Thomas S. C. Li

MEDICINAL PLANTS

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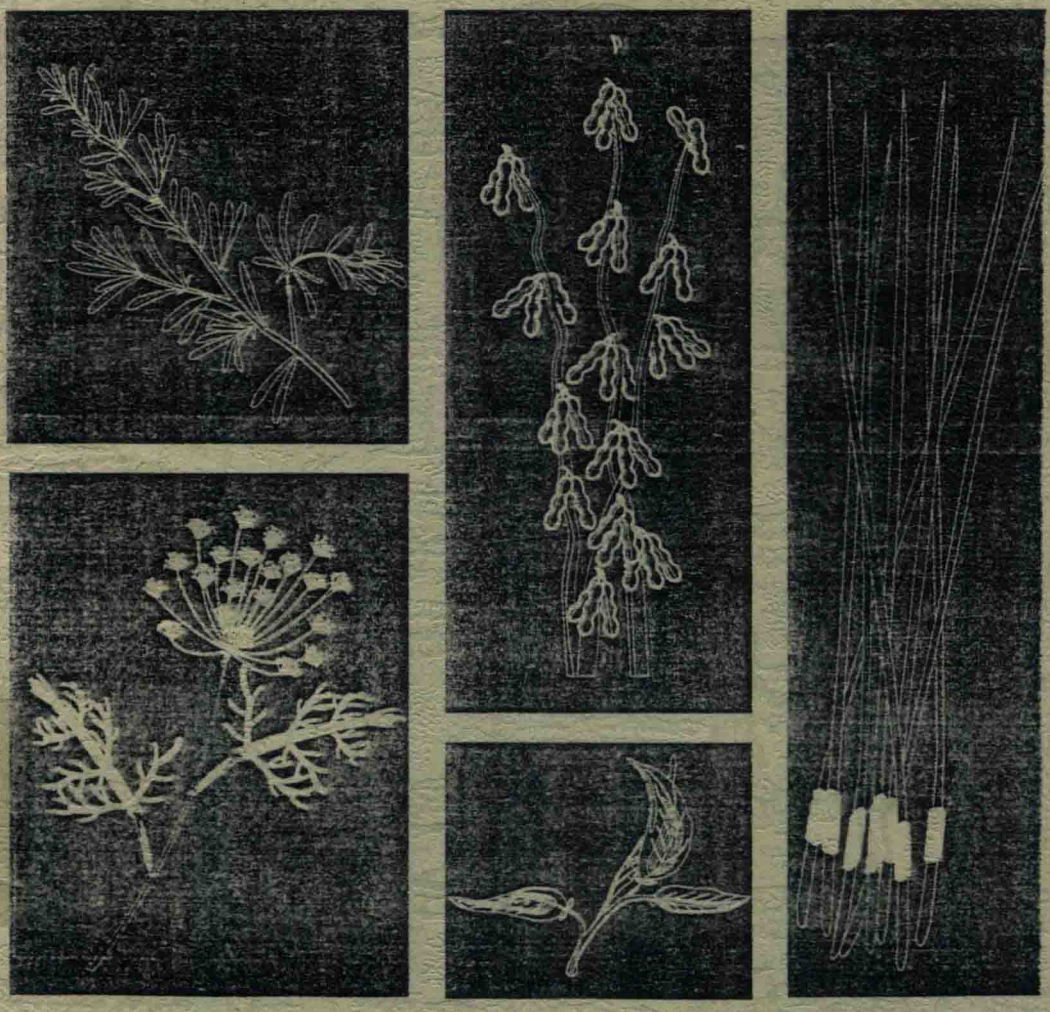
Culture, Utilization and Phytopharmacology



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Culture, Utilization and Phytopharmacology

