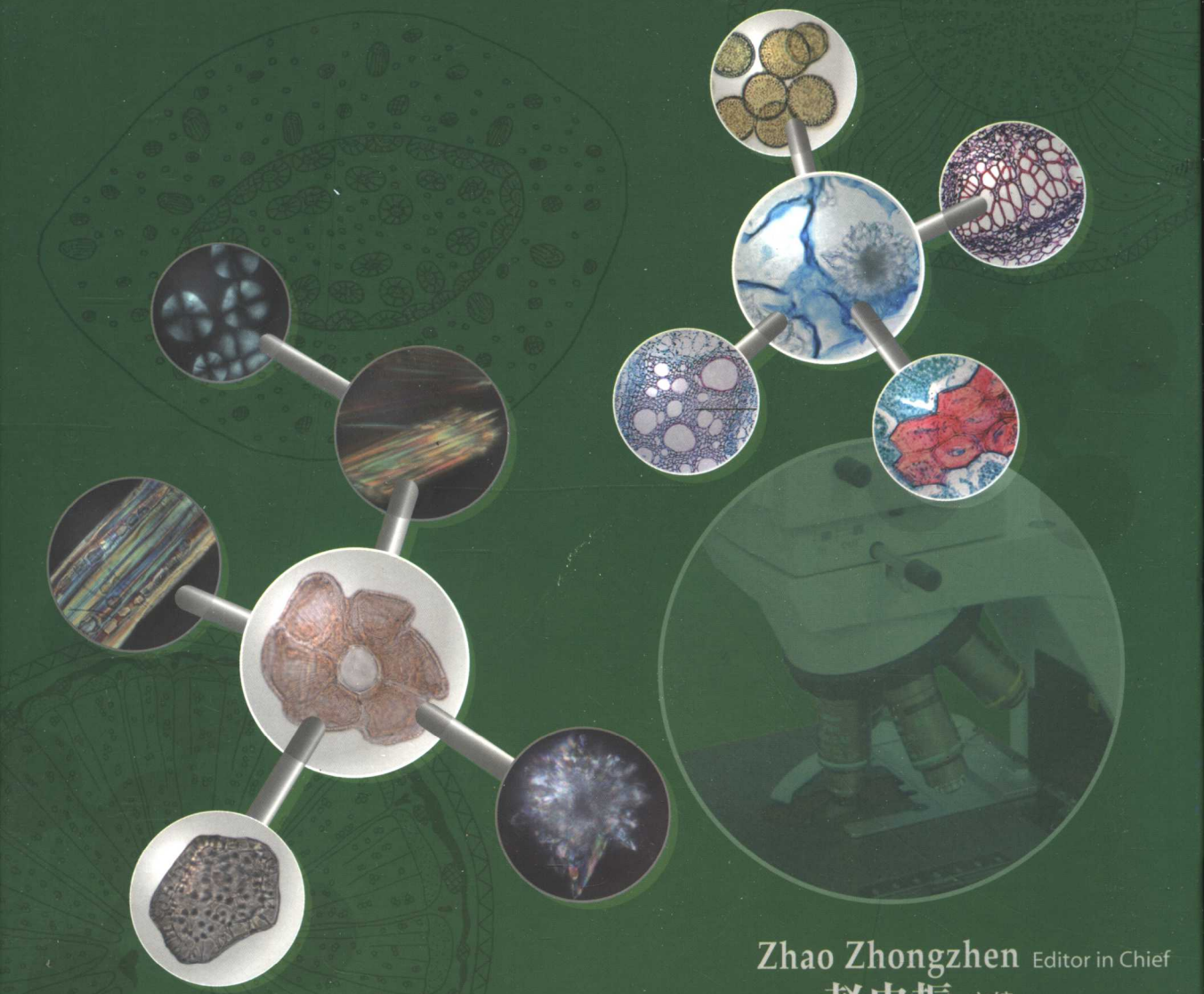
An Illustrated Microscopic Identification of Chinese Materia Medica

