

Encyclopedia of Medicinal Plants



Edited by Z.Z. Zhao & P.G. Xiao



Encyclopedia of **Medicinal Plants**

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3

World Publishing Corporation

图书在版编目(CIP)数据

当代药用植物典 = Encyclopedia of Medicinal Plants. 3:
英文 / 赵中振, 肖培根主编. —上海: 上海世界图书出版
公司, 2010.3

ISBN 978-7-5100-1759-9

I. ①当… II. ①赵…②肖… III. ①药用植物—词典—英文
IV. ①S567-61

中国版本图书馆CIP数据核字(2010)第025085号

Encyclopedia of Medicinal Plants 3

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Publisher: Shanghai World Publishing Corporation
9F-10F, 88 Guangzhong Road, Shanghai, PRC 200083
Website: www.wpcsh.com.cn / www.wpcsh.com

Printer: C & C Offset Printing Co., Ltd.

ISBN 978-7-5100-1759-9/S · 9

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Preface

Traditional Chinese medicine (TCM) has several thousand years of history with documented literature and clinical experience. With the increasing acceptability of TCM worldwide, practitioners of modern medicine, researchers and product developers are increasingly taking cues from TCM or experience gained from integrative Chinese and Western medicine. Better understanding of medicinal plants and their properties will help promote further development and application of TCM in the international community.

Hong Kong Jockey Club Institute of Chinese Medicine (HKJCICM) pursues a public mission to spearhead the advancement of the Chinese medicine industry through quality, science, evidence and applications (www.hkjcicm.org). The initiative of compiling an "Encyclopedia of Medicinal Plants" represents a commitment of HKJCICM to provide high quality and sector-relevant information to the research community and the industry at large.

Main features of this encyclopedia:

1. **Comprehensive:** The four-volume set embraces a vast collection of medicinal plants of regional interests: the Eastern Chapter (Volume 1 & Volume 2), the Western Chapter (Volume 3) and the Lingnan Chapter (Volume 4).
2. **Up-to-date:** The set includes information from traditional medicine and scientific literature on phytochemistry, pharmacology and clinical medicine collected through in-depth study of plants from the local community, mainland China and overseas. It will also be developed into a continuously updated electronic database or equivalent in the future.
3. **Vivid illustration:** Most of the photos capture Chinese medicine cultivation bases and natural growing zones, with some of them located in remote areas. This encyclopedia scientifically records authentication characteristics of medicinal plants and vividly demonstrates their natural growing environment. Specimens listed in the encyclopedia have been properly preserved and stored in the Chinese Medicine Centre of The Hong Kong Baptist University.
4. **Novel perspective:** This encyclopedia is more than a simple compilation of literature. Commentaries are listed at the end of each chapter, recording the perspectives of the authors on medicinal plant development and sustainable uses. Notes on safety issues of selected plants are also provided when such information is available.
5. **Bilingual:** To facilitate international exchange, the four-volume set of this encyclopedia is published in both Chinese (traditional and simplified Chinese versions) and English.

The Editorial and Coordinating Committee hereby expresses its appreciation and gratitude to the HKJCICM Board of Directors and Management for their guidance and support. We hope that this encyclopedia will be a useful reference for educators, researchers, practitioners of medicine, industrialists, traders and those with interest in traditional Chinese medicine and medicinal plants.

We welcome your invaluable advice and feedback.

Editorial and Coordinating Committee
Hong Kong Jockey Club Institute of Chinese Medicine

Editors in Chief



Prof. Zhao Zhongzhen is currently the course director of Bachelor of Pharmacy in the School of Chinese Medicine, Hong Kong Baptist University. He is a member of the Chinese Medicine Council of Hong Kong and the scientific committee of Hong Kong Chinese Materia Medica Standards, an advisor of the traditional medicine in the Western Pacific Region of the World Health Organization and the committee of the American Herbal Pharmacopeia. He has long been engaged in the research fields of medicinal plant resources, and identification and quality evaluation of Chinese medicinals.

1982 Bachelor of Chinese Medicine, Beijing University of Traditional Chinese Medicine

1985 Master of Chinese Pharmacy, China Academy of Traditional Chinese Medicine

1992 Doctor of Pharmacy, Tokyo University of Pharmacy and Life Sciences

Prof. Zhao is the editor-in-chief of *A Colored Atlas of Microscopic Identification of Chinese Materia Medica in Powdered Form as Specified in Pharmacopoeia of the People's Republic of China*, *Illustrated Chinese Medicinal Formulae* (English and Chinese versions), *An Illustrated Chinese Materia Medica in Hong Kong* (English and Chinese versions), *An Illustrated Microscopic Identification of Chinese Materia Medica* (Bilingual), and *Easily Confused Chinese Medicines in Hong Kong* (English and Chinese versions).



