa 1992
<b>Antimigraine</b>	Rhizome, administered sublingually as part of Gelstat migraine product (combined with feverfew)	Clinical trial: human adults, both male & female, with acute migraine (n=30); administered during mild pain phase	Showed therapeutic potential as treatment for acute migraine	Cady et al. 2005
<b>Anti-motion sickness &amp; antivertigo effect</b>	Dried rhizome powder; dose: 1.0 g/person, administered orally	Human clinical trial; seasickness on the open sea	Active	Grontved et al. 1988
<b>Anti-motion sickness effect</b>	Dried rhizome powder; dose: 940.0 mg/person administered orally	Clinical trial; human volunteers susceptible to motion sickness (n=36)	Active	Mowrey & Clayson 1982

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antinauseant</b>	Dried rhizome powder; dose: 250.0 mg/person, given orally, 4 × daily for 4 days	Placebo-controlled human clinical trial: women with hyperemesis gravidarum (n=30); 2-day washout period	Active; significant improvement, diminishment or elimination of symptoms compared to placebo based on scoring systems of symptom relief & severity; no adverse effects were reported	Fischer-Rasmussen et al. 1991
<b>Antinauseant</b>	Fresh rhizome; dose: 250.0 mg/person given orally	Double-blind placebo-controlled clinical trial: healthy volunteers (n=1761)	Active; showed efficacy as a treatment for seasickness	Schmid et al. 1995
<b>Antiplatelet</b>	Rhizome powder; dose: 5.0 g/person	Human clinical trial; adults with ADP- or epinephrine-induced aggregation	Active	Verma et al. 1993
<b>Antivertigo</b>	Rhizome; dose: 1.0 g/person, given orally	Controlled clinical trial; human adults	Active	Grontved & Hentzer 1986
<b>Fibrinolytic</b>	Dried rhizome powder; 5 g administered orally	Human clinical trial; administered fatty meal with 50 g of fat to healthy adult volunteers (n=30)	Prevented fall in fibrinolytic activity induced by fatty meal & significantly increased fibrinolytic activity (P < 0.001)	Verma & Bordia 2001
<b>Gastric motility stimulant</b>	Dried rhizome, hydro-alcoholic extract; 200.0 mg/day, administered orally	Randomized double-blind placebo-controlled clinical trial; two-period crossover study; male volunteers (n=12)	Fasting & postprandial gastroduodenal motility measured by stationary manometry; showed significant increase in gastroduodenal motility & motor response to test meal, during fasting & overall	Micklefield et al. 1999
<b>Gastric mucosal exfoliant</b>	Fresh rhizome aqueous extract; dose = 6.0 g/person administered intragastrically	Human clinical trial; adult volunteers	Active; showed significant increase in exfoliation of epithelial cells of the gastric surface	Desai et al. 1990
<b>Platelet aggregation inhibition</b>	Powdered dried rhizome; dose: 10.0 g; given orally	Controlled clinical trial	Active; showed significant reduction in platelet aggregation induced by ADP & epinephrine	Bordia et al. 1997

### Laboratory and Preclinical Data: *Zingiber officinale*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic</b>	Dried rhizome juice; dose: 199.8 mg/animal, administered intragastrically	In vivo: mice; tail flick response to radiant heat model	Active; showed analgesic effect equivalent to that of 10 mg/kg b.w. aspirin	Latifah 1987
<b>Analgesic</b>	Dried rhizome aqueous-methanolic extract (1:1), administered subcutaneously	In vivo: mice; inhibition of acetic-acid induced writhing model	Active; at a dose of 10.0 g/kg showed analgesic effects	Kasahara et al. 1983
<b>Anesthetic</b>	Rhizome, hot water extract; 1.0% concentration, applied topically	Frog sciatic nerve	Active	Sugaya et al. 1979
<b>Anthelmintic</b>	Dried rhizome saline extract	<i>Anisakis</i> spp. larvae (anisakiasis-causing parasitic nematode)	Active at a concentration of 2.5%; showed 100% larvicidal effect	Kasuya et al. 1988
<b>Antiatherosclerotic &amp; hypolipidemic</b>	Dried rhizome, aqueous-ethanolic extract (50%); dose: 500.0 mg/kg, administered intragastrically	In vivo: male cholesterol-fed rabbits	Active; showed reduction in atherogenic index from 4.7 to 1.2 & lowered LDL- & total cholesterol levels	Sharma et al. 1996
<b>Antibacterial</b>	Rhizome, ethanolic extract (80%)	In vitro: agar plate against <i>Bacillus subtilis</i> , <i>B. anthracis</i> , <i>Staphylococcus aureus</i> , <i>S. epidermidis</i> , <i>S. hemolyticus</i> , <i>Salmonella typhi</i> , <i>Escherichia coli</i> , <i>Proteus mirabilis</i> & <i>Pseudomonas aeruginosa</i>	Active at a concentration of 500.0 µg/disc	Mascolo et al. 1989
<b>Antibacterial</b>	Dried rhizome, methanolic extract	In vitro: agar plate; <i>Helicobacter pylori</i>	Active; MIC = 25.0 µg/mL	Mahady et al. 2000

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<b>Antibacterial</b>	Fresh rhizome aqueous extract	In vitro: agar plate against <i>Pseudomonas aeruginosa</i> , <i>Proteus mirabilis</i> , <i>Salmonella paratyphi</i> , <i>S. typhi</i> , <i>Klebsiella pneumoniae</i> , <i>Escherichia coli</i> , <i>Enterococcus faecalis</i> , <i>Chromobacterium violaceum</i> , <i>Bacillus subtilis</i> & <i>Staphylococcus aureus</i>	Active at a concentration of 0.3 mL/well	Srinivasan et al. 2001
<b>Anticonvulsant</b>	Rhizome, hot water extract	In vitro: snail neurons with metrazol-induced bursting	Active; showed inhibition of abnormal bursting activity induced by metrazol in snail neurons	Sugaya et al. 1978
<b>Anticonvulsant, anxiolytic &amp; antiemetic</b>	Dried rhizome, benzene extract; dose: 20.0, 30.0 & 30.0 mg/kg respectively; administered intraperitoneally	In vivo: male rats with experimentally-induced convulsions	Active	Vishwakarma et al. 2002
<b>Antiedema</b>	Rhizome, methanolic extract; dose: 2.0 µg/ear, applied topically	In vivo: mice with experimentally-induced ear inflammation (12-O-tetradecanoylphorbol-13-acetate (TPA))	Active; showed an inhibition ratio (IR) of 9	Yasukawa et al. 1993
<b>Antiemetic</b>	Dried rhizome, CHCl <sub>3</sub> extract; dose: 1.0 g/kg, administered intragastrically	In vivo: frogs with copper sulfate-induced emesis	Active	Kawai et al. 1994
<b>Antiemetic</b>	Dried rhizome, acetone extract; dose: 200.0 mg/kg, administered intragastrically	In vivo: male & female dogs with cisplatin-induced emesis	Active	Sharma et al. 1997

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiemetic</b>	Dried rhizome administered orally; dose: 2.0 g/day; compared with droperidol 1.25 mg or both ginger & droperidol	Randomized placebo controlled clinical trial; human female adults (n=120) scheduled for gynecological diagnostic laparoscopy	Inactive; did not show significant decrease in postoperative nausea & vomiting compared to placebo or positive control	Visalyaputra et al. 1998
<b>Antiemetic &amp; anti-nauseant</b>	Rhizome powder administered orally; dose = 0.5 g	Clinical trial: pregnant women with major gynecological surgery (n=60)	Active	Bone et al. 1990
<b>Antiemetic mechanism</b>	Fresh rhizome; dose: 1.0 g/person, orally	Double-blind placebo-controlled trial; human adults	Determined mechanism of antiemetic action does not involve the central nervous system (nystagmus response to optokinetic or vestibular stimuli) but rather most likely is due to ginger's influence on the gastrointestinal system	Holtmann et al. 1989
<b>Antifungal</b>	Essential oil (full strength concentration)	In vitro: agar plate	Active against several species of fungi including <i>Aspergillus candidus</i> , <i>A. flavus</i> , <i>A. fumigatus</i> , <i>A. nidulans</i> , <i>Trichophyton rubrum</i> , <i>Mucor mucedo</i> , <i>Penicillium digitatum</i> , <i>Microsporum gypseum</i> , <i>Rhizopus nigricans</i> , <i>Helminthosporium saccharii</i> , <i>Cladosporium herbarum</i> , <i>Trichothecium roseum</i> & <i>Cunninghamella echinulata</i>	Sharma & Singh 1979
<b>Antihepatotoxic</b>	Fresh rhizome ethanolic (95%) extract; dose: 100.0 mg/kg, administered intragastrically	In vivo: male & female rats with country-made-liquor-induced injury	Active	Bhandari et al. 2003
<b>Anti-hepatotoxic</b>	Dried rhizome	In vitro: cell culture of liver cells	Active against D-galactosamine- & CCl <sub>4</sub> -induced hepatotoxicity	Hikino 1985
<b>Anti-hypercholesterolemic</b>	Oleoresin administered orally	In vivo: rats fed high cholesterol diet to induce hypercholesterolemia	Active; inhibited cholesterol absorption; parameters measured: serum & hepatic cholesterol levels	Gujral et al. 1978



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-hypercholesterolemic</b>	Dried rhizome: ethanolic extract (95%); dose: 200.0 mg/kg, administered intragastrically	In vivo: cholesterol-fed male rabbits	Active; showed decrease in serum cholesterol levels	Bhandari, Sharma et al. 1998
<b>Anti-hyperglycemic &amp; antidiabetic</b>	Rhizome, ethanolic extract (100%); dose: 250.0 mg/kg; administered intragastrically	In vivo: albino rats	Active as shown in oral glucose tolerance tests	Kar et al. 1999
<b>Antihyperglycemic &amp; antidiabetic activity</b>	Dried rhizome ethanolic extract (95%); dose: 250.0 mg/kg, administered intragastrically	In vivo: male rats with alloxan-induced hyperglycemia	Active	Kar et al. 2003
<b>Antihyperlipidemic</b>	Fresh rhizome ethanolic (95%) extract; administered intragastrically	In vivo: male rabbits	Active	Bhandari, Grover et al. 1998
<b>Antihypothermic</b>	Fresh rhizome acetone extract; dose: 100.0 mg/kg via gastric intubation	In vivo: mice with serotonin-induced hypothermia	Active	Huang et al. 1990
<b>Anti-inflammatory</b>	Rhizome, hot water extract, dose: 2.0 g/kg, administered intragastrically	In vivo: rats with formalin-induced paw edema	Active	Basavarajaiah et al. 1990
<b>Anti-inflammatory</b>	Rhizome, ethanolic extract (80%); dose: 50.0 mg/kg administered intragastrically	In vivo: rats with carrageenan-induced paw edema	Active	Mascolo et al. 1989
<b>Anti-inflammatory</b>	Dried rhizome methanolic extract; dose: 20.0 µL/animal	In vivo: mice with 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced ear inflammation	Active	Okuyama et al. 1995

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory</b>	Fresh rhizome hydro-alcoholic extract given intraperitoneally	In vivo: rats with carrageenan-induced paw edema & serotonin-induced paw & skin edema	Active; significantly inhibited paw & skin edema	Penna et al. 2003
<b>Antimalarial</b>	Dried rhizome aqueous-ethanolic (1:1) extract	Plasmodium falciparum	Active	Etkin 1997
<b>Antinematodal</b>	Rhizome, methanolic extract; 1.0 mg/mL	Against larvae of the parasitic nematode <i>Toxocara canis</i>	Active	Kiuchi et al. 1989
<b>Antiobesity</b>	Dried rhizome, methanolic extract; dose: 250.0 mg/kg, administered intragastrically	In vivo: female mice with gold thioglucose-induced obesity	Active	Goyal & Kadnur 2006
<b>Antioxidant</b>	Rhizome, ethanolic extract (75%)	In vitro & in vivo: rats with alloxan-induced diabetes	Active; IC <sub>50</sub> = 22.0 µg/mL	Sabu & Kuttan 2003
<b>Antioxidant</b>	Rhizome: juice, aqueous high speed supernatant & hot water extract	In vitro	Active at concentrations of 0.02 mL, 0.04 mL & 0.02 mL, respectively	Lee et al. 1986
<b>Antioxidant</b>	Rhizome; given as 5.0% of diet	In vivo: rats	Active	Afshari et al. 2007
<b>Antipyretic</b>	Rhizome, ethanolic extract (80%); dose: 100.0 mg/kg, administered intragastrically	In vivo: rats with hyperthermia induced by yeast injection	Active	Mascolo et al. 1989
<b>Antipyretic &amp; interleukin-1-alpha release inhibition</b>	Dried rhizome, hot water extract; dose: 20.0 mg/mL, administered intragastrically	In vivo: female mice with influenza virus infection	Active	Kurokawa et al. 1998

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antisecretory</b>	Dried rhizome aqueous-methanolic extract (1:1); dose: 10.0 g/kg (dry weight of plant), administered subcutaneously	In vivo: mice	Active; showed significant gastric antisecretory activity (P < 0.05)	Kasahara et al. 1983
<b>Antispasmodic</b>	Dried rhizome, acetone extract	In vitro: isolated rat ileum with electrically induced contractions	Active at a concentration of 1.0 µg/mL	Borrelli et al. 2004
<b>Antispasmodic</b>	Dried rhizome, ethanolic extract (95%)	Isolated rabbit ileum with acetylcholine-induced contractions	Active	Annamalai & Manavalan 1990
<b>Antispasmodic</b>	Dried rhizome ethanolic (95%) & aqueous extracts; concentration: 200.0 µg/mL	Guinea pig ileum with experimentally-induced contractions	Active; ethanolic extract showed antispasmodic activity in histamine- & barium-induced contractions while aqueous extract was active against barium-induced contractions	Itokawa et al. 1983
<b>Antitumor-promoting</b>	Dried rhizome methanolic extract	In vitro: cell culture of raji cells with 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced Epstein Barr virus early antigen activation	Strongly active at a concentration of 200.0 µg/mL	Murakami et al. 1997
<b>Antiulcer</b>	Rhizome (150.0 mg/kg), butanol extract (285.0 mg/kg), water extract (640.0 mg/kg) & acetone-ethanolic extract (1:1) (500.0 mg/kg)	In vivo: rats with HCl- & ethanol-induced gastric ulcers	Active; inhibited ulcer formation by 57.5%, 12.4%, 45.8% & 91.9%, respectively	Yamahara et al. 1992
<b>Antiulcer</b>	Dried rhizome, ethanolic extract (95%); administered intravenously for 2 days	In vivo: male rabbits with aspirin-induced ulceration of the stomach	Active	Annamalai & Manavalan 1990

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiulcer</b>	Dried rhizome hot water extract; dose: 50.0 mg/kg; administered intragastrically	In vivo: male & female rats with cold stress-, aspirin- & pylorus ligation-induced ulcers	Active	Agrawal et al. 2000
<b>Antiulcer</b>	Rhizome acetone & methanolic extracts; dose: 1000 mg/kg of each extract	In vivo: rats with HCl-ethanol-induced ulcers	Active	Yamahara et al. 1988
<b>Antiulcer</b>	Dried rhizome ethanolic (95%) extract; dose: 500.0 mg/kg	In vivo: rats	Active against aspirin-, indomethacin- & cold stress-induced ulcers	Al Yahya et al. 1989
<b>Antiulcer</b>	Fresh rhizome, ethanolic (70%) & acetone extracts	In vivo: rats with stress- (restraint) & pylorus ligation-induced ulcers	Active; ED <sub>50</sub> = 62.01 mg/kg	Sertie et al. 1992
<b>Antiviral</b>	Rhizome, decoction	In vitro: cell culture; virus-rotavirus	Active at a concentration of 0.05 mg/mL	Kim et al. 2000
<b>Antiviral</b>	Dried rhizome hexane extract	In vitro: cell culture, plaque assay	Active; showed antiviral activity against rhinovirus type 1-B	Denyer et al. 1994
<b>Antiviral</b>	Lyophilized extract of rhizome	In vitro: cell culture	Active against influenza A virus; effect mediated by macrophage activation & subsequent production of TNF-alpha	Imanishi et al. 2006
<b>Carcinogenesis inhibition</b>	Dried rhizome decoction; dose: 0.125% administered in drinking water	In vivo: female mice with spontaneous mammary tumorigenesis	Active; inhibited carcinogenesis in mouse mammary gland	Nagasawa et al. 2002
<b>Central nervous system stimulant</b>	Dried rhizome, ethanolic extract (95%); 1.5 mL, administered intravenously	In vivo: rabbits	Active	Emig 1931
<b>Chemokine expression</b>	Fresh rhizome aqueous-ethanolic (1:1) extract	In vitro: human peripheral blood mononuclear leukocytes	Active; at a concentration of 10.0 mg/mL showed stimulation of interleukin-6 formation & tumor necrosis factor induction; at 20.0 mg/mL, showed stimulation of interleukin-1 formation & GM-CSF secretion	Chang et al. 1995

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Choleretic</b>	Rhizome chromatographic fraction; intraduodenal administration	In vivo: rats	Active at a dose of 150.0 mg/kg; results significant (P < 0.01)	Yamahara et al. 1985
<b>Cholesterol level decrease</b>	Dried rhizome powder; given as part of feed: 50.0 mg %	In vivo: rats	Active; showed cholesterol-lowering effects as detected in adrenal gland steroidogenesis	Babu & Srinivasan 1993
<b>Cholesterol synthesis inhibition, anti-atherosclerotic, hypotriglyceridemic &amp; hypocholesterolemic</b>	Dried rhizome; ethanolic extract (95%), administered intragastrically	In vivo: atherosclerotic, apolipoprotein-E deficient mice	Active; reduced plasma triglycerides, cholesterol, VLDL, LDL & lipid peroxides; inhibited cholesterol synthesis, LDL oxidation & aggregation	Fuhrman et al. 2000
<b>Diuretic</b>	Hydroalcoholic (1:1) extract of the dried aerial parts; administered intraperitoneally; dose: 45.0 mg/kg	In vivo: rats	Active	Aswal et al. 1984
<b>Epstein-Barr Virus early antigen activation inhibition</b>	Dried rhizome ethanolic extract (95%)	In vitro: Raji cells with 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced early antigen activation	Active at a concentration of 100.0 µg/mL	Kapadia et al. 2002
<b>Gastric emptying time</b>	Dried rhizome: ethanolic extract (100%) & juice; dose: 500.0 mg/kg & 4.0 mL/kg; administered intragastrically	In vivo: male & female rats with cisplatin-induced delay in gastric emptying	Active; reversed cisplatin-induced effect by stimulating an increase in rate of gastric emptying	Sharma & Gupta 1998
<b>Gastric motility stimulant</b>	Rhizome, acetone extract; dose: 75.0 mg/kg administered intragastrically	In vivo: mice	Active	Yamahara et al. 1990
<b>HIV-1 integrase inhibition</b>	Dried rhizome ethanolic (95%) & aqueous extracts	In vitro: cell culture; virus HIV-1	Active; ethanolic extract was active at IC <sub>50</sub> = 4.0 µg/mL & aqueous extract at IC <sub>50</sub> = 1.8 µg/mL	Tewtrakul et al. 2003

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hypoglycemic</b>	Hydroalcoholic (1:1) extract of the dried aerial parts; administered by gastric intubation; dose: 45.0 mg/kg	In vivo: rats	Active	Aswal et al. 1984
<b>Hypoglycemic</b>	Rhizome, ethanolic extract (80%); dose: 100.0 mg/kg, administered intragastrically	In vivo: rabbits	Active	Mascolo et al. 1989
<b>Hypoglycemic &amp; hypolipidemic</b>	Dried rhizome, administered as part of feed (0.5%)	In vivo: male albino rats	Active based on evaluation of serum glucose levels & lipid profile	Ahmed & Sharma 1997
<b>Hypotensive</b>	Dried rhizome aqueous-methanolic extract (1:1) administered intravenously	In vivo: rats	Active; dose of 0.25 m/kg showed hypotensive activity & dose of 0.5 g/kg showed significant activity (P < 0.01)	Kasahara et al. 1983
<b>Hypotensive</b>	Dried rhizome aqueous low speed supernatant; doses of 10, 25, 50, 100 & 200 mg (dry weight of plant)/kg, intravenously	In vivo: dogs	Showed highly dose-dependent & significant activity with a maximum effective dose of 100 mg/kg; pulse pressure decreased; presence of potassium ions in the extract did not produce significant change	Hantrakul & Tejason 1976
<b>Immunoglobulin production inhibition</b>	Rhizome, saline extract; concentration: 10.0 mg/mL	In vitro: rat lymphocytes	Active	Kaku et al. 1997
<b>Immunostimulant</b>	Ethanolic extract (5%) of the dried fibers; dose: 25.0 mg/kg administered intragastrically	In vivo: mouse	Active	Puri et al. 2000
<b>Interleukin-1-beta release inhibition, cyclooxygenase 2 inhibition &amp; cytokinin antagonist</b>	Dried rhizome extract	In vitro: cell culture of THP-1 monocytes with beta-amyloid peptide-induced chemokine & cytokine expression	Active; inhibited chemokine & cytokine expression	Grzanna et al. 2004

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Lipid peroxidase inhibition</b>	Dried rhizome powder; administered as part of feed: 1.0% of diet	In vivo: male rats with experimentally-induced lipid peroxidation & oxidative stress	Active; significantly lowered malathion-induced lipid peroxidation & oxidative stress in serum	Ahmed et al. 2000
<b>Monoamine oxidase activity increase</b>	Dried rhizome methanolic extract	In vitro: mitochondria	Active at a concentration of 1.0 µg/mL	Hwang et al. 1999
<b>Platelet aggregation inhibition</b>	Dried rhizome; ethyl-acetate & methanolic extracts	In vitro: platelets with collagen-, ADP- & platelet aggregating factor-induced aggregation	Active; IC <sub>50</sub> < 0.3 mg/mL & 1.0 mg/mL, respectively	Okada et al. 1997
<b>Positively inotropic</b>	Dried rhizome aqueous-methanolic extract (1:1)	Guinea pig atrium	Active: showed positive inotropic effect at a concentration of 9.1 mg/mL	Kasahara et al. 1983
<b>Prostaglandin &amp; arachidonate metabolism inhibition</b>	Rhizome decoction; concentration: 0.3 mg/plate	In vitro: microsomes; sheep vesicular gland microsomal fraction	Active; measured proportion of PGH <sub>2</sub> & arachidonic acid metabolites	Umeda et al. 1988
<b>Prostaglandin inhibition</b>	Rhizome, ethanolic extract (80%)	In vitro: leukocyte cell culture	Active at a concentration of 100. µg/mL	Mascolo et al. 1989
<b>Protease inhibition</b>	Dried rhizome methanolic extract	In vitro: hepatitis C virus	Active at a concentration of 100.0 µg/mL	Hussein et al. 2000
<b>Respiratory stimulant</b>	Dried rhizome ethanolic (95%) extract administered intravenously	In vivo: cats	Active	Ally 1960
<b>Serotonin (5-HT) antagonist</b>	Rhizome, acetone extract	Isolated guinea pig ileum with 5-HT-induced contractions	Active; at a concentration of 25.0 µg/mL	Yamahara et al. 1989
<b>Smooth muscle relaxant</b>	Essential oil	Isolated guinea pig ileum & trachea	Active; ED <sub>50</sub> = 171 mg/L for isolated trachea & 36.0 mg/L for isolated ileum	Reiter & Brandt 1985
<b>Smooth muscle relaxant</b>	Dried rhizome, aqueous extract	Isolated guinea pig ileum	Active at a concentration of 10.0 mg/mL	Chakma et al. 2001
<b>Smooth muscle relaxant</b>	Fresh rhizome ethanolic (95%) extract	Isolated guinea pig ileum	Active at a concentration of 50.0 mg/mL; showed dose-dependent effect	Ketusinh et al. 1984
<b>Thermogenic</b>	Dried rhizome, CHCl <sub>3</sub> extract	Isolated rat hind quarters, perfusion	Active at a concentration of 5.0 & 50.0 µg/mL; stimulated hindlimb oxygen intake	Eldershaw et al. 1992

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Tyrosinase inhibition</b>	Dried rhizome, methanolic extract	In vitro	Active at a concentration of 0.1 mg/mL	Khanom et al. 2000
<b>White blood cell stimulant</b>	Fresh rhizome juice; administered intraperitoneally	In vivo: mice	Active; ED <sub>50</sub> = 0.08 mL/animal; showed 76% increase in neutrophil accumulation	Yamazaki & Nishimura 1992

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# Juana la Blanca

## OTHER COMMON NAMES

False buttonweed (English).

## SCIENTIFIC NAME

*Spermacoce verticillata* L. or *Spermacoce assurgens* Ruiz and Pavón; synonym: *Borreria laevis* (Lam.) Griseb. [Rubiaceae (Madder and Bedstraw Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Excess or abnormal vaginal discharge
- Infertility
- Kidney infections
- Kidney stones
- Menstrual cramps (dysmenorrhea)
- Vaginal infections

**Plant Part Used:** Whole plant.

**Traditional Preparation:** Typically prepared as a tea by infusion or decoction; may also be added to complex multi-herb preparations.

**Traditional Uses:** *Juana la blanca* is used to treat infertility and is often added as an ingredient along with other plants to *botellas* for women. It is also an ingredient in the popular purchased proprietary herbal formula known as “*La Sra. Mueller*.” For menstrual cramps (*dolores menstruales*) and vaginal infections or excess discharge (*flujo vaginal*), a tea is prepared of *juana la blanca* and horsetail (*cola de caballo*). For kidney infections and kidney stones, boil *juana la blanca* and molasses (*melaza*) in water, taken as a tea.

**Availability:** The dried herb can be purchased from select *botánicas*.

## BOTANICAL DESCRIPTION

*Juana la blanca* (*Spermacoce assurgens*) is a subshrub that grows upright or along the ground (30-50 cm long). Leaves grow in opposite pairs and are narrowly oval (2.5-5.5 × 0.5-1.7 cm), thin and papery in texture and smooth-surfaced with tiny, sharp hairs along the edges. Flowers grow in terminal clusters and

along the sides of branches with white petals. Fruits are narrowly oval capsules with two chambers, each containing a light brown seed (Acevedo-Rodríguez 1996).

**Distribution:** This plant is native to tropical America and has been introduced and naturalized in tropical Africa and Asia; as a common weed, it can often be found in open, disturbed areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Insufficient information available in the literature.

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

No published laboratory or clinical studies were found in a Medline search for the species *Spermacoce assurgens*; however, one study on the antioxidant effects of a related species in the same genus was identified and is described in the table below.

### Laboratory and Preclinical Data: *Spermacoce* spp.

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant &amp; nitric oxide (NO) inhibition</b>	Methanol plant extract ( <i>Spermacoce articularis</i> & <i>S. exilis</i> )	In vitro; using FTC, TBA & DPPH free radical scavenging methods; Griess assay for measuring NO inhibition	<i>Spermacoce articularis</i> showed strong NO inhibition & DPPH free radical scavenging activity that was comparable to standards; <i>S. exilis</i> showed moderate antioxidant activity & NO inhibition (due to cytotoxic effects on cells)	Saha et al. 2004

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# Lechosa

## OTHER COMMON NAMES

*Papaya* (Spanish); papaya (English).

## SCIENTIFIC NAME

*Carica papaya* L. [Caricaceae (Papaya Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Flatulence and intestinal gas
- Gastrointestinal pain
- Heart disease
- Heartburn
- High blood pressure
- Indigestion

**Plant Part Used:** Fruit and leaves.

**Traditional Preparation:** The fruit is typically ingested raw.

**Traditional Uses:** For digestive disorders including indigestion, flatulence, intestinal gas, stomach or intestinal pain, heartburn, the fruit is recommended because it is not very acidic like other fruits and can alleviate gas and excess acid in the stomach. Also, the fruit is considered a supportive therapy for people with heart disease and high blood pressure. For menopausal hot flashes and other conditions associated with excess heat in the body, the fruit is eaten for its cooling properties. In the Caribbean, the unripe fruit is applied topically to treat skin infections and the root maceration is taken orally for urinary tract infections (Germosén-Robineau 2005).

**Availability:** In New York City, *lechosa* fruit can be found at grocery stores, supermarkets and fruit stands that sell tropical fruit, depending on seasonal availability.

## BOTANICAL DESCRIPTION

*Lechosa* (*Carica papaya*) is a small tree (typically 6 m tall), all parts of which contain an abundant milky exudate. Numerous large leaf scars mark the trunk. Leaves are palmately lobed with 7-11 sharply pointed segments. Male and female flowers typically grow on separate trees and have white- to creamy-yellow-colored petals. Fruits are typically oblong and somewhat pear-like in shape (5-45 × 5-15 cm), turning from green to yellow as they ripen and containing a yellow to light-orange, sweet-tasting pulp and numerous black seeds (Acevedo-Rodríguez 1996).

**Distribution:** Native to tropical America, this plant is now cultivated widely in tropical regions, and although it is usually found only in cultivation, it sometimes grows spontaneously in disturbed, moist areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

The ripe fruit is consumed widely and generally considered safe. Allergic reactions including asthma attacks have been reported in association with this plant, its pollen and papain, an extract of its enzymes (Blanco et al. 1998).

**Animal Toxicity Studies:** In mice, the aqueous root extract (100 g/500 mL water) administered orally (10 mL/kg) for 14 days did not show observable signs of toxicity (Souza Brito 1988). In rabbits, the grated unripe fruit applied topically (2 g/5 cm<sup>2</sup>) for 5 consecutive days did not show signs of dermal irritation (Garcia-Gonzalez et al. 2001). Toxicity studies have determined the LD<sub>50</sub> of the crude ethanol extract of



the unripe fruit administered intraperitoneally in mice to be 325.2 mg/kg body weight (Mansfield et al. 1985).

**Contraindications:** Pregnancy & lactation – unripe papaya fruits and papain enzymes are not to be taken by pregnant women or during lactation due to possible abortifacient, embryotoxic and teratogenic effects (Lohiya et al. 1994). Not to be taken by children under 12 years of age due to lack of clinical data on potential effects. Contraindicated for individuals with a history of allergic reaction or hypersensitivity to papain (Germosén-Robineau 2005).

**Drug Interactions:** Warfarin: concomitant use with papaya extract has demonstrated increased international normalized ratio (INR) levels; therefore, patient should be monitored for symptoms of bleeding and INR levels if taking both simultaneously (Shaw et al. 1997).

## SCIENTIFIC LITERATURE

The following effects of this plant have been investigated in human clinical trials: antiparasitic, immunomodulatory and wound-healing (see “Clinical Data” table below). In laboratory and animal studies, this plant has shown the following activity: abortifacient, anthelmintic, antiamebic, antifertility (in males and females), antihypertensive, antimicrobial, antioxidant, anti-salmonella, diuretic, immunomodulatory, immunostimulatory and uterine stimulant (see “Laboratory and Preclinical Data” table below).

Laboratory research on papain, the raw proteolytic enzymes of the latex of this plant, has demonstrated it to have the following therapeutic effects: anti-inflammatory (contradictory evidence), antimicrobial (contradictory evidence), anthelmintic, anti-ulcer, edema-reducing and possibly fibrinogenous effects. Also, it has been shown to be useful for digestive disorders and pancreatic conditions and as a wound-healing agent due to its proteolytic activities (Gruenwald et al. 2004). More specifically, chymopapain, one active constituent, appears to function as a desloughing agent, thus promoting growth and healing scar tissue, while carpaines and aglycones have demonstrated antimicrobial activity which is also important for disinfecting and treating wounds (Starley et al. 1999).

Biologically active constituents identified in the fruit include the following: 4-terpineol, alpha-linolenic acid, alpha-phellandrene, alpha-terpinene, benzaldehyde, benzyl-isothiocyanate, beta-phellandrene, butyl-alcohol, caryophyllene, ethyl-acetate, gamma-terpinene, geranyl-acetone, hexanal, isoamyl-acetate, linalool, lycopene, malic acid, methyl-acetate, methyl-salicylate, myrcene, papain, terpinolene and zeaxanthin (Duke & Beckstrom-Sternberg 1998). This fruit is a significant source of dietary fiber, folate, potassium and vitamins A, C, E and K (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** TRAMIL has classified this plant as REC meaning that it is recommended for the following uses: to treat urinary tract infections (root prepared as a maceration and taken orally) and forunculosis (green fruit crushed or baked and applied topically). This plant should not be administered for more than 7 consecutive days (Germosén-Robineau 2005). Commercial preparations of papaya enzymes (papain) are available in tablet form and typical dosage depends on the preparation.