中药显微鉴别图鉴



Zhao Zhongzhen Editor in Chief
赵中振 主编

辽宁科学技术出版社
LIAONING SCIENCE AND TECHNOLOGY PUBLISHING HOUSE

国际中医药学会（澳门）专著
International Society for Chinese Medicine (ISCM) Monograph

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Editor-in-Chief

Prof. Zhao Zhongzhen is currently the course director of the Bachelor of Pharmacy (Hons) in Chinese Medicine, School of Chinese Medicine, Hong Kong Baptist University. He is also a member of the Chinese Medicines Board of the Chinese Medicine Council of Hong Kong and a member of the HKSAR Department of Health Scientific Committee on Hong Kong Chinese Materia Medica Standards. Dr. Zhao has long been engaged in the study of Chinese medicines resources, species and quality.

- 1982: graduated from the Beijing University of Traditional Chinese Medicine and Pharmacology with a bachelor's degree in Chinese medicine
- 1985: obtained a Master's degree in Chinese medicines from the China Academy of Traditional Chinese Medicine
- 1992: obtained his Ph.D degree in Pharmacy from the Tokyo University of Pharmacy and Life Science in Japan
- 1989: commissioned by the World Health Organization as Main Editor of *Medicinal Plants in China*
- 1999: commissioned by The State Pharmacopoeia Commission of the People's Republic of China as Chief Editor 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*.
- 2003: commissioned by Eu Yan Sang (Hong Kong) Limited as Chief Editor of *An Illustrated Chinese Materia Medica in Hong Kong. (Chinese and English versions)*
- 2004: commissioned by Hong Kong Chinese Medicine Merchants Association as Chief Editor of *Hong Kong Commonly Confused Chinese Medicines*.

主编简介

赵中振教授,现任香港浸会大学中医药学院中药课程主任,兼任香港中医药管理委员会中药组委员,香港卫生署中药标准科学委员会委员,长期从事中药资源、品种与质量研究。

— 1982年在北京中医药大学获中医学学士学位。

— 1985年在中国中医研究院获中药学硕士学位。

— 1992年在日本东京药科大学获药学博士学位。

— 1989年受世界卫生组织委托主要负责编著《Medicinal Plants in China》。

— 1999年受中国药典委员会委托主编《中国药典中药显微鉴别图集》。

— 2003年受余仁生(香港)有限公司委托主编《香港中药材图鉴》(中、英文版)。

— 2005年受香港中药联商会委托主编《香港容易混淆中药》。

Editorial Committee

Special Thanks to Hong Kong Research Grant Council for subsiding some of the experiments of this book and, the valuable advice from Prof. Xu Luoshan

编辑委员会

鸣谢: 本书部分实验工作得到香港研究资助局资助,
徐珞珊教授提供宝贵意见。

Foreword 1

Authentication of Chinese Materia Medica (CMM) is the premise of the standardization and internationalization of Chinese medicine, and microscopic identification is the most essential part in the process of authentication.

It was heartening to learn that Prof. Zhao Zhongzhen of the School of Chinese Medicine of Hong Kong Baptist University intended to compile a publication on the identification of CMM and their various dosage forms, with special focus on microscopic manifestations. Prof. Zhao's plan happened to coincide with that of the International Society for Chinese Medicine (ISCM), an organization based in Macau, which was about to launch a series of high level academic monographs on Chinese medicine with a view to enhancing exchange among local and overseas scholars and researchers. The two parties 'clicked' instantly and joined hands to endeavor on the bold and forward-looking project of the compilation of "An Illustrated Microscopic Identification of Chinese Materia Medica", a publication of profound significance as well as practical value.

While ISCM provides financial support to the project, Prof. Zhao, being the Chief Editor, leads the editorial team composed of experts and experienced researchers, to conduct thorough microscopic identification for over 100 types of CMM. Applying modern technique of digital microphotography, the tissue sketch drawings, enlarged tissue and colored powder microscopic photographs for each species are clearly shown in the book, with comprehensive illustrations on the microscopic features as well as detailed bilingual elaborations.