Prof. Xiao Peigen, the research fellow and the honorary director of the Institute of Medicinal Plant Development, is currently the head of the key laboratory on resource utilization and conservation of Chinese Materia Medica, the State Administration of Traditional Chinese Medicine. He is also the honorary dean and visiting professor of the School of Chinese Pharmacy, Beijing University of Chinese Medicine, and a visiting professor of Hong Kong Baptist University. He has long been engaged in the research of medicinal plants and Chinese medicinals, and has pioneered the establishment of "Phytomedicophylogeny".

1953 Bachelor of Science, Xiamen University

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2002 Honorary Doctor of Science, Hong Kong Baptist University

Prof. Xiao is the editor-in-chief of *China Journal of Chinese Materia Medica*, *A Pictorial Encyclopedia of Chinese Medicinal Herbs*, and *Modern Chinese Materia Medica*, as well as a member of the editorial boards of *Journal of Ethnopharmacology*, *Phytomedicine*, and *Phytotherapy Research*.

About HKJCICM

Hong Kong Jockey Club Institute of Chinese Medicine was set up by the HKSAR Government in 2001, with a pledged donation of HK\$500 million from Hong Kong Jockey Club Charities Trust to support the research and development (R&D) of Chinese medicine (CM).

Being the strategic local focal point and the CM R&D Centre under the aegis of the innovation and technology development strategy, HKJCICM undertakes a public mission to spearhead the advancement of Chinese medicine and the industry through quality, science, evidence and application. The scope of work covers standardization & quality control, CM and natural product applied research, information & exchange, and value management for technology transfer and commercialization.

Please visit the website for more information: www.hkjcicm.org

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Special thanks to Erich Stoeger, Christine Leon, Steven Foster (@2006 Steven Foster) and Roy Upton (American Herbal Pharmacopeia).

General Notices

1. Published in traditional Chinese, simplified Chinese, and English, 500 commonly used botanicals all over the world, involving over 800 species of medicinal plants, are documented in this book. The entire book is consisted of the Eastern Chapter (Volume 1-2, commonly used medicinal plants of traditional Oriental medical systems, such as those from China, Japan, the Korean Peninsula, and India), the Western Chapter (Volume 3, commonly used American and European medicinal plants, such as those from Europe, Russia, and the United States) and the Lingnan Chapter (Volume 4, medicinal plants commonly used and produced in the Lingnan area, including those commercially circulated via this area).

2. The official botanical names are arranged as entries in this book. The contents are described in the sequence of names, overview, photos of original plants, photos of medicinal materials, chemical composition and chemical structures, pharmacological activities, applications, comments, and references.

3. Names

(1) Scientific names of botanical species are adopted as formal names and are arranged according to alphabetical order in this book. On the right upper side of each entry, abbreviations are used to indicate if the title species is listed in pharmacopeias of different countries: CP (*Chinese Pharmacopeia*), JP (*Japanese Pharmacopeia*), KHP (*Korean Herbal Pharmacopeia*), VP (*Vietnamese Pharmacopeia*), IP (*Indian Pharmacopeia*), USP (*U. S. Pharmacopeia*), EP (*European Pharmacopeia*), BP (*British Pharmacopeia*).

(2) In addition to the formal Chinese name, pinyin and English names of the medicinal plant, Chinese and Latin names of the medicinal material are included in this book.

(3) Scientific and Chinese names are preferentially selected from the *Chinese Pharmacopeia*, or otherwise from *Modern Chinese Materia Medica* and *Materia Medica of China*. Names of folk medicinal plants are selected from *China Ethnomedicinal Materials*. Scientific names of Western medicinal plants are selected from pharmacopeias of related countries, while their Chinese names are based on *Euro-American Botanical Medicines* and other literature.

(4) Chinese and Latin names of the medicinal materials are based on the *Chinese Pharmacopeia*; or based on *Materia Medica of China* if they are not listed in the *Chinese Pharmacopeia*.

4. Overview

(1) Profile of plant classification is described in the sequence of scientific name, pinyin name, common name and family name. Medicinal parts and corresponding medicinal names are recorded.

(2) Information on the global distribution of the related genus and the title species is provided.