### Clinical Data: *Carica papaya*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiparasitic</b>	Leaves prepared as a paste with opium & salt; applied for 3 days	Epidemiological & clinical study of guinea worm infection (dracunculiasis)	Relieved symptoms & allowed for easier extraction of the worm ( <i>Dracunculus medinensis</i> ) from the body	Sanghvi 1989

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Immunomodulatory</b>	Polyenzyme preparation (Wobenzyme®) containing 20 mg papain per 100 mg drug	Placebo-controlled clinical trial with 28 healthy volunteers; dose: 5-20 tablets	Increased production of reactive oxygen species and cytotoxicity in polymorphonuclear leukocytes	Zavadova et al. 1995
<b>Wound-healing</b>	Crushed papaya fruit, applied externally on gauze to the burn twice daily for several wks	Clinical trial; treating pediatric patients with full-thickness & infected burns	Positive outcome; some cases resulted in wounds clean enough for successful grafting; however, in other cases, partial thickness burns became full-thickness wounds after treatment	Starley et al. 1999

### **Laboratory and Preclinical Data: *Carica papaya***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Abortifacient &amp; antifertility (female)</b>	Selected fruit components; administered orally (ingested)	In vivo: albino Wistar rats (cycling and pregnant)	Interrupted estrous cycle & induced abortions; abortifacient property decreased as fruit ripened; no malformations observed in surviving fetuses; exogenous progesterone counteracted adverse effects on pregnancy	Gopalakrishnan & Rajasekharasetty 1978
<b>Anthelmintic</b>	Latex suspended in water; dose levels of 2, 4, 6 & 8 g/kg body weight	In vivo: mice infected with <i>Heligmosomoides polygyrus</i>	Antiparasitic efficacy of 55.5, 60.3, 67.9 & 84.5% with corresponding dose levels; potentially effective as anthelmintic against patent intestinal nematodes of mammalian hosts	Satrija et al. 1995
<b>Antiamebic</b>	Extract of mature seeds	In vitro	Exhibited significant activity (MIC less than 100 µg/mL), as compared with metronidazole as a reference product	Tona et al. 1998

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifertility (male)</b>	Seed chloroform extract, benzene chromatographic fraction of; oral administration	In vivo: male albino rats; dose regimens 5 and 10 mg/animal/day orally for 150 days	Exhibited antifertility effects in rats by suppression of cauda epididymal sperm motility & decreased sperm count, viability & % normal sperm without adverse toxicity; observed changes returned to normal 60 days after ending treatment	Pathak et al. 2000
<b>Antifertility (male)</b>	Seeds: benzene, chloroform & ethyl acetate chromatographic fraction of the chloroform extract of the seeds	In vivo: adult male rabbits; dose regimen: 50 mg/animal/day for 150 days	Benzene chromatographic fraction resulted in uniform azoospermia after 15 days of treatment & was maintained throughout course of the study; no toxicity or change in libido observed; results were reversible; effects appear to be mediated through the testis	Lohiya et al. 1999
<b>Antihypertensive</b>	Crude ethanol extract prepared from the unripened fruit (10 µg/mL)	In vitro: using isolated rabbit arterial (aorta, renal & vertebral) strips	Produced relaxation of vascular muscle tone which was attenuated by phentolamine (0.5-1.5 µg/mL)	Eno et al. 2000
<b>Antihypertensive</b>	Crude ethanol extract prepared from the unripened fruit	In vivo: rats divided into 3 groups with 15 members per group: renal, DOCA-salt hypertensives & normotensives; then further divided into 3 groups: untreated, hydrallazine & extract-treated groups	Produced a significant decrease in mean arterial blood pressure and heart rate; the fruit juice contains antihypertensive agents which exhibit alpha-adrenoceptor activity primarily	Eno et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial &amp; antioxidant</b>	Unripe papaya: meat, seed & pulp	In vitro: agar-cup method	Bacteriostatic against enteropathogens; exhibited scavenging action on superoxide and hydroxyl radicals; antioxidant activity may explain ability to counteract oxidative stress of gastrointestinal disease	Osato et al. 1993
<b>Anti-salmonella</b>	Methanol extracts of leaves and roots, alone and in combination with other herbs	In vitro	A mixture containing <i>Carica papaya</i> roots and other plants exhibited greater bactericidal activity at lower concentrations than a mixture containing the leaves and other plants	Nkuo-Akenji et al. 2001
<b>Antiulcer</b>	Latex of the unripened fruit; crystalline papain	In vivo: rats; stomach acid secretion induced by intravenous infusion of histamine in chronic gastric fistulated rats	Fruit latex & papain were both effective in protecting exogenous ulcers & significantly reduced acid secretion; concluded that papain is the active principle	Chen et al. 1981
<b>Diuretic</b>	Root extract; administered orally; dose: 10 mg/kg	In vivo: rats	Showed significant increase in urine output (74% of the effect of the equivalent dose of hydrochlorothiazide); perhaps due to high salt content of extract	Sripanidkulchai et al. 2001
<b>Immunomodulatory &amp; immunostimulatory</b>	Crude extract of seed & isolated bioactive factors	In vitro: lymphocyte proliferation assays & complement-mediated hemolytic assay	Enhanced phytohemagglutinin responsiveness of lymphocytes; not able to protect against toxicity from chromium; some active constituents showed hemolytic effects	Mojica-Henshaw et al. 2003

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Uterine stimulant</b>	Fruit latex extract	In vitro: rat uterine preparations at different stages of the estrous and gestation periods	Remarkably increased uterine contractile activity in a dose-dependent manner; more active in proestrus and estrus stages compared to metestrus and diestrus stages; evoked sustained contraction of the uterus acting mainly on the alpha adrenergic receptor population of the uterus	Cherian 2000

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antimicrobial</b>	Papaya leaf sprouts; ethanol, water & acetone-diluted extracts	In vitro: <i>E. coli</i> and <i>Staphylococcus aureus</i> ; samples from local shrimp and fish muscle	Demonstrated no microbicidal activity	Vieira et al. 2001

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# Limón

## OTHER COMMON NAMES

*Limón agrío*, *raíz de limón* (Spanish); lemon, lime (English).

## SCIENTIFIC NAME

*Citrus limon* (L.) Burm.f. or *Citrus aurantifolia* Swingle. [Rutaceae (Rue Family)].

**Note:** Because lemon (*Citrus limon*) and lime (*Citrus aurantifolia*) are often used interchangeably (and both may be referred to by the same common names: *limón* or *limón agrío*), information for these two species is combined in the sections that follow.

## DOMINICAN MEDICINAL USES

In ethnobotanical interviews conducted in New York City, Dominican interview participants reported using this plant for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Bruises
- Burns
- Common cold
- Contusions and musculoskeletal trauma
- Flu
- Kidney stones
- Menstrual disorders
- *Paño*

**Plant Part Used:** Fruit, leaves and root.

**Traditional Preparation:** Lemon or lime fruit juice is used to prepare a raw syrup (mixed with honey or sugar) which may be taken by the spoonful on its own, added to teas or applied topically. The root is an ingredient in some complex multi-herb preparations and may also be extracted by decoction or tincturing in alcohol.

**Traditional Uses:** *Limón* is commonly used as an ingredient in home remedies and teas for numerous ailments, both as a flavoring and a therapeutic agent. Most frequently, it is used to treat symptoms of the common cold or flu. The fresh fruit or its juice (*zumo*) is typically combined with honey (or sugar) and

taken orally by the spoonful. It can also be prepared as a tea with cinnamon (*canela*). A similar preparation can be used for treating kidney stones. For burns or bruises, the fresh fruit juice is applied topically to the affected area.

Lime or lemon fruit juice is an ingredient in a remedy for contusions or musculoskeletal injury in combination with soursoap (*guanábana*) leaves, lemongrass (*limoncillo*) leaves and sweet orange (*naranja*) leaves, prepared as a tea and taken orally. For *pañó*, lemon juice is combined with seashells (*concha de caracól*) until the calcium from the shells begins to dissolve due to the acidity of the citrus juice. This preparation is then applied topically to the affected area. For diarrhea, the fresh fruit juice is taken with salt. The root is added to complex, multi-herb preparations of herbs for treating women's health conditions, including menstrual disorders.

**Availability:** In New York City, *limón* fruits are commonly sold at grocery stores, supermarkets and fruit stands. Lime or lemon leaves are sometimes available at *botánicas*, select grocery stores or from home-grown plants.

## BOTANICAL DESCRIPTION

*Limón* (*Citrus limon*) is a small tree that usually grows 6-7 m tall, and its trunk and branches are typically covered with short, stout spines. Leaves are compound but reduced to a single leaflet; leaflets are oblong to narrowly-oval (10 cm long) with toothed or scalloped margins, dotted with glands and yielding a characteristic pungent odor when crushed. Flowers grow singly or in small clusters, have 5 white petals and exude a sweet fragrance. Fruits are round- to pear-shaped with a nipple at the end and thick, leathery skin that turns bright yellow when ripe, containing numerous seeds and pale-yellow, highly acidic pulp. Fruit acidity, shape and size vary between cultivars (Bailey-Hortorium Staff 1976).

**Distribution:** Most likely native to Southeast Asia, this plant is widely cultivated (particularly in California and Italy) for its fruits (Bailey-Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

When used appropriately, no major adverse effects or health hazards associated with the therapeutic use of the fruit have been identified in the available literature. Skin contact with the essential oil of lemon can lead to allergic reactions, but the potential for sensitization is low (Gruenwald et al. 2004; see "Hypersensitivity" below). Lemon or lime oil is known to cause phototoxicity when applied topically prior to sun exposure (see "Phototoxicity" below). The fruit juice may erode teeth enamel due to its high acidity (see "Erosive Capacity" below).

**Hypersensitivity:** In a human clinical trial of Indonesian cosmetics, the raw source material for *Citrus aurantifolia* fragrance, when administered via a patch test to 32 subjects, resulted in hypersensitivity reactions in 4 (12.5%) of the study participants. Another series of patch tests using extracts of citrus fruits and flowers was administered to 159 patients who did not test positive to fragrance mixtures and who were suspected of contact dermatitis. Of this group, only 2 subjects (1.2%) tested positive for hypersensitivity, indicating that citrus-based raw materials for fragrance are not strongly antigenic (Roesyanto-Mahadi et al. 1990).

**Phototoxicity:** Lemon oil contains compounds that may result in phototoxicity. The constituents which cause this effect are the furanocoumarin (or furocoumarin) derivatives oxypeucedanin and bergapten, and the relative amounts of these compounds in lemon essential oil vary substantially depending on the region and conditions of cultivation. Lime essential oil also contains significant quantities of oxypeucedanin which has been shown to cause skin photopigmentation in animal studies using guinea pigs (Naganuma et al. 1985).

Based on a case report of a 6-year-old boy who presented with severe bullous photodermatitis due to prolonged dermal contact with lime juice and subsequent sun exposure. The compounds determined to be responsible for the phototoxic reaction in this case were the furanocoumarins (particularly bergapten)



present in the citrus fruit rind. Symptoms of phytophototoxicity typically include mild erythema and post-inflammatory hyperpigmentation; however, severe reactions, such as painful erythema, edema and large bullae are possible as was shown in this case (Wagner et al. 2002). In another clinical report, exposure to limes and subsequent sun-bathing during a beach vacation caused phytophotodermatitis in one patient. Phototoxicity manifested as acute erythema and vesiculation with an appearance resembling that of severe sunburn followed by inflammation and hyperpigmentation (Weber et al. 1999).

In some cases, phytophotodermatitis, caused by topical application of lime juice and subsequent sun exposure, manifesting as skin lesions and hyperpigmentation, may simulate the signs of child abuse. If the clinical symptoms of plant-induced phototoxicity in a child are misinterpreted, the patient's caretakers may be erroneously investigated for child abuse (Coffman et al. 1985).

**Erosive Capacity:** Lemon and lime fruit juices have been shown to erode human teeth in laboratory studies. Erosive capacity was measured by the amount of calcium and phosphate dissolved from teeth enamel into solution and was attributed to the acidity (low pH) of these juices (Lissera et al. 1998).

**Contraindications:** Do not use lemon or lime in cases of hypersensitivity or potential allergy (Gruenwald et al. 2004; Roesyanto-Mahadi et al. 1990). Avoid exposure to sunlight if using the essential oil or after prolonged contact with the fruit rind due to the photosensitizing effects of constituent furocoumarins (Coffman et al. 1985; Naganuma et al. 1985; Wagner et al. 2002; Weber et al. 1999). Prolonged exposure of teeth enamel to lemon or lime juice should be avoided to minimize potential demineralization (Lissera et al. 1998).

**Drug Interactions:** Lime juice has been shown to inhibit cytochrome P (CYP) 450 3A4 enzymes which mediate the metabolism of many drugs and other substances (Bailey et al. 2003). Concomitant administration of lime juice and CYP 450-metabolized drugs, supplements or food is not advised.

## SCIENTIFIC LITERATURE

In clinical studies, *C. limon* essential oil as an ingredient in a mouth rinse (including dilute peppermint and tea tree essential oils) has been shown to effectively decrease malodor and volatile sulphur compound production (Hur et al. 2007). However, a nasal spray containing lemon juice and *Cydonia oblongata* fruit did not show significant effects on intranasal mucociliary clearance (Degen et al. 2000; see "Clinical Data" table below). Laboratory and preclinical studies have demonstrated the following effects of extracts or constituents of *C. limon* or *C. aurantifolia*: antibacterial, antimutagenicity, antioxidant, antiproliferative, immunomodulatory and insecticidal (see Laboratory and Preclinical Data table below).

Major chemical constituents: The fruit has been shown to contain high quantities of flavonoids which are important for their health-related functions and could partially explain their medicinal activity (del Rio et al. 2004). Other major chemical constituents identified in this plant include the following: aureusidin, bergamottin, bergapten, beta-bisabolene, beta-elemene, diosmetin and stachydrine; fruit: caffeic acid, diosmin, ferulic acid, hesperidin, imperatorin, isopimpinellin, limonin, p-coumaric acid, perillaldehyde, rutin, salicylates and thymol; essential oil: alpha-humulene, alpha-phellandrene, alpha-pinene, alpha-terpinene, alpha-terpineol, beta-pinene, byakangelicin, cadinene, camphene, carveol, carvone, citral, gamma-terpinene, geranial, geraniol, hexanal, isoimperatorin, limonene, myrcene, neral, oxypeucedanin, terpinen-4-ol and terpinolene; pericarp: naringin, narirutin, neohesperidin, p-cymene and syringin; root: osthole, seselin, xanthoxyletin and xanthyletin (Duke & Beckstrom-Sternberg 1998). Lemons are a rich source of vitamin C (U.S. Dept. of Agriculture 2006).

**Indications and Usage:** Modes of internal administration of lemon include the following: fresh fruit, juice, oil or tincture (Gruenwald et al. 2004). Insufficient information is available on the recommended administration and dosage of this plant.

### Clinical Data: *Citrus limon* & *C. aurantifolia*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Intranasal mucociliary clearance</b>	1% & 3% solution of lemon juice ( <i>C. limon</i> ) & aqueous extract of <i>Cydonia oblongata</i> fruit; dose: 20 puffs (0.13 mL per puff) in each nostril within 24 h	Clinical trial, 3-way crossover study; 18 healthy male & female subjects (age: 20-49 y); a modified saccharin test was used to measure mucociliary transport time, before & after treatment	No effect; the results indicated that the agents tested showed no detectable difference in intranasal mucociliary function	Degen et al. 2000
<b>Mouth malodor reduction</b>	Diluted essential oil ( <i>C. limon</i> ) mouthwash (with essential oils of <i>Melaleuca alternifolia</i> & <i>Mentha piperita</i> ), administered for 3 minutes	Clinical trial; intensive care unit patients; malodour detected by a 10 cm visual analogue scale; halimeter used to detect volatile sulfur compounds before, 5 min after & 1 h post-treatment; positive control: Tantum® (benzylamine hydrochloride)	Significantly reduced levels of mouth malodour & volatile sulphur compound production between 5-min & 1 h post-treatment assessments (p<0.001)	Hur et al. 2007

### Laboratory and Preclinical Data: *Citrus limon* & *C. aurantifolia*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Lemon & lime juice concentrates	In vitro: temperature: -23 degrees C to 0 degrees C	Inactivation of <i>Escherichia coli</i> O157:H7, <i>Listeria monocytogenes</i> & <i>Salmonella</i> spp.	Nogueira et al. 2003
<b>Antibacterial</b>	Lime juice	In vitro: against <i>Vibrio cholerae</i>	Lime juice inhibited bacterial growth	Rodrigues et al. 2000
<b>Antimutagenicity</b>	Citrus flavonoids: naringin, hesperidin & tangeretin	In vitro: activity against mutagens in a <i>Salmonella</i> /microsome assay	Showed weak activity against benzo[a]pyrene	Calomme et al. 1996

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Lemon & lime fruits	In vitro: radical scavenging activity against hydroxy radical, HOCl & hydrogen peroxide; positive control: the common food additives butylated hydroxyanisole (BHA) & butylated hydroxytoluene (BHT)	Lemon showed strong radical scavenging activity against hydroxy radicals; lime showed strong activity against HOCl; both were effective against hydrogen peroxide	Murcia et al. 2001
<b>Antiproliferative</b>	34 citrus juices, extracted fractions with flavonoid glycosides removed	In vitro: cancer cell lines	Sweet lime inhibited 3 out of 4 cancer cell lines & was markedly less cytotoxic in normal cell lines	Kawaii et al. 1999A
<b>Antiproliferative</b>	27 citrus flavonoids	In vitro: tumor vs. normal human cell lines	7 flavonoids were strongly active against tumor cell lines but showed weak effects against normal cells: luteolin, natsudaoidain, quercetin, tangeretin, eriodictyol, nobiletin, & 3,3',4',5,6,7,8-heptamethoxyflavone	Kawaii et al. 1999B
<b>Antiproliferative</b>	Concentrated lime juice ( <i>C. aurantifolia</i> ) from freeze-dried fresh juice, adjusted to physiological pH & depleted low molecular weight micronutrients	In vitro: breast carcinoma MDA-MB-453 & lymphoblastoid B RPMI-8866 human tumor cell lines; 24 hrs of incubation	Showed significant inhibition of RPMI-8866 cell line spontaneous proliferation; no effect observed in MDA-MB-453 cell line; effect attributed to protein components of lime juice extract	Gharagozloo et al. 2002
<b>Immunomodulatory (Antiproliferative)</b>	Concentrated lime juice ( <i>C. aurantifolia</i> ) extract; freeze dried & buffered	In vitro: human mitogen activated mononuclear cell culture; effect determined by the production of specific polyclonal antibodies in rabbits	250 & 500 µg/mL of the extract significantly inhibited proliferation of phytohemagglutinin activated mononuclear cells; the extract only inhibited proliferation of staphylococcal protein A activated mononuclear cells at 500 µg/mL (p<0.05)	Gharagozloo & Ghader 2001

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Insecticidal</b>	Lemon peel oil	<i>Culex pipiens</i> & <i>Musca domestica</i> larvae & adults	Active against larvae, pupae & adult stages of these insects	Shalaby et al. 1998

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# Limoncillo

## OTHER COMMON NAMES

Lemongrass (English).

## SCIENTIFIC NAME

*Cymbopogon citratus* (DC.) Stapf. [Poaceae (Grass Family)].

**Note:** This grass-like herb is not to be confused with the small, green, lime-like, round fruit which is also often called *limoncillo* or *quenepa* (*Melicoccus bijugatus* Jacq. [Sapindaceae]) in the Dominican Republic.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Arthritis
- Asthma
- Common cold
- Contusions and musculoskeletal trauma
- Diarrhea
- Flu
- Gastrointestinal pain
- Indigestion
- Menopausal hot flashes
- Stomach disorders

**Plant Part Used:** Leaves and leafy stem.

**Traditional Preparation:** Typically prepared as a tea of the leaves by infusion or decoction.

**Traditional Uses:** *Limoncillo* is a pleasant-tasting tea, renowned for its sweet, lemon-like flavor and stress-relieving properties. It is commonly added to other teas or herbal preparations as both a flavoring and a therapeutic agent. For asthma, the common cold and flu symptoms, a tea is prepared of the leaves. This remedy may be combined with other medicinal plants, such as the eucalyptus (*eucalipto*) and soursop (*guanábana*) leaves. This herb is a popular tea for treating stomach disorders including indigestion and gastrointestinal pain. In children with diarrhea, the leaves are prepared as a tea with ragweed (*altamisa*) leaves and lemon/lime (*limón*) leaves; this remedy is said to cleanse the intestines. The tea of this herb is also used for treating “hot” conditions including menopausal hot flashes. For arthritis, the leaves are prepared as a tea with cinchona (*quina*) bark. As an infusion, the leaves are an ingredient in a remedy for healing from contusions and musculoskeletal injury (*golpe*), combined with soursop (*guanábana*) leaves, lemon/lime (*limón*) fruit and sweet orange (*naranja*) leaves.

**Availability:** In New York City, *limoncillo* can sometimes be found at grocery stores and supermarkets where it may be sold fresh or dried; also, it is sold at select *botánicas* (Latino/Afro-Caribbean herb shops).

## BOTANICAL DESCRIPTION

*Limoncillo* (*Cymbopogon citratus*) is an aromatic grass that grows to 2 m tall with a smooth stalk. Leaves are long, narrow and tapered at both ends with rough edges and parallel veins (90 × 1.3 cm). Flowers grow in large, loose, branching clusters, with reddish brown slender bracts and hairs along the joints and sides of the inflorescence. Fruits are linear- to lance-shaped spikelets. As a cultigen, this plant rarely develops flowers or fruits (Bailey Hortorium Staff 1976).

**Distribution:** Native to South India and Sri Lanka, this plant is cultivated widely as a culinary seasoning and for its essential oil (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Clinical studies have shown that an herbal tea made of the leaves and stalk of *limoncillo* is not toxic; when given as a single dose or orally administered daily for 2 weeks, no significant changes were observed in serum measures, urine analysis, EEG or EKG (Leite et al. 1986). In rare cases, allergic reactions have been reported linked to dermal application of salves containing the essential oil and 2 cases have been documented of toxic alveolitis due to inhalation of the essential oil (Gruenwald et al. 2004).

**Animal Toxicity Studies:** Animal studies have also confirmed that this herb, when taken internally as an infusion, has no toxic properties. In one study, no toxic effects were induced when doses up to 20 times

greater than the estimated corresponding human dosage were administered orally to male and female rats; when given to rodents prior to mating or during pregnancy, no evidence of toxicity was observed in their offspring (Souza et al. 1986).

**Contraindications:** Should not be used during pregnancy.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

One clinical study has been identified in the literature, and the results of this study did not support its use as an anxiolytic and hypnotic agent. In laboratory and preclinical studies, this medicinal plant and/or its constituents have demonstrated the following effects: antibacterial, antifungal, anti-inflammatory, antimalarial, antimicrobial, antinociceptive, antioxidant, antitumor, carcinogenesis inhibition, chemopreventive, enzyme inhibition (acetylcholinesterase, butyrylcholinesterase and lipoxygenase), heart rate-lowering, hypocholesterolemic, polyphenol oxidase inhibition and vasorelaxant (see “Laboratory and Preclinical Data” table below).

Major chemical constituents identified in this plant include: 1,8-cineole, alpha-citral (geranial), alpha-pinene, alpha-terpineol, caprylic acid, caryophyllene, citral, citronellal, citronellol, cymbopogone, diacetyl, dipentene, farnesal, farnesol, furfural, geraniol, geranyl acetate, isopulegol, isovaleraldehyde, isovaleric acid, limonene, linalyl acetate, luteolin, myrcene, neral, nerol, quercetin, rutin, saponin and triacontanol (Duke & Beckstrom-Sternberg 1998). The essential oil is 80% citral (Abe et al. 2003).

**Indications and Usage:** Typical administration is as a tea prepared with 2 g of dried leaf in 150 mL of boiling water. Standard daily dosage is approximately 2.0 mL/kg b.w., 2 g dried leaf powder or 2 fresh, chopped leaves (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Cymbopogon citratus*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Essential oil	In vitro: against <i>Staphylococcus albus</i> , <i>Staphylococcus aureus</i> , <i>Escherichia coli</i> , <i>Pseudomonas aeruginosa</i> , <i>Salmonella typhi</i> , <i>Cholera</i> spp. & <i>Klebsilla</i> spp.	Exhibited dose dependent inhibition of growth of all bacteria tested except for <i>Pseudomonas aeruginosa</i>	Katewa et al. 2003
<b>Antibacterial</b>	Essential oil	In vitro: agar diffusion method; against <i>Listeria monocytogenes</i> and <i>Staphylococcus aureus</i> ; examined by flow cytometry in <i>Listeria innocua</i>	Exhibited significant antibacterial activity due to permeabilization of cytoplasmic membrane	Nguefack et al. 2004

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Essential oil constituents	In vitro: gram negative and gram positive organisms	Individual antibacterial components identified: alpha-citral (geranial) and beta-citral (neral); myrcene enhanced activities of these components although it did not have antibacterial activity on its own	Onawunmi et al. 1984
<b>Antibacterial</b>	Essential oil	In vitro: against zoonotic enteropathogens, including <i>Salmonella species</i> , <i>Escherichia coli</i> & <i>Clostridium perferingens</i>	Exhibited significant antibacterial activity	Wannissorn et al. 2005
<b>Antifungal</b>	Essential oil, citral & cream	In vitro: against 35 clinical isolates of 4 dermatophytes: <i>Trichophyton mentagrophytes</i> , <i>T. rubrum</i> , <i>Epidermophyton floccosum</i> & <i>Microsporum gypseum</i>	Demonstrated significant antifungal activity in agar diffusion method; mechanism determined to be fungicidal; 2.5% essential oil was the minimum concentration for preparation of antifungal cream for further clinical study	Wannissorn et al. 1996
<b>Antifungal</b>	Essential oil & citral, the chief constituent (80%) of the essential oil	In vitro: against growth of <i>Candida albicans</i>	Both essential oil and citral inhibited mycelial growth at 25 and 200 µg/mL; also, more than 200 micro g/mL of citral markedly inhibited yeast-form growth; suggest potential use in treating oral or vaginal yeast infections	Abe et al. 2003
<b>Anti-inflammatory</b>	Infusion of fresh leaves administered orally, essential oil & its constituents	In vivo: rats with hyperalgesia induced by subplantar injections of carrageenan, prostaglandin E2 or dibutyryl cyclic AMP; mice with iloprost i.p. injection-induced writhing	Infusion exhibited dose-dependent peripheral analgesic effects in first two tests with a different mechanism than aspirin-like drugs; myrcene identified as the primary analgesic constituent and confirmed in contortion test with mice	Lorenzetti et al. 1991
<b>Antimalarial</b>	Essential oil of fresh leaves	In vivo: mice; 4-day suppressive test	Showed significant suppression of parasitaemia: 62.1%, 81.7% & 86.6% (at concentrations of 200, 300 & 500 mg/kg of mouse per day; chloroquine (10 mg/kg of mouse, positive control) activity was 100%	Tchoumboungang et al. 2005



<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Essential oil	In vitro against <i>Helicobacter pylori</i> and in vivo in mice	Completely inhibited bacterial growth at a concentration of 0.1% (v/v); no resistance developed even after 10 sequential passages as compared with the drug clarithromycin to which resistance developed under same conditions; reduced density of <i>H. pylori</i> in stomach of mice significantly	Ohno et al. 2003
<b>Antinociceptive</b>	Essential oil	In vivo: mice; tests: reaction time to thermal stimulus, acetic acid-induced writhing & formalin	Significant activity observed at the following doses: 25-100 mg/kg i.p., 50-200 mg/kg, p.o. or i.p. & 50 and 200 mg/kg i.p. respectively in each test; results suggest activity at both peripheral and central levels	Viana et al. 2000
<b>Antioxidant</b>	Methanol, methanol/water extracts, infusion & decoction	In vitro: peroxidation of DPPH radical and scavenging of superoxide anion	Showed significant antioxidant activity at concentrations of 33 and 50 µg/mL & inhibited lipid peroxidation in erythrocytes at 500 µg/mL	Cheel et al. 2005
<b>Antitumor</b>	Citral (from essential oil); 44.5 microM (same amount as 1 cup of tea from 1 g herb)	In vitro: several hematopoietic cancer cell lines	Induced apoptosis, DNA fragmentation & caspase-3 catalytic activity; mechanism of apoptotic effect depended upon alpha, beta-unsaturated aldehyde group	Dudai et al. 2005
<b>Chemo-preventive</b>	80% ethanol extract; doses of 0.5 or 5 g/kg body weight by gavage	In vivo: rats with azoxymethane-induced DNA adducts and aberrant crypt foci	Significantly inhibited DNA adduct formation and aberrant crypt foci (predictive of tumor incidence) in rat colon	Suaeyun et al. 1997
<b>Enzyme inhibition</b>	Crude ethanolic extract of leaves	In vitro: against acetylcholinesterase, butyrylcholinesterase & lipoxigenase enzymes	Exhibited significant inhibition activity (≥ 50%)	Khattak et al. 2005
<b>Heart rate lowering</b>	Aqueous extract of leaves; doses of 0.038, 0.38, 3.8 & 38 mg	Ex vivo: isolated hearts of 21 male rats	Demonstrated significant reduction in cardiac rate (possibly due to stimulation of cardiac muscarinic receptors) & did not alter contractile force	Gazola et al. 2004

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Carcinogenesis inhibition</b>	Leaf extract at concentrations of 0.2, 0.6 or 1.8% for 10 wks	In vivo: male rats with diethylnitrosamine-induced hepatocarcinogenesis	Exhibited inhibition of early phase hepatocarcinogenesis: reduced the number of putatively preneoplastic, glutathione S-transferase placental form-positive lesions & injury levels of oxidative hepatocyte nuclear DNA	Puatanachokchai et al. 2002
<b>Hypo-cholesterolemic</b>	Leaves; ingested (15% of diet)	In vivo: normal and hypercholesterolemic rats (n=24)	Reduced triglycerides in hypercholesterolemic & normal rats, no effect on total serum cholesterol; increased HDL triglycerides; reduced fat accumulation	Mohamed et al. 2002
<b>Polyphenol oxidase inhibition</b>	Essential oil	In vitro	Inhibited the activity of polyphenol oxidase; suggest use as a naturally occurring tyrosinase inhibitor	Ranasinghe et al. 2003
<b>Vasorelaxant</b>	Extract of stalk	In vitro: isolated rat aorta and mesenteric vascular bed	Exhibited significant vasodilatory activity in resistance vessels involving several biochemical mediators	Runnie et al. 2004

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hypnotic &amp; anxiolytic</b>	Herbal tea from dried leaves	Double-blind placebo-controlled clinical trial; 50 healthy volunteers; given a single dose or 2 wks of daily oral administration	No significant hypnotic (measured by changes in sleep induction, sleep quality, dream recall & reawakening) or anxiolytic (assessed by anxiety-inducing test) effects	Leite et al. 1986

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# Llantén

## OTHER COMMON NAMES

Plantain (herb), great plantain, narrow-leaf plantain (English).

## SCIENTIFIC NAME

*Plantago major* L. or *Plantago lanceolata* L. [Plantaginaceae (Plantain Family)].

**Note:** Because of their similar appearance and comparable properties, the two species *Plantago major* and *P. lanceolata* are often used interchangeably as an herbal remedy; therefore, information for both species is included in the description below. This plant should not be confused with the banana-like fruit called plantain (*plátano*, *Musa* spp.), even though this fruit shares the same English common name as *llantén* (*Plantago* spp.).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Abortifacient
- Headache
- High cholesterol
- Liver disorders
- Menopausal hot flashes
- Menorrhagia (excessive menstrual bleeding)
- Migraine headache
- Nausea
- Skin abrasions
- Stomach ache and abdominal pain
- Uterine fibroids
- Vaginal infections
- Wound-healing

**Plant Part Used:** Leaves.

**Traditional Preparation:** The fresh leaves can be crushed or liquefied to extract their juice or a tea can be prepared by decoction of the fresh or dried leaves, either alone or in combination with other medicinal herbs. For external application, the fresh leaves are crushed or warmed and applied topically to the affected area.