The book fills up the gaps in the existing microscopic identification works on one hand, and helps to promote the standardization and internationalization of Chinese medicine on the other. It is also beneficial to the public by way of helping to enhance the quality and foster the proper use of CMM. People engaging in different aspects of Chinese medicine, such as quality control, production, trading, teaching, research and development, and enthusiasts of Chinese medicine alike will certainly find the book informative, helpful, interesting and worth owning.

I am pleased to see that the modernization and internationalization of Chinese medicine have made a further stride with the introduction of "An Illustrated Microscopic Identification of Chinese Materia Medica". Using scientific language and modernized techniques, Chinese medicine experts are all working hard together to preserve and demonstrate this traditional wisdom worldwide. We look forward to seeing the emergence of this traditional wisdom in the international arena and anticipate to heralding the strengths of Chinese medicine being brought into full play when it is thoroughly integrated with modern science.

Dr Daniel C.W. Tse
Chairman, The Chinese Medicine Council of Hong Kong
Chairman, The International Society for Chinese Medicine

序言一

中药鉴定是中药标准化及国际化的前提,而中药显微鉴别则是中药鉴定重要的一环。

欣悉香港浸会大学中医药学院的赵中振教授有意编著一本从微观角度鉴别各类常用中药及其制剂的专著;适逢其会,设于澳门的国际中医药学会亦正准备出版一系列高水平的学术专辑,以供区内及海外的中医药专家学者参阅交流。于是,双方一拍即合,愿意共同为这本学术意义深远而实用价值浓厚的《中药显微鉴别图鉴》贡献一份力量。中医药学会作为组织者斥资出版图鉴,而赵中振教授作为主编统筹多位专家及科研人员,为超过100种常用的中药进行精密细致的显微鉴别工作。专家们采用先进的数码显微成像技术,将每个中药品种的组织墨线图、组织显微彩图、局部特征放大图和粉末显微彩图一一展示,全面精准而有系统地选取了中药材的微观特征,并以中英双语作详尽的图注说明。

《中药显微鉴别图鉴》不仅弥补了现有中药显微鉴定工作的不足,同时对中药显微鉴定技术的标准化以及对推动中药国际化起着重大作用。《中药显微鉴别图鉴》除具备重要学术价值外,对提高中药质量、保障市民用药安全以及开拓中药国际市场均具意义;亦是海内外从事中药检验、生产、贸易、教研的专业人士,动植物研究者和中药学爱好者珍贵而实用的参考工具书。

我很高兴透过《中药显微鉴别图鉴》,看见中医药在现代化和国际化的道路上又向前迈进了一步。从事中医药的研究工作的学者正运用最新科学技术和现代的语言向世界展示中医药这一有几千年传统的智慧结晶,我们期待中医药与现代科学顺利接轨,让世人能清楚看见和明白其博大精深之处,让中医药继续发挥其保健治病的功效,为人类健康做出贡献。

谢志伟博士
香港中医药管理委员会主席
国际中医药学会主席

Foreword 2

Traditional Chinese Medicine (TCM) is undergoing rapid globalisation; its current world market, estimated at US$ 722 million, is testament to this recent phenomemon. It was in the mid-1980s that TCM first caught the attention of the West in a significant way following successful TCM treatments in many Western countries for skin conditions, notably eczema and psoriasis. Western medicine has yet to find effective long-term solutions for these chronic conditions and it was in the wake of these clinical successes that numerous TCM clinics soon became established in many countries, notably UK, Germany, France, Netherlands, Spain, USA, Canada and Australia. Today, TCM clinics have a highly visible presence on the average British high street and numbers nationwide are thought to exceed 3,000.