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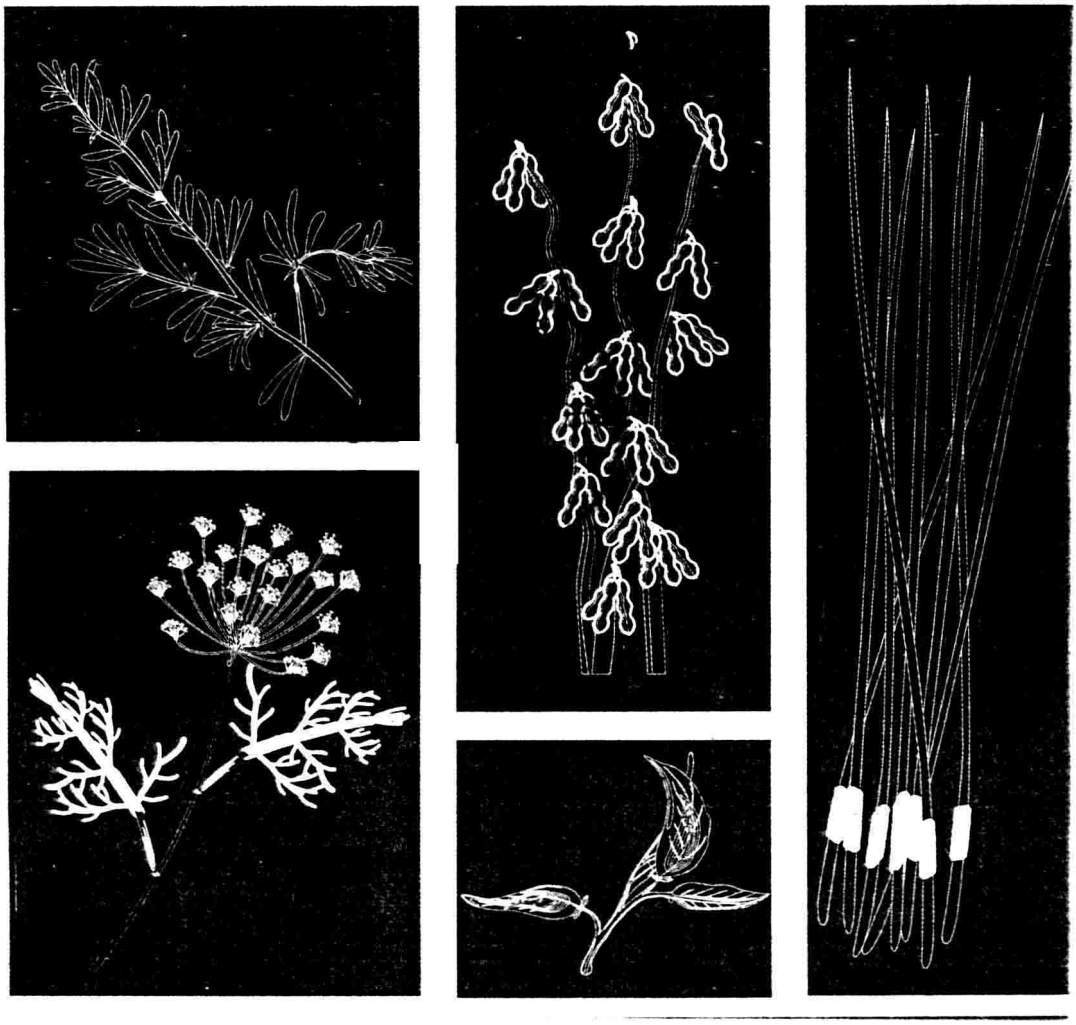

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FOREWORD

Medicinal plants are rapidly regaining the prominent position that they possessed in past centuries in Western medicine and that they have always held in most of the world. Explosive growth is occurring in the multibillion dollar business of medicinal plants, most evident in the increasing array of herbal offerings and supplements found in health food stores and supermarkets. The mass media too have become fascinated with the health-promoting and curative powers of medicinal plants and regularly feature the virtues of the latest species to catch the attention of the public. Those who grow, process, market, prescribe, or personally use medicinal plants or their components have a vital need to obtain accurate, contemporary, and correct information. Unfortunately, there are serious hazards and pitfalls associated with medicinal plants that can only be avoided when authoritative information is available.

There is certainly no shortage of information—there are hundreds of books that deal with the subject, and millions of presentations on the World Wide Web. However, most of the information provided in these sources is superficial, and an alarming amount is incorrect, misleading, and harmful. A very large proportion of important information on medicinal plants occurs in the foreign literature, unfamiliar to most people in the western world, or in the "gray literature," i.e., in obscure publications that are rarely retrievable using current bibliographic tools. Accordingly, there are relatively few books that are genuinely authoritative and comprehensive, such as the present volume by Dr. Thomas Li. This is a veritable treasure chest of information critical to all professionals who deal in one way or another with medicinal plants. Dr. Li, one of the world's most knowledgeable and well-known researchers on medicinal plants, has dedicated many years of effort to acquiring and condensing the information presented in this reference text. He is to be congratulated on this superb and invaluable synthesis.

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PREFACE

The use of medicinal plants for health reasons started thousands of years ago and is still part of medical practice in China, Egypt, India, and other developing countries. Over the centuries, the use of medicinal herbs has become an important part of daily life in the western world despite significant progress in modern medical and pharmaceutical research. Since World War II, the increasing availability of medicinal herbal products, a desire for nutraceuticals or functional foods and alternative medicines, and concerns about the possible side effects of some synthetic drugs have revived the use of medicinal herbs. Recently, there has been a tremendous surge of interest in medicinal plants or herbs, and their products have become a multibillion dollar industry in both North America and Europe.