**Traditional Uses:** *Llantén* is considered a cooling (*fresco*) plant with many traditional uses as a remedy. If the fresh plant is available, it can be crushed and liquefied (using a blender, juice extractor, grater or mortar and pestle) to extract the green juice of the leaves which is reported to have numerous therapeutic applications, including wound-healing properties. For liver disorders, vaginal infections, high cholesterol, stomach ache and abdominal pain, menopausal hot flashes or conditions associated with excess heat in the body, a refreshing tea is prepared of the leaves and can be sweetened with molasses (*melaza*).

For treating headache, migraines (*jaqueca*) and nausea, the leaves are slightly warmed and combined with animal lard or sheep's tallow (*sebo de flande*) and bitter orange (*naranja agria*) leaves and applied to the forehead or affected area as a bandage, covered with a cloth. As an abortifacient, this plant is used either on its own or in combination with other plants in a multi-herb decoction or tincture (*botella*).

**Availability:** This medicinal plant can be found growing along roadsides, sidewalks and parks in urban areas of New York City. Also, the dried aerial parts of this plant can be purchased from some *botánicas*.

## BOTANICAL DESCRIPTION

*Llantén* (*Plantago major*) is a perennial herbaceous plant that typically grows to about 20-30 cm tall. Leaves grow directly from the base of the plant in a whorl-like pattern; each leaf is simple, widely-oval to lance- or spatula-shaped (15-25 × 6-10 cm), narrowing at the base, with numerous prominent parallel veins and leaf edges that are slightly wavy. Flowers are numerous, tiny and grow in a dense, elongated cluster or spike, born atop a central stalk with white petals. Fruits are tiny, round, dry, straw-colored capsules, each containing 15-20 wedge-shaped seeds (Acevedo-Rodríguez 1996).

**Distribution:** Native to Eurasia, this plant is a cosmopolitan species that is often found in wet, moist areas and grows throughout the Americas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

In one human clinical trial, the plant extract did not show any toxic effects when administered for 25-30 days (Matey et al. 1982).

**Animal Toxicity Studies:** In an animal study, no evidence of acute toxicity or deaths were caused by doses of up to 2 g/kg body weight of the methanol seed and leaf extracts in mice (Atta & El Sooud 2004).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In one clinical trial, an extract of *Plantago major* showed improvement of chronic bronchitis symptoms (see "Clinical Data" table below). In another clinical trial of this plant, no diuretic effect was observed on urine output or sodium excretion (see "Effect Not Demonstrated" table below). In laboratory and/or animal studies, *Plantago major* has demonstrated the following effects: antibacterial, antidiarrheal, antinociceptive, antitumor, antiviral, chemopreventive, cytotoxic, gastroprotective, immunomodulatory

and laxative (see “Laboratory and Preclinical Data” table below). The following additional pharmacological effects of *llantén* (*Plantago lanceolata*) have been demonstrated or suggested in the literature: antibacterial, blood clotting, epithelization and treatment of respiratory tract infections (Gruenwald et al. 2004).

Biologically active constituents of *Plantago major* include: acetoside, adenine, alkaloids, allantoin, apigenin, aucubin, baicalein, baicalin, benzoic acid, caffeic acid, catalpol, chlorogenic acid, cinnamic acid, ferulic acid, fumaric acid, geniposidic acid, gentisic acid, hispidulin, luteolin, mucilage, neo-chlorogenic acid, nepetin, oleanolic acid, p-coumaric acid, p-hydroxybenzoic acid, salicylic acid, sorbitol, syringin, tyrosol, ursolic acid and vanillic acid (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** *Llantén* (*Plantago lanceolata*) is approved by the *Commission E* for the following health conditions: common cold, cough, bronchitis, fevers, inflammation of the mouth and throat and inflammation of the skin (Blumenthal et al. 1998).

### Clinical Data: *Plantago major*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Bronchitis treatment</b>	Plant extract; administered for 25-30 days	Clinical trial: n=25 patients with chronic bronchitis	Active; rapid effect on reported symptoms & clinical measures in 80% of patients; no toxic effects observed	Matey et al. 1982

### Laboratory and Preclinical Data: *Plantago major*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Leaf compound: soluble pectin polysaccharide; administered intraperitoneally	In vivo: mice infected with <i>Streptococcus pneumoniae</i> ; treated 1x 3 days before infection or 1-3 x from 3-48 hrs after challenge	Active; protected against pneumococcal infection if administered pre-challenge as recorded in the number of bacteria in blood & survival rate; mechanism due to stimulation of innate rather than adaptive immune system	Hetland et al. 2000
<b>Antidiarrheal</b>	Leaf extract; 200 & 400 mg/kg	In vivo: rats with castor oil-induced diarrhea (measure: distance traveled by charcoal meal in intestines); rabbit duodenum motility	Significant, dose-dependent effect; decreased gastrointestinal movement; at low doses ( $\leq 1.6$ mg/kg), methanol extract temporarily stimulated motility followed by inhibition	Atta & Mouneir 2005
<b>Antinociceptive</b>	Methanol seed & leaf extracts; 400 mg/kg orally administered	In vivo: mice, acetic acid-induced writhing & tail-flick test	Active; showed significant inhibition of nociception; no major signs of acute toxicity or mortality at doses up to 2 g/kg b.w.	Atta & El-Sooud 2004

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antitumor</b>	Way-bread subcutaneous injection of intracellular fluid	In vivo: female mice	Reduced incidence of tumor formation (i.e. control tumor frequency was 93.3 % vs. 18.2% in treated mice)	Lithander 1992
<b>Antiviral</b>	Aqueous extract & pure compounds	In vitro: HSV-1/-2, adenoviruses	Aqueous extract showed slight anti-herpes virus activity whereas isolated phenolic compounds exhibited potent activity	Chiang et al. 2002
<b>Antiviral, cytotoxic &amp; immunomodulatory</b>	Hot water plant extract	In vitro: against HSV-1 & -2, adenoviruses & human cancer cells	Active; dual immunomodulatory effect: enhanced lymphocyte proliferation & secretion of interferon-gamma at < 50 µg/mL but inhibited effect at >50 µg/mL	Chiang et al. 2003
<b>Chemopreventive</b>	Polyphenolic complex plantastine	In vivo: rats with amidopyrine- & sodium nitrite-induced tumors & hepatotoxicity	Active; inhibited carcinogenesis by reducing hepatotoxicity & decreasing tumor yield from 87.5% to 33.3%	Karpilovskaia et al. 1989
<b>Immunomodulatory</b>	Leaf endotoxin-free methanol extract	In vitro: rat peritoneal macrophages	Increased nitric oxide & TNF-alpha production; showed dose-dependent potentiation of Con A-induced lymphoproliferation	Gomez-Flores et al. 2000
<b>Laxative &amp; gastroprotective</b>	Polyholozidic fraction of <i>Plantago</i> seeds & leaves	Two unspecified experimental models	Active; showed gastroprotective action & laxative action at higher doses	Hriscu et al. 1990

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Diuretic</b>	Traditional plant remedy	Placebo-controlled, double-blind crossover clinical trial	No effect shown in measures of 12- & 24-hour urine output or sodium excretion	Doan et al. 1992

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# Maguey

## OTHER COMMON NAMES

*Maguey amargo*, *maguey blanco*, *maguey de bestia*, *maguey morado*, *maguey gruesa* (Spanish); agave, tequila plant (English).



## SCIENTIFIC NAME

*Agave* spp.; most commonly: *Agave antillarum* Descort. [Agavaceae (Century Plant or Cactus Family)].

**Note:** The genus *Agave* includes more than 300 different species, and there is some variation in the characteristics associated with each species. Dominicans who reported medicinal uses for this plant often distinguish between several distinct types of *maguey*. For example, *Maguey de bestia* has long, purple, wavy (*blandita*) leaves; whereas, *maguey gruesa* and other varieties have thicker leaves.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Asthma
- Cysts
- Headache
- Joint pain
- *Limpiar la sangre*
- Muscle strain
- Sexually transmitted infections
- Sprain or strain
- Stomach ache and abdominal pain
- Tumors
- Ulcers
- Upper or lower respiratory tract infections
- Uterine fibroids
- Vaginal infections

**Plant Part Used:** Leaves (*las pencas*) and bark.

**Traditional Preparation:** Typically the leaves and/or bark of this plant is prepared as a tea by decoction or added to multi-herb decoctions or tinctures. For external use, the leaves may be heated or prepared as a syrup or oil and applied topically.

**Traditional Uses:** To treat arthritis, joint pain and symptoms associated with *sangre sucia* (“dirty blood”), a few small pieces of the husk or bark (*cáscara*) of *maguey* are prepared as a decoction with aloe (*sábila*) leaf (*penca*) and guinea hen-weed (*anamú*) root. For headache, *maguey* leaves can be heated and applied topically to the forehead. *Maguey de bestia* is used for sprains or strains and is applied by wrapping the leaves around the affected area. For asthma, pulmonary infections or phlegm in the lungs, the leaf can be added to a syrup/oil *botella* along with other medicinal plants and ingredients. For stomach ache, abdominal pain and ulcers, this plant is prepared as a tea. To treat sexually transmitted infections, the leaf is tinctured in alcohol along with other plants to prepare a multi-herb *botella* that is taken internally until the infection has cleared. *Maguey* can be used in a vaginal wash for women’s health conditions such as excessive vaginal discharge and yeast or other vaginal infections, prepared by boiling the leaves. For cysts, tumors and fibroids, the bark or husk (*cáscara*) is used as an ingredient in multi-herb tinctures (*botellas*) or strong decoctions.

**Availability:** In New York City, *maguey* leaves can be purchased from some grocery stores, supermarkets, *bodegas* and *botánicas*. Because the sharp spines along the edges of the leaves are usually

removed in commerce, it can be difficult to determine which particular species of *maguey* is used without this identifying characteristic.

## BOTANICAL DESCRIPTION

*Maguey* (*Agave* spp.) is a robust perennial herb which can appear stemless because its stems are so short. Roots are hard and fibrous. Leaves are large, succulent or fibrous with a stiff, sharp spine at the tip; leaf edges are often armed with sharp prickles, but they can be smooth. Flowers grow in branching or spike-like, umbrella-shaped or rounded clusters, each borne atop a long, leafless flower-stem; each flower has six large creamy white to yellowish or light green petals. Fruits are capsules which contain numerous black, flattened seeds (Acevedo-Rodríguez 1996).

**Distribution:** Distributed widely throughout Latin America and southern U.S., some species of *maguey* are cultivated for their strong fibers or distilled to make tequila (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

Contact dermatitis has been reported in cases of prolonged and repeated occupational exposure due to calcium oxalate crystals in fresh leaf juice. According to a case report of irritant contact dermatitis from a tequila distillery and agave plantation workers, one droplet (0.03 mL) of juice pressed from the leaves of *Agave tequilana* contains 100-150 calcium oxalate crystals (raphides) which are 30-500  $\mu\text{m}$  in length and sharpened at both ends (Salinas 2001). In another case report, oxalic acid crystals from *A. americana* embedded in the skin caused oxalism and purpuric eruption, potentially leading to vascular damage (Cherpelis & Fenske 2000).

**Contraindications:** Because of its emmenagogue and abortifacient effects, this herb is contraindicated during pregnancy (Brinker 1998).

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

No human clinical trials of this plant have been identified in the available literature. Laboratory studies of *Agave* spp. have shown the following effects: anti-inflammatory, capillary permeability decreased, cytotoxic and steroidal (see “Laboratory and Preclinical Data” table below).

Steroidal compounds have been identified and isolated in several species of this genus. Biologically active compounds of *Agave* species include agavegenin (cholestane steroid), chlorogenin, oxalic acid, saponins (including steroidal saponins), sapogenins (hecogenin and diosgenin), smilagenin and tigogenin (Duke & Beckstrom-Sternberg 1998, Jin et al. 2004, Quilez et al. 2004).

**Indications and Usage:** Unknown; insufficient information available in the literature.

### Laboratory and Preclinical Data: *Agave* spp.

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-inflammatory</b>	Dry extracts from decoctions ( <i>A. intermixta</i> )	In vivo: carrageenan-induced rat paw edema (orally); mouse ear edema test (topically), tetradecanoylphorbol acetate used as an inflammatory agent	Showed significant anti-inflammatory effect in both models; reduced levels of myeloperoxidase enzyme in tissues	Garcia et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Capillary permeability decreased</b>	Saponins isolated from leaves ( <i>A. shrevei</i> )	In vitro	Showed significant inhibition of capillary permeability activity, but did not show hemolytic effects	da Silva & Parente 2005
<b>Cytotoxic</b>	<i>A. intermixta</i>	In vitro: anti-mitotic assay for determination of inhibition of cell division & cytostatic activity against Hep-2 cells	Complete inhibition of cell division at 24 hrs of treatment & a moderate cytostatic activity against Hep-2 cells	Saenz et al. 2000
<b>Steroidial</b>	Steroid constituents isolated from waste residue of fiber separation of leaves ( <i>A. americana</i> )	Isolation of steroid constituents; structures determined through spectroscopic analysis, NMR & hydrolytic cleavage.	Four new steroid constituents found: 3 steroidal saponins & 1 cholestane steroid agavegenin.	Jin et al. 2004
<b>Steroidial</b>	Saponins isolated from leaves ( <i>A. lophantha</i> )	Structures: 2 steroidal saponins determined by spectroscopic & chemical methods & NMR.	New structures determined & pharmacological activities discussed	Abdel-Khalik et al. 2002
<b>Steroidial</b>	Saponin isolated from leaves ( <i>A. attenuate</i> )	Haemolytic potential was evaluated; anti-inflammatory activity shown in capillary permeability assay	Novel steroidal saponin was isolated; anti-inflammatory activity shown	da Silva et al. 2002

### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory</b>	Isolated sapogenins ( <i>A. intermixta</i> )	Steroidial sapogenins (hecogenin & diosgenin) were isolated and identified	No effect shown in isolated sapogenins on the histamine release in peritoneal mast cells	Quilez et al. 2004

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## Mala Madre

### OTHER COMMON NAMES

*Bruja* (Spanish); palm beach-bells (English).

### SCIENTIFIC NAME

*Kalanchoe gastonis-bonnierei* Raym. – Hamet and H. Perrier. [Crassulaceae (Sedum Family)].

**Note:** The Spanish common name *mala madre* can also be used to refer to another species; see entry for: *Bruja* (*Kalanchoe pinnata*). Distinguishing feature: the leaves of *mala madre* are longer than those of *bruja*.

### DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Abortifacient
- Contraception
- Infections
- Inflammation
- Menopausal hot flashes
- Menorrhagia
- Menstrual cramps (dysmenorrhea)
- Ovarian cysts
- Pain
- Urinary tract infections
- Vaginal infections

**Plant Part Used:** Leaves.

**Traditional Preparation:** The leaves are typically prepared as a tea by boiling them in water and are often combined with other medicinal plants. They may also be prepared as a douche.

**Traditional Uses:** *Mala madre* is considered a cooling (*fresca*) or refreshing plant that is used for treating many illnesses, including pain (unspecified), urinary tract infections or inflammation (in general) and to alleviate women's health conditions. To treat menstrual disorders, ovarian cysts, tumors, fibroids and menopausal symptoms, the leaves are added to multi-herb preparations (*botellas*) and taken orally. For vaginal infections, menstrual cramps or excessive menstrual bleeding, the leaves are prepared as a douche or vaginal wash with other herbs and taken internally as a tea with Mexican prickly poppy (*cardo santo*). This preparation is said to cleanse the vagina from the inside out. For contraception it is prepared as a vaginal wash along with alum (*alumbre*). Also, it can be taken to induce abortion in combination with Caribbean pine (*cuaba*), malt beverage (*malta alemana*) and pharmaceutical pills (antiulcer medication), all boiled together and taken internally as a tea.

**Availability:** In New York City, the fresh leaves of *mala madre* are available at select *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) and are sometimes grown as house-plants.

## BOTANICAL DESCRIPTION

*Mala madre* (*Kalanchoe gastonis-bonnieri*) is a succulent, perennial herb that grows to 76 cm tall. Leaves grow in opposite pairs along stems and are lance- or spatula-shaped (15-38 cm long), smooth-surfaced, with wavy or scalloped leaf edges. Flowers grow in rounded clusters at the tops of stems and are tubular and flask-like in shape with yellowish to reddish 4-lobed petals (Bailey Hortorium Staff 1976).

**Distribution:** Native to Africa and Madagascar, this plant is cultivated and has become naturalized in pan-tropical regions (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No information on the safety or potential adverse effects of this plant in humans has been identified in the available literature.

**Animal Toxicity Studies:** In vivo studies have shown the LD<sub>50</sub> in mice to be 596 mg/kg of the aqueous extract administered orally (Vasquez Tineo 1990). The administration of 1.5 mL of the fresh leaf juice administered to 30 mice did not cause mortality or evidence of toxic effects even after 30 days of observation (Vasquez Tineo 1995).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Only one pharmacological study of this species was identified in the available literature, and this study showed antifertility and contraceptive effects of the leaf juice in rats (see “Laboratory and Preclinical Data” table below). Laboratory studies on other closely related species of the genus *Kalanchoe* have demonstrated the following biological activities: analgesic, anti-inflammatory and immunomodulatory (see “Laboratory and Preclinical Data: Related *Kalanchoe* spp.” table below). Major chemical constituents found in the leaves of this plant include: catechol tannins, coumarins, flavones, saponins, sterols and triterpenes (Duke & Beckstrom-Sternberg 1998, Germosén-Robineau 1995).

**Indications and Usage:** TRAMIL has designated this herb as “INV” meaning that more investigation is needed before making a recommendation with regard to its traditional use in the Caribbean as a leaf decoction taken orally for urogenital infections, stomach ache and abdominal pain and used externally as a wash for infections of the genitalia or urinary tract (Germosén-Robineau 1995).

### Laboratory and Preclinical Data: *Kalanchoe gastonis-bonnierei*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifertility &amp; contraceptive</b>	Leaf juice ( <i>Kalanchoe gastonis-bonnierei</i> )	In vivo (male rats); 150-300 mg/kg orally administered for 30 days	50-100% fertility inhibition, with 100% recovery of fertility 30 days after stopping treatment; sperm motility, viability and density were also decreased significantly	de la Luz Miranda-Beltran et al. 2003

### Laboratory and Preclinical Data: Related *Kalanchoe* spp.

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Analgesic</b>	Aqueous and ethanol extracts of dry leaves ( <i>Kalanchoe crenata</i> )	In vivo: mice and rats	Both extracts showed some analgesic effects	Nguelefack et al. 2004
<b>Immuno-modulatory &amp; anti-inflammatory</b>	Juice obtained from the leaves ( <i>Kalanchoe brasiliensis</i> )	In vivo (male rats)	Treatment reduced footpad thickness, leukocyte infiltration & blood flow in the footpad area; reduced B cell number in lymph node cells; reduced zymosan-induced inflammation	Ibrahim et al. 2002

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# Malagueta

## OTHER COMMON NAMES

Allspice (English).

## SCIENTIFIC NAME

*Pimenta dioica* (L.) Merr. [Myrtaceae (Myrtle Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Allergies
- Anxiety
- Depression
- Diabetes
- Gastrointestinal disorders
- Lack of energy
- *Limpiar el sistema*

- Menorrhagia
- Menstrual cramps (dysmenorrhea)
- Nausea
- Nervous system support
- Postpartum depression
- Pregnancy
- Sinusitis
- Stomach disorders
- Stress
- Upper or lower respiratory tract infections
- Vomiting

**Plant Part Used:** Unripe, dried fruit.

**Traditional Preparation:** Typically the seeds are prepared as a tea by decoction and are often combined with other plants.

**Traditional Uses:** *Malagueta* seeds are commonly used as a culinary spice and flavoring agent, especially when preparing tea, and are attributed numerous therapeutic properties. This medicinal plant is described as being hot (*caliente*), stimulating and energy-giving (*levanta el ánimo*), and it is said to function in part by heating the body. Sometimes the seeds are added to soups as a culinary seasoning. An invigorating and delicious tea that is good for digestive disorders, nausea and stomach disorders can be made by combining *malagueta* seeds with anise (*anis*) seeds, cinnamon (*canela*) bark and mint (*hierbabuena*) leaves.

For stress, anxiety, nervous tension and to support the nervous system, a decoction of the seeds is prepared with cloves (*clavo dulce*), cinnamon (*canela*) and mint (*hierbabuena*). For sinusitis, allergies and upper or lower respiratory tract infections, the seeds are prepared as a tea with cumin (*anis comino* or *comino*) seeds, rose (*rosa*) petals and cinnamon (*canela*). In the Dominican Republic, the seeds are commonly used as a treatment for vomiting, prepared as a decoction with salt and cinnamon, administered orally (Germosén-Robineau 2005).

**Availability:** Dried *malagueta* seeds are often available at grocery stores and supermarkets as a culinary spice. They can also be found at many *botánicas*.

## BOTANICAL DESCRIPTION

*Malagueta (Pimenta dioica)* is an aromatic tree that typically grows to 20 m tall with a stem diameter of approximately 30 cm and light brown bark that peels off in thin strips. Leaves are alternate, narrowly oval and highly aromatic. Flowers are small, numerous and white, arranged in branching terminal clusters. Fruits are round, dark brown berries (6-8 mm diameter; Bailey Hortorium Staff 1976).

**Distribution:** Native to the Caribbean and Central America, this plant grows in forested areas and is widely cultivated (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Widely used as a culinary spice, the seeds (dried unripe berries) of this plant are generally considered safe for human consumption.

**Animal Toxicity Studies:** Animal studies have shown that this plant has relatively low toxicity. The LD<sub>50</sub> in mice of the aqueous seed decoction was shown to be 24.4 ± 4.84 g/kg when administered orally and 5



± 1.46 g/kg when administered intraperitoneally. During 30 consecutive days of oral administration of 18.75 mL/kg in mice, no mortality was provoked (Herrera 1988).

**Contraindications:** No information is available on the safety of this plant in children, during pregnancy or lactation (Germosén-Robineau 2005).

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Radical scavenging effects of this plant have been studied extensively and at least 25 compounds isolated from the berries have demonstrated high antioxidant activity (Nakatani 2000). This plant has also demonstrated antihemorrhagic properties (see “Laboratory and Preclinical Data” table below). The fruit of this plant contains the following biologically active constituents: alpha-humulene, calcium oxalate, delta-3-carene, delta-cadinene, eugenol, eugenol methyl ether, methyl eugenol and terpinen-4-ol (Duke & Beckstrom-Sternberg 1998).

**Indications and Usage:** TRAMIL has designated the seeds of this plant as “recommended” for its traditional use in treating vomiting, prepared as a decoction and administered orally (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Pimenta dioica*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antihemorrhagic</b>	Ethanol, ethyl acetate, & aqueous extracts of Costa Rican tropical plants, including <i>Pimenta dioica</i>	In vivo: mice injected intradermally with venom of snake <i>Bothrops asper</i> or venom-extract mixture	Resulted in total inhibition of hemorrhage; mechanism probably due to chelation of zinc required for the catalytic activity of the venom’s hemorrhagic metalloproteinases	Castro et al. 1999
<b>Antioxidant</b>	Galloylglucosides isolated from berries	In vitro: radical 1, 1-diphenyl-2-picrylhydrazyl	Showed radical scavenging activity nearly equivalent to that of gallic acid	Kikuzaki et al. 2000
<b>Antioxidant</b>	Ethyl acetate-soluble extract of berries and isolated compounds	In vitro: against 1,1diphenyl-2-picrylhydrazyl radical and on liposome peroxidation	Showed strong antioxidant and radical-scavenging activity	Miyajima et al. 2004

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# Manzana

## OTHER COMMON NAMES

Apple, common apple (English).

## SCIENTIFIC NAME

*Malus pumila* Mill. Synonyms: *Malus communis* Poir, *Malus domestica* Borkh. [Rosaceae (Rose Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Common cold
- Flu
- Heart disease
- High blood pressure
- High cholesterol
- Menopausal hot flashes

**Plant Part Used:** Fruits.

**Traditional Preparation:** The fruits are prepared as a remedy by boiling them in hot water and preparing a tea.

**Traditional Uses:** *Manzana* is considered a fresh plant with cooling and calming properties. For treating conditions caused by excessive heat in the body, the fruit is prepared by cutting it into small pieces and boiling it as a tea (decoction method) with other medicinal herbs and spices. The fruit is eaten for nutritional purposes and to prevent and/or treat high blood pressure, high cholesterol and heart disease. As a remedy for the common cold or flu, a tea is prepared of *manzana* fruits combined with cinnamon (*canela*) bark and lemon/lime (*limón*) juice.

**Availability:** As a popular food, *manzana* fruit is typically available at most grocery stores and supermarkets in the produce section.

## **BOTANICAL DESCRIPTION**

*Manzana* (*Malus pumila*) is a small tree (2-12 m tall). Leaves are twice as long as their leaf-stems, narrowly oval to egg-shaped in outline, rounded- or sharply-toothed along the leaf edges with persistent soft hairs densely covering the underside of the leaf. Flowers are arranged in umbrella-like clusters of 4-7 with white or pinkish petals and fuzzy sepals. Fruits are of variable size with crisp, juicy, white, sweet to sour flesh and skin color ranging from yellow to green, red or variegated, depending on the particular cultivar (Bailey Hortorium Staff 1976).

**Distribution:** Native to Europe and southwest Asia, this plant is cultivated widely for its fruits (Bailey Hortorium Staff 1976).

## **SAFETY & PRECAUTIONS**

This fruit is widely consumed and generally considered safe. There are no known health hazards or negative side effects associated with the appropriate therapeutic use of this plant (Gruenwald et al. 2004).

**Contraindications:** None identified in the available literature.

**Drug Interactions:** None identified in the available literature.

**Indications and Usage:** The fresh, dried or juiced fruit can be taken orally, and the peel can be used in teas. Pharmaceutical preparations are available in liquid and dried pectin forms (Gruenwald et al. 2004).

## **SCIENTIFIC LITERATURE**

*Manzana* has demonstrated improvement of gastroenteritis in clinical studies and anti-inflammatory, antioxidant and antirheumatic effects in laboratory and/or animal studies (see data tables below). Bioactive fruit constituents include: acetic acid, alpha-linolenic acid, asparagine, avicularin, biotin, caffeic acid, chlorogenic acid, d-catechin, estragole, hyperoside, isoquercitrin, lutein, p-coumaric acid, p-hydroxy benzoic acid, protocatechuic acid, quercitrin and reynoutrin. The skin or pericarp contains the flavonoids quercetin and rutin (Duke & Beckstrom-Sternberg 2006). Apples are a significant source of dietary fiber and vitamin C (U.S. Dept. of Agriculture 2006).

### Clinical Data: *Malus pumila*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Gastroenteritis treatment</b>	Pectin-containing apple paste; single ingestion	Clinical; 56 patients with chronic enteritis in different stages aged 19-55	Myoelectrical activity of intestines studied pre- & post-treatment; intestinal absorptive function & condition of microflora evaluated post-treatment; exhibited positive effects on the pathogenic measures of enteritis	Filak 2002

### Laboratory and Preclinical Data: *Malus pumila*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antioxidant</b>	Phenolic extracts from fruit; total phenolics calculated as gallic acid equivalents (GAE)	In vitro: via autoxidation of methyl linoleate	Demonstrated strong antioxidant activity even though total phenolic contents were low (GAE < 12.1 mg/g)	Kahkonen et al. 1999
<b>Antirheumatic &amp; anti-inflammatory</b>	Dried 96% ethanol extract dissolved in water; administered as an oral dose of 500 mg/kg b.w.	In vivo: rats with carrageenan- & cotton pellet-induced inflammation; done 1 hour after treatment	Extract (23%) showed significant inhibition of inflammation in both models	Ageel et al. 1989

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# Manzanilla

## OTHER COMMON NAMES

Chamomile (English).

## SCIENTIFIC NAME

*Chamaemelum nobile* (L.) All. (English chamomile) and *Matricaria recutita* L. (German chamomile).  
Synonym: *Matricaria chamomilla* L. [Asteraceae (Aster or Daisy Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Anxiety
- Childbirth - labor pain
- High blood pressure
- Insomnia
- Menopausal hot flashes
- Menorrhagia
- Menstrual cramps (dysmenorrhea)
- *Nervios*
- Postpartum
- Stress
- Uterine fibroids

**Plant Part Used:** Flowers.

**Traditional Preparation:** Typically prepared as a tea by steeping the dried flowers in hot water; also frequently added to other herbal teas.

**Traditional Uses:** *Manzanilla* flowers are sweet, pleasant-tasting and well-known for their calming effects. The tea (infusion/decoction) can be prepared as for regulating blood pressure, relieving menstrual cramps and to improve circulation. Often combined with linden (*tilo*) flowers or mint (*hierbabuena*) leaves, it is a popular remedy for relaxation and to relieve anxiety, nervousness, stress and insomnia. This herb is sometimes given to children when they have trouble falling asleep. Also, for labor pain during childbirth and to support postpartum recovery, a tea is prepared of *manzanilla* flowers, star anise (*anis de estrella*) seeds and allspice (*malagueta*) fruits.

**Availability:** In New York City, *manzanilla* dried flowers can be purchased from health food and herbal supplement stores, farmer's markets, some grocery stores and pharmacies and most *botánicas*.

## BOTANICAL DESCRIPTION

*Matricaria recutita* is very similar to *Chamaemelum nobile* in appearance, and these species are often used interchangeably. *Manzanilla* (*Chamaemelum nobile*) is a perennial, creeping, many-branched herb that grows to 30 cm with downy stems that can be upright or low to the ground. Leaves are alternate and 2-3-times divided with feathery, linear segments. Flowers are terminal and have frilly, white petals arranged in a ring around a yellow, disc-shaped flower head (up to 2.5 cm across). Fruits are dry, 3-angled and light brown with vertical ribs; each fruit contains single seed (Bailey Hortorium Staff 1976).

**Distribution:** Native to Western Europe, the Mediterranean and northern Africa, this plant is cultivated widely (Bailey Hortorium Staff 1976).

**Note:** Because *Chamaemelum nobile* and *Matricaria recutita* are often used interchangeably in Dominican herbal medicine, their use information above has been combined; however, since most experimental and clinical research on this plant is species-specific with varying results for each species, these two species of *manzanilla* will be addressed separately in the following sections.

### Research Results for *Manzanilla: Chamaemelum nobile*

## SAFETY & PRECAUTIONS

There are no known health risks or pathological side effects associated with the proper use of *manzanilla* (*Chamaemelum nobile*) except for a small potential for sensitization (Gruenwald et al. 2004).

**Contraindications:** In early pregnancy, orally administration of the whole plant extract may be contraindicated if taken in excessive doses due to its emmenagogue effect; however, the flowers have not shown an emmenagogue effect. If the flower infusion is administered topically, avoid contact with the eyes or surrounding area due to potential irritation. Allergic reactions have been reported but appear to be rare (Brinker 1998).

**Drug Interactions:** The essential oil of *Matricaria recutita* has been shown to inhibit ulcer formation caused by indomethacin in animal studies (Brinker 1998).

## SCIENTIFIC LITERATURE

In laboratory and/or animal studies, this plant has shown hypoglycemic activity (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** Until further research on the clinical efficacy of this herb (*Chamaemelum nobile*) has been conducted, no therapeutic application can be recommended. Typical forms of administration include as a decoction (3 g herb/100 mL water), infusion (7-8 flower heads/1 cup water), tincture, syrup, ointment or powder. Average daily dose of the herb is 1.5 g (3 × daily with meals) and of the infusion is 50 mL to 200 mL. As a bath additive, 50 g to herb can be added to 10 L water. Poultices and compresses can be applied 2-3 times daily (Gruenwald et al. 2004).