The rapid growth in TCM worldwide has spawned many new TCM trading companies too, sourcing mainly from Hong Kong and the Chinese Mainland. While dried herbs ready for decoction (Yin Pian) continue to provide the bulk of herbs imported, increasingly granules and powdered extracts are proving increasingly popular. The speed at which these supply chains have become established to meet this rapidly expanding market has in the main, however, not been accompanied by rigorous herbal quality assurance systems. Traceability of herbs and their associated products are almost impossible to determine and, in the absence of reliable quality certification systems, the Western TCM market has suffered from exposure to Chinese herbs of highly variable identity and/or quality. This, coupled with lack of TCM practitioner regulation, has resulted in a spate of adverse reactions in the West, some serious. Essentially, the Western public has been put at risk by TCM outlets prescribing or selling TCM medicines of doubtful or potentially harmful quality.

Major efforts are now underway to fill these quality assurance gaps. Controls include new legislation such as the EU Traditional Herbal Medicinal Products Directive, approved suppliers schemes, mandatory training of herbal dispensers, provision of authentication resources, as well as the inclusion of TCM herbal monographs in national and regional Western pharmacopoeias. However, these all take time to become fully operational and what is hampering work in many areas is the lack of pharmacognosy skills. The loss of pharmacognosy as a mainstream discipline from many Western universities over the last 20 years has become a major constraint in the development of herbal quality assurance systems in the West. Prof. Zhao Zhongzhen's 'Illustrated Microscopic Identification of Chinese Materia Medica' represents a very significant contribution towards filling this acute knowledge gap.

With text in both Chinese and English, it provides detailed anatomical descriptions of some 126 of the most widely used TCM plant species. The presentation of each monograph is superbly designed. Each monograph is divided roughly into 4 parts: sketches of the crude drugs, photographs of sections of crude drugs, a description of characteristic plant tissues, and photographs of the cellular structure of the powdered drug. As one of the leading experts in the field of TCM microscopy, Prof. Zhao Zhongzhen's book makes available a wealth of knowledge that will undoubtedly prove invaluable to all those in the West concerned with the use of correct and unadulterated TCM herbs. Reliable anatomical texts in English for TCM herbs are in short supply. This volume provides a significant contribution to filling this gap and as such stands to benefit a wide audience: TCM suppliers, regulators, training colleges, natural product laboratories and other TCM researchers in the West. To Dr Zhao Zhongzhen and his colleagues, I would like to extend my heartfelt congratulations.

Christine Leon
Head, Chinese Medicinal Plants Authentication Centre
Royal Botanic Gardens, Kew
Richmond, Surrey, TW9 3AB

序言二

中医药正经历急促的全球化过程,传统中药于全球市场的总值约7亿2000万美元,中医药国际化现象方兴未艾。早在20世纪80年代中期,中医药在治疗湿疹和牛皮癣等皮肤病症上的卓越疗效,就引起西方国家注意。迄今,对于这些慢性疾病的治疗,西药仍束手无策。许多西方国家相继建立了大量的中医药诊所,尤其是英国、德国、法国、荷兰、西班牙、美国、加拿大和澳大利亚。如今,中医药诊所在英国已遍布街头巷尾,全英国的中医诊所数目估计超过3千家。

随着中医药在世界的兴起,应运而生了许多相关的贸易公司,他们的货源主要来自中国香港和中国大陆。虽然干燥药材饮片仍为输入的主体,但颗粒与粉末提取物已愈来愈得到大众的垂青。市场需求的迅速扩增带动货源供给网络的形成,但与之配套的严格中草药质量检测系统却没有迅速建立,对中草药及其相关产品仅靠简单的描述是不足以用于鉴定的。在中药制成品来源难以断定的情况下,西方中药市场承受了中药品种严重混淆与品质良莠不齐带来的苦果,中医药在西方的应用中出现了一些不良甚至负面反应,销售质量存疑甚或有害的中药销售商,使西方公众人士的生命受到威胁。