(3) The ancient text in which the medicinal plant first appeared and the historical changes and developments are briefly documented. The official position of the medicinal plant in the main production country and the production areas of the medicinal material are described.

(4) Phytochemical research achievements of the medicinal plant are briefly documented by the introduction of the active constituents and marker compounds. Methods adopted by related pharmacopeia for the quality control of the medicinal material are described.

(5) Pharmacological activities of the medicinal plant are briefly described.

(6) Main functions of the medicinal plant are introduced.

5. Photos of original plants and medicinal materials

Photos of original plants (sometimes including related species), medicinal materials (sometimes including prescription medicinal materials), and some of the plantation sites are provided in this book.

6. Chemical composition

Major constituents, effective constituents (or nutritious constituents of both edible and medicinal species specified by China Ministry of Health) and characteristic constituents that have been published in academic journals and monographs are documented in this book, especially marker compounds that can be used for the quality evaluation of the medicinal material. Proteins, amino acids, polysaccharides, and trace elements are generally not included. Related references are indicated in brackets.

7. Chemical structures are drawn with ISIS Draw software.

(1) A colon is used behind each category of constituents; a comma is used behind each individual component; a semicolon is used when one category is finished; and a period is used when constituents of the entire organs are finished.

(2) Constituents of different medicinal parts from the same plant are documented respectively.

8. Pharmacological activities

(1) Representative pharmacological activities of medicinal materials, different extracts, or effective constituents are documented. The medicinal parts, solvents used for the extraction, experimental animals, routes of administration, and pharmacological effects and their mechanisms are described. Related references are indicated in brackets.

(2) Abbreviations of technical terms are used when they appear in the context for the second time.

9. Applications

Main indications of the medicinal plant are briefly documented.

10. Comments

(1) From a historical and future point of view, research characteristics and flaws of the title species are reviewed, and perspectives and directions of future developments and utilizations are suggested.

(2) Those specified by China Ministry of Health as both edible and medicinal species, or those on the list of common poisonous Chinese medicines in Hong Kong, are pointed out.

(3) The distribution of the plantation sites of the title species is described.

(4) Issues of safety and precaution of some medicinal plants are described according to public reports on their adverse reactions

11. References

(1) Some scattered and lost literature published before the 1990s are quoted from other publications.

(2) Obvious errors of technical terms and authors' names in the original literature are corrected.

(3) References are arranged in accord with the international convention.

12. Metrology

Universally adopted measurement units and symbols are used in this book. Arabic numbers are adopted, and 2 effective numbers are kept when contents of chemical constituents are provided.

13. Indexes

Indexes of scientific, common, and pinyin names, as well as index of chemical components, are provided.

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Encyclopedia of Medicinal Plants

Volume 3



Yarrow

Shi, 薺

Overview

Achillea millefolium L., also known as yarrow or shi, is a plant of the Asteraceae family; the dried aerial part and capitulum are used as medicine. Its medicinal name is yarrow (*yangshicao* in Chinese).

There are about 200 species of plants in the *Achillea* genus in the world, widely distributed in the northern temperate areas. About 10 species can be found in China, and about 3 species in this genus are used as herbal medicinals. This species has its origin in Europe and western Asia, and is now widely cultivated in the northern temperate areas of North America and Asia.

The applications of yarrow were first recorded in the age of Homer during the 11th to the 9th century BC. Yarrow was widely used in England during World War II^[1]. This species is stated in the *European Pharmacopoeia* (5th Edition) and the *British Pharmacopoeia* (2002) as the official botanical origin of yarrow (*Herba et Flos Millefolii*). The medicinal material is mainly produced in European countries such as the UK, especially in eastern and southeastern Europe.

Achillea millefolium contains volatile oils, terpenoids, flavonoids and coumarins, of which the volatile oils and chamazulene are the marker components. The *European Pharmacopoeia* and the *British Pharmacopoeia* specify that the content of volatile oils shall be not less than 2.0mL/kg, and the content of proazulene, calculated as chamazulene, shall be not less than 0.020%, in order to control the quality of the medicinal material.

Pharmacological studies indicate that *Achillea millefolium* has hemostatic, anti-inflammatory, anti-oxidant, and anti-tumor effects.

According to folk medicine, yarrow has hemostatic, anti-pyretic, diaphoretic, astringent, and diuretic activities; in traditional Chinese medicine, *yangshicao* dispels wind, promotes blood circulation, relieves pain, clears heat, and resolves toxicity.

Achillea millefolium L.