## Laboratory and Preclinical Data: *Chamaemelum nobile*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hypoglycemic</b>	Aqueous extract of aerial parts; administered both as a single dose and daily for 15 days (20 mg/kg body weight)	In vivo: normal and streptozotocin-induced rats; measured blood glucose concentrations and basal insulin levels	Exhibited significant hypoglycemic effect in both normal and diabetic rats without affecting basal plasma insulin concentrations	Eddouks et al. 2005
<b>Hypoglycemic</b>	HMG-containing flavonoid glucoside chamaemeloside	Phytochemical study based on in vivo results	Determined that HMG (3-hydroxy-3-methylglutaric acid) has hypoglycemic activity comparable to that of free HMG; improved isolation scheme presented	Konig et al. 1998

## Research Results for *Manzanilla: Matricaria recutita*

### SAFETY & PRECAUTIONS

Considered safe if used appropriately; however, in high doses, *Matricaria recutita* may cause emesis (Bradley 1992).

**Contraindications:** In early pregnancy, oral administration of the whole plant extract may be contraindicated if taken in excessive doses due to its emmenagogue effect; however, the flowers have not shown an emmenagogue effect. If the flower infusion is administered topically, avoid contact with the eyes or surrounding area due to potential irritation. Allergic reactions have been reported but appear to be rare (Brinker 1998).

**Drug Interactions:** *Anticoagulants* – increased risk of bleeding when taken simultaneously due to umbelliferone, a coumarin present in this herb (Newall et al. 1996); therefore, caution is advised when administered concomitantly and signs and symptoms of excessive bleeding in patient should be monitored closely (Gruenwald et al. 2004). *Alcohol/Benzodiazepines* - concomitant use may result in enhanced or additive effects of alcohol and benzodiazepines and should be avoided (Gruenwald et al. 2004).

### SCIENTIFIC LITERATURE

In one clinical case report, a mouthwash made from *Matricaria recutita* was effective in treating oral mucositis induced by methotrexate therapy for rheumatoid arthritis (see “Clinical Data” table below). In laboratory and/or animal studies, this plant has shown antifungal, antipruritic, antiulcer and anxiolytic activity (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** Approved by the German *Commission E* for the following health conditions: cough/bronchitis, fevers and colds, inflammation of the skin, inflammation of the mouth and throat, tendency to infection and wounds and burns (Blumenthal et al. 1998).

### Clinical Data: *Matricaria recutita*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Oral mucositis treatment</b>	Wild chamomile mouthwash	Case report: patient with rheumatoid arthritis & methotrexate therapy-induced oral mucositis	Successfully treated oral mucositis with chamomile mouthwash	Mazokopakis et al. 2005

### Laboratory and Preclinical Data: *Matricaria recutita*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Aqueous, ethanolic & petroleum ether extracts	In vitro: strains of <i>Candida albicans</i> isolated from clinical samples obtained from patients with acute vaginitis	Activity possibly attributed to flavonoids	Trovato et al. 2000
<b>Antipruritic</b>	Ethyl acetate extract of dried flower, ethanol extract, & hot water extract; ingested as part of diet (1.2 w/w%); 11 days	In vivo: mice with induced scratching (by compound 48/80)	Dose-dependently suppressed scratching without affecting body weight increase; comparable to anti-allergic agent oxatomide (10 mg/kg p.o.)	Kobayashi et al. 2003
<b>Antipruritic</b>	Ethyl acetate flower extract (300 mg/kg) or essential oil & combined effect with antiallergic agents; single oral administration	In vivo: mice with pruritis provoked by compound 48/80 subcutaneous injection	Showed significant dose-dependent inhibition of scratching without affecting spontaneous motor activity; enhanced effectiveness of antihistamine H1 antagonists (oxatomide & fexofenadine)	Kobayashi et al. 2005
<b>Antiulcer</b>	Plant extract	In vivo: rats with indomethacin induced gastric ulcers	Exhibited dose dependent effect; linked to reduced acid output & increased mucin secretion; confirmed histologically; possibly due to flavonoid content & antioxidant properties	Khayyal et al. 2001



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anxiolytic</b>	Apigenin from flowers	In vivo: mice	Apigenin (a ligand for central benzodiazepine receptors) exerted anxiolytic & slight sedative effects, but no anticonvulsant or muscle relaxant activity was shown	Viola et al. 1995

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# Naranja Agria

## OTHER COMMON NAMES

Bitter orange, sour orange (English).

## SCIENTIFIC NAME

*Citrus aurantium* L. [Rutaceae (Rue Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Diarrhea
- Sinusitis
- Headache
- Common cold
- Flu

**Plant Part Used:** Fruit, fruit juice, fruit peel, leaves.

**Traditional Preparation:** The leaves are prepared as a tea by decoction or infusion, or the fruit juice is taken on its own or combined with other herbs as a mixture.

**Traditional Uses:** For diarrhea, the fresh juice is boiled in water with garlic (*ajo*) and lemon/lime (*limón*), taken as a tea. For sinusitis or headache, the leaves are heated and applied topically to the forehead or face. The leaves can also be prepared as a tea, often with lime/lemon (*limón*) as a remedy for cold and flu (*gripe*) and headache. For sinusitis, *naranja agria* fruit juice is combined with castor bean plant (*higuereta*) oil, camphor (*alcanfor*) essential oil and tallow (*cebo flande*) to make a salve or ointment that is applied externally to the affected area.

**Availability:** In New York City, *naranja agria* fruits are sold at Latino/Caribbean grocery stores, super markets and fruit stands and leaves are sometimes sold at *botánicas*.

## BOTANICAL DESCRIPTION

*Naranja agria* (*Citrus aurantium*) is a spiny tree that typically grows 6-9 m tall. Leaves are alternate and compound but reduced to one, simple leaflet with broadly-winged leaf-stalks; each leaf is oblong-to-oval in shape (10 cm long), thick and leathery, dotted with glands and fragrant when crushed. Flowers grow singly and have 5 white scented petals. Fruits are leathery-skinned, 8.5 cm in diameter, with orange to reddish skin, containing many seeds and orange pulp and bear some resemblance to the fruits of sweet orange, a closely related *Citrus* spp. However, *naranja agria* fruits are considerably more acidic, sour or bitter in taste than most commercial oranges (Bailey Hortorium Staff 1976).

**Distribution:** Native to southern Vietnam, this plant is cultivated in many subtropical and tropical regions, including Florida and the Caribbean (Bailey Hortorium Staff 1976). *Naranja agria* is one of the main export crops of the Dominican Republic and it is primarily cultivated for the aromatic essential oil of its flowers (known commercially as neroli) which is used for fragrance.

## SAFETY & PRECAUTIONS

No health risks or negative side effects have been identified in the scientific literature associated with the appropriate therapeutic use of this plant; however, increased UV-sensitivity is possible due to the phototoxic effect of its furocoumarin constituents. Sensitization has reported due to frequent contact in an occupational setting resulting in dermatological irritations (Gruenwald et al. 2004).

After ephedrine was withdrawn from the dietary supplement marketplace, weight-loss products have replaced their former ephedrine content with synephrine from bitter orange and concerns have been raised about the safety of this alkaloid and its two isomers: p-synephrine and m-synephrine (Allison et al. 2005). Adverse reactions have been reported associated with the use of weight loss herbal preparations containing *naranja agria* as a primary constituent (Firenzuoli et al. 2005). One of the reported adverse effects is the possible incidence of acute lateral-wall myocardial infarction (MI) which coincided with the use of *naranja agria* (300 mg daily for a year) in a dietary supplement (Edita's Skinny Pill); the patient was a 55-year-old white woman with no previous history of heart disease, hypertension or hyperlipidemia, although she did smoke (Nykamp et al. 2004).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In one clinical trial, the oil of this plant showed antifungal activity against tinea corporis, cruris and pedis (see "Clinical Data" table below). Antifungal, antioxidant, insecticidal and relaxant (see "Laboratory and Preclinical Data" table below). According to the *Physician's Desk Reference for Herbal Medicines*, this plant has also shown mild spasmolytic effects and stimulation of gastric juice secretion in laboratory studies (Gruenwald et al. 2004).

**Indications and Usage:** The fruit peel is approved by the *Commission E* for the treatment of dyspeptic disorders and loss of appetite (Blumenthal et al. 1998). Typical daily dosage is 4 to 6 g dried fruit peel, prepared as a tea using 1 teaspoon of dried, cut and coarsely powdered fruit peel infused in hot water for 10 minutes, then strained (Gruenwald et al. 2004).

### Clinical Data: *Citrus aurantium*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Oil; 25% emulsion (3 × daily); 20% of oil in alcohol (3 × daily); pure oil (1 × daily)	Clinical trial; 60 patients (20 in each of 3 groups) with tinea corporis, cruris & pedis	Exhibited antifungal activity: group 1: 80% patients cured in 1-2 wks, the remaining 20% in 2-3 wks; group 2: 50% cured in 1-2 wks, 30% in 2-3 wks, 20% in 3-4 wks; group 3: 25% did not continue trial; remaining patients: 33.3% cured in 1 wks, 60% in 1-2 wks, 6.7% in 2-3 wks; produced no side effects except mild irritation when using pure oil	Ramadan et al. 1996

### Laboratory and Preclinical Data: *Citrus aurantium*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Oil	In vitro: pathogenic dermatophytes	Active	Ramadan et al. 1996
<b>Antioxidant</b>	Cyanidine 3-O-beta-glucopyranoside	In vitro: inhibitory effects measured on the oscillations of hydrogen peroxide, acidic iodate, malonic acid and Mn(II)-catalyzed system (Briggs-Rauscher reaction)	Antioxidant activity demonstrated	Cervellati et al. 2002
<b>Insecticidal</b>	Extract of oil from fruit peel	In vitro: susceptibility tests in mosquito larvae ( <i>Culex quinquefasciatus</i> )	Larvae mortalities observed; potentially useful insecticide	Mwaiko 1992
<b>Relaxant</b>	Essential (volatile) oils	In vitro: tracheal and ileal smooth muscles of guinea pig	Demonstrated relaxant effects on the tracheal smooth muscle; produced marked increase in resting force (i.e. contracture)	Reiter & Brandt 1985

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# Orégano de Comer

## OTHER COMMON NAMES

*Orégano* (Spanish); oregano, Greek or Italian oregano (English).

## SCIENTIFIC NAME

*Origanum* spp.; typically *Origanum vulgare* L. [Lamiaceae (Mint Family)].

**Note:** Several different species are referred to by the name “*Orégano*,” including *orégano de comer* (*Origanum vulgare*), *orégano poleo* (*Coleus amboinicus*), *oreganillo* (*Lippia micromera*), *orégano mejorana* (*Origanum marjorana*) and others.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Allergies
- Common cold
- Diarrhea
- *Empacho*
- Flatulence and intestinal gas
- Gastrointestinal disorders
- Indigestion
- Lack of appetite
- *Madre*
- Nasal congestion
- Nausea
- *Padrejón*
- *Pasmo*
- *Saltadura*
- Sinusitis
- Stomach disorders
- Vomiting

**Plant Part Used:** Leaves, stems and oil.

**Traditional Preparation:** Typically a tea is prepared of the leaves by infusion or decoction.

**Traditional Uses:** For indigestion and stomach disorders, including gastrointestinal inflammation, nausea, vomiting and diarrhea, this herb (either the leaves or the aerial parts: leaves, stems and flowers) is prepared as a tea, sometimes with a small amount of salt added instead of sugar. For sinusitis, nasal congestion and difficulty breathing due to common cold or allergies, the leaves are applied topically to the face. This is said to open up the blocked nasal passages. For pain in the womb or pelvic area due to gas or *pasmo*, this tea is also used in combination with star anise (*anís de estrella*), anise (*anís*) and pepperweed (*mastuerzo*). For lack of appetite and culturally-specific illnesses associated with indigestion

or blockage of the digestive tract, such as *empacho*, *padrejón*, *madre* and *saltadura*, the fresh leaves are taken as a tea (prepared by decoction) with crushed garlic (*ajo*) and salt.

**Availability:** Typically dried and sometimes fresh *orégano* herb can be found at many grocery stores, supermarkets and *botánicas* (Latino/Afro-Caribbean herb and spiritual shops).

## BOTANICAL DESCRIPTION

*Orégano de comer* (*Origanum vulgare*) is a perennial herbaceous plant that grows to 76 cm tall. Stems are square in cross-section. Leaves are arranged in opposite pairs along stems and are narrowly oval to egg-shaped (to 3-4 cm long), can be smooth or hairy on the surface and typically have smooth or sometimes toothed leaf-edges. Flowers occur in dense, oblong-shaped spikelets at the tops of stems with purple bracts and tiny, white to purplish petals. Fruits are small nutlets (Bailey Hortorium Staff 1976).

**Distribution:** Native to Europe and central Asia, this plant has become naturalized in the eastern United States and is cultivated widely as a culinary seasoning with highly variable subspecies (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Internal therapeutic use of this herb is considered relatively safe when used appropriately (Gruenwald et al. 2004). This herb is widely consumed as a culinary herb and generally regarded as safe.

**Contraindications:** During pregnancy, excessive use should be avoided due to potential abortifacient and emmenagogue effects of this plant (Brinker 1998).

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

In one clinical trial, the essential oil administered in tablet form was effective in 10 out of 13 patients in the treatment of enteric parasites (see “Clinical Data” table below). Oregano oil and/or its isolated constituents have shown the following effects in laboratory and/or animal studies: antifungal, antimicrobial, antimutagenic and antioxidant (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** This herb can be administered as an infusion (tea) or can be added to bathwater for a therapeutic soak. For internal use, prepare as a tea (1 teaspoon herb/1 cup boiling water), steeped for 10 minutes and strained; taken orally several times daily as needed (Gruenwald et al. 2004).

### Clinical Data: *Origanum vulgare*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiparasitic</b>	Essential oil in tablet form; 3 × daily for 6 wks	Clinical trial; n=13 with enteric parasites; 8 w/ <i>Blastocystis hominis</i> & 4 w/ <i>Entamoeba hartmanni</i>	Active; 77% (10 of 13) patients were parasite-free at end of treatment; reduced symptoms of bloating, gastrointestinal cramping, diarrhea, constipation & fatigue	Force et al. 2000

## Laboratory and Preclinical Data: *Origanum vulgare*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antifungal</b>	Essential oil & phenolic compounds	In vitro: against <i>Candida albicans</i>	Active; most active constituent identified as phenolic compound carvacrol	Stiles et al. 1995
<b>Antimicrobial</b>	Essential oil & phenolic compounds	In vitro	Active constituents identified as thymol & carvacrol	Biondi et al. 1993
<b>Antimutagenic</b>	Isolated constituent: rosmarinic acid	In vitro	Showed antimutagenic & anticarcinogenic effects	Milic & Milic 1998
<b>Antioxidant</b>	Essential oil & nonpolar residue of plant matter	Phytochemical analysis	Identified tocopherols as primary antioxidant components	Lagouri & Boskou 1996

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# Orégano Poleo

## OTHER COMMON NAMES

*Orégano de hoja ancha* (Spanish); Spanish thyme, Indian borage, country borage (English).

## SCIENTIFIC NAME

*Plectranthus amboinicus* (Lour.) Spreng. Synonyms: *Coleus aromaticus* Benth.; *Coleus amboinicus* Lour. [Lamiaceae (Mint Family)].

**Note:** Several different species are referred to by the name “Orégano,” including *orégano de comer* (*Origanum vulgare*), *orégano poleo* (*Coleus amboinicus*), *oreganillo* (*Lippia micromera*), *orégano mejorana* (*Origanum marjorana*) and others.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Diarrhea
- Earache
- *Empacho*
- Gastrointestinal disorders
- Headache
- Indigestion
- Sinusitis
- Stomach disorders

**Plant Part Used:** Leaves.

**Traditional Preparation:** Typically prepared as a tea by decoction or infusion; also used topically as a poultice.

**Traditional Uses:** For diarrhea, the leaves are boiled to prepare a tea. For indigestion or stomach disorders (particularly for adults), including *empacho*, a tea is prepared of the leaves with salt. The leaves can also be used as a poultice for headaches and sinusitis by heating them and applying them externally to the affected area. For earache, the heated and wilted leaf is applied topically to the ear.

**Availability:** In New York City, the fresh leaves of this plant are sometimes available at ethnic markets or grocery stores (*bodegas*) in Latino neighborhoods. The fresh and/or dried leaves are sold at select *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) that specialize in selling medicinal plants.

## BOTANICAL DESCRIPTION

*Orégano poleo* (*Plectranthus amboinicus*) is an aromatic perennial herb that grows upright to 50-100 cm tall. Stems are square in cross-section. Leaves grow in opposite pairs and are fleshy, oval and dotted with glands on the underside; have scalloped or rounded-teeth along leaf-edges; and are covered with short, straight hairs (3.5-6.5 cm long). Flowers are arranged in clusters crowded at the tips of branches; they are small with pale purple petals that are fused together to form a tube, opening at the end into 4 lobes that look like two boat-shaped lips. Fruits are 4 small, smooth nutlets each containing a single seed (Bailey Hortorium Staff 1976).

**Distribution:** Although its exact origin is uncertain, this plant is most likely native to the Old World tropics and ranges in cultivation from India to the Malaysian Archipelago; it is also cultivated in tropical America where it is sold for culinary purposes (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Insufficient information available in the literature.

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

This species has shown the following effects in animal and in vitro studies: anticlastogenic (in bone marrow chromosomal aberrations induced by anticancer drugs), antimicrobial, antiurolithiatic, diuretic and nitric oxide radical scavenging. Related species of the same genus as *Coleus amboinicus* have demonstrated the following activity: inhibition of HIV-1 integrase, anti-implantation, antimicrobial, anti-obesity and inhibition of complement-mediated hemolysis.

The leaves are commonly used as a condiment. A closely related plant, *Coleus forskohlii*, has been used in Ayurvedic medicine for centuries to treat a variety of diseases and is now popular in weight-loss supplements; the active ingredient is forskolin, a diterpene compound which also affects drug-metabolizing enzymes in the liver (Ding & Staudinger 2005). Another related species, *Coleus parvifolius*, is used as a medicinal plant in Thailand.

**Indications and Usage:** Insufficient information available in the literature.

### Laboratory and Preclinical Data: *Plectranthus amboinicus*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anticlastogenic</b>	Ethanollic plant extract; doses: 10, 15, 25, 50 & 100 mg/kg b.w.; fed plant extract orally for 7 days	In vivo & in vitro: mice; given 2 doses of anticancer drugs via intraperitoneal injection after 7-days plant extract: cyclophosphamide (25 & 50 mg/kg b.w.) & mitomycin-C (4 & 8 mg/kg b.w.)	Showed activity in bone marrow chromosomal aberration assay & micronucleus test in chromosomal aberrations induced by cyclophosphamide & mitomycin-C; lower doses were more effective in protecting against cytogenetic damage	Prasad et al. 2002
<b>Antimicrobial</b>	Essential oil ( <i>Coleus aromaticus</i> & <i>C. zeylanicus</i> )	In vitro; against 7 bacteria & 8 fungi	Active; <i>C. zeylanicus</i> had a slightly higher inhibitory effect overall	Deena et al. 2002
<b>Antiurolithiatic</b>	Water extract of leaves (0.5 & 1.0 g/kg, given orally once daily for 30 days	In vivo; rats w/calcium oxalate stones induced by feeding 3% w/w sodium oxalate	Active; effectively reduced kidney deposition of calcium oxalate & increased urinary excretion of calcium oxalate	Ghosh et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Diuretic</b>	Water extract of leaf; 0.5 g/kg & 1.0 g/kg p.o.)	In vivo; normal male rats using furosemide as standard reference drug (4 mg/kg p.o.)	Active; produced diuresis; significantly increased urine output & electrolyte concentration	Sur et al. 2003
<b>Nitric oxide (NO) radical scavenging</b>	Plant extract	In vitro; nitroprusside as NO donor	Showed significant, dose-dependent effect; suggest use in illnesses associated with excess NO & peroxynitrite generation	Jagetia & Baliga 2004

### Laboratory and Preclinical Data: Closely related species (*Coleus* spp.)

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-HIV-1: inhibition of HIV-1 integrase (IN)</b>	Water & ethanol extracts of <i>Coleus parvilolius</i> (aerial parts)	In vitro	Showed potent activity (IC <sub>50</sub> value of 9.2 µg/mL) in inhibiting HIV-1 integrase which is an enzyme necessary for viral replication; active constituents identified	Tewtrakul et al. 2003
<b>Anti-implantation &amp; delayed fetal development</b>	<i>Coleus barbatus</i> hydroalcoholic extract at increasing doses: 220, 440 & 880 mg/kg daily by gavage	In vivo; pregnant rats received plant extract (or distilled H <sub>2</sub> O in control group) during preimplantation or organogenic periods of pregnancy (days 0-5 or 6 to 15)	Active; treatment w/880 mg/kg daily of plant extract before embryo implantation delayed fetal development & showed anti-implantation effect	Almeida & Lemonica 2000
<b>Antimicrobial</b>	<i>Coleus blumei</i> chloroform extract of air-dried leaves	In vitro	Isolated abietane type diterpene active against <i>Bacillus subtilis</i> , <i>Pseudomonas aeruginosa</i> & <i>Candida albicans</i>	Ragas et al. 2001
<b>Antiobesity</b>	<i>Coleus forskohlii</i> 50g/kg extract	In vivo; female ovariectomized rats	Active; observed a reduction in fat accumulation, food intake & body weight	Han et al. 2005
<b>Inhibition of complement-mediated hemolysis</b>	<i>Coleus kilimanschari</i> ethanolic extract	In vitro	Active against both the classical & alternative pathways of the complement system	Cos et al. 2002

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# Piña

## OTHER COMMON NAMES

Pineapple (English).

## SCIENTIFIC NAME

*Ananas comosus* (L.) Merr. [Bromeliaceae (Pineapple Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Bacterial infections
- High blood pressure
- High cholesterol

- Inflammation
- *Limpiar el sistema*
- Kidney disorders
- Menopausal hot flashes
- Urinary tract infections
- Uterine fibroids

**Plant Part Used:** Fruit and fruit rind.

**Traditional Preparation:** The fresh fruit may be eaten or prepared as a juice; the rind is also used to prepare a refreshing drink (called *guarapo*) by soaking it in water.

**Traditional Uses:** *Piña* is a delicious tropical fruit and a popular natural remedy. Considered a cooling plant, *piña* can be taken as a refreshing remedy for conditions associated with excessive heat in the body such as inflammation. As a remedy for high cholesterol or high blood pressures, the fruit is liquefied in a blender to make a juice (*batida*). To make a nutritious and healthy-promoting drink, additional ingredients are sometimes added to this juice, such as celery (*apio*), cucumber (*pepino*) and/or kiwi. The juice is often taken as a diuretic (*para sacar el agua*) for urinary tract or kidney disorders, combined with honey (*miel*) as a sweetener. The fresh juice is considered a strong antibiotic and is taken internally as a treatment for diseases caused by infection. As a therapy for cancer, the fresh juice is taken orally and often combined with the juice of other fruits such as custard apple (*anón*).

To make a cooling drink that is said to cleanse the body internally (called a *guarapo*), immerse pieces of the fruit rind (*cáscara*) in water with sugar. This mixture is set in a covered container at room temperature for 3-4 days to allow it to ferment and then stored in the refrigerator until used.

This fruit is regarded as being exceptionally sour (*agria*) and acidic; as such it can cause irritation in individuals who are sensitive or allergic. Dominican herbalists contraindicate this plant in individuals who have a history of hypersensitivity to this fruit because ingestion may cause an allergic reaction.

**Availability:** *Piña* fruit can be purchased at grocery stores, fruit stands and supermarkets, depending on seasonal availability.

## BOTANICAL DESCRIPTION

*Piña* (*Ananas comosus*) is a perennial herbaceous plant that grows to 1.2 m tall with a short stem. Leaves are arranged in a spiral pattern from the base of the plant and are narrow, linear (90 × 6 cm), thorny at the tip and toothed with sharp thorns along the leaf-edges. Flowers grow in dense clusters along spikes (30 cm long); emerge from the axils of reddish, thorny bracts; are blue, purple or white in color; 3-petaled and fused to form a funnel-like shape. Fruits are numerous and fused together to form a pinecone-like shape (10-25 × 15-25 cm) with yellow to orange red, bumpy or warty skin, white to golden yellow, sweet flesh and a tuft of leaves at the top. Native to tropical America, *piña* is cultivated extensively for its fruits (Bailey Hortorium Staff 1976, Gruenwald et al. 2004).

## SAFETY & PRECAUTIONS

When administered appropriately, no health hazards are known in conjunction with the therapeutic use of this plant. Some reported side effects that may occur when taken internally include diarrhea and stomach disorders. When used repeatedly, allergic reactions have been reported (Gruenwald et al. 2004).

**Contraindications:** Insufficient information available in the literature; however, caution is advised when administered to pregnant women due to possible abortifacient effects of steroids in plant extracts (Pakrashi & Basak 1976).

**Drug Interactions:** *Antibiotics:* elevation of serum levels of antibiotics has been observed when administered concurrently. *Anticoagulants and thrombocyte aggregation inhibitors:* when taken concurrently with bromelain, an increased tendency to bleeding has been observed. *Tetracyclines:* when taken with bromelain, elevated plasma and urine concentrations have been observed (Gruenwald et al. 2004).

## SCIENTIFIC LITERATURE

In laboratory and/or animal studies, this plant has demonstrated the following effects: antidiabetic, antidyslipidemic, antifertility, antioxidant, antitumor, burn debridement and diuretic (see “Laboratory and Preclinical Data” table below). According to a secondary clinical reference, *piña* has demonstrated the following pharmacological effects: antineoplastic, antiphlogistic, antineoplastic, fibrinolytic, proteolytic; wound-healing due to proteolytic enzymes; and inhibition of thrombocyte aggregation (Gruenwald et al. 2004). Also, plant extracts have shown burn-debridement and anti-fertility effects in vivo.

Bromelain, a non-toxic enzyme complex extracted from the stem of *Ananas comosus*, has been associated with the following properties: “(1) interference with growth of malignant cells; (2) inhibition of platelet aggregation; (3) fibrinolytic activity; (4) anti-inflammatory action; (5) skin debridement properties” (Taussig & Batkin 1988). These biological effects of bromelain suggest its use in modulating: “(a) tumor growth; (b) blood coagulation; (c) inflammatory changes; (d) debridement of third degree burns; (e) enhancement of absorption of drugs” (Taussig & Batkin 1988).

**Indications and Usage:** *Piña* is approved by the German *Commission E* for treating wounds and burns (Blumenthal et al. 1998). Typical dosage of bromelain (the mixture of proteolytic enzymes from the stem of *piña* which is extracted and sold commercially) is 500 to 2000 mg daily; for children: 150 to 300 FIP (Federation Internationale Pharmaceutique) units.

### Laboratory and Preclinical Data: *Ananas comosus*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antidiabetic, antioxidant &amp; antidyslipidemic</b>	Ethanol extract of leaves; dosage: 0.40 g/kg	In vivo: rats with diabetes & dyslipidemia induced by alloxan and high-fat/high-cholesterol diet	Significantly inhibited increase in blood glucose in diabetic rats in oral glucose tolerance & increased postprandial triglyceride levels in both normal and diabetic rats in olive oil load tests; demonstrated antioxidant, antidiabetic & antidyslipidemic activity	Xie et al. 2005
<b>Antifertility (female)</b>	Juice of unripe fruits; 50 mL daily for 1-7 days	In vivo: rats	Showed antiimplantation activity	Garg et al. 1970
<b>Antitumor</b>	Bromelain (enzyme complex extracted from stem)	In vitro	Inhibited growth of tumor cells	Taussig et al. 1985
<b>Burn debridement</b>	Pineapple stem enzyme fractions; topical treatment (24 hours postburn)	In vivo: rats with experimentally induced full-thickness skin burns	Showed rapid, even debridement of burn injury; suggest potential use as agents of non-surgical debridement	Rowan et al. 1990

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Diuretic</b>	Root extract, given orally (10 mg/kg)	In vivo: rats	Demonstrated significantly increased urine output (79% of the effect of an equivalent dose of hydrochlorothiazide with similar profiles of urinary electrolyte secretion)	Sripanidkulchai et al. 2001

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# Rábano

## OTHER COMMON NAMES

Radish (English).

## SCIENTIFIC NAME

*Raphanus sativus* L. [Brassicaceae (Mustard Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Asthma
- Bronchitis
- Common cold
- Flu

**Plant Part Used:** Root.

**Traditional Preparation:** Eaten raw or liquefied and taken orally as a juice.

**Traditional Uses:** For asthma, it can be liquefied in a blender and taken as a drink with sugar and water. For bronchitis, the common cold, flu and cough, raw *rábano* is combined with honey and sometimes fresh watercress (*berro*), taken orally by the spoonful.

**Availability:** This vegetable is commonly sold in the produce section of grocery stores and super markets.

## BOTANICAL DESCRIPTION

*Rábano* (*Raphanus sativus*) is an annual or biennial herbaceous plant that grows to 1 m high with a slightly hairy stem. Roots vary between cultivars but are typically round and thick with reddish-purple skin and white, crisp, pungent flesh. Leaves grow in an alternate pattern along stems and are vertically lobed or cleft with rounded terminal lobes and smaller lower lobes. Flowers are white to yellowish with purplish-lilac veins and 4 petals. Fruits are green, podlike, many-seeded capsules (Bailey Hortorium Staff 1976).

**Distribution:** Native to Europe and eastern Asia, this plant is cultivated widely for its edible roots (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

The roots are widely consumed as a vegetable and used medicinally as a laxative and abortifacient. Insufficient information available in the literature. The fresh root is approved by the German Commission E for its use in the treatment of “peptic disorders, especially those related to dyskinesia of the bile ducts, catarrhs of the upper or lower respiratory tract” (p. 193; Blumenthal 1998).

**Contraindications:** Not to be used in cases of cholelithiasis (Blumenthal 1998).

**Drug Interactions:** Insufficient information available in the literature.



## SCIENTIFIC LITERATURE

Medline literature searches yielded three published studies on the therapeutic effects of this plant, showing support for the following activity: antiurolithiatic, gastrointestinal stimulatory and uterotonic (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** The fresh root, prepared as a pressed juice and administered orally, is approved by the German Commission E for its use in the treatment of “peptic disorders, especially those related to dyskinesia of the bile ducts, catarrhs of the upper respiratory tract” (p. 193). According to the German *Commission E*, average daily dosage consists of 50-100 mL of the pressed juice (Blumenthal 1998).

### Laboratory and Preclinical Data: *Raphanus sativus*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiuro lithiatic</b>	Aqueous extract of the bark	In vivo: rats with urolithiasis induced by implantation of zinc disc in urinary bladder	Active; decreased weight of stones after treatment; increased 24 hrs urine volume (as compared with control)	Vargas et al. 1999
<b>Gastrointestinal stimulatory &amp; uterotonic</b>	Crude leaf extract, dietary administration (0.03-10 mg/mL)	Ex vivo; isolated rabbit jejunum, rat stomach fundus & uterus (partially blocked by atropine) & guinea pig ileum	Active; showed spasmogenic effect (possibly due to saponins); mechanism partially mediated through cholinergic receptors in rabbit & rat tissues; functioned through histaminergic activation in guinea-pigs	Ghayur & Gilani 2005
<b>Gut stimulatory</b>	Crude leaf extract	In vivo & ex vivo; effect was insensitive to pre-treatment with atropine but totally eradicated by pyrilamine thus demonstrating involvement of H1 receptors;	Active; dose-dependent effect on spasmogenicity of guinea-pig ileum & colon; mechanism involved histaminergic (H1) receptors; high doses caused contractile effect followed by relaxation; enhanced transit of charcoal meal in mice (at 30-100 mg/kg); petroleum spirit, chloroform & aqueous fractions showed histaminergic activity; support use of plant in treating constipation	Gilani & Ghayur 2004

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# Remolacha

## OTHER COMMON NAMES

Beet (English).

## SCIENTIFIC NAME

*Beta vulgaris* Roscoe [Chenopodiaceae (Goosefoot or Beet Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Anemia
- Cysts of the ovaries or breasts
- *Purificar la sangre*
- Tumors
- Uterine fibroids

**Plant Part Used:** Root.

**Traditional Preparation:** Raw juice of 2-3 beets, usually mixed with 1-2 tablespoons of molasses, taken 1-2 times daily (Balick et al. 2000, Yukes et al. 2002-2003).

**Traditional Uses:** *Remolacha* is a popular remedy for cysts of the ovaries or breasts, uterine fibroids and tumors, and it is typically taken in combination with molasses (*melaza*). It is also used to treat anemia, often in combination with annatto (*bija*) and malt beverage (*malta alemana*). For ovarian cysts, the fresh juice (*zumo*) of the root may be prepared with guinea hen-weed (*anamú*) root. *Remolacha*'s reported therapeutic action is to break apart (*desbaratar*) cysts, tumors and fibroids and to fortify and strengthen the blood (Balick et al. 2000, Yukes et al. 2002-2003).

**Availability:** As a common vegetable food, *remolacha* is available at most grocery stores, supermarkets and farmers' markets in New York City (Yukes et al. 2002-2003).

## BOTANICAL DESCRIPTION

*Remolacha* (*Beta vulgaris*) is a biennial or annual plant that grows to 1.5 m tall with stems that emerge during the second year of growth. Roots are thick, fleshy, edible tubers that can be deep-magenta, golden-yellow, pink or whitish in color. Leaves are oval to oblong in shape and grow upright on long leaf-stalks, emerging from the top of the tuber in a basal rosette. Flowers are small, greenish or reddish, without petals and arranged in tight clusters. Fruits are dried, woody, hardened, seed-like structures (Bailey Hortorium Staff 1976).

**Distribution:** Native to Eurasia, there are several varieties of this plant, and it is widely cultivated. The *crassa* [(Alef.) J. Helm.] variety is grown chiefly for its roots and is used as a vegetable or forage crop

and as a source of sugar whereas the *cicla* (L.) cultivar is grown as a leafy vegetable, also known as chard (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Overall, the roots and leaves of this plant are safe for human consumption and medicinal use. However, when the leaves are ingested in extremely large quantities, they may lead to hypocalcemia or kidney damage due to their oxaluric acid content (Gruenwald et al. 2004).

**Contraindications:** None identified in the literature.

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

In laboratory and/or animal studies, this plant has shown the following effects: anticarcinogenic, antidiabetic, anti-inflammatory, antioxidant, antiviral (influenza), estrogenic, glycosylation inhibition, hepatoprotective and hypoglycemic (see “Laboratory and Preclinical Data” table below). According to the *Physician’s Desk Reference for Herbal Medicines*, this plant’s hepatoprotective effects are due to its ability to prevent fat from being deposited in the liver as shown in animal studies. The most likely active constituent responsible for this effect is the concentration of betaine in the herb which plays an important role in the liver’s transmethylation process (Gruenwald et al. 2004). In studies involving humans, beeturia (the pinkish or reddish coloration of urine that occurs in some individuals after consumption of beets) has been shown to be a likely indicator of iron-deficiency anemia (Sotos 1999).

Nutritional analyses of beets have shown that they contain high amounts of dietary fiber (2.8 g/100 g raw beets; U.S. Department of Agriculture 2005) and iron (1.55 mg per half cup, boiled; Pennington 1989), both of which have therapeutic implications, especially in the treatment of estrogen-related gynecological conditions and anemia (Fugh-Berman et al. 2004). Beets also contain extremely high quantities of carotenoids (precursors of Vitamin A) which are known to be antioxidant and could hypothetically inhibit the growth of fibroids as suggested by studies of retinoic acid (Vitamin A) and its inhibition of cell proliferation in tissue cultures of human uterine smooth muscle cells. This antiproliferative effect was shown to be linked to the expression of retinoic acid receptors of the steroid/thyroid family in uterine cells (Boettger-Tong et al. 1997).

**Indications and Usage:** Beet roots can be administered as a cooked food (boiled, steamed or baked), fresh juice or powdered. Typical dosage is 10 grams daily after meals 3 times daily for 14 days; 5 grams per day thereafter for at least 3 months (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Beta vulgaris*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anticarcinogenic</b>	Fresh leaves, orally; 1.5 g/kg b.w. (var. <i>benghalensis</i> )	In vivo: male mice with induced toxicity by lead subacetate injection	Active; significantly reduced cytotoxic effects of known carcinogen	Nandi et al. 1997
<b>Antidiabetic</b>	Chard extract (var. <i>cicla</i> )	In vivo: diabetic rats	Active; significantly decreased serum urea and creatinine levels	Yanarda et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antidiabetic &amp; antioxidant</b>	Chard extract (var. <i>cicla</i> )	In vivo: diabetic rats	Active; reversed the effects of diabetes on blood glucose, tissue lipid peroxidation & glutathione levels	Sener et al. 2002
<b>Antidiabetic &amp; glycosylation inhibition</b>	Extract (var. <i>cicla</i> )	In vivo: diabetic rats	Active; shown to inhibit increases in nonenzymatic glycosylation of skin proteins & blood glucose, thereby inhibiting related diabetes symptoms	Tunali et al. 1998
<b>Antidiabetic &amp; hepatoprotective</b>	Extract (var. <i>cicla</i> )	In vivo: diabetic rats	Active; shown to have a protective effect on the liver in diabetes mellitus	Ozsoy-Sacan et al. 2004
<b>Anti-inflammatory</b>	Ethanollic extract	In vivo: rat & mouse	Active; dose-dependent effect in acute & chronic tests	Atta & Alkofahi 1998
<b>Antiviral - influenza</b>	Aqueous extract	In vivo: mice	Exhibited partial protection against influenza infection, including significant decrease in the hemagglutination titers recorded in mouse lung homogenates, decrease in mortality rate & increase in survival time	Prahoveanu et al. 1986
<b>Estrogenic</b>	Extract (var. <i>benghalensis</i> )	In vivo: female mice	Active	Grunert et al. 1969
<b>Hypoglycemic</b>	Chard extract (var. <i>cicla</i> )	In vivo: diabetic rats	Reduced the blood glucose levels & increased the number of pancreatic B cells	Bolkent et al. 2000
<b>Hypoglycemic</b>	Compounds isolated from root	In vivo: rats; oral glucose tolerance test	Isolated betavulgarosides II, III & IV exhibited hypoglycemic activity	Yoshikawa et al. 1996

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# Repollo

## OTHER COMMON NAMES

*Repollo morado* (Spanish); cabbage; green, purple or red cabbage (English).

## SCIENTIFIC NAME

*Brassica oleracea* L. var. *capitata* L. [Brassicaceae (Mustard Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Diabetes
- Heart disease
- Menstrual disorders
- Obesity
- Intestinal parasites
- Uterine fibroids

**Plant Part Used:** Leaves (fresh cabbage head) and juice from the leaves.

**Traditional Preparation:** The leaves can be cooked (either as a vegetable or in a soup) or liquefied to make a fresh juice (*zumo*) and consumed as a nutritional foodstuff.

**Traditional Uses:** Due to the disagreeable taste of the fresh juice, a small amount of fresh lemon/lime (*limón*) or carrot (*zanahoria*) juice can be added to make the juice more palatable and nutritious. In the Dominican Republic, the leaves are reputed to have wound-healing properties and are applied externally as a poultice (Liogier 2000).

**Availability:** As a common vegetable, *repollo* can be purchased from most grocery stores, supermarkets and farmers' markets in New York City.

## BOTANICAL DESCRIPTION

*Repollo* (*Brassica oleracea* var. *capitata*) is an herbaceous plant that typically grows to 2 m tall with thin roots and a short, stout, woody stem; most of the plant is coated with a waxy bloom. Leaves are fleshy, smooth and, at the top of the plant, are tightly wrapped around each other forming a cabbage head; in color, they are blue-green, pale whitish-green or purple with visible, white veination; leaf edges are straight or slightly wavy. Flowers grow in clusters at the top of the plant and are 4-petaled and whitish- or golden-yellow. Fruits are dry and pod-like (Bailey Hortorium Staff 1976).

**Distribution:** Originally native to the Mediterranean, it is now cultivated widely in temperate and moist regions around the world (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No adverse effects have been identified in the literature associated with the appropriate use of this plant. Extracts of this plant were shown to be nontoxic in animal studies (Yurtsever & Yardimci 1999).

**Contraindications:** *Thyroid conditions:* Caution is advised in patients with conditions such as hypothyroidism and euthyroid goiter which diminish thyroid function because the ingestion of cabbage leaves can reduce or interfere with iodine absorption (Brinker 1998).

**Drug Interactions:** *Prothrombopenic anticoagulants:* Anticoagulants such as bishydroxycoumarin (Dicoumarol®), warfarin (Coumadin®) and acenocoumarol may be antagonized or hindered by concomitant use of cabbage leaves due to their high Vitamin K content. *Hypothyroid medications:* Because cabbage leaves are goitrogenic, they may reduce thyroid iodine uptake and interfere with thyroid treatment (Brinker 1998).

## SCIENTIFIC LITERATURE

*Repollo's* therapeutic activities include its gastroprotective effects which are attributed to Vitamin U, an anti-ulcer factor that stimulates the regeneration of the mucous membrane of the stomach to protect it from gastric hydrochloric acid (Gruenwald et al. 2004). Cabbage leaves are a rich source of calcium (Brinker 1998).

**Indications and Usage:** *Repollo* leaves can be eaten raw, prepared as a fresh juice or taken in pill form. Typical administration and dosage is 1 liter of juice taken daily for 3 weeks; duration of treatment not to exceed 6 weeks (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Brassica oleracea* var. *capitata*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antitumor</b>	Juice extract prepared using petroleum ether, ether, ethanol and an A12O3 column	In vivo: mice with Ehrlich ascites (EA) solid tumors; administered 20 mg/day extract intraperitoneally for 28 days	Complete disappearance of tumors observed in 54.5% of treatment group and regression in 27%; also demonstrated strong protective and preventive effects	Yurtsever & Yardimci 1999
<b>Antiulcer</b>	Plant extract	In vivo: experimental peptic ulceration	Demonstrated peptic anti-ulcerogenic effects	Singh et al. 1962
<b>Antiulcer</b>	Leaf powder and aqueous extract	In vivo: rats with aspirin-induced gastric ulcers	Active; gastric mucosal protection suggested by lowering of ulcer index & raised hexosamine levels	Akhtar & Munir 1989

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# Roble

## OTHER COMMON NAMES

*Roble prieto* (Spanish); Indian bean (English).

## SCIENTIFIC NAME

*Catalpa longissima* (Jacq.) Dum.-Cours. Synonym: *Bignonia longissima* Jacq. [Bignoniaceae (Trumpet-creeper Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Abortifacient
- Common cold
- Delayed menses
- Flu
- Menstrual disorders
- Uterine fibroids

**Plant Part Used:** Bark.

**Traditional Preparation:** For the common cold or flu, the bark (*cáscara* or *corteza*) is prepared as a tea.

**Traditional Uses:** This herbal remedy is attributed bitter and astringent properties. To treat menstrual disorders, uterine fibroids, delayed menses and painful periods, the bark is added to multi-herb preparations (*botellas*) that are used for treating a variety of women's health conditions or taken as a simple decoction. The bark is sometimes combined with other herbs and used as an abortifacient. In the



Dominican Republic, a decoction of the bark is used for treating stomach ache and abdominal pain (Germosén-Robineau 2005).

**Availability:** In New York City, this plant is available for sale in select *botánicas* (Latino/Afro-Caribbean herb and spiritual stores) which specialize in selling medicinal plants from the Caribbean.

## **BOTANICAL DESCRIPTION**

*Roble* (*Catalpa longissima*) is a deciduous tree that grows to 15 m. Leaves are arranged in opposite pairs along branches and are narrowly oval to lance-shaped and grow 10 -13 cm long with long leaf-stems. Flowers grow in branching, pendulous clusters with bell-shaped petals that are white in color with pink or purple fine lines. Fruits are long, slender capsules that split into 2 segments when ripe and contain numerous seeds adorned by a tuft of hairs at each end (Bailey Hortorium Staff 1976).

**Distribution:** This plant is native to the Caribbean and is planted in South Florida (Bailey Hortorium Staff 1976). This plant is often cultivated as an ornamental tree for its showy flowers and is also used for timber.

## **SAFETY & PRECAUTIONS**

No information on the safety or toxicity of this plant in humans has been identified in the available literature.

**Animal Toxicity Studies:** TRAMIL animal toxicity studies: an aqueous extract of the bark given orally to mice (25 g/kg) did not result in observable signs of toxicity or death; this extract administered intraperitoneally to mice yielded an LD<sub>50</sub> of 17.26 ± 4.28 g/kg. Daily administration of the extract for 30 days did not result in death during this study at doses of 6.25, 12.5 and 18.75 g/kg (Herrera 1988). Aqueous and organic fractions of the crude bark extract, administered orally at doses of up to 5 g/kg in mice did not induce observable signs of toxicity (Souza Brito 1995).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## **SCIENTIFIC LITERATURE**

*Roble* (*Catalpa longissima*) and a closely related plant species (*Catalpa ovata*) have demonstrated the following pharmacological effects: antibacterial, antitumor, antiulcer, anti-inflammatory, antinociceptive, oxytocic and uterine relaxant (see “Laboratory and Preclinical Data” table below). Major biologically active chemical constituents are iridoid glycosides.

**Indications and Usage:** TRAMIL has designated *Catalpa longissima* as “REC” meaning that it is recommended for use in treating stomach ache and abdominal pain and amenorrhea (*retraso de regla*) prepared as a decoction of the bark and taken orally; it is also recommended for the treatment of fever prepared as decoction of the leaf with salt, taken orally (Germosén-Robineau 2005).

**Laboratory and Preclinical Data: *Catalpa longissima* and Related Species,  
*Catalpa ovata***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anti-inflammatory</b>	Catalposide, an iridoid glycoside isolated from <i>Catalpa ovata</i> stem	In vitro: RAW 264.7 macrophages activated from lipopolysaccharide	Showed inhibition of tumor necrosis factor-alpha, interleukin-1beta and -6 & activation of nuclear factor kappaB; potential adjunctive therapy in gram-negative bacterial infections	An et al. 2002
<b>Anti-inflammatory &amp; antinociceptive</b>	Crude extracts of pods, seeds or leaves; ethyl ether, butanolic, & aqueous fractions of the pod extract ( <i>Catalpa longissima</i> )	In vitro	Significant anti-inflammatory & antinociceptive effects; may be due to saponins, sterols or phenols content of leaves & pods	Munoz-Mingarro et al. 2003
<b>Anti-inflammatory &amp; colitis treatment</b>	Catalposide isolated from <i>Catalpa ovata</i> ; intrarectal administration	In vivo: mice with trinitrobenzene sulfonic acid (TNBS)-induced colitis	Dramatically reduced weight loss, colonic damage & mucosal ulceration characteristic of TNBS-induced colitis; suppressed expression of TNF-alpha, interleukin-1beta & intercellular adhesion molecule-1, NF-kappa B p65 translocation into nucleus in colitis	Kim et al. 2004
<b>Antitumor</b>	<i>Catalpa ovata</i> stem bark extract; naphthoquinones isolated by bioassay-directed fractionation	In vitro: Raji cells	Exhibited significant inhibitory activity against 12-O-tetradecanoylphorbol 13-acetate (TPA)-induced Epstein-Barr virus early antigen activation	Fujiwara et al. 1998
<b>Antiulcer</b>	<i>Catalpa longissima</i> ; aqueous & organic fractions of hydroalcoholic crude extract (70%); 1 g/kg	In vivo: administered orally in rats with indomethacin- & ethanol-induced gastric ulcers	Active; inhibited lesion formation; in ethanol-induce gastric ulcer model, fractions showed 40% inhibition	Souza Brito 1995

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Nitric oxide (NO) synthase &amp; TNF-alpha production inhibition</b>	Stem bark of <i>Catalpa ovata</i> ; methanol extract	In vitro: endotoxin lipopolisaccharide-stimulated RAW 264.7 macrophages	Inhibited production of TNF-alpha & nitric oxide with significant decreases in mRNA levels of TNF-alpha & inducible NO synthase, suggesting may have anti-inflammatory potential	Pae et al. 2003
<b>Oxytocic</b>	<i>Catalpa longissima</i> ; leaf decoction (100 g)	In vitro: isolated rat uterus in estrus	Active at doses of 12-124 mg/mL; increased contraction amplitude but not frequency	Herrera 1988
<b>Uterine relaxant</b>	<i>Catalpa longissima</i> leaf, aqueous extract; 33 mL/L	In vitro: isolated rat uterus	Active; exhibited muscle relaxant activity	Feng et al. 1964

#### Effect Not Demonstrated

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimalarial</b>	<i>Catalpa longissima</i> ; hydroalcoholic bark extract	In vivo: mice; subcutaneously administered: 1 g/kg	No activity shown	Sauvain et al. 1990
<b>Antimicrobial &amp; cytotoxic</b>	<i>Catalpa longissima</i> ; crude extracts of pods, seeds or leaves & organic fractions of pod extracts	In vitro	No antimicrobial or antitumoral effects shown	Munoz-Mingarro et al. 2003

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# Sábila

## OTHER COMMON NAMES

Aloe vera (English, Spanish).

## SCIENTIFIC NAME

*Aloe vera* (L.) Burm. F. Synonyms: *Aloe perfoliata* L. var. *vera* L., *Aloe barbadensis* Mill, *Aloe vulgaris* Lam. [Liliaceae (Lily Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Boils (*nacios*)
- Common cold
- Flu
- Fungal infections
- HIV/AIDS
- Skin abrasions
- Sunburn

- Uterine fibroids
- Wounds

**Plant Part Used:** Leaves and the gel (*la cristal*) from inside the leaves.

**Traditional Preparation:** First, the spines are removed from the leaf to prevent injury, then the leaf is cut along the sides and opened to reveal a yellowish-greenish-gel inside. This gel is either placed in water for a period of time and then strained for use in internal preparations or applied topically to the affected area for external applications. Sometimes the entire leaf is cut open and placed directly on to a wound or other injury as a bandage to facilitate healing.

**Traditional Uses:** *Sábila* is considered by many to be a cure-all, a powerful remedy for everything from minor cuts and abrasions to serious and chronic diseases like HIV/AIDS and cancer. For treating skin conditions such as cuts, scrapes, skin abrasions, sunburn, wounds, fungal infections and boils (*nacíos*), the gel (*cristal*) is applied locally to the affected area. *Sábila* is also used for the common cold and flu (*gripe*) and is prepared by combining the clear gel from inside the leaf with any or all of the following additional ingredients: honey (*miel*), lemon/lime (*limón*), garlic (*ajo*), onion (*cebolla*) and/or shallots (*cebollín*). This mixture is liquefied in a blender and typically stored covered in a glass container in the refrigerator. As a remedy, this raw “syrup” preparation is administered orally in small amounts (by the spoonful). Another remedy for symptoms of the common cold (*catarro* or *resfriado*) and pulmonary infections is *sábila* gel added to coffee (*café*).

**Availability:** Fresh leaves can sometimes be purchased from grocery stores and supermarkets. Some *botánicas* also carry the fresh leaves. Aloe vera gel can be found at most pharmacies, drug stores, supermarkets and health food stores.

## BOTANICAL DESCRIPTION

*Sábila (Aloe vera)* is a stemless, fleshy herb that typically grows 60-90 cm tall with horizontally creeping root-stems. Leaves are arranged in a dense spiral and are narrowly lance-shaped (30-60 × 3.5-8 cm), pointed at the tip, pale green in color, covered with a whitish waxy coating, sometimes spotted with irregular white marks. The leaves have a succulent, thick, stiff texture due to the clear watery sap or “gel” that they contain and are lined with reddish-tipped, spinelike teeth along the edges. Flowers grow in dense, branching clusters and are yellow to orangish in color, tubular in shape and borne atop a long, leafless stalk (Acevedo-Rodríguez 1996).

**Distribution:** Native to the Mediterranean and northern Africa, this plant has been naturalized in warm and arid conditions, can be found in disturbed areas throughout Latin America and the Caribbean and is cultivated widely (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

As a strong purgative, spasmodic gastrointestinal disorders are a common side effect of internal administration of *sábila*; these complaints include abdominal pain, diarrhea, nausea and perianal irritation and exacerbation of hemorrhoids. Rare cases of the following additional adverse reactions have been reported: arrhythmia, nephropathies, edema and accelerated bone deterioration. Due to the anthraquinone content of aloe latex, internal administration of this plant may stimulate uterine muscle activity or cause abortion (Gruenwald et al. 2004). Prolonged exposure of skin to the fresh gel or preparations made with the gel may result in contact dermatitis, skin irritation and hypersensitivity, so caution is recommended.

**Animal Toxicity Studies:** Toxic effects were shown in animal studies when mice were administered 100mg/kg of an alcohol extract of *Aloe vera* in water for 3 months (Shah et al. 1989). However, the

relevance of this study is questionable because this plant is primarily used fresh or as a decoction rather than as an alcohol extract.

**Contraindications:** Not to be used by pregnant or lactating women or by children under 12 years of age. Contraindicated for those with intestinal obstruction, inflammatory intestinal diseases such as Crohn’s disease and ulcerative colitis, any type of ileus, appendicitis and abdominal pain of unknown origin (Gruenwald et al. 2004). Caution is advised when taken internally for in high doses for prolonged periods of time as this may lead to damage to enteric nervous tissue, pigmentation in the intestinal mucosa (*Pseudomelanosis coli*), albuminuria, hematuria, electrolyte loss, potassium depletion and hypokalemia (Gruenwald et al. 2004).

**Drug Interactions:** *Cardiac glycosides and antiarrhythmic drugs:* Because chronic use of Aloe can result in potassium loss which intensifies the effects of cardiac glycosides and antiarrhythmic drugs, concomitant use should be avoided and monitored for digoxin toxicity and potassium levels. *Thiazide diuretics, loop diuretics, licorice and corticosteroids:* due to increased potential for potassium deficiency when Aloe is used in combination with these drugs, avoid concomitant use. *Antidiabetic agents:* when taken with Aloe, can lead to increased risk of hypoglycemia; if administered concomitantly, monitor blood glucose levels and signs or symptoms of hypoglycemia (Gruenwald et al. 2004).

## SCIENTIFIC LITERATURE

In clinical studies, *Aloe vera* gel has demonstrated the following effects: anesthetic, antiviral, burn healing and wound healing (see “Clinical Data” table below). In laboratory and/or animal studies, it has demonstrated antidiabetic, anti-inflammatory, antimutagenic, antioxidant, antitumor, antiulcer, apoptosis induction, burn healing, circulation stimulant, cytotoxic, enzyme inhibition, phase II enzyme induction, thyroid hormone inhibition and wound healing effects (see “Laboratory and Preclinical Data” table below).

**Indications and Usage:** Approved by the German *Commission E* for treatment of constipation (Blumenthal et al. 1998). Preparations of *Aloe vera* are available for internal use as capsules (250 mg, 470 mg), softgel capsules (1000 mg), powder, aqueous extracts and aqueous alcoholic extracts in powdered or liquid form. Recommended daily dosage is 20-30 mg hydroxyanthracene derivatives per day (calculated as anhydrous aloin); this translates as 0.05 g *Aloe vera* powder, usually taken in the evening. *Caution:* not to be used over an extended period of time; i.e., for more than 1 to 2 weeks. For external use, fresh gel from the leaf or stabilized gel and cream preparations may be used as needed (Gruenwald et al. 2004).

### Clinical Data: *Aloe vera*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anesthetic</b>	Gel	Humans	Effective insect sting treatment	Coutts 1979
<b>Antiviral</b>	Gel	Human clinical study	Antiviral against HSV-1 and 2	Sydiskia & Owen 1987
<b>Burn healing</b>	Gel	Human clinical study	Treatment of hot water burns	Crewe 1939
<b>Wound healing</b>	Gel	Human clinical studies	Active; facilitates wound-healing	Cobble 1975, Loveman 1937, Barnes 1947

### Laboratory and Preclinical Data: *Aloe vera*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antidiabetic</b>	Leaf pulp and gel extracts	In vivo: rats; non-diabetic, type I & type II groups; effectiveness as a hypoglycemic agent compared with glibenclamide	Leaf pulp showed hypoglycemic activity in type I and type II diabetic rats but was ineffective in lowering blood sugar level of non-diabetic rats; leaf gel extract showed hyperglycemic activity in type II diabetic rats; recommend leaves devoid of gel for treatment of non-insulin dependent diabetes mellitus	Okyar et al. 2001
<b>Anti-inflammatory</b>	Gel	In vivo: mice	Anti-inflammatory	Davis et al. 1991
<b>Antitumor, antimutagenic &amp; cytotoxic</b>	Diethylhexyl-phthalate (DEHP) isolated from plant	In vitro: human & animal cell lines; <i>Salmonella typhimurium</i> strains	Showed inhibition of tumor growth & anti-mutagenic effects in <i>Salmonella</i> assay	Lee, Kim et al. 2000
<b>Antiulcer</b>	Gel	In vivo: rats	Antiulcer	Galal et al. 1975
<b>Apoptosis induction</b>	Diethylhexyl-phthalate (DEHP) isolated from plant	In vitro: human leukemic cell lines K562, HL60 and U937	Significant effect observed at 10 µg/mL; induced apoptosis in cancer cells	Lee, Hong et al. 2000
<b>Enzyme inhibition</b>	Crude ethanolic extract of leaves	In vitro: against acetylcholinesterase, butyrylcholinesterase & lipoxygenase enzymes	Active; showed significant inhibition of enzymes (≥ 50%)	Khattak et al. 2005
<b>Phase II enzyme induction &amp; antioxidant</b>	Fresh leaf pulp extract	In vivo: mice given extract at doses of 30 µL and 60 µL/day/mouse for 14 days	Induced phase-II enzyme system; decreased liver dehydrogenase activity & malondialdehyde formation; showed protective effects against prooxidant-induced membrane and cellular damage; detoxified reactive metabolites in other organs (lung, kidney & forestomach)	Singh et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Thyroid hormone inhibition</b>	Leaf extract (125 mg/kg)	In vivo: male mice	Inhibited serum levels of T(3) and T(4); suggest use in regulation of hyperthyroidism	Kar et al. 2002
<b>Wound healing &amp; circulation stimulant</b>	Lyophilized gel	In vivo: 48 rats; 4 groups: control, untreated burn-wound, saline-treated burn-wound, & gel treated burn-wound	Stimulated microcirculation, showed anti-inflammatory activity & promoted wound-healing on induced 2 <sup>nd</sup> degree burn wound	Somboonwong et al. 2000

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# Tabaco

## OTHER COMMON NAMES

Tobacco (English).

## SCIENTIFIC NAME

*Nicotiana* spp. L.; typically *Nicotiana tabacum* L. [Solanaceae (Tomato Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Boils (*nacío ciego*)
- Edema or water retention
- Headache
- Insect bites
- Sinusitis
- Skin infections
- Wounds

**Plant Part Used:** Leaves.

**Traditional Preparation:** For all of these health conditions, the leaf is applied topically to the affected area.

**Traditional Uses:** This plant is described as a bitter herb. For wounds (*heridas*), peripheral edema or swelling (*hinchazón*), skin infections, boils (*nació ciego*) and insect bites, the dried leaves are applied topically with castor oil (*aceite de higuiereta*) as a poultice. Swelling is reported to be reduced almost immediately upon applying this remedy. For headache and sinusitis, the leaf is slightly warmed and then applied topically to the forehead or sinus area to alleviate pain, reduce pressure and clear the sinuses. *Tabaco* smoke is said to dispel negativity (*espanta lo malo*) and is used in ritual healing or by spiritual healers to see visions, clear harmful energy and to enter a trance state for spirit mediumship.

**Availability:** Dried leaves of *tabaco* can be purchased from some *botánicas*.

## BOTANICAL DESCRIPTION

*Tabaco* (*Nicotiana tabacum*) is a stout, sticky annual or perennial herb that typically grows to 1-3 m. Leaves are alternate and oval-egg-shaped to lance-shaped. Flowers occur in large, branching clusters; petals are greenish-cream to pink or red in color and fused together at the base to form a tubular shape, then spreading at the end into 5-pointed lobes. Fruits are 2-valved capsules containing several tiny seeds (Bailey Hortorium Staff 1976).

**Distribution:** Native to tropical America, this cultigen originated in pre-Columbian times and is now widely grown, including in the Caribbean, as the main source of commercial tobacco which is used in the manufacture of cigarettes and cigars (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

Case Reports of Adverse Effects in Humans: One case has been reported of toxic effects in a child due to ingestion of the dried leaf resulting in CNS depression (Borys et al. 1988). The fresh leaf has shown allergenic activity in adult humans and has been reported as inducing dermatitis (Goncalo et al. 1990) and other forms of cutaneous hypersensitivity, as well as blood clotting disorders and fibrinolysis (Becker et al. 1981). Nicotine toxicity (called “Green tobacco sickness”) has been reported in 47 human adults due to dermal contact with the fresh leaf as a result of occupational exposure; the following toxic effects were observed: nausea, vomiting, weakness and vertigo (Anonymous 1993). Acute poisoning from nicotine has occurred from ingestion of aerosol insecticides containing this compound as an active ingredient or from ingestion of products derived from *tabaco*. The acute lethal dose for human adults is 60 mg of nicotine-based substances (Taylor 1996).

**Contraindications:** Not recommended for use by pregnant or lactating women or children under the age of 5 years due to lack of information on safety for use by these populations (Germosén-Robineau 2005).

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

This plant has demonstrated acaricidal, antibacterial, antifungal and insecticidal activity in vitro. Plant extracts have shown antiglaucoma activity (Hodges et al. 1991). A related species, *Nicotiana glauca*, has demonstrated hepatoprotective effects in vivo in carbon tetrachloride-intoxicated rats given an oral dose of 4 mL/kg body weight of the non-boiled aqueous leaf extract (Janakat & Al-Merie 2002). The primary

active compounds include pyridine alkaloids: nicotine (up to 30-60% of alkaloid content), N-formyl nor-nicotine, cotinine, myosmine, nicotyrine, anabasine and nicotelline (Gruenwald et al. 2004).

**Indications and Usage:** Oral administration of the leaf or herbal preparations of the leaf is not recommended because of potential toxicity. However, the external use of the leaves is indicated for specific health conditions. TRAMIL has classified *tabaco* as “REC” meaning that it is recommended for use in treating pediculosis (*piojos*), according to traditional methods which have been substantially documented. The above contraindications and precautions should be observed. A decoction or infusion of 2-4 dry leaves can be prepared per 1 liter of water; for a decoction, boil for at least 10 minutes in a covered container; for an infusion, combine the boiling water with the dried leaves, cut into small pieces, cover and allow it to cool (Germosén-Robineau 2005).

### Laboratory and Preclinical Data: *Nicotiana tabacum*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Acaricidal</b>	Methanolic leaf extract	Against <i>Rhipicephalus appendiculatus</i>	Active at 50 mg/mL	Van Puyvelde et al. 1985
<b>Antibacterial</b>	Methanolic leaf extract (60%)	In vitro; 9 bacterial isolates	Active against 6 out of 9 bacteria at 25 mg/mL	Akinpelu & Obuotor 2000
<b>Antifungal</b>	Methanolic extract of the fresh leaf	In vitro	Active against <i>Aspergillus fumigatus</i>	Leifertova & Lisa 1979
<b>Antifungal</b>	Seed	In vitro	Active against <i>Puccinia recondita</i>	Grunweller et al. 1990
<b>Insecticidal</b>	Methanolic leaf extract & alkaloid fractions	Against larvae of <i>Culex pipiens</i>	Active; 50% mortality within 48 h	Yamaguchi et al. 1950

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# Tamarindo

## OTHER COMMON NAMES

Tamarind (English).

## SCIENTIFIC NAME

*Tamarindus indica* L. [Caesalpiaceae (Senna Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Cleansing the blood
- Excess heat
- Headache
- Hepatitis C
- Hormonal imbalance
- Insomnia
- Kidney disorders
- Liver disorders
- Menopausal hot flashes
- Migraine headache

- Nightsweats
- Prostate disorders

**Plant Part Used:** Ripe fruit pods, leaves and bark.

**Traditional Preparation:** To prepare a refreshing and therapeutic beverage from the fruit, the ripe seed pods are broken open, the stringy veins, seeds and rind are removed and the fruit pulp is squeezed out. This pulp is lightly pounded and allowed to soak in water so that it softens, releases its juices and imparts a tangy flavor to the water.

**Traditional Uses:** The fruit pulp and leaves of this plant are considered cooling (*fresca*) and blood purifying/cleansing remedies. A beverage made from the fruit-pulp (called *refresco de tamarindo* or *jugo de tamarindo*) is a remedy for insomnia, headache, migraines, menopausal hot flashes, nightsweats, hormonal imbalance and conditions associated with excess heat in the body.

A decoction of the fruit pulp is used for menopausal hot flashes and is often combined with cornsilk (*barba de maíz*), prepared with the pulp of one tamarind fruit and one small handful of cornsilk (equivalent to the silky tassel of one ear of corn) per 2 cups of water. For treating disorders of the liver, kidney and prostate, the dried leaves, branches or bark can be prepared as a tea or decoction and taken orally. For severe liver disorders or Hepatitis C, this plant may be combined with other medicinal plants such as Caribbean coralfruit (*batata de burro*) or cockleburr (*caudillo de gato*).

**Availability:** Seed pods are available at select grocery stores and supermarkets that sell ethnic foods and can also be purchased at *botánicas* (Latino/Afro-Caribbean herb and spiritual shops) along with the dried leaves.

## BOTANICAL DESCRIPTION

*Tamarindo* (*Tamarindus indica*) is a long-lived tree that grows to 10 m. Leaves are pinnately compound such that they are composed of several leaflets arranged in opposite pairs; each leaflet is oblong-oval in shape with a blunt or rounded tip and asymmetric base. Flowers grow in branching clusters; petals are yellow with reddish veins. Fruits are oblong legumes (10-15 cm long) that are leathery when ripe, can be straight or curved in shape and tan to light brown in color; each pod contains several dark brown seeds surrounded by a tart, brown, edible, sticky pulp that has a fruity, sweet aroma (Acevedo-Rodríguez 1996).

**Distribution:** Native to India, this plant is cultivated and naturalized throughout the tropics including the Caribbean, commonly growing in open, dry areas (Acevedo-Rodríguez 1996).

## SAFETY & PRECAUTIONS

As the fruit of this plant is widely eaten in diverse geographical regions, it is generally considered safe for human consumption. No known negative side effects or health risks have been identified in the scientific literature associated with the appropriate therapeutic use of this plant (Gruenwald et al. 2004). However, the fruits or seed pods of this plant contain an irritating, hypoglycemic alkaloid. Insufficient information is available on the toxicity of the leaves or the bark (Germosén-Robineau 1995). In a mutagenicity study using the fruit, this plant demonstrated positive results against strains of *Salmonella thyphimurium* TA-1535, but not against strains 1537, 1538 or 98 (Sivaswamy et al. 1991).

**Animal Toxicity Studies:** No evidence of acute toxicity was shown when a polyphenolic extract of the seeds was administered to mice at doses of 100-500 mg/kg (Komutarin et al. 2004).

**Contraindications:** None identified in the available literature.

**Drug Interactions:** When administered concomitantly with Ibuprofen, tamarind fruit extract significantly increased the bioavailability of the drug, especially if taken with meals (Garba et al. 2003).

## SCIENTIFIC LITERATURE

In one clinical study, the fruit pulp showed increased bioavailability of ibuprofen (see “Clinical Data” table below). In laboratory and/or animal studies, this plant has shown the following effects: antidiabetic, anti-inflammatory, antioxidant, colon cell proliferation stimulation, hepatoprotective, immunomodulatory and nitric oxide inhibition (see “Laboratory and Preclinical Data” table below). In one animal study, this plant did not show hypocholesterolemic effects (see “Effect Not Demonstrated” table below). According to secondary references, the fruit pulp and/or dried seeds have demonstrated laxative, anti-inflammatory, antimicrobial, immunomodulatory effects and wound-healing (Gruenwald et al. 2004).

This plant is officially recognized by the following national or regional pharmacopeias: Oriental Medicine 1969; France, IX Ed; and Indonesia 1965. Also, it is registered in the following directories: Directory of Japanese Drugs 1973; List of the Office of Control of Medications, Berna 1978; and the Pharmaceutical Codex of India 1953 (Penso 1980). Active constituents include fruit acids: tartaric, malic, citric and lactic acids; pectin, pyrazines and thiazols (Gruenwald et al. 2004). The pulp contains significant amounts of vitamin C and iron.

**Indications and Usage:** TRAMIL has categorized this plant as “INV” meaning that it needs more investigation before a clinical recommendation can be made. In particular, research is needed to support the following popular uses reported in the Caribbean: internal use of the leaf decoction to treat chickenpox and decoctions of various parts of the plant for treating jaundice. Additionally, data on the LD<sub>50</sub> and subchronic toxicity of oral preparations of this plant is needed (Germosén-Robineau 1995). Based on results from a Chinese dosification study on medicinal plants, the daily therapeutic dose of the dried fruit is 2 g (Germosén-Robineau 1995). The seed pods are often sold as a raw paste which can be added to hot water or pureed with other laxative ingredients (such as figs) with a daily dosage of 10-50 g of the cleaned paste (Gruenwald et al. 2004).

### Clinical Data: *Tamarindus indica*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Ibuprofen bioavailability</b>	Fruit extract, incorporated into meal plus 400 mg Ibuprofen tables	Clinical study; healthy human volunteers (n=6)	Increase in plasma levels of Ibuprofen & its metabolites significantly greater when fruit extract was administered with ibuprofen tablets rather than when fasting	Garba et al. 2003

### Laboratory and Preclinical Data: *Tamarindus indica*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antidiabetic</b>	Aqueous seed extract; 80 mg/0.5 mL water/100 g b.w./day by gavage	In vivo: rats with streptozotocin-induced diabetes; duration: 7 & 14 days	Reduced fasting blood sugar levels; elevated liver & skeletal muscle glycogen content	Maiti et al. 2004

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Anti-inflammatory</b>	Aqueous, ethanol & chloroform plant extract; topical or intraperitoneal administration	In vivo: mice with ear edema induced by arachidonic acid & rats with subplantar edema induced by carrageenan	At least one extract was moderately active	Rimbau et al. 1999
<b>Antioxidant</b>	Plant extract	In vitro: DPPH radical reduction assay & lipid peroxidation test	Active; showed IC <sub>50</sub> <30 micro g/mL & IC <sub>50</sub> <32 micro g/mL in lipid peroxidation inhibition test	Ramos et la. 2003
<b>Colonic cell proliferation effects</b>	Fruit pulp	In vivo: mouse with subacute dose of N-nitroso N'-methyl urea (MNU)	Showed a co-stimulatory effect on MNU-induced colonic cell proliferation rates; may have implications for cancer susceptibility	Shivshankar & Shyamala Devi 2004
<b>Hepatoprotective &amp; antioxidant</b>	Aqueous leaf extract (infused for 15 minutes, followed by maceration for 4 hours)	In vitro: rat liver cells experimentally intoxicated with tert-butyl hydroperoxide (TBH); DPPH radical scavenging test	Opposed rat liver cell death induced by TBH & exhibited antioxidant activity against lipid peroxidation	Arvis et al. 1986
<b>Immuno-modulatory</b>	Isolated polysaccharide	In vitro	Active; showed phagocytic enhancement, leukocyte migration inhibition & inhibition of cell proliferation	Sreelekha et al. 1993
<b>Nitric oxide inhibition</b>	Seed coat extract (polyphenolic flavonoid)	In vivo & in vitro: murine macrophage-like cell lines & isolated mouse peritoneal macrophages	Active; concentration- & dose-dependent inhibition of nitric oxide (in vitro as much as 68%); no evidence of acute toxicity	Komutarin et al. 2004

### Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hypo-cholesterolemic</b>	Seed paste, dietary administration; 5 × the normal human intake level	In vivo: rats, normal & with a hypercholesterolemic inducing diet	No signs of cholesterol-lowering effect on serum & liver cholesterol levels	Sambaiah & Srinivasan 1991

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# Tilo

## OTHER COMMON NAMES

*Té de tilo* (Spanish); linden, lime tree (not citrus), basswood (English).

## SCIENTIFIC NAME

***Tilia* spp.** (L.); typically ***Tilia mandshurica*** (Rupr. and Maxim.), ***Tilia platyphyllos*** (Scop.) and another common commercial species, ***Tilia cordata*** (Mill.) which is widely planted as an ornamental street tree [Tiliaceae (Linden Family)].



## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Anxiety
- Insomnia
- Menopausal hot flashes
- Menorrhagia (excessive menstrual bleeding)
- *Nervios*
- Stress
- Uterine fibroids
- Women's health conditions

**Plant Part Used:** Flowers and attached leaf bracts, usually dried.

**Traditional Preparation:** To prepare a tea, steep a small handful of dried flowers in hot water for 5 minutes and take 1 cup 2-3 times daily, as needed.

**Traditional Uses:** This plant is attributed calming and cooling properties and is a popular remedy for insomnia, stress and nervousness or anxiety (*nervios*). The flowers are often prepared as a tea for relaxation. It is also a common remedy for women's health conditions, including menorrhagia, uterine fibroids and menopausal hot flashes. Combined with chamomile (*manzanilla*) flowers, it can be used as a tea for difficulty with falling asleep and is sometimes given to children.

**Availability:** Sold as an herbal tea in some supermarkets and grocery stores, the dried flowers are available for purchase at several *botánicas*. Some Dominicans have reported collecting *tilo* flowers from trees growing in New York City parks or tree-lined streets as it is commonly cultivated as an ornamental tree.

## BOTANICAL DESCRIPTION

*Tilo* (*Tilia mandshurica*) is a large, deciduous tree that can grow to 20-30 m tall. Leaves are alternate, dark green, smooth and rounded-oval to heart-shaped (15 cm long) with fine, long-pointed, uneven teeth along the edges; upper surface is sparsely covered with short, soft hairs and the lower surface is thickly covered with grayish- or whitish-wooly hairs without tufts at the intersections of veins (as in other *Tilia* species). Flowers occur in rounded clusters of 7-10 individuals and have 5 petals that are light yellowish to white and sweetly fragrant (to 2 cm across); each flower stalk is attached for half its length to a long, slender, pale green leaf bract that is rounded at the tip. Fruits are round and nutlike with 5 ribs along the base and containing 1-3 seeds (Bailey Hortorium Staff 1976).

**Distribution:** Native to Northeast Asia, this plant is cultivated widely in temperate regions of the northern hemisphere as an ornamental tree, a source of nectar for bees and to furnish fiber from the inner bark and wood. Species within this genus are relatively similar and frequently hybridize to form different varieties (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No health risks or harmful side effects are known associated with the appropriate therapeutic use of this plant (Gruenwald et al. 2004). This plant has been rated as "relatively safe" as long it is not taken in excessive amounts or for an extended period of time (Griffith 1998). Excessively frequent and repeated use of the tea may be harmful to the heart (Pahlow 1979). Bacterial (*Bacillus cereus*) and yeast contamination have been detected in commercial supplies of dried flowers (Martins et al. 2001). In an

acute toxicity test of the inflorescence extracts in mice, the LD<sub>50</sub> was 375 mg/kg of the methanol extract and 2900 mg/kg for the hexane extract (Aguirre-Hernández et al. 2007).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

*Tilo* (*Tilia* species) has demonstrated the following pharmacological effects in laboratory studies: antigenotoxic, anti-inflammatory, antimicrobial, antinociceptive, antioxidant, anxiolytic, GABA<sub>A</sub> receptor binding, hepatoprotective, immunomodulatory, iron absorption increase, mucilaginous and sedative (see “Laboratory and Preclinical Data” table below). In one in vitro study a water extract of *T. argentea* failed to show antibacterial activity in a disk diffusion assay (Yildirim et al. 2000). Proper storage is important because heat and moisture may decrease the therapeutic action of this plant (List and Hörhammer 1979). In European herbal medicine, this plant has been used since medieval times as a diaphoretic (to promote perspiration) and as both a nervine (tranquilizer) and a stimulant. It has also been used to treat headaches, indigestion, hysteria, diarrhea and epilepsy (Foster and Tyler 1999).

Major chemical constituents of the leaf include: flavonoids: tiliroside, kempferol-3,7-dirhamnoside, kempferol-3-O-glucoside-7-O-rhamnoside, linarine, quercetin-3,7-di-O-rhamnoside, quercetin-3-O-glucoside-7-O-rhamnoside; tannins and mucilage. The flower contains: afzelin, astragalol, hyperoside, isoquercitrin, kempferitrin, quercitrin, tiliroside, quercetin-3-O-glucoside-7-O-rhamnoside, kempferol-3-O-rhamnoside, kempferol-3-O-glucoside-7-O-rhamnoside, quercetrin-rhamnoxyloside, rutin; hydroxycoumarins: calycanthoside, aesculin; caffeic acid derivatives: chlorogenic acid; mucilage; tannins; and volatile oil: linalool, germacrene, geraniol, 1,8-cineole, 2-phenyl ethanol, phenyl ethyl benzoate and alkanes (Gruenwald et al. 2004).

**Indications and Usage:** Flowers are approved by the *Commission E* for the treatment of cough and bronchitis (Blumenthal et al. 1998). Dried flowers are available in crushed or powdered form and administered as a tea. To prepare a tea, infuse 2 g herb (1 heaping teaspoonful) in 1 cup hot water and steep for 5-10 minutes. Recommended daily dosage is 2-4 g of the herb (Gruenwald et al. 2004).

### Laboratory and Preclinical Data: *Tilia* spp.

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antigenotoxic</b>	Infusion of <i>Tilia cordata</i>	In vitro: hydrogen peroxide used as oxidative genotoxicant	Active; desmutagenic; detoxified the mutagen hydrogen peroxide, potentially due to phenols	Romero-Jimenez et al. 2005
<b>Antinociceptive &amp; anti-inflammatory</b>	Flavonoids from leaves of <i>Tilia argentea</i>	In vivo: mice; induced writhing & paw edema models	Potently active at 50 mg/kg; no acute toxicity or gastric damage	Toker et al. 2004
<b>Antioxidant</b>	Water extract of <i>Tilia argentea</i>	In vitro: thiocyanate method	Active; statistically significant at $\geq 100 \mu\text{g}$	Yildirim et al. 2000
<b>Anxiolytic</b>	Complex fraction of <i>Tilia tomentosa</i> flower extract	In vivo: mice; administered intraperitoneally	Active; showed anxiolytic effects in elevated plus-maze & holeboard tests	Viola et al. 1994

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Anxiolytic</b>	Lyophilized aqueous extracts of the flowers of <i>Tilia europea</i> (dosage: 5-100 mg/kg)	In vivo: mice in elevated plus maze, open-field & horizontal wire tests	Showed significant anxiolytic effects; strong sedative effect (doses 10-100 mg/kg)	Coleta et al. 2001
<b>Anxiolytic &amp; sedative</b>	Inflorescence extracts of <i>Tilia americana</i> var. <i>mexicana</i> (100 mg/kg dosage of various extracts)	In vivo: mice, tests of sodium pentobarbital-induced hypnosis potentiation, ambulatory activity, plus-maze & exploratory cylinder	Active; methanol & hexane extracts showed significant dose-dependent response; showed central nervous system depression; effects similar to those of diazepam	Aguirre-Hernández et al. 2007
<b>GABA<sub>A</sub> receptor binding</b>	Aqueous extracts of <i>Tilia europeae</i>	In vitro: rat brain assay	Inhibited (3H) muscimol binding, displaced (3H) flunitrazepam bound to synaptic membranes & stimulated <sup>36</sup> Cl <sup>-</sup> uptake by synaptoneuroosomes	Cavadas et al. 1997
<b>Hepatoprotective</b>	Methanolic flower extract of <i>Tilia argentea</i> ; isolated flavonol glycosides, including tiliroside	In vivo: mice with experimentally-induced liver injury (by D-galactosamine or lipopolysaccharide)	Active; mechanism involved inhibition of tumor necrosis factor-alpha (TNF-alpha) production, protection of liver cells against D-galactosamine & decreased sensitivity of liver cells to TNF-alpha	Matsuda et al. 2002
<b>Immuno-modulatory</b>	Scopoletin, a coumarin isolated from <i>Tilia cordata</i> (EC <sub>50</sub> =251 ± 15 µg/mL)	In vitro: normal T lymphocytes & hyper-proliferative T lymphoma cells	Showed concentration-dependent cytostatic & cytotoxic effects; stimulated cell proliferation in normal T lymphocytes via interaction with protein kinase C; results suggest potential as an antitumoral agent in cancer treatment	Manuele et al. 2006
<b>Iron absorption increased</b>	Flower extract	Ex vivo: tied-off intestinal segments of rats	Active; promoted absorption of iron	el-Shobaki et al. 1990
<b>Mucilaginous</b>	Raw polysaccharides of <i>Tilia cordata</i>	Ex vivo: epithelial tissue based on porcine buccal membranes	Moderately active; support use in treating irritated buccal membranes	Schmidgall et al. 2000

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# Timacle

## OTHER COMMON NAMES

*Bejuco de barraco, bejuco de berraco, quimaque, timaque* (Spanish); West Indian snowberry, snowberry (English).

## SCIENTIFIC NAME

*Chiococca alba* (L.) Hitchc. Synonym: *Chiococca parvifolia* Wullschl. ex. Griseb. [Rubiaceae (Bedstraw or Madder Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Genitourinary infections
- *Limpiar el sistema*
- Reproductive disorders
- Sexually transmitted infections
- Uterine fibroids

**Plant Part Used:** Root, leaf, flower and aerial parts.

**Traditional Preparation:** *Timacle* root is often added to herbal mixtures or tinctures (*botellas*) and strong infusions or decoctions (*tisanas*) in combination with other roots and herbs; these herbal preparations may be used to treat a variety of ailments.

**Traditional Uses:** In the Dominican Republic, this plant is attributed the following therapeutic properties: astringent, diuretic and emetic. The flowers are considered emollient (Liogier 2000).

**Availability:** *Timacle* can sometimes be purchased from *botánicas* that specialize in selling Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Timacle* (*Chiococca alba*) is a climbing shrub or vine that grows to 10 m tall with numerous side branches in opposite pairs along the stem. The main stem is twining, furrowed and hairy. Leaves are opposite, smooth-surfaced and narrowly oval in shape. Flowers are yellow and grow in small clusters; petals are fused at the base to form a funnel-like shape, are marked by reddish lines on the outer surface and open at the end into 5 triangular lobes resembling a star. Fruits are fleshy, nearly circular, flattened drupes that turn from green to white when ripe (Acevedo-Rodríguez 1996).

**Distribution:** Distributed throughout the Caribbean and much of Latin America, this common climbing shrub can be found in open, disturbed, moist areas (Acevedo-Rodríguez 1996) and is commonly used for herbal medicine where it grows.

## SAFETY & PRECAUTIONS

No information on the safety of this plant in humans has been identified in the available literature.

**Animal Toxicity Studies:** Toxicity studies in mice using the aqueous decoction of the root (1-5 g/kg) did not result in any fatalities (Saravia 1992). In mice, the ethanolic extract of the root showed hypoactivity but did not cause death when administered as a single oral dose (up to 2000 mg/kg) nor did it show signs of liver monooxygenase activity alteration. Intraperitoneal and subcutaneous administration of ethanolic root extracts showed significantly greater toxicity. In chronic toxicity tests, gavage administration of the ethanolic root extract for 14 days did not result in any deaths. In mutagenicity studies using the Salmonella/microsome assay, the ethanolic extract did not show mutagenic effects. Overall, when administered orally to mice, ethanolic extracts of the root were “not mutagenic and presented a low acute and subacute toxicity” (Gazda et al. 2006).

**Contraindications:** Unknown; insufficient information available in the literature.

**Drug Interactions:** Unknown; insufficient information available in the literature.

## SCIENTIFIC LITERATURE

This plant has exhibited antibacterial, anti-inflammatory and cytotoxic activity in laboratory studies (see “Laboratory and Preclinical Data” table below). The following compounds have been identified in the root: alkaloids, methyl salicylate and tannins (Duke 1992). Merilactone (a C-19 metabolite from methanol root extract) is a novel nor-seco-primaraine chemical structure that was recently isolated (Borges-Argaez et al. 2001). Three new iridoid compounds (alboside I, alboside II and alboside III) and a novel seco-iridoid (alboside V) have been isolated from this plant (Carbonezi et al. 1999).

**Indications and Usage:** According to TRAMIL, the medicinal use of the aqueous maceration of the root remains classified as “Needing more investigation” before making a clinical recommendation. This classification is based on its most frequently reported use in the Caribbean as a remedy for the treatment of urethritis and ganglial inflammation of the groin (Germosén-Robineau 1995). This plant has been recognized by the French Pharmacopoea, IX Ed. and is registered in the Directory of Japanese Drugs, 1973 (Penso 1980).

### Laboratory and Preclinical Data: *Chiococca alba*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Ethanolic extract of root	In vitro: <i>Bacillus subtilis</i>	Demonstrated slight antibacterial activity	Le Grand & Wondergem 1986
<b>Anti-inflammatory</b>	Ethanolic extract of leaves	In vivo	Demonstrated anti-inflammatory activity	Schapoval et al. 1983
<b>Cytotoxic</b>	Ethanolic extract (95%) of the entire dried plant	In vitro: tumor cell lines	Extracts demonstrated inhibition of tumor growth: root extract 77.5%, stem 69.6%, leaf 65.9%	Nascimento et al. 1990

## Effect Not Demonstrated

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antigonorrhoeal</b>	Ethanollic maceration of the root (10%)	In vitro: <i>Neisseria gonorrhoea</i>	Not active	Caceres et al. 1992

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# Tomillo

## OTHER COMMON NAMES

Common thyme, garden thyme, thyme (English).

## SCIENTIFIC NAME

*Thymus vulgaris* L. [Lamiaceae (Mint Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Cough
- Digestive and gastrointestinal disorders
- Skin disorders
- Upper or lower respiratory tract infections

**Plant Part Used:** Leaves and stems.

**Traditional Preparation:** An infusion or decoction of the leaves or aerial parts is used for treating digestive and gastrointestinal disorders, cough and upper or lower respiratory tract infections.

**Traditional Uses:** The leaves are added to baths for skin disorders and spiritual purposes.

**Availability:** As a popular culinary seasoning *tomillo* herb (usually dried but sometimes fresh) can be found at most grocery stores and supermarkets and is also sold at many *botánicas* in New York City.

## BOTANICAL DESCRIPTION

*Tomillo* (*Thymus vulgaris*) is a multi-branching small shrub that grows upright to 15-38 cm tall with woody stems that are square in cross section. Leaves are small, dark green and arranged in opposite pairs along stems; they are linear to narrowly oval in shape, covered with glandular dots and slightly hairy on the underside. Flowers occur in dense, rounded clusters with pale lilac to whitish petals. Fruits are four smooth, tiny nuts. This plant is highly aromatic with a sharp, musky-camphor-like odor (Bailey Hortorium Staff 1976).

**Distribution:** Originally native to the western Mediterranean, this popular culinary herb is cultivated in diverse temperate regions around the world (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

As a popular culinary seasoning, this herb is widely used as a condiment. When administered appropriately, there are no known health hazards or negative side effects associated with its therapeutic use, except for a low potential for allergic reaction (Gruenwald et al. 2004). Few cases of hypersensitivity



to *tomillo* have been reported; however, cross-sensitivity to plants belonging to the mint (Lamiaceae) family has been observed in clinical settings and laboratory research (Benito et al. 1996).

**Animal Toxicity Studies:** In an animal study involving rats fed a diet containing 2% or 10% *Thymus vulgaris* leaves, no evidence of toxicity was observed (Haroun et al. 2002). The essential oil, administered orally to mice as 0.25% of feed ad libitum for two weeks prior to mating resulted in no positive or negative observable effects on embryo growth or development as shown in embryos in the blastocyst stage collected on day four of pregnancy (Domaracký et al. 2007).

**Contraindications:** Contraindicated during pregnancy due to demonstrated effects as an emmenagogue. Caution advised in patients with acute inflammation of the urinary tract or gastrointestinal tract due to the potentially irritating effects of this herb on mucosa of the renal, urinary and gastrointestinal tracts. (Brinker 1998). Patients with extensive skin injuries, acute dermatological conditions, high fevers, severe infectious diseases, heart conditions or hypertonia should avoid whole-body baths except when approved by a physician (Gruenwald et al. 2004).

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

In clinical studies, this herb (in combination with other plant extracts) was shown to be an effective treatment for bronchitis and cough, and in preclinical and laboratory studies, the following effects have been demonstrated: acetylcholinesterase (AChE) inhibition, antibacterial, antifungal, anti-inflammatory, antioxidant, antiplatelet, antiprotozoan, antispasmodic, antiviral (against herpes simplex virus), phase I & II enzyme induction trypanocidal activity (see “Clinical Data” and “Laboratory and Preclinical Data” tables below.)

Primary active compounds include the volatile oil (1.0-2.5%): thymol, p-cymene, carvacrol, gamma-terpinene, borneol and linalool; caffeic acid derivatives: rosmarinic acid; flavonoids: luteolin, apigenin, naringenin and eriodictyol, cirsilineol, salvigenin, cirsimaritin, thymonine and thymusine; and triterpenes: ursolic acid and oleanolic acid (Gruenwald et al. 2004). Dried thyme is a significant source of Vitamin K, iron, manganese and calcium (US Dept. of Agriculture 2006).

**Indications and Usage:** This herb has been approved by the *Commission E* for the treatment of cough and bronchitis (Blumenthal et al. 1998). Typical daily dosage is 10 g herb. This herb can be prepared as dried leaves, powdered herb, tea, infusion, bath, tincture, oil or liquid extract. To prepare a tea, add 1 cup (150 mL) boiling water to 1.5-2 g (1 heaping teaspoonful) of herb, steep for 10 minutes, then strain; take 1-3 × daily. For an infusion, steep longer; take several times daily. For the powdered herb, take 1-4 g twice daily. For a bath, add 500 g herb to 4 liters boiling water, filter, then add to bath water or add 0.004 g thyme oil to 1 liter water and then add to bath; bath duration: 10-20 minutes (Gruenwald et al. 2004).

### Clinical Data: *Thymus vulgaris*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Bronchitis treatment</b>	Fixed fluid extract combination of thyme & ivy leaves; dosage: 5.4 mL 3 × daily; treatment duration: 11 days	Randomized, double-blind, placebo-controlled, multicenter study; 361 outpatients with acute bronchitis & ≥ 10 coughing fits daily, bronchial mucus production & bronchitis severity score symptoms	Herbal treatment was superior to placebo; showed mean reduction of coughing fits relative to baseline of 68.7% vs. 47.5% for placebo (on days 7-9 of intervention); treatment group showed 50% reduction in coughing fits from baseline 2 days prior to placebo; improved acute bronchitis symptoms; no serious adverse effects	Kemmerich et al. 2006
<b>Bronchitis treatment</b>	Thyme fluid extract & primrose root fluid extract in Bronchicum Elixir (fluid test medication, 6 × 5 mL daily ) or Bronchicum Tropfen (drops test medication, 5 × 1 mL daily)	Randomized, single-blind, bicentric clinical trial: n=189 outpatients (121 women, 68 men) with acute, previously untreated bronchitis with a duration of 48 hours; treatment duration: 7-9 days	Showed statistically significant decrease on BSS symptom score as compared with baseline; no significant differences between treatment groups were observed; both treatments were well tolerated & showed comparable results in efficacy of symptom relief	Gruenwald et al. 2006
<b>Cough treatment</b>	Herbal cough syrup with ivy, thyme, aniseed & marshmallow root mucilage (extracted by decoction); mean daily intake: 10 mL syrup; mean duration: 12 days	Open clinical trial: n=62; patients with irritating cough due to common cold (n=29), bronchitis (n=20) or other respiratory tract diseases which cause mucus formation (n=15)	Improved symptoms scores compared to baseline & treatment was well-tolerated; doctors & patients reported good or very good efficacy (86% & 90%); one adverse event was reported but was considered unrelated to treatment	Büechli et al. 2005

### Laboratory and Preclinical Data: *Thymus vulgaris*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Acetylcholinesterase (AChE) inhibition</b>	Essential oil & select constituents: thymol, carvacrol & derivatives	In vitro	Active: thymohydroquinone showed strongest inhibitory effect	Jukic et al. 2007
<b>Antibacterial</b>	Essential oil	In vitro: disc diffusion and colorimetric assays	Exhibited significant colicidal & colistatic properties against <i>Escherichia coli</i>	Burt & Reinders 2003

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antibacterial</b>	Organic and aqueous extracts	In vitro: <i>Bacillus subtilis</i> , <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> (methicillin resistant/sensitive), <i>Pseudomonas aeruginosa</i> and <i>Enterococcus fecalis</i>	Active against both gram-positive and gram-negative bacteria	Essawi & Srour 2000
<b>Antibacterial</b>	Essential oils	In vitro: clinical, locally pathogenic, antibiotic-resistant bacteria; 189 gram-negative and 135 gram-positive strains	Active; of 11 essential oils tested, exhibited the highest and broadest antibacterial activity	Hersch-Martinez et al. 2005
<b>Antibacterial</b>	Aqueous & acetone extracts	In vitro: agar plate and rapid radiometric methods	Active; both extracts inhibited growth of <i>Mycobacterium tuberculosis</i> H37Rv at 0.5 mg/mL	Lall & Meyer 1999
<b>Antibacterial</b>	Essential oil	In vitro: <i>Listeria innocua</i> , <i>L. monocytogenes</i> & <i>Staphylococcus aureus</i> ; examined by flow cytometry	Active; due to permeabilization of the cytoplasmic membrane	Nguefack et al. 2004
<b>Antibacterial</b>	Essential oil	In vitro: against <i>Dermatophilus congolensis</i>	Active; more effective than the standard povidone-iodine treatment	Yardley 2004
<b>Antibacterial</b>	Essential oil	In vitro: 25 different genera of bacteria	Active	Dorman & Deans 2000
<b>Antibacterial</b>	Essential oil; plants harvested at four ontogenetic stages	In vitro: 9 gram-negative and 6 gram-positive strains; bio-impedance	Active; significant bacteriostatic activity; most effective when plant harvested in full flower	Marino et al. 1999
<b>Antifungal</b>	Essential oil; 6 chemotypes	In vitro: <i>Candida albicans</i>	Active; thymol chemotype most active; potentiates antifungal action of amphotericin B	Giordani et al. 2004
<b>Antifungal</b>	Essential oil	In vitro & in vivo: rats experimentally infected with dermatophytes	Active; fungicidal and/or fungistatic against various dermatophytes that cause human mycoses	Ouraini et al. 2005
<b>Antifungal</b>	Essential oil of <i>Thymus</i> spp. & major compounds	In vitro: against <i>Candida</i> spp.	Potent activity; warrants future therapeutic trials	Pina-Vaz et al. 2004
<b>Anti-inflammatory</b>	Plant extract	In vitro: murine macrophage cell line	Active; inhibited net nitric-oxide production	Vigo et al. 2004
<b>Antioxidant</b>	Leaf extract; fractionated extract	In vitro: DPPH radical assay	Active	Dapkevicius et al. 2002

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Phenolic compounds isolated from leaves	In vitro: peroxidation assays	Active; protected biological systems from various oxidative stresses	Haraguchi et al. 1996
<b>Antioxidant</b>	Aqueous infusion & essential oil	In vitro: low-density lipoprotein copper-induced oxidation model	Active; showed dose-dependent protective effect attributed to phenolic monoterpenes, thymol & carvacrol in essential oil & polyphenols & flavonoids in aqueous extracts	Kulisić et al. 2007
<b>Antioxidant</b>	Essential oil; diet supplementation	In vivo: mature rats, liver & heart activity	Active; increased antioxidant capacity against age-related changes	Youdim & Deans 1999
<b>Antiplatelet</b>	Thymol & isolated compounds from leaves	In vitro: platelet aggregation induced by collagen, ADP, arachidonic acid & thrombin	Active; inhibited platelet aggregation	Okazaki et al. 2002
<b>Antiprotozoan</b>	Essential oil & isolated mono- and sesquiterpenes	In vitro: against <i>Leishmania major</i> , <i>Trypanosoma brucei</i> & human HL-60 cells; Almar Blue assay	Active against <i>T. bruceia</i> : 50-fold to 80-fold more toxic to bloodstream forms of <i>T. bruceia</i> than HL-60 cells; Inactive against <i>L. major</i>	Mikus et al. 2000
<b>Antispasmodic</b>	Plant & ethanol extract	In vitro: isolated guinea pig tracheae	Active; concentration-dependent & reversible	Meister 1999
<b>Antispasmodic</b>	Thymol isolated from essential oil	In vitro: strips of circular smooth muscle from guinea pig stomach & portal vein	Showed agonistic effect on alpha(1)-, alpha(2)- & beta-adrenergic receptors; spasmolytic activity observed at $10^{-6}$ M & inhibited 100% of smooth muscle contraction at $10^{-4}$ M; may explain mechanism of analgesis	Beer et al. 2007
<b>Antispasmodic</b>	Flavonoids isolated from herb	In vitro: isolated smooth muscles of guinea-pig ileum and trachea and rat vas deferens	Active; induced relaxation of the carbachol contracted tracheal strip without stimulation of blocked beta 2-receptors	Van Den Broucke et al. 1983
<b>Antiviral – Herpes simplex virus (HSV) type 1</b>	Essential oil	In vitro: HSV-1 clinical isolates of drug-resistant strain (acyclovir)	Active; showed potent virucidal activity; significantly reduced plaque formation	Schnitzler et al. 2007

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiviral - Herpes simplex virus (HSV) type 1 &amp; 2</b>	Aqueous extracts	In vitro: HSV type 1, type 2 & an ancylovir-resistant strain; RC-37 cells in a plaque reduction assay	Active: showed dose-dependent response; mechanism affects virus before adsorption but does not impact intracellular virus replication; results suggest therapeutic topical applications	Nolkemper et al. 2006
<b>Phase I &amp; II enzyme induction</b>	Herb & constituents: thymol & carvacrol	In vivo: mice fed herb (0.5% or 2.0% diet) or isolated compounds (50-200 mg/kg)	Induced both phase I & phase II xenobiotic-metabolizing enzymes of mouse liver	Sasaki et al. 2005
<b>Relaxant</b>	Macerated & aqueous extracts (0.25, 0.5, 0.75 & 1.0 g %)	Tracheal chains of guinea-pigs, experimentally-induced contractions	Active; showed potent relaxant effect, comparable to those of positive control, theophylline	Boskabady et al. 2006
<b>Trypanocidal</b>	Essential oil	In vitro: <i>Trypanosoma cruzi</i>	IC <sub>50</sub> /24 hours=77 µg/mL for epimastigotes & 38 µg/mL for trypomastigotes; activity may be attributed to thymol	Santoro et al. 2007

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# Toronja

## OTHER COMMON NAMES

Grapefruit, pomelo (English).

## SCIENTIFIC NAME

*Citrus × paradisi* Macfady or *C. grandis* (L.) Osbeck. Synonym: *C. maxima* (Burm. ex Rumph.) Merr. [Rutaceae (Rue Family)].

**Note:** *Citrus × paradisi* is a hybrid between pomelo (*C. maxima*) and sweet orange (*C. sinensis* L. Osbeck), but its properties most closely resemble the former. Although the common name *toronja* may be used to refer to more than one species (*C. × paradisi* and *C. grandis*), both species are often used interchangeably for food and medicine because they share similar properties.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this edible food plant as a remedy for the following health conditions (Yukes et al. 2002-2003):

- Constipation
- Diabetes
- Gastrointestinal disorders
- Indigestion
- Obesity (to facilitate weight loss)

**Plant Part Used:** Fruit, juice from fruit.

**Traditional Preparation:** This remedy, which is attributed acidic and sour properties, is typically administered raw as a juice or eaten as a fruit.

**Traditional Uses:** For some digestive disorders, aloe vera (*sábila*) is also used as a laxative in combination with grapefruit juice.

**Availability:** *Citrus × paradisi* is typically available at grocery stores and fruit stands in the United States, and its closely-related ancestor, *Citrus grandis*, is also sold but less popular.

## BOTANICAL DESCRIPTION

*Toronja* (*Citrus × paradisi*) is a tree that grows 9-15 m tall. Leaves are oval, dark green, thick and leathery with wavy margins, glandular dots, a characteristic pungent odor when crushed and broadly-winged leaf-stems. Flowers are white and grow in clusters of 2-20. Fruits are round and occur in dense clusters, have light yellow to yellow-orange skin and contain numerous seeds and tart, succulent yellow to pink pulp. Fruit color, size, seed-content and sweetness vary between cultivars (Bailey Hortorium Staff 1976).

**Distribution:** Native to China and southeast Asia, this plant is cultivated in tropical, subtropical and warm temperate regions (Bailey Hortorium Staff 1976).



## SAFETY & PRECAUTIONS

The fruit and fruit juice are widely consumed and generally considered safe except for well-demonstrated drug interactions (see below).

**Contraindications:** None identified except herb-drug interactions (see below).

**Drug Interactions:** Grapefruit juice is known to interact with liver enzymes that metabolize certain drugs; therefore, it should not be taken concomitantly with medications that are metabolized by cytochrome P450 (CYP 450) 3A4 enzymes as this may increase the oral bioavailability of these drugs (Neuman 2002, Unger & Frank 2004). The mechanism for this interaction involves furanocoumarin derivatives with geranyloxy side chains, and in vivo and in vitro experiments have shown that these compounds are both competitive and mechanism-based inhibitors of CYP 450 3A4 enzymes (Guo & Yamazoe 2004). Grapefruit juice has been shown to interact with nifedipine in rats (Uesawa & Mohri 2005b).

Pomelo juice (*Citrus grandis*) also contains furanocoumarin derivatives (Uesawa & Mohri 2005a) and has shown drug interactions similar to those of grapefruit juice, affecting CYP 450 3A and P-glycoprotein drug metabolism. Drugs that have been shown to interact with this fruit juice by increasing their bioavailability include: cyclosporine (human clinical trials; Grenier et al. 2006) and tacrolimus (case reports & in vitro, human liver microsomes; Egashira et al. 2004 & Egashira et al. 2003). Swine co-administered a decoction of the fruit pericarps and cyclosporine showed acute toxicity; therefore, blood levels should be monitored in patients concomitantly both these substances (Hou et al. 2000a). Honey co-ingested with a decoction of the fruit pericarps reduces the naringin and naringenin absorption from this plant and may reduce its potency (Hou et al. 2000b).

## SCIENTIFIC LITERATURE

*Toronja* (*Citrus × paradisi*) has demonstrated the following effects in human clinical trials: antiatherosclerotic, antihyperglycemic, antioxidant, body weight and metabolic syndrome improvement, cardiac electrophysiology modulation, coronary artery disease preventive, HIV medication increased bioavailability, hypocholesterolemic, insulin resistance inhibition, periodontitis symptom improvement, weight loss and vitamin C level. In laboratory and preclinical studies, the following activity has been reported: acetylcholinesterase inhibition, antiasthmatic, anticancer, antioxidant, antiplatelet, antitussive, anti-ulcer, chemopreventive, cytoprotective, expectorant, gastroprotective, hypocholesterolemic, inhibition of dihydropyridine oxidation and aflatoxin B1 activation and osteoporosis modulating (see “Clinical Data” and “Laboratory and Preclinical Data” tables below). An epidemiological study has shown an association between consumption of citrus peels (which have a high d-limonene content) and reduced risk of squamous cell skin cancer (Hakim et al. 2000).

Grapefruit (*Citrus × paradisi*) contains compounds that may interact with CYP450, including the flavonoids naringin and naringenin and the furanocoumarins bergamottin and bergapten. Other flavonoids include neohesperidin, hesperidin, narirutin and quercetin (Ho et al. 2001). Volatile constituents of the essential oil include: ethyl acetate, methyl butyrate, ethyl butyrate, limonene, octanal, cis-3-hexenol, cis-linalool oxide, trans-linalool oxide, linalool, terpinen-4-ol, alpha-terpineol and nootkatone (Pino et al. 2000). Pomelo (*Citrus grandis*) has a similar chemical composition and also contains furanocoumarins including bergamottin, bergaptol and 6',7'-dihydroxybergamottin (Uesawa & Mohri 2005a) and coumarins xanthyletin, xanthoxyltin and suberosin (Teng et al. 1992). Grapefruit is a significant source of vitamin C, dietary fiber, vitamin A, potassium, folate and vitamin B (US Dept. Agriculture 2006).

**Indications and Usage:** No dosage information available except for its traditional and nutritional use.

**Clinical Data: *Citrus* × *paradisi* unless otherwise specified**

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Cardiac electrophysiology</b>	Grapefruit juice, administered orally	Clinical trial: 10 human volunteers	Showed significant QTc prolongation; proposed mechanism involves blocking of HERG channels by flavonoids	Zitron et al. 2005
<b>HIV medication increased bioavailability</b>	Fruit juice (400 mL) & saquinavir (protease inhibitor) administered orally (600 mg) or intravenously (12 mg)	Placebo-controlled clinical trial: 8 healthy volunteers, following an overnight fast; blood sampled over a 24 hour period	Active; enhanced bioavailability & therefore the effectiveness of oral saquinavir without affecting its clearance; may involve inhibition of intestinal CYP3A4	Kupferschmidt et al. 1998
<b>Hypocholesterolemic &amp; antiatherosclerotic</b>	Grapefruit pectin; supplemented as part of diet; 16 wks duration (no other changes in lifestyle)	Randomized, double-blind crossover clinical trial: volunteers with hypercholesterolemia & at risk for coronary heart disease (n=27)	Decreased plasma cholesterol levels 7.6%, low-density lipoprotein (LDL) cholesterol levels 10.8% & LDL:HDL cholesterol levels ratio 9.8%	Cerda et al. 1988
<b>Hypocholesterolemic, antioxidant &amp; antiatherosclerotic</b>	Fruit juice – hybrid of <i>C. grandis</i> & <i>C. × paradisi</i> (100 or 200 mL, orally for 30 days)	Randomized, controlled clinical trial; hypercholesterolemic patients, post bypass surgery (n=72)	Lowered serum levels of lipids, low-density lipoprotein cholesterol & total glycerides; increased serum, albumin & fibrinogen antioxidant capacities	Gorinstein et al. 2004
<b>Vitamin C level increase &amp; periodontitis treatment</b>	Fruit (ingested)	Randomized, controlled clinical trial: smokers & non-smokers with & without periodontitis	Increased plasma levels of vitamin C (below normal vitamin C levels are associated with periodontitis) & reduced sulcus bleeding index	Staudte et al. 2005
<b>Weight loss, antihyperglycemic &amp; insulin resistance inhibition</b>	Grapefruit juice or half of a fresh grapefruit with placebo capsules or grapefruit capsules w/apple juice, 3 times daily	Randomized, controlled clinical trial: 91 obese patients; duration: 12 wks	Weight loss per group: fresh grapefruit = 1.6 kg; grapefruit juice = 1.5 kg; grapefruit capsules = 1.1 kg; placebo = 0.3 kg; significant weight loss; grapefruit resulted in reduced 2-hour post-glucose insulin levels & improved insulin resistance	Fujioka et al. 2006

### Laboratory and Preclinical Data: *Citrus × paradisi* unless otherwise specified

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Acetylcholinesterase (AChE) inhibition</b>	Essential oil	In vitro	Active; inhibited activity of acetylcholinesterase	Miyazawa et al. 2001
<b>Antioxidant</b>	Fruit juice & freeze-dried products ( <i>C. grandis</i> ); methanol extracts	In vitro: kinetic model using DPPH, superoxide anion & hydrogen peroxide; compared with BHA & vitamin C	Active; showed potent radical scavenging activity; red variety exhibited stronger effects than white variety due to higher phenol content	Tsai et al. 2007
<b>Antiplatelet</b>	Isolated coumarins (from <i>C. grandis</i> )	In vitro: rabbit platelets	Active; inhibited thromboxane A2 formation & breakdown of phosphoinositides	Teng et al. 1992
<b>Antitussive, expectorant &amp; antiasthmatic</b>	Extract ( <i>C. grandis</i> var. <i>tomentosa</i> )	In vivo: mice & guinea pigs with experimentally-induced cough & asthma	Showed significant effects	Li et al. 2006
<b>Chemopreventive</b>	Citrus juice (double-strength) & flavonoids (hesperetin & naringenin); administered orally	In vivo: female rats with experimentally-induced mammary tumors; in vitro: human breast carcinoma cell line (MDA-MB-435)	Showed inhibition of cancer cell proliferation & delayed tumor growth	So et al. 1996
<b>Chemopreventive</b>	Citrus flavonoids & fruit juice	In vivo: Sprague-Dawley rats with experimentally-induced mammary tumors; in vitro: human breast cancer cell lines	Hesperetin may be more effective than naringenin in inhibiting mammary tumorigenesis; shows positive synergistic effects with drugs; flavonoids inhibit estrogen receptor-negative MDA-MB-435 & estrogen receptor-positive MCF-7	Guthrie & Carroll 1998
<b>Chemopreventive &amp; antitumor</b>	Essential oil of fruit given orally or added to diet	In vivo: mice	Active; increased glutathione S-transferase activity & inhibited tumor formation	Wattenberg et al. 1985
<b>Cytoprotective</b>	Isolated flavonoid, naringin	In vitro: normal hepatocytes with experimentally-induced cell damage	Active; prevented DNA fragmentation & cell death; protected normal cells against toxins	Blankson et al. 2000

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Dihydropyridine oxidation inhibition &amp; aflatoxin B1 activation</b>	Flavonoid naringin (which is metabolized as naringenin in humans)	In vitro: human liver microsomes	Active; potentially relevant to cancer chemoprevention involving carcinogens activated by CYP450	Guengerich & Kim 1990
<b>Gastroprotective &amp; antiulcer</b>	Seed-extract	In vivo: rats with ethanol-induced gastric lesions	Active; gastroprotective via increased gastric microcirculation	Zayachkivska et al. 2004
<b>Hypocholesterolemic &amp; antioxidant</b>	Citrus juice & isolated polyphenols & ascorbic acid	In vivo: hamster model of atherosclerosis; in vitro: heart disease & low density lipoprotein oxidation models	Active; showed cholesterol- & triglyceride-lowering effects; showed antioxidant activity	Vinson et al. 2002
<b>Osteoporosis prevention &amp; antioxidant</b>	Fruit juice	In vivo: male senescent orchidectomized rat model	Active; enhanced serum antioxidant status & prevented osteoporosis; reversed orchidectomy-induced antioxidant suppression; restored bone strength & density	Deyhim et al. 2006

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# Uña de Gato

## OTHER COMMON NAMES

Cat's claw (English).

## SCIENTIFIC NAME

*Uncaria tomentosa* (Willd. ex Roem. and Schult.) D.C. and *Uncaria guianensis* (Aubl.) J.F. Gmel. [Rubiaceae (Madder and Bedstraw Family)].

**Note:** These two species are used almost interchangeably in commerce although *U. tomentosa* is particularly sought after because it is reputed to be a more potent medicine. In the Dominican Republic, the common name *uña de gato* may refer to several unrelated species (other than *Uncaria* spp.); however, most of these plants are not commonly used medicinally (Liogier 2000).

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Arthritis
- Cancer
- Diabetes
- Kidney disorders

- Leukemia
- Menstrual disorders
- Uterine fibroids

**Plant Part Used:** Inner bark, branch, root. (The root is less-frequently sold in commerce because its harvest is particularly destructive to already vulnerable plant populations).

**Traditional Preparation:** The inner bark, branches and/or root are typically prepared as a tea by decoction. This plant is sometimes added to preparations of herbal mixtures or tinctures (*botellas*).

**Availability:** This herb may be sold at particular *botánicas* (Latino/Afro-Caribbean herbal and spiritual shops) and some health food, nutritional supplement and drug stores. As this plant has become a widely used herbal supplement, its popularity has led to over-exploitation such that wild plant populations are dwindling.

## BOTANICAL DESCRIPTION

*Uña de gato* (*Uncaria tomentosa*) is a climbing vine or liana that grows to 10 m tall with branches that are square in cross section and somewhat hairy, especially at the nodes. Sharp, curved thorns, resembling cat's claws, protrude from the leaf nodes. Leaves grow in opposite pairs and are ovate to elliptical-oblong (8-12 × 5-7 cm) in shape, blunt or abruptly pointed at the tip, rounded at the base, shiny smooth on the upper surface and hairy along the veins below. Flowers are numerous and occur in dense, spherical clusters arranged in groups of 3-5; each flower has yellowish-green petals. Fruits are 2-celled capsules containing numerous winged seeds (Williams & Cheesman 1928).

**Distribution:** Native to Central and South America, this plant grows in the Caribbean (Williams & Cheesman 1928).

**Note:** *Uncaria guianensis* has a very similar appearance to the above description, and the inner bark of both species is golden-brown in color; however, *U. tomentosa* has yellow to white flowers and curved but straight spines whereas *U. guianensis* has reddish-orange flowers and sharply curved spines that each resemble a hook.

## SAFETY & PRECAUTIONS

In a human clinical trial involving 4 healthy male volunteers taking 5 mg/kg C-MED-100 for 6 consecutive weeks, no toxicity was observed (Sheng et al. 2000). No toxicity or negative side effects were observed in a human clinical trial involving 12 healthy adults given 250 and 350 mg/day of C-Med-100 supplement when clinical symptoms, serum clinical chemistry, whole blood analysis and leukocyte differential accounts were assessed (Sheng et al. 2001).

**Animal Toxicity Studies:** Median lethal dose (LD<sub>50</sub>) and maximum tolerated dose (MTD) in rats was determined to be greater than 8g/kg of the aqueous bark extract (C-MED-100) as a single oral dose, and in a long-term study in which rats were treated daily with 10-80 mg/kg of extract for 8 weeks or 160 mg/kg for 4 weeks, no signs or symptoms of acute or chronic toxicity were observed. Aqueous extracts of the bark did not demonstrate any toxicity when evaluated in vitro for the presence of toxic compounds in Chinese hamster ovary cells and bacterial cells (*Photobacterium phosphoreum*) using four tests (Santa Maria et al. 1997).

**Contraindications:** Autoimmune disorders & patients taking immunosuppressants – patients with autoimmune conditions or taking immunosuppressants to prevent rejection of implanted organs should avoid use of cat's claw due to its immune stimulating properties (Reinhard 1999). Not to be used during

pregnancy or while breastfeeding (Gruenwald et al. 2004). Oral ingestion of the herb may interfere with nuclear medical examination (resulting in misdiagnosis) and has shown potential for interaction with radiopharmaceuticals based on a preclinical study in rats in which administration of this herb affected the uptake and biodistribution of sodium pertechnetate, a radiobiocomplex (Moreno et al. 2007).

**Drug Interactions:** Concomitant use of cat's claw with the following medications may increase the risk of bleeding (due to this herb's rhynchophylline content which may inhibit platelet aggregation) and should be avoided: anticoagulants, antiplatelet and thrombolytic agents and low molecular weight heparins. As cat's claw has been shown to inhibit cytochrome P450 3A4 (in vitro), concomitant use with drugs metabolized by this enzyme should be administered with caution (Gruenwald et al. 2004).

## SCIENTIFIC LITERATURE

Clinical studies have demonstrated the following therapeutic activities of this plant: anti-arthritic, DNA repair enhancement, immune enhancement and immunostimulant. Laboratory and preclinical studies have shown the following biological activities: amyloid protein-binding, anti-allergic, anti-amnesic, anticancer, anti-genotoxic, anti-inflammatory, antimicrobial, antimutagenic, antineoplastic, antinociceptive, antioxidant, antiproliferative, apoptotic, anti-tumor, antiviral, chemopreventive, chondroprotective, cytoprotective, desmutagen, DNA repair enhancement, immune enhancement, immunomodulatory and stimulation of leukemic cell viability (see "Clinical Data" and "Laboratory and Preclinical Data" tables below).

Primary bioactive constituents of *Uncaria tomentosa* include: alkaloids: 5-alpha-carboxystrictosidine, alloisopteropodine, allopteropodine, isopteropodine, isomitraphylline, mitraphylline, pteropodine, isopteropodine, rhynchophylline, isorhynchophylline, speciophylline (uncarine D), uncarine F; organic acids: oleanolic acid, ursolic acid; quinovic acid glycosides; triterpenes; procyanidins: (-)-epicatechin, cinchonain; sterols: beta-sitosterol, stigmasterol, campesterol (Gruenwald et al. 2004; Duke & Beckstrom-Sternberg 2007). Two different chemotypes of this species have been identified, each with unique alkaloid constituents in their roots; one contains pentacyclic oxindoles (which mainly act on the immune system on the cellular level) and the other has tetracyclic indoles (which primarily affect central nervous system function). Because tetracyclic alkaloids have shown antagonistic effects on the immunomodulating activity of pentacyclic alkaloids, these two chemotypes should not be mixed together or administered concomitantly (Reinhard 1999). The following compounds have been identified in *Uncaria guianensis*: quinovic acid glycosides (Yépez et al. 1991) and indole alkaloids uncarine C and uncarine E (Lee 1999).

**Indications and Usage:** Available for use in powdered, capsule or liquid extract forms for internal administration. To prepare a decoction, simmer 30 g powder in 800 mL water for 45 minutes (until reduced to 500 mL remaining water), strain and refrigerate after cool. Take 60 mL once daily in the morning on an empty stomach (Schauss 1998). Daily dosage is 350-1000 mg daily (Gruenwald et al. 2004).



### Clinical Data: *Uncaria tomentosa*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Arthritis treatment</b>	Sierrasil (mineral supplement) combined with cat's claw extract vincaria ( <i>Uncaria guianensis</i> )	Double-blinded, randomized clinical trial: patients with osteoarthritis of the knee (n=107); treatment duration = 8 wks	Improved joint health & function (within 1-2 wks); group taking herb & mineral supplements showed lower use of rescue medication (28-23%); significant benefits were not sustained	Miller et al. 2005
<b>Arthritis treatment</b>	Extract from the pentacyclic alkaloid-chemotype	Randomized double blind placebo-controlled trial: 40 active rheumatoid arthritis patients; 52 wks, 2 phases	Active; reduced number of painful joints & only minor side effects were observed	Mur et al. 2002
<b>DNA repair induction</b>	Water extract (C-Med-100); 250 mg & 350 mg tablet for 8 wks	Human clinical trial: 12 healthy adults; DNA damage induced by hydrogen peroxide	Active; significant decrease in DNA damage & increase in DNA repair in supplement groups	Sheng et al. 2001
<b>Immunostimulant</b>	Bark extract: C-Med-100 (350 mg 2 × daily for 2 mo)	Human intervention study: 23 valent pneumococcal vaccine response	Active; elevated lymphocyte/neutrophil ratios of peripheral blood & reduced decay in 12 serotype antibody titer; showed atoxicity	Lamm et al. 2001
<b>Immunostimulant</b>	Aqueous extract C-Med-100; 5 mg/kg for 6 wks	Human clinical trial: 4 healthy male volunteers	Active; white blood cell levels significantly elevated	Sheng et al. 2000

### Laboratory and Preclinical Data: *Uncaria tomentosa*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antiamnesic</b>	Total alkaloid (10-20 mg/kg i.p.) & oxindole alkaloid components (10-40 mg/kg i.p.)	In vivo: passive avoidance test of impairment of retention performance by amnesic drugs	Active; reduced memory impairment induced by dysfunction of cholinergic brain systems; possibly involve glutamatergic systems	Mohamed et al. 2000
<b>Antiamyloidogenic</b>	Mitraphylline, an isolated oxindole alkaloid	In vitro: beta-amyloid 1-40 protein using the capillary electrophoresis method	Active; amyloid protein binding constant: $K = 9.95 \times 10^5 \text{ M}^{-1}$ ; results may have implications for research on Alzheimer's disease therapies	Frackowiak et al. 2006

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antigenotoxic &amp; desmutagen</b>	Aqueous extract (infusion)	In vitro: using oxidative genotoxicant hydrogen peroxide	Active; showed desmutagen effects by detoxifying mutagen; mechanism may involve radical scavenging effects of phenols	Romero-Jiménez et al. 2005
<b>Anti-inflammatory</b>	Spray-dried hydroalcoholic extract vs. aqueous freeze-dried extract	In vivo: carrageenan-induced paw edema model in mice	Active; hydroalcoholic extract significantly higher; little inhibition of cyclooxygenase-1 and -2	Aguilar et al. 2002
<b>Anti-inflammatory</b>	Plant extracts	In vivo: carrageenan-induced rat paw edema	Active; isolated active principles: new quinovic acid glycoside 7	Aquino et al. 1991
<b>Anti-inflammatory</b>	Plant extract; administered for 8 days	In vivo: mice with respiratory inflammation due to ozone exposure	Active; prevented ozone-induced respiratory inflammation	Cisneros et al. 2005
<b>Anti-inflammatory</b>	Bark extract	In vitro: epithelial & macrophage cell lines in response to peroxynitrite (300 µM)	Active; protected against oxidative stress and negated activation of NF-kappaB; describes mechanism	Sandoval-Chacon et al. 1998
<b>Anti-inflammatory &amp; antiallergenic</b>	Ethanollic leaf extract ( <i>Uncaria guianensis</i> )	In vivo: administered orally as a pre-treatment; in vitro: murine peritoneal macrophages & spleen cells	Active; inhibited experimentally-induced edema & pleural exudation; lowered leukocyte, neutrophil & eosinophil recruitment to pleural cavity	Carvalho et al. 2006
<b>Anti-inflammatory &amp; antioxidant</b>	Plant extracts ( <i>U. tomentosa</i> & <i>U. guianensis</i> )	In vitro & in vivo	Activity independent of alkaloid content; <i>U. guianensis</i> shown to be more potent	Sandoval et al. 2002
<b>Anti-inflammatory (mechanism)</b>	Plant extracts	In vitro: THP-1 monocyte-like cells; ELISA assays	Showed effects on cytokine expression: inhibited MAP kinase signaling pathway; increased LPS-dependent expression of IL-1beta (2.4-fold); inhibited LPS-dependent expression of TNF-alpha (5.5-fold)	Allen-Hall et al. 2007
<b>Antimicrobial</b>	Micropulverized plant material	In vitro: clinical isolates of oral <i>Streptococcus mutans</i> , <i>Staphylococcus</i> spp. & Enterobacteriaceae	3% concentration of herb inhibited: 8% Enterobacteriaceae, 52% of <i>S. mutans</i> & 96% of <i>Staphylococcus</i> spp.	Ccahuana-Vasquez et al. 2007

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antimicrobial</b>	Oxindole alkaloid, isopteropodine (0.3%)	In vitro: Gram positive bacteria	Active	García et al. 2005
<b>Antimutagenic</b>	Bark extract and chromatographic fractions	In vitro & in vivo: <i>Salmonella typhimurium</i> strains; human smoker, decoction ingested daily for 15 days	Showed no mutagenic effect in vitro against <i>S. typhimurium</i> , but exhibited protective antimutagenic effect; decreased mutagenicity of <i>S. typhimurium</i> in subject's urine	Rizzi et al. 1993
<b>Antimutagenic &amp; antiproliferative</b>	Bark & leaf extracts and chromatographic fractions	In vitro: human breast cancer cell lines (MCF7)	Active; exhibited anti-mutagenic & anti-proliferative activity; active fractions showed 90% inhibition at 100 mg/mL concentration	Riva et al. 2001
<b>Antineoplastic, antiproliferative &amp; apoptotic</b>	Isolated oxindole alkaloids	In vitro: human lymphoblastic leukemia T cell lines	Active; alkaloids pteropodien & uncarine F strongly inhibited proliferation & induced apoptosis	Bacher et al. 2006
<b>Antinociceptive</b>	Industrial fraction containing 95% oxindole alkaloids, administered intraperitoneally	In vivo: mice, chemical & thermal models of nociception	Active; showed dose-dependent effects; mechanism involves interaction with 5-HT <sub>2</sub> receptors	Jürgensen et al. 2005
<b>Antioxidant</b>	Bark & root methanolic extracts	In vitro: rat liver homogenates	Active; exhibited antioxidant activity and prevented free radical-mediated DNA-sugar damage	Desmarchelier et al. 1997
<b>Antioxidant</b>	Bark decoction (aqueous extract)	In vitro: reaction with superoxide anion, peroxy & hydroxyl radicals	Showed potent radical scavenging activity & protection from lipid peroxidation	Gonçalves et al. 2005
<b>Antioxidant</b>	Aqueous & ethanolic bark extracts	In vitro: trolox equivalent antioxidant capacity, peroxy radical-trapping capacity & superoxide radical scavenging capacity	Active; ethanolic preparations showed more potent activity but may have undesirable gastric effects due to high tannin content	Pilarski et al. 2006
<b>Antioxidant &amp; anti-inflammatory</b>	Plant extract ( <i>Uncaria guianensis</i> )	In vitro: DPPH radicals, TNF $\alpha$ & PGE <sub>2</sub> production	Active; quenched DPPH radicals, anti-inflammatory effects may involve inhibition of TNF $\alpha$ & PGE <sub>2</sub> production	Piscocya et al. 2001

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antiproliferative</b>	Mitraphylline (pentacyclic oxindole alkaloid) isolated from inner bark	In vitro: human glioma GAMG & neuroblastoma SKN-BE(2) cell lines; controls were cyclophosphamide & vincristine	Active; showed dose-dependent cytotoxicity & inhibition of cancer cell growth (IC <sub>50</sub> =12.3 μM at 30 hrs & 20 μM at 48 h, respectively)	García Prado et al. 2007
<b>Antitumor</b>	Hot water extract (C-Med 100)	In vitro: normal mouse T & B lymphocytes	Active; inhibited proliferation, possibly due to retarded cell cycle progression	Akesson, Lindgren, et al. 2003
<b>Antitumor</b>	Water extract (C-Med-100)	In vitro: human leukemic & EBV-transformed B lymphoma cell lines	Active; strong antiproliferative effects via selective induction of apoptosis	Sheng et al. 1998
<b>Antiviral</b>	Bark extract & isolated glycosides	In vitro	Active	Aquino et al. 1989
<b>Biological effects</b>	Quinic acid, isolated from aqueous extract (C-Med 100)	In vivo (mice) & in vitro	Showed significant increase in number of spleen cells; inhibited transcriptional regulator NF-kappaB activity	Akesson et al. 2005
<b>Chemopreventive</b>	Plant extract; 4 different solvents: n-hexane, ethyl acetate, n-butanol & methanol	In vitro: human premyelocytic leukemia HL-60 cell lines	Induced DNA fragmentation & cell death in a time-dependent manner; showed anti-cancer potential	Cheng et al. 2007
<b>Chondroprotective</b>	Vincaria ( <i>Uncaria guianensis</i> extract), alone & in combination with <i>Lepidium meyenii</i> (RNI 249)	In vitro: human chondrocytes from cartilage samples from surgical specimens	Active; increased IGF-1 mRNA levels & production; protected IGF-1 when exposed to IL-1beta; reduced nitric oxide production	Miller et al. 2006
<b>Cytoprotective</b>	Decoction of powdered bark (freeze-dried vs. non-freeze dried)	In vitro: murine macrophages in response to DPPH & UV light	Active; fully protective against DPPH and UV irradiation-induced cytotoxicity; suppressed TNFalpha synthesis	Sandoval et al. 2000
<b>DNA repair enhancement</b>	Aqueous extract (with very little oxindole alkaloids): C-Med-100	In vitro: human skin organ cultures irradiated with 0-100 mJ/cm <sup>2</sup> UVB	Active; decreased death of skin cells due to UV exposure; showed potential as a sunscreen	Mammone et al. 2006

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>DNA repair enhancement</b>	Water extract (C-Med-100); low alkaloid content (<0.05%); water soluble active compound identified as quinic acid esters	In vitro	Active; showed inhibition of cell growth but no cell death; conducive to DNA repair & immune enhancement, anti-inflammatory & chemopreventive properties	Sheng et al. 2005
<b>Immunomodulatory</b>	Ethanollic plant extract (stem bark)	In vitro: assays: complement cascade inhibition & ADP-induced platelet aggregation inhibition	Active; impaired both complement pathways	Deharo et al. 2004
<b>Immunomodulatory</b>	Plant extract: administered prophylactically at 50, 100, 150 and 200 mg/kg for 7 days	In vivo: mice with lethal dose of Listeria monocytogenes	Active; dose-dependent stimulation of myelopoiesis; increased serum colony-stimulating activity; prevented myelosuppression & splenomegaly; increased granulocyte-macrophage progenitors (CFU-GM) in bone marrow; increased IL-1 & IL-6 levels	Eberlin et al. 2005
<b>Immunomodulatory</b>	Standardized extract	In vitro	Active; stimulated macrophage phagocytosis (up to 4.7-fold) which the authors suggest is the primary mechanism of immunomodulatory activity of this herb	Groom et al. 2007
<b>Immunomodulatory</b>	Ethanol & HCl extracts; mixtures of tetracyclic & pentacyclic oxindole alkaloids	In vitro: isolated human peripheral blood mononuclear cells; stimulated with mitogens	Inhibited mitogen-induced neopterin production & tryptophan degradation; immunomodulatory mechanism involves interferon-gamma induced pathways	Winkler et al. 2004
<b>Immunomodulatory &amp; prolonged lymphocyte survival; antileukopenic</b>	Hot water extract (C-Med 100)	In vivo: mice, administered in drinking water	Prolonged cell survival, was reversible, no side effects; potential agent for treating leukopenia	Akesson, Pero, et al. 2003

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Immunostimulant</b>	Aqueous extract: C-Med-100	In vivo: rat model with doxorubicin-induced leukopenia	Active; more rapid recovery & increased white blood cells	Sheng, Pero & Wagner 2000
<b>Immunostimulant &amp; DNA repair enhancement</b>	Aqueous extract (C-Med-100); doses of 0, 5, 10, 20, 40 & 80 mg/kg for 8 wks by gavage	In vivo: female rats with phytohemagglutinin stimulated lymphocyte proliferation & 12 Gy irradiation	Active; elevated white blood cell levels; improved repair of DNA single & double strand breaks	Sheng et al. 2000
<b>Stimulation of leukemic cell viability</b>	Plant extracts (Vilcacora purchased from the Andean Center)	Ex vivo: leukemic cells (clinical samples) & cell lines; MTT assay, cell-cycle analysis & annexin-V binding assay	Leukemic cells showed high resistance; stimulated survival of leukemic cells in 96% of cases; showed no effect on normal lymphocytes	Styczynski & Wysocki 2006

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# Verbena

## OTHER COMMON NAMES

*Verbena azul*, *verbena mansa*, *verbena morada* (Spanish); porterweed (English).