为了填补质量验证系统中的不足,有关方面正致力作出改善,其中中医规管包括立法程序,如《欧盟传统中药制品指南》、核准供货商计划、中药配药员的强制训练、提供正确的货源以及将传统中药专论加入全国和区内的西方药典中。这些规则的全面实施尚需要一定的时间,生药技能的缺乏不利于这项工作的进展。过去20年里,西方大学都没有把生药学作为主要学科,严重阻碍了西方中草药质量认证系统的建立。赵中振博士的《中药显微鉴别图鉴》为此做出了重大贡献,足以填补生药学科上的一大空白。

此专著以中英两种文字撰写,收录了126种常用中药材,精心设计加以详细的显微解剖学描述。每种药大致分为四个部分:原药材照片,药材组织简图,组织照片详图,药材粉末图。作为显微鉴定方面的专家,赵中振博士这本书无疑为西方社会所有关注真伪鉴别的人士提供了很大帮助,是一项难能可贵之举,丰富了中药材在显微鉴定学方面的英文数据,也有利于更多的读者来了解这方面的知识,中药供货商、管理者、培训学校、天然产物实验室以及其他的西方中药研究人士读过此书定会有所裨益。最后谨向赵中振博士和他的同事们致以衷心的祝贺。

Christine Leon
英国皇家植物公园
中药植物验证中心主任

Foreword 3

Microscopic Identification is one of the most significant measures of accreditation of the quality of Chinese medicine. With such features as high efficiency and great ease, it not only can be employed in accreditation of Chinese drugs, but also in that of Chinese patent medicine products. This verification measure has been successively adopted by "Pharmacopoeia of the People's Republic of China", "The Japanese Pharmacopoeia", "The Ayurvedic Pharmacopoeia of India" and "British Pharmacopoeia". The forthcoming publication of the "Hong Kong Standards of Chinese Materia Medica" also keeps an account of this measure and the corresponding standards. In this era of rapid development in chemical analysis, the microscopic identification is still a paramount verification technique which should be underscored as well as further developed.

Over the recent 20 years, Dr. Zhao Zhong Zhen has been making painstaking efforts in research of the microscopic identification of Chinese medicine. With insights in Chinese medicine and Chinese patent medicine, Dr. Zhao has made plenty of academic publications. In 1999, he was recruited by the Committee of Pharmacopoeia of the People's Republic of China as Chief Editor of the "A Colored Microscopic Atlas of the Powder Chinese Materia Medica Specified in Pharmacopoeia of the People's Republic of China". This time, the book, "An Illustrated Microscopic Identification of Chinese Materia Medica", is solely attributed to the contributions of a research team led by Dr. Zhao, in addition to the support by the Research Grants Council of Hong Kong, China throughout the past five years. This achievement can be acclaimed as a novel collection of identification experiences.

Macroscopically, several features of the book are as follows:

1. All statistics are exhaustive and authentic. All graphics and diagrams originate from the first-hand data of the experimental research. This is a scientific book dedicated to the restoration of experimental records as evidence.
2. All species and drugs recorded are correspondingly referenced. The approach of "From the Macroscopic to the Microscopic" is adopted for the use of cross-referencing by readers.
3. All pen-and-ink drawings, tissue diagrams and powder diagrams are incorporated together. With the application of the multi-color microscopic photographing technique, the principal microscopic identification features of Chinese drugs are genuinely and vividly recapitulated.
4. The contents are correspondingly referenced in English and Chinese. The descriptions are concise. It is for the ease of international communication.

Concerning the modernization and globalization of Chinese medicine, standardization serves as the foundation whereas the verification becomes the indispensable measure. "An Illustrated Microscopic Identification of Chinese Materia Medica" is another excellent masterpiece in the wake of the publication of its sister book in the arena of Chinese medicine identification, "An Illustrated Chinese Materia Medica in Hong Kong". The latter lays stress on the sources and description of the species whilst this book puts an emphasis on the microscopic identification. The publication of the above books with its dedication is also an innovative step forward by the School of Chinese Medicine, Baptist University of Hong Kong in the setting of a platform of pharmacognosy in Hong Kong, hoping to enhance the development of Chinese medicine.

For those working in the field of teaching, research, quality and quantity control as well as traders of Chinese medicine, this publication should be a reference book of practical values.