Research on medicinal and cosmetic uses of herbs is contributing to the growth of the herbal industry. Increasing knowledge of metabolic processes and the effects of plants on human physiology have enlarged the range of application of medicinal plants. Some lesser known plants have been found to have significant medicinal value. According to the report by the World Bank in 1997 (Technical Paper No. 355), it is apparent that the significance of plant-based medicines has been increasing all over the world. Nearly 50 percent of medicines on the market are made of natural basic materials. Interestingly, the market demand for medicinal herbs is likely to remain high because many of the active ingredients in medicinal plants cannot yet be prepared synthetically.

In developed countries, the huge demand for medicinal plants or herbs largely reflects the growing interest in health enhancement, whereas in the developing world, because of the limited availability and high cost of modern medicines and medical and pharmaceutical services, medicinal plants or herbs continue to be used in medical practice based on a strong traditional belief in herbal medicine. One consequence of this high demand is the threatened existence of some of these natural resources. Some herbs are now listed as endangered species, and further harvesting is forbidden by law.

In many countries, medicinal plants or herbs are predominantly harvested from the wild

in an unregulated manner. Yield and quality of herbs collected from the wild are unpredictable; both are significantly affected by the weather, pests, and other uncontrollable variables. Farming some of the popular herbs would help reduce problems of inconsistent supply and would thus regularize the trade. Furthermore, farmed products could be certified as to source, identity, and quality. However, cultivation of medicinal plants is presently constrained by a lack of suitable technology, which leads to low yield and products of poor quality.

This book is designed to provide manufacturers, researchers, and producers with easy access to information on medicinal herbs compiled from widely scattered sources in the literature. Each chapter presents data for more than 400 species in a table format arranged in alphabetical order by the scientific name followed by the common name. The individual chapters present current information on major constituents and medicinal values; toxicity or hazards; essential oils and their fractions; value-added products and their possible uses; cultivation and harvesting; and infectious diseases and insects. In addition to an index, three appendices cross-reference major active ingredients and their sources; essential oils and their derivations; and the common and scientific names of the medicinal plants cited in the tables.

The information in this book is primarily for reference and education. It is not intended to be a substitute for the advice of a physician. The uses of medicinal plants described in this book are not recommendations, and the author is not responsible for liability arising directly or indirectly from the use of information in this book.

ACKNOWLEDGMENTS

The author thanks Peggy Watson, librarian, for her constant and tireless effort in the literature search. Appreciation is also extended to M. Walker and T. Foreman for their help. I also thank my colleagues, Drs. Tom Beveridge, Benoit Girard, Dave Oomah, and Peter Sholberg, for their valuable editing assistance.

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CHAPTER 1

Major Constituents and Medicinal Values of Medicinal Plants

Recent research on medicinal plants and herbs has generated a great deal of information about the biologically active chemical components that are responsible for the claimed medicinal effects. The level of active ingredients or chemical constituents has been used as a standard or marker for the quality of raw plant materials and value-added products.

Medicinal substances found in plants are the products of natural metabolic processes. However, each species has its own genetic structure that governs the presence of chemical components or bioactive molecules. In addition, the effects of environment and differences among varieties or cultivars within each species create variations in the quantity of compounds present. Thus, each plant species or variety produces chemical compounds differently, and some plants produce medicinally useful compounds, others do not or do so in very small quantities.

Until recently, almost all of the uses of medicinal plants for the treatment of human ailments were based on hearsay, folklore, or tradition, without scientific proofs, a practice that is potentially harmful and dangerous. The recent surge of interest in the use of medicinal plants has generated a great deal of research on major constituents and their effects on human health. The results of clinical studies have proven some of the claims. However, more research is needed to extend the search for potentially beneficial herbs from natural sources and determine their use in modern medicine.

The information provided in this chapter should not be used for the diagnosis, treatment, or prevention of diseases in humans or animals or replace the services of a physician. It is not intended to be used as a guide or a recommendation for medical treatment but, rather, as a source of information about medicinal plants, their potential, and their possibilities.

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Table 1. Major constituents and medicinal values of medicinal plants.