## SCIENTIFIC NAME

*Stachytarpheta jamaicensis* (L.) Vahl. Synonyms: *Verbena jamaicensis* L., *Valerianoides jamaicense* (L.) Kuntze. *Stachytarpheta cayennensis* (L. C. Rich.) Vahl. [Verbenaceae (Verbena Family)].

**Note:** These two species are often used interchangeably as they are similar in appearance; however, *S. jamaicensis* appears to be more commonly used medicinally.

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this plant as a remedy for the following health conditions or effects (Yukes et al. 2002-2003):

- Anxiety
- Diarrhea
- Gastrointestinal disorders
- Flatulence and intestinal gas
- *Limpiar la sangre*
- *Mala sangre*
- Menopausal symptoms
- *Nervios*
- Stress

**Plant Part Used:** Leaves and stems.

**Traditional Preparation:** Typically prepared as a tea of the leaves and/or aerial parts.

**Traditional Uses:** For intestinal gas or flatulence, a tea is prepared with the aerial parts of this plant and sweetened with molasses (*melaza*). The leaves are also used for treating diarrhea and other stomach disorders, prepared as an infusion and taken orally. To relax and relieve nervousness, stress, anxiety and tension, a calming tea is prepared with the leaves as an infusion. This remedy is also used for treating menopausal symptoms including hot flashes and to cleanse the blood for conditions associated with “bad blood” (*mala sangre*). This herb is attributed bitter and astringent qualities.

**Availability:** Dried leaves and stems are sometimes sold at *botánicas* that specialize in Caribbean medicinal plants.

## BOTANICAL DESCRIPTION

*Verbena (Stachytarpheta jamaicensis)* is an upright herb or small shrub that grows to 30-40 cm tall with stems that are bluntly 4-angled and smooth or with a few slender hairs. Leaves are oblong to oval in shape (2-10 × 1.3-4.2 cm) and have coarsely-toothed margins. Flowers are densely clustered on long, curving terminal spikes and have light violet, lavender or bluish-purple petals that are fused at the base to form a trumpet-like shape with 5 rounded lobes at the end. Fruits are dry, woody and nearly cylindrical with 2 fused chambers, each containing a seed (Acevedo-Rodríguez 1996).

**Distribution:** Range extends from southern United States to northern South America, including the Caribbean; this plant has been introduced and naturalized in other tropical regions and grows in disturbed, open areas (Acevedo-Rodríguez 1996).

**Note:** The morphology of *Stachytarpheta cayennensis* is similar to the above description; however, this species has pale blue-purple to white flowers as compared with the darker, deeper blue or indigo colored petals of its close relative, *S. jamaicensis*.

## SAFETY & PRECAUTIONS

TRAMIL describes the herb (aerial parts: leaf and stem, excluding the flowers) as relatively atoxic (Germosén-Robineau 1995). No data on safety or toxicity in humans has been identified in the available literature.

**Animal Toxicity Studies:** In vivo studies have shown the LD<sub>50</sub> of the plant extract to be 700 mg/kg, administered intraperitoneally (Rojas et al. 1989). The LD<sub>50</sub> in mice administered intraperitoneally is 100 mg/kg (Feng et al. 1964). Acute toxicity of the leaf extract administered orally and intraperitoneally to male and female Swiss albino mice (n=40) and observed for 14 days resulted in an LD<sub>50</sub> of 25 g/kg given orally and 11.18 ± 0.56 g/kg intraperitoneally (Herrera 1992). When freeze-dried aqueous extracts of *S. cayennensis* were orally administered to mice at doses of up to 2 g/kg body weight, no signs of toxicity were observed (Mesia-Vela 2004).

**Contraindications:** Insufficient information available in the literature.

**Drug Interactions:** Insufficient information available in the literature.

## SCIENTIFIC LITERATURE

Research studies have shown the following biological activity for *Stachytarpheta jamaicensis*: analgesic, anthelmintic, antioxidant, antispasmodic, bioactivity – multiple effects (motor, nervous system and thermoregulatory), hypotensive, insecticidal (against mosquito), nematocidal and spasmogenic. *S. cayennensis* has demonstrated analgesic, antacid, antidiarrheal, anti-inflammatory, antinociceptive, antisecretory, antiulcer and laxative effects (see “Laboratory and Preclinical Data” tables below).

Compounds isolated from extracts of *S. jamaicensis* include the iridoid ipolamiide and the phenylpropanoid glycoside verbascoside (Melita Rodríguez & Castro 1996); apigenol-7-glucuronide, 6-hydroxyluteolol-7-glucuronide, chlorogenic acid, dopamine, luteolol-7-glucuronide, stachytarphine and tarphetalin (Duke 1992). Identified constituents of *S. cayennensis* include: citral, essential oil, geraniol and salicylic acid (Duke 1992).

**Indications and Usage:** TRAMIL has provisionally designated the internal use this herb (except its flowers) as “Recommended” for the following applications: treatment of diarrhea, intestinal parasites, poor quality of blood, *nervios* and *susto* (emotional shock). This recommendation is based on the herb’s relative atoxicity and recent data confirming its spasmolytic, antidiarrheal, nematocidal, antiseptic, coleretic, hepatoprotective and tranquilizing activities (Germosén-Robineau 1995).

However, preparations of the flowers of this herb are categorized as “Needing more investigation” before a clinical recommendation can be offered pending data from toxicity studies on the internal use of the flowers. Also, the internal administration of a decoction of leaves and branches for hypertension is also designated as “Needing more investigation” due to contradictory data on its therapeutic effects (Germosén-Robineau 1995).

### Laboratory and Preclinical Data: *Stachytarpheta jamaicensis*

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Analgesic</b>	Extract given intraperitoneally & subcutaneously	In vivo: rats	Active; also showed depressive, sedative and hypothermic effects	Rojas et al. 1989

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Ethyl acetate & n-hexane extracts of dried leaves	In vitro & in vivo: rat peritoneal macrophages stimulated to produce reactive oxygen species	Ethyl acetate extract active; showed significant oxygen radical scavenging activity at concentrations of 0.4-40 µg/mL	Alvarez et al. 2004
<b>Antispasmodic</b>	Leaf decoction (1:1)	In vitro: isolated rat ileum; contractions induced by acetylcholine	Active; inhibited contraction at 0.014 mg/mL concentration	Herrera 1992
<b>Bioactivity - multiple effects: motor, nervous system &amp; thermoregulatory</b>	Aqueous extract of leaves; intraperitoneal administration	In vivo: rats; dosages increased incrementally until death of the animals	Showed multiple effects: decrease in motor activity & inhibited alarm reaction; ataxia, sedation, analgesia, anesthesia, piloerection, head tremors & lowered body temperature	Melita Rodríguez & Castro 1996
<b>Hypotensive &amp; hypertensive</b>	Aqueous extract of dry plant (leaf and stem)	In vivo: rats; administered intravenously	Active; at doses of 0.55 g/kg, showed hypotensive effects; however, at 1.85 g/kg was hypertensive	Vallete 1990
<b>Insecticidal (mosquito)</b>	Plant extract	In vitro: bioassays for <i>Aedes aegypti</i> mosquito	Active; showed toxicity towards mosquito	Chariandy et al. 1999
<b>Nematocidal &amp; anthelmintic</b>	Aqueous methanolic extracts of fresh leaves	In vitro: larvae of <i>Strongyloides stercoralis</i>	Active; time of inactivation of 50% larvae = 81.5 hours; potential treatment for parasitic intestinal helminth	Robinson et al. 1990
<b>Spasmogenic</b>	Aqueous extract	In vitro: guinea pig ileum tissue	Active	Feng 1964

### **Laboratory and Preclinical Data: *Stachytarpheta cayennensis***

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Analgesic, antisecretory &amp; laxative</b>	Freeze-dried aqueous extracts (0.1-1 g/kg body weight, orally)	In vivo: rodent model	Active; showed mild laxative effects & strong inhibition of gastric secretion; showed potent analgesic effects in abdominal writhing model (ED <sub>50</sub> =700 mg/kg p.o.)	Mesia-Vela et al. 2004

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antidiarrheal</b>	Leaf: crude aqueous extract	In vivo: rats & mice	Active; reduced gastrointestinal propulsion in mice but did not increase water absorption in rats	Almeida et al. 1995
<b>Anti-inflammatory &amp; antinociceptive</b>	Dried leaves; alcoholic & n-butanolic extracts & isolated fractions; 100-300 mg/kg, intraperitoneally & orally	In vivo & in vitro: rats & isolated guinea pig ileum	Inhibited experimentally-induced contractions of guinea-pig ileum; showed antinociceptive activity in hot plate test	Schapoval et al. 1998
<b>Anti-inflammatory &amp; antiulcer</b>	Ethanollic extracts; 100 mg/kg, orally	In vivo: Swiss mice	Inhibited edema & leukocyte accumulation; protected against experimentally-induced gastric ulcer formation	Penido et al. 2006
<b>Antiulcer, antacid &amp; laxative</b>	Whole plant; freeze-dried aqueous extracts; 0.5-2 g/kg, orally	In vivo: mice	Increased intestinal motility; protected against experimentally-induced ulcer formation; inhibited secretion of gastric acid by cholinergic & histaminergic pathways	Vela et al. 1997

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# Zanahoria

## OTHER COMMON NAMES

Carrot (English).

## SCIENTIFIC NAME

*Daucus carota* L. var. *sativus* Hoffm. [Apiaceae (Carrot Family)].

## DOMINICAN MEDICINAL USES

In ethnobotanical studies conducted in New York City, Dominican interview participants reported using or knowing about the use of this food plant as a remedy or preventive agent for the following health conditions (Balick et al. 2000, Yukes et al. 2002-2003):

- Anemia
- Cancer
- Diabetes
- Diarrhea
- Gastrointestinal disorders
- Immune system support

- Liver disorders
- Menopausal hot flashes
- Stomach disorders
- Tumors
- Uterine fibroids
- Vision and eye problems

**Plant Part Used:** Root.

**Traditional Preparation:** Typically the fresh root is taken as a raw juice or vegetable, and it may also be eaten cooked.

**Traditional Uses:** The root of *zanahoria* is used medicinally for its refreshing or cooling properties (*fresca*) and may be indicated for illnesses associated with excess heat in the body. For treating diabetes, the fresh root is grated with onion (*cebolla*) to make a juice (*zumito*) and taken in the amount of 1 cup, 3 times per day. For anemia, including severe and chronic anemia (*sangre débil*) and possibly also sickle cell anemia, the fresh root of *zanahoria* is combined with beet (*remolacha*) root. Variations on this recipe for fortifying the blood include alternating every other day between adding the following to this mixture: fresh sweet orange (*naranja*) fruit juice one day and milk (*leche*) the next to make a drink that is taken as needed. Another remedy for chronic anemia includes the raw vegetable juice of *zanahoria*, beet (*remolacha*) and watercress (*berro*). The fresh juice or cooked vegetable is also taken for vision problems and to improve eyesight.

As a remedy for cancer (in its early stages), tumors and uterine fibroids, a fresh juice is prepared of *zanahoria* root, agave (*maguey*) leaf, beet (*remolacha*) root and shark cartilage (*cartilago de tiburón*). For nourishment and to strengthen and fortify the immune system (*para subir la defensa*), carrot is prepared with raw beet (*remolacha*) root, annatto (*bija*) seeds and honey (*miel*) and may be supplemented with iron (*hierro*) and calcium (*calcio*). This remedy may be administered to both children and adults and is prepared by grating (or blending) these raw vegetables, straining them well and taking 1-2 ounces of the juice daily. However, herbalists advise that this remedy should not be administered first thing in the morning as it can cause nausea when taken on an empty stomach.

**Availability:** As a widely consumed vegetable, *zanahoria* fresh roots are commonly available at grocery stores and supermarkets.

## BOTANICAL DESCRIPTION

*Zanahoria* (*Daucus carota*) is an annual or biennial branching, herbaceous plant that grows to 1 m tall with thick, fleshy, orange roots. Leaves are feather-like and finely divided into numerous narrow segments. Flowers are arranged in umbrella-like clusters with numerous small flowers subtended by down-curved bracts; each flower has 5 white petals. Fruits are small, oblong, dry, striated seeds covered with bristly hairs (Bailey Hortorium Staff 1976).

**Distribution:** Although this plant is a horticultural variety that is widely cultivated for its nutritious roots, its wild relative (*Daucus carota* var. *carota*) is native to Eurasia and is now cosmopolitan in range (Bailey Hortorium Staff 1976).

## SAFETY & PRECAUTIONS

No negative side effects or health hazards are known associated with the proper therapeutic use of this plant, except for a low risk for allergic reaction due to frequent or prolonged skin contact (Gruenwald et al. 2004).

**Contraindications:** None identified in the literature.

**Drug Interactions:** None identified in the literature.

## SCIENTIFIC LITERATURE

In clinical studies, this plant has shown the following effects: antioxidant, bioavailability of lutein and beta-carotene, colonic motility effects, dental caries susceptibility, hypocholesterolemic and immunomodulatory. In laboratory and preclinical studies, this plant has shown antibacterial, antioxidant, antispasmodic, antitumor, beta-carotene bioavailability, hepatoprotective, hormone modulation and hypocholesterolemic effects (see “Clinical Data” and “Laboratory and Preclinical Data” tables below). Secondary references describe the following pharmacological effects associated with this plant: anthelmintic, antimicrobial, vermifuge (essential oil), blood pressure lowering, constipating (due to high pectin content), mild diuretic and vision enhancement, especially for visual acuity in dim light (Gruenwald et al. 2004).

Major chemical constituents (compounds present in significant amounts) include beta-carotene, caryophyllene, gamma-terpinene, linalool, linoleic-acid, lithium and sabinene (Duke 1992). The root is high in vitamin A and a significant source of vitamins K, C, B1, B3 and B6, dietary fiber, potassium, manganese, molybdenum, phosphorus, magnesium and folate (US Dept. Agriculture 2006).

**Indications and Usage:** The root can be administered as a vegetable (cooked or raw) or as a juice made from the fresh, grated root (Gruenwald et al. 2004).

### Clinical Data: *Daucus carota*

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Antioxidant</b>	Carrot juice (16 mg beta carotene) w/orange juice (145 mg vitamin C), orally; diet high in polyunsaturated fat	Human clinical trial: male cigarette smokers (n=15) who were not taking other supplements; duration: 3 wks	Decreased oxidation of low-density lipoprotein as evidenced by analysis of oxidation products before & after vitamin supplementation	Abbey et al. 1995
<b>Beta-carotene &amp; lutein bioavailability</b>	Yellow carrot (genetically selected variety containing lutein); 1.7 mg lutein/day, administered orally for 7 days	Double-blind, randomized, crossover study (n=9): negative control = white carrot; positive control = lutein supplement	Showed significant increase in serum concentrations of lutein & beta-carotene; lutein from yellow carrots may support healthy vision & prevent macular degeneration	Molldrem et al. 2004
<b>Colonic motility</b>	Root fiber; diet supplementation for 3-wk periods	Human clinical trial: healthy male volunteers	Active; more diffuse colonic postprandial motor response; no side-effects observed	Guedon et al. 1996
<b>Dental caries susceptibility</b>	Root juice given to children in nursing bottles	Clinical case report	Sugar content of carrot juice (6.9-14.3 g/100 mL) associated with child dental caries of primary teeth (age > 1 yr)	Wetzel et al. 1989



<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Hypocholesterolemic</b>	Raw root, 200 g eaten daily	Human clinical trial: 3 wks	Significantly reduced serum cholesterol (11%), increased fecal bile acid & fat excretion (50%)	Robertson et al. 1979
<b>Immuno-modulatory</b>	330 mL/day of carrot juice (27.1 mg beta-carotene & 13.1 mg alpha-carotene) vs. tomato juice (37.0 mg lycopene) with a low-carotenoid diet	Randomized, blinded, crossover study; healthy men; 2 wks treatment duration followed by a 2 wks depletion period	Showed modulation of immune system function: increased natural killer cell proliferation & lytic activity (as evidenced by cytokine secretion) in a time-delayed manner	Watzl et al. 2003

### **Laboratory and Preclinical Data: *Daucus carota***

<i>Activity/Effect</i>	<i>Preparation</i>	<i>Design &amp; Model</i>	<i>Results</i>	<i>Reference</i>
<b>Antibacterial</b>	Seeds, methanol extract	In vitro: 11 pathogenic bacterial species	Active against one bacterial species	Kumarasamy et al. 2002
<b>Antioxidant</b>	Water-soluble anthocyanin from callus cultures	In vitro: linoleic acid auto-oxidation system	Active; exhibited stronger activity than alpha-tocopherol	Ravindra & Narayan 2003
<b>Antispasmodic</b>	Nitrogen containing tertiary base from seeds	In vitro: animal ileum, uterus, blood vessels & trachea	Active; exhibited papaverine-like nonspecific smooth muscle relaxant and spasmolytic activity	Gambhir et al. 1979
<b>Antitumor</b>	Seeds, petroleum ether extract; administered intraperitoneally	In vivo: mice with Ehrlich ascites tumor in mice	Active; exhibited anti-tumor effects at doses of 3 mg/kg body weight/day for 7 days	Majumder & Gupta 1998
<b>Beta-carotene bioavailability</b>	Root; dietary	In vitro: digestion method	Cooking carrot pulp with oil released the highest amount of beta-carotene (39% vs. raw pieces 3%)	Hedren et al. 2002
<b>Hepatoprotective</b>	Root extract, administered orally for 30 days	In vivo: rats with lindane-induced hepatotoxicity	Active; normalized serum enzyme, cholesterol & antioxidant levels	Balasubramaniam et al. 1998
<b>Hepatoprotective</b>	Root extract	In vivo: mouse liver with carbon tetrachloride-induced acute liver damage	Active; pretreatment lowered serum enzyme levels in a dose-responsive manner	Bishayee et al. 1995

<b>Activity/Effect</b>	<b>Preparation</b>	<b>Design &amp; Model</b>	<b>Results</b>	<b>Reference</b>
<b>Hormone modulation</b>	Root, acute feeding; vs. retinoic acid (a metabolite of carrot)	In vitro: isolated rabbit ovarian perfusion system	Carrot significantly decreased progesterone secretion & human chorionic gonadotropin-induced P secretion; retinoic acid stimulated progesterone secretion	Keenan et al. 1998
<b>Hypocholesterolemic &amp; antioxidant</b>	Root; dietary	In vivo: rats; duration: 3 wks	Active; lowered liver cholesterol levels; increased fecal steroid excretion; improved antioxidant status; suggest potential cardiovascular protective effects	Nicolle et al. 2003

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# APPENDIX A:

## KEY TO SYMBOLS AND ABBREVIATIONS

®	registered trademark
&	and
%	percent
'	prime
±	plus or minus
×	times or hybrid cross
<	less than
=	equals
>	greater than
≈	almost equal to or approximately equal to
≤	less than or equal to
≥	greater than or equal to
b.w.	body weight
btw	between
cm	centimeter(s)
cm <sup>2</sup>	square centimeter(s)
d	day(s)
DPPH	2,2-diphenyl-1-picrylhydrazyl; used in pharmacology studies to determine antioxidant and free radical scavenging activity
EC <sub>50</sub>	half maximal effective concentration; 50% effective concentration
ED <sub>50</sub>	effective dose; median effective dose
et al.	abbreviation of Latin phrase “et alia,” which means “and others”
ex vivo	Latin phrase meaning “out of the living”; refers to a laboratory technique or medical procedure which entails removing cells, tissue or an organ from a living organism into an artificial environment
g	gram(s)
g/kg	gram(s) per kilogram body weight
gram -	gram negative (bacteria)
gram +	gram positive (bacteria)
hrs	hours
i.p.	intraperitoneal (as a mode of administration)
IC <sub>50</sub>	half maximal inhibitory concentration
in vitro	Latin phrase meaning “in glass;” refers to laboratory techniques in which biological or chemical experiments are performed in a test tube, petri dish or other artificial environment rather than in the living system
in vivo	within the living organism
K	amyloid protein binding constant: K
kg	kilogram(s)
L	liter(s)
LD <sub>50</sub>	median lethal dose
m	meter(s)
M	mole
M <sup>-1</sup>	per mole
mg	milligram(s)
MIC	minimum inhibitory concentration
min(s)	minute(s)

mL	milliliter(s)
mm	millimeter(s)
mM	millimoles or millimolar
mo	month(s)
n	number (sample size)
oz	ounce(s)
p	p-value in statistical hypothesis testing; used to determine statistical significance
p.o.	by mouth; oral administration route (literally “per os”)
pH	minus the decimal logarithm of hydrogen ion activity in aqueous solution; a measure of acidity
pp.	pages
ppm	parts per million
pv.	pathovar; a pathogenic strain or variant of a nonpathogenic bacterial species
RAW	mouse leukaemic monocyte-macrophage cell lines
spp.	species
v/v	volume to volume ratio
var.	variety
vs.	versus
w/	with
w/o	without
w/w	weight to weight ratio
wk(s)	week(s)
wt	weight
yr(s)	year(s)
μg	microgram(s)
μL	microliter(s)
μm	micrometer(s)
μM	micromole(s) or micromolar

## APPENDIX B:

# GLOSSARY OF BOTANICAL TERMS

This list of botanical and horticultural terms is provided to aid in understanding the plant descriptions found in the text. These definitions are excerpted from a glossary produced by Michael J. Balick (co-author of this volume) and collaborators for a book he published on poisonous plants, *Handbook of Poisonous and Injurious Plants, Second Edition* (Lewis S. Nelson, M.D., Richard D. Shih, M.D. and Michael J. Balick 2007). The content for this list was based primarily on two standard references, *Manual of Vascular Plants of Northeastern United States and Adjacent Canada, Second Edition* by Henry A. Gleason and Arthur Cronquist (1991) and *Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada* by Liberty Hyde Bailey and Ethel Zoe Bailey, Revised and Expanded by The Staff of the Liberty Hyde Bailey (1976). Some definitions have been modified from the original for ease of use and understanding by the non-botanist, and the reader is urged to consult a botanical textbook if greater detail is required.

**Alternate:** Arranged singly at different heights and on different sides of the stem—as in alternate leaves.

**Annual:** Yearly; a plant that germinates, flowers and sets seed during a single growing season.

**Aril:** A specialized, usually fleshy outgrowth that is attached to the mature seed; more loosely, any appendage or thickening of the seed-coat.

**Bark:** Outer surface of the trunk of a tree or woody shrub.

**Berry:** The most generalized type of fleshy fruit, derived from a single pistil, fleshy throughout and containing usually several or many seeds; more loosely, any pulpy or juicy fruit.

**Biennial:** Living two years only and blooming the second year.

**Blade:** The expanded, terminal portion of a flat organ such as a leaf, petal or sepal, in contrast to the narrowed basal portion.

**Bract:** Any more or less reduced or modified leaf associated with a flower or an inflorescence that is not part of the flower itself.

**Bulb:** A short vertical, underground shoot that has modified leaves or thickened leaf-bases

prominently developed as food-storage organs.

**Capsule:** A dry, dehiscent fruit composed of more than one carpel.

**Climbing:** Growing more or less erect without fully supporting its own weight, instead leaning, scrambling, twining or attaching onto some other structure such as a tree or wall.

**Coarse:** Rough, as in the texture of a leaf.

**Compound leaf:** A leaf with two or more distinct leaflets.

**Cone:** A cluster of sporophylls or ovuliferous scales on an axis; a strobilus, as in pine or cycad cones.

**Creeping:** Growing along (or beneath) the surface of the ground and rooting at intervals, usually at the nodes.

**Cultivar:** A horticultural variety originating from a cultivated plant, possessing interesting or important characters such as color, smell, taste, disease resistance, etc. that make it worthy of distinction through naming.

**Deciduous:** Falling after completion of the normal function. A deciduous tree is one that normally loses its leaves at the approach of winter or the dormant season.

**Divided:** Cut into distinct parts, as a leaf that is cut to the midrib or the base.

**Drupe:** A fleshy fruit with a firm endocarp (“pit or stone”) that permanently encloses the usually solitary seed or with a portion of the endocarp separately enclosing each of two or more seeds.

**Elliptic:** With approximately the shape of a geometrical ellipse (applied only to flat bodies).

**Erect:** Upright.

**Escaped:** As in an introduced plant species that has escaped from cultivation into the wild.

**Evergreen:** Remaining green throughout the winter, as in a tree that keeps its leaves throughout the year.

**Feathery:** Feather shaped in outline, as in leaves.

**Female flowers:** Referring to flowers that are pistillate, having pistils but no stamens.

**Filament:** The stalk of stamen, i.e., the part that supports the anther.

**Finely toothed leaves:** Leaves with small serrations on the edges.

**Fleshy:** Thick and juicy; succulent.

**Flower:** An axis bearing one or more pistils or one or more stamens or both.

**Fruit:** A ripened ovary along with any other structures that may ripen with it and form a unit with it.

**Fruit pulp:** Fleshy material inside of a fruit, often the part that is eaten by humans or animals.

**Furrowed (stems):** Having longitudinal channels or grooves along the stem.

**Glossy:** Shiny.

**Head:** A cluster of flowers crowded closely together at the tip of a floral stem.

**Herb:** A plant, either annual, biennial or perennial, with the stems dying back to the ground at the end of the growing season and without woody stems.

**Herbaceous:** Adjectival form of herb; also, leaf-like in color or texture or not woody.

**Horticultural varieties:** As in cultivars.

**Hybrid:** A plant that results from a cross between two parent species that are genetically different.

**Indehiscent:** Remaining closed at maturity.

**Inflorescence:** A flower-cluster of a plant; the arrangement of the flowers on the axis.

**Lance-shaped:** As in leaves that are several times longer than broad and widest below the middle, tapering with convex sides upward to the tip.

**Latex:** A colorless, white, yellow or reddish liquid, produced by some plants, characterized by the presence of colloidal particles of terpenes dispersed in water.

**Leaflet:** An ultimate unit of a compound leaf.

**Leathery:** Thick and leather-like in texture, as in a leaf.

**Lobe:** A projecting segment of an organ, too large to be called a tooth but with the adjoining sinuses usually extending less than half-way to the base or mid-line.

**Mature fruit:** A fruit that has ripened; and often assumed a different color from when it was young.

**Midrib:** The main rib or longitudinal vein (an externally visible vascular bundle) of a leaf or leaflet.

**Milky latex:** White colored sap of a plant.

**Native:** Having its origins in a particular geographic area, as in a plant native to the Western United States.

**Naturalized:** Thoroughly established in a particular geographic region, but originally coming from another geographic area.

**New World:** Pertaining to North and South America, as in a plant native to that region.

**Nut:** A relatively large, dry, indehiscent fruit with a hard wall, usually containing only one seed.

**Oblong:** Shaped more or less like a geometrical rectangle (other than a square).

**Old World:** Pertaining to Europe, Asia and Africa, as in a plant native to that region.

**Opposite:** Situated directly across from each other at the same node or level, as the leaves or leaflets of some plants; situated directly in front of (on the same radius as) another organ, as stamens opposite the petals.

**Ovate:** Shaped like a long-section through a hen's egg, with the larger end toward the base.

**Palmately Compound:** As in a leaf with three or more lobes arising from a common point.

**Pantropical:** Found throughout the tropical regions.

**Perennial:** A plant living more than two years.

**Petal:** A member of the inner set of floral leaves, usually colored or white and serving to attract pollinators.

**Pistil:** The female organ of a flower, ordinarily differentiated into an ovary, style and stigma.

**Pit:** Hardened covering enclosing seed or seeds in a fruit, as in a peach.

**Pod:** Any kind of dry, dehiscent fruit.

**Prickle:** A sharp outgrowth from the epidermis or bark.

**Resinous:** Containing resin.

**Rhizome:** A creeping underground stem.

**Rosette:** A cluster of leaves or other organs arranged in a circle or disk, often in a basal position.

**Runner:** A long, slender, prostrate stem rooting at the nodes and tip.

**Sap:** Liquid contained within the stem.

**Seed coat:** Outside coating of a seed.

**Seed pods:** As in a fruit or pod containing seeds.

**Serrate:** Toothed along the margin with sharp, forward-pointing teeth.

**Serrated Leaf:** Saw toothed, with teeth pointing forward towards the tip of the leaf.

**Shrub:** A woody plant that remains low and produces shoots or trunks from its base.

**Silky:** A covering of fine, soft hairs.

**Simple leaf:** A leaf with the blade all in one piece (although it may be deeply cleft), not compound.

**Spear-shaped:** As in a leaf shaped like the head of a spear.

**Spike:** A more or less elongate inflorescence, with sessile (lacking a stalk) flowers attached directly by their base.

**Spikelet:** A small spike.

**Spine:** A firm, slender sharp-pointed structure, representing a modified leaf or stipule; more loosely, a structure having the appearance of a true spine.

**Sporophyll:** A modified leaf that bears or subtends the spore bearing cases in certain plants



such as ferns and cycads

**Stamen:** The male organ of a flower, consisting of an anther usually on a filament.

**Strobilus:** A cluster of sporophylls or ovule bearing scales on an axis, such as in a cone.

**Tendrils:** A slender, coiling or twining organ (representing a modified stem or leaf or part thereof) by which a climbing plant grasps its support.

**Terminal clusters:** As in flowers clustered at the end or tip of a branch.

**Thorn:** A stiff, woody, modified stem with a sharp point.

**Tooth:** Serration, as on the edge of a leaf (plural, teeth)

**Tuberous:** Thickened like a tuber, as in roots.

**Variegated:** Multiply colored, as in a leaf.

**Velvety:** With erect, straight moderately firm hairs, such as on a stem or leaf.

**Warty:** Covered with wart-like structures.

**Weed:** A plant that aggressively colonizes disturbed habitats or places where it is not wanted.

**Winged seed:** A thin, flat extension or projection from the side or tip of a seed.

## REFERENCES

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