Delighted as I can read it ahead, I write this preface with the same delight.

Prof. Xiao Peigen
Academician
Chinese Academy of Engineering
People's Republic of China

序言三

显微鉴别法是鉴定中药真伪优劣的重要手段之一,具有快速、简便的特点,不但适用于中药材,同时也适用于部分中成药制品。这一检测方法,先后被《中国药典》、《日本药局方》、《印度草药典》、《英国草药典》等采用,刚出版的《香港中药材标准》也收录了这一方法与相应标准。在化学分析飞速发展的今天,显微鉴别仍然是一项不可忽视并有待发展的重要检测技术。

赵中振博士近20年来潜心从事中药显微鉴别研究,在中药与中成药方面颇有心得,发表了众多学术论文,1999年他还曾被中国药典委员会聘请主编《中华人民共和国药典中药粉末显微鉴别彩色图集》。这本《中药显微鉴别图鉴》主要是他领导的研究组,过去5年在香港研究资助局(RGC)的支持下完成的,可谓新的显微鉴别经验集成。

纵观《中药显微鉴别图鉴》有以下几个特点:

1. 全书数据翔实,所有图像均为实验研究的第一手资料,是一部以实验制片为依据的科学专著。
2. 全书所收品种均与药材相互参照,从宏观到微观,便于读者应用。
3. 全书将墨线图、组织详图与粉末图相结合,应用彩色显微摄影技术,真实、生动地再现了中药材的主要显微鉴别特征。
4. 中英双语对照,文字说明扼要,便于国际交流。

谈及中药的现代化与国际化,标准化是基础,检测则是必要的措施。《中药显微鉴别图鉴》是在《香港中药材图鉴》之后的又一佳作,两书在中药鉴别方面堪称姊妹篇,《香港中药材图鉴》重在基原与性状鉴定,本书重在显微鉴别。以上专著的出版也是香港浸会大学中医药学院在构筑香港生药技术平台,促进中医药学发展方面又迈出的新的一步。

本书对于从事中药教学、研究、质量检验和中药贸易人员来说,均不失为一部实用的参考书。

先睹欣喜之余,乐为之序。

肖培根
中国工程院院士

A guide to the use of this book

1. This publication documents 126 items of commonly used Chinese Materia Medica (CMM). The selection is based on the circulation of CMM in the market today, from the main species in the An Illustrated Chinese Materia Medica in Hong Kong and the 2005 edition of the Pharmacopoeia of the People's Republic of China (C.P.). However, one representative species is documented as to those Chinese Materia Medica with multiple sources.

2. The entries of this publication are arranged according to the alphabetical order of Latin names of CMM. Besides, Pin Yin index,Chinese name index and Latin name index of sources are also included in the appendix.

3. For each documented CMM, the information given generally includes:
   i. Name: including Latin name, Chinese common name and Pin Yin of Chinese common name;
   ii. Source: including the family name, the species name and the part used for medicinal purposes;
   iii. Photographs of the CMM;
   iv. Sketch of the transverse section;
   v. Detailed photographs of the transverse section;
   vi. Main powder characteristics;
   vii. Explanatory notes.

4. As the main microscopic characteristics photographs which are useful for identification are documented in this publication, surface view pictures of 11 CMM species were documented instead of their transverse section photographs. The explanatory notes attached are referred to Xu Guojun's Microscopic Identification of Unprocessed Chinese Drugs (published in 1986) and Zhao Dawen's Chinese Medicinal Materials Illustration for Morphology, Histology and Powder (published in 1998).

5. All the photographs printed in this publication are of authenticated CMM well observed and shot through experiments. Every group of transverse section pictures includes a sketch and a detailed photograph. Sketches are pen-and-ink drawings with the tissues' names labeled beside, showing the distribution and arrangement of different tissues; while the detailed photographs are digital ones with serial numbers from top down, showing the microscopic characteristics. The powder photographs only include the main microscopic characteristics and