Scientific name	Common name	Major constituents	Medicinal values*
Abies balsamea (L.) Mill.	Balsam fir	Oleo-resin, *l*-pinene[8, 30]	Antiseptic, stimulant for congestion, and chest infections.
Achillea millefolium L.	Yarrow	Achilleine, tannins, cineole, chamazulene, sesquiterpene lactones, menthol, camphor, sterols, triterpenes[8, 30, 40, 59, 120, 135]	Reduce fever, anti-inflammatory, treat common cold, diarrhea, dysentery, hypertension, and gastrointestinal complaints. Externally in poultices, lotions, and bath preparations.
Aconitum napellus L.	Monkshood	Aconitine, malonic acid, caffeic acids, hypaconitine, mesaconitine, neoline, napelline, benzol-aconitine[40, 120, 132]	Heart and nerve sedative, anticarcinogenic, and reduce fever.
Acorus calamus L. var. Americanus Wolff. *A. tatarinowii* L.	Calamus, sweet flag Shi Chang Pu	Acoric acid, asarone, linalool, palmitic acid, methylamine, saponin, mucilage[19, 30, 40, 135]	Used as a panacea. Antibacterial, antifungal, antiseptic, digestive upsets, fevers, and antiamebic, also used as a vermifuge, and antiprotozoal agent.
Actaea alba L. *A. rubra* (Ait.) Willd.	White baneberry Red baneberry	Resins in the root, trans-aconitic acid and protoanemonoid compounds in the seeds[120]	Used as rheumatic remedy, treat headache, insomnia, melancholy, and convulsions.
Aesculus hippocastanum L.	Horse chestnut	Aescin, citric acid, resin, saponin, tannin, uric acid, quercetin, kaempherol, flavonoids, coumarin derivatives[30, 40]	For antipyretic, antithrombin, and anti-exudative effects, treat lymphatic congestions, cerebral and pulmonary edema, crural ulcer, and hemorrhoidal complaints.

Scientific name	Common name	Major constituents	Medicinal values*
Agastache foeniculum L. *A. anethrodora* L.	Aniseed	Methylchavicol, anerhole, anisaldehyde[48, 120, 134]	Relieve abdominal distention, nausea or vomiting.
Agrimonia eupatoria L.	Agrimony	Tannins, coumarins, flavonoids luteolin, polysaccharides[30, 39]	Heal wounds and encourages clot formation, treat diarrhea, used as a tonic for digestion.
Agropyron repens (L.) Beauvois	Couch grass	Polysaccharides (triticin), mucilage, agropytene[30, 120]	Diuretic properties, treat urinary infections, enlarged prostate and cystitis, lower blood cholesterol level, goat, and rheumatism.
Alchemilla vulgaris L. *A. xanthochlora* Rothm.	Lady's mantle	Tannins, flavonoids, salicylic acid[30]	Treat mild diarrhea; as a wound healer, it reduces heavy menstrual bleeding, relieves menstrual cramps, and improves regular cycle.
Allium cepa L.	Onion	Thiamin, riboflavin, beta-carotene, ascorbic acid, sterols, alliin, allicin, quercetin, caffeic acid, linoleic acid [30, 134]	Relieve intestinal gas pains, reduce hypertension, inflammation, and cholesterol.
A. sativum L.	Garlic	Alliin, Iodine, diallyl trisulfide, 2-vinyl-4H-1,3-dithin, ajoene, linoleic acid, diallyl disulfide, scordinins, selenium[8, 30, 134]	Reduce serum cholesterol, lower blood pressure, and platelet aggregation. It is anticancer (intestinal tract), antimicrobial, and antithrombotic. With antioxidant value.
A. schoenoprasum L.	Chives	Alliin, sulphoxide, linoleic acid, sulphoevernan[61, 157]	Used as heart and blood circulation remedies.