Herba et Flos Millefolii

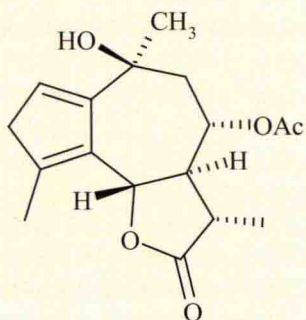


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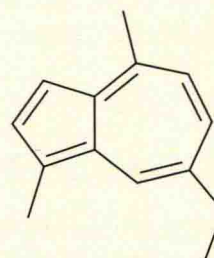
A. alpina L.

Chemical composition

The aerial part and capitulum contain essential oils (mainly consisting of sesquiterpenes): chamazulene, β -pinene, (E)-nerolidol, caryophyllene oxide, spathulenol ^[2], α -bisabolol, α -copaene ^[3]; terpenoids: achillicin ^[4], achillin, 8 α -angeloxy-



achillicin



chamazulene

Achillea millefolium L.

achillin, leucodin, 8 α -angeloxy-leucodin, desacetylmaticarin^[5], desacetoxymatricarin, matricin, tigloyl-artabsin, angeloyl-artabsin, santamarin^[6], millefin^[7], artecamin, estafiatin, balchanolide^[8], isoapressin, 10-isovaleroyldesacetyloapressin, 10-angeloyldesacetyloapressin, 8-tigloyldesacetylezomontanin, α -peroxyachifolid, β -peroxyisoachifolid^[9], isoachifolidiene^[10], achimillic acids A, B, C^[11]; flavonoids: apigenin, luteolin, schaftoside, isoschaftoside^[12], cosmoisin^[13], artemetin, casticin^[14], coumarins: umbelliferone, scopoletin, aesculetin^[15]; triterpenoids: taraxasterol^[16]; alkaloids: achilleine (betonicine)^[17].



Pharmacological activities

1. Anti-hemorrhagic effects

Achilleine stopped bleeding. The essential oils prevented festering of wounds, accelerated wound healing and decreased pain^[18]. The herbal sesquiterpene lactones also had a hemostatic effect^[8].

2. Anti-inflammation

The herbal sesquiterpene lactones inhibited auricular swelling induced by croton oil in mice. Santamarin inhibited the transcription factor NF- κ B^[6].

3. Anti-microbe

The essential oils possessed anti-microbial activity against *Streptococcus pneumoniae*, *Clostridium perfringens*, *Candida albicans*, *Mycobacterium smegmatis*, *Acinetobacter lwoffii* and *Candida krusei*^[19].

4. Anti-oxidation

In vitro, the essential oils scavenged the diphenylpicrylhydrazyl radical, and inhibited the nonenzymatic lipid peroxidation of rat liver homogenate^[19]. Chamazulene was one of the anti-oxidant constituents^[20]. In rats with hepatic fibrosis, oral administration of the ethanol-precipitated water extract of the aerial part enhanced liver superoxide dismutase activity, and decreased the serum malondialdehyde content. The extract protected hepatocytes via reducing the damage caused by oxygen radicals^[21].

5. Effect on the reproductive system

Oral administration of yarrow reduced fetal weight and increased placental weight in pregnant rats^[22]. Continuous oral administration of the aqueous extract of the leaf increased the percentage of abnormal sperm in adult male rats^[23]. Ethanolic extract (via intraperitoneal administration) or hydroalcoholic extract (via oral administration) of the flower caused alterations of exfoliation of immature germ cells, germ cell necrosis, and seminiferous tubule vacuolization in male mice^[24].

6. Immunomodulation

In vitro, the essential oils and azulene stimulated mouse peritoneal macrophages to produce H₂O₂ and tumor necrosis factor- α ^[25].

7. Others

Yarrow also had anxiolytic^[26], hypoglycemic^[27], and anti-tumor effects^[11].



Applications

1. Traumatic hemorrhage, nosebleed, internal hemorrhage; 2. Hepatic dysfunction; 3. Hyperlipidemia, hypertension; 4. Poor appetite, dyspepsia, constipation; 5. Amenorrhea.



Comments

Achillea apina L. is also medicinally used. The cultivated species can be found in China.

Yarrow has been commonly used as a hemostatic: the fresh herb can be mashed and applied onto wounds for immediate hemostasis; the dry powder of the leaf can be blown into the nostril to stop epistaxis immediately; medicated liquor made from yarrow can be used to treat menorrhagia. In the UK, yarrow is used as a folk medicine to treat burns, snake and insect bites; and the Native Americans use yarrow to treat liver and kidney disorders.