Scientific name	Common name	Major constituents	Medicinal values*
Alnus crispus (Ait.) Pursh *A. incana* (L.) Moench. subsp. *tenufolia* *A. glutinosa* (L.) Gaertn.	Alder	Tannins, oils, resins, phlobaphenes, flavone glycoside, alnulin, taraxerol, protoalnulin, beta-sitosterol[40, 120]	As an astringent, with hemostatic function, reduce inflammation, and internal hemorrhage.
Aloe vera (L.) Burm. *A. barbadensis* L.	Aloe	Aloin, isobarbaloin, aloeresin A, B, aloesin glycone, aloesone, emodin, chrysophanic acid, 1,8-dihydroxy-anthracene derivatives, barbaloin, anthraquinone glycosides[27, 30, 40, 107]	Purgative, eupeptic, and cholagogue effect. With properties of laxative and cathartic. Juice from leaves used for cuts and possibly other skin problems.
Althaea officinalis L.	Marshmallow	Mucilage, asparagine, pectin, flavonoids, starch[30, 36]	Used as emollient, demulcent, antitussive, and expectorant. Treat bronchitis, asthma, and stomach disorder.
Amelanchier alnifolia Nutt.	Saskatoon	Anthocyanin, quinate, galacturonate, citrate, pyruvate, cis-aconitate, fumaric acid, oxalic acid[120, 122]	Treat diarrhea, watery stools, and prevent miscarriage.
Ananas comosus (L.) Merr.	Pineapple	Bromelain, vitamin A, C, citric acid, vanillin, methyl-n-propyl ketone, valerianic acid, isocaproic acid, acrylic acid, malic acid[40]	Unripe fruit improves digestion, increases appetite, and relieves dyspepsia. Used as uterine tonic. Ripe fruit reduces excessive gastric acid, juice as digestive tonic and diuretic.
Anaphalis margaritacea (L.) Bench and Hook	Everlastings	Monoterpenes, flavonoids, aglycones[120]	Used as pain reliever, treat lung congestion, sore throats and mumps, fevers, diarrhea, and irritable bowels.

Scientific name	Common name	Major constituents	Medicinal values*
Anethum graveolens L.	Dill	Carvone, limonene, flavonoids, coumarins, xanthones, triterpenes[30a, 40a, 134]	Used as infant colic, cough, cold and flu remedies. Relieve digestive disorders.
Angelica archangelica L.	Angelica	Angelicide, brefeldin A, ligustilide, n-butyldenephthalide, phyllandrene, tinnins, valeric acid, ferulic acid, limonene, coumarin, lactones[8, 30, 40, 134, 173]	Stimulate blood circulation, regulate menstruation, stimulate appetite, alleviating coughs and pain. It is carminative.
A. sinensis (Oliv.) Diels	Dong quai	Coumarins, vitamin B_{12}, beta-sitosterol[30]	Used as a tonic. It is antispasmodic, sedative, and promotes menstrual flow.
Antennaria magellanica Schultz	Everlastings	See *Anaphalis margaritacea*	
Anthemis nobilis L.	Chamomile	See *Chamaemelum nobile*	
Apium graveolens L.	Celery	Limonene, coumarins, apiin, oleic, linoleic, palmitic, palilolеic, petroselinic, petroselaidic, stearic myristic and myristoleic acids, bergapten[30, 33, 120]	It is carminative and antirheumatic.
Aralia racemosa L. *A. nudicaulis* L.	Spikenard	Volatile oil, tannins, diterpene acids, glucoside, arctiin[30, 120]	Treat rheumatism, asthma, and coughs. Externally for skin conditions, including eczema.

Scientific name	Common name	Major constituents	Medicinal values*
Arctium lappa L.	Burdock	Inulin, mueilage, tannins, resin, arctiin, arctic acid, arctiol, dehydrofukinone[30, 40]	For rheumatism, gout, and lung disease. It is laxative, diuretic, and perspiration inducer.
Arctostaphylos uva-ursi (L.) Spreng.	Bearberry, Uva-ursi	Arbutin, methylarbutin, tannins, monotropein, polyphenolic acid, (caffeic, chlorogenic) aspirin[40, 98, 135, 160]	Treat kidney stone, bladder, and urinary infections. It is antibacteria and diuretic.
Armoracia rusticana Gaertn, Mey and Scherb.	Horseradish	Asparagine, sinigrin, resin, vitamin C[30]	Internally for arthritis, gout, sciatica, and respiratory and urinary infections. Externally as a poultice for infected wounds, pleurisy, and arthritis.
Arnica latifolia Bong. *A. montana* L. *A. chamissonis* L. subsp. *foliosa* *A. condifolia* Hook *A. fulgens* Pursh *A. sororia* Greene	Arnica	Helenalin, sesquiterpene lactones, 11-α,13-dihydrohelenalin, arnidiol, carotenoides, arnicin, amidendiol, tannins, egin, anthoxanthine, inulin, phytosterol[27, 40, 77, 87, 135, 161]	Antineoplastic, antibacterial, antifungal, anti-inflammatory, antiseptic, reduce pain and swelling. Used as tonic, spasmodic agent, counterirritant. Applied locally to produce superficial inflammation to reduce pain.
Artemisia absinthium L.	Wormwood	Absinthol, tannins, thujyl alcohol, flavonoids, phenolic acid, lignans[30, 120]	Anthelmintic. External antiseptic.
A. annua L.	Qing Hao	Abrotamine, artemisinin, vitamin A[30]	Treat fever, headaches, dizziness, and tight-chested sensation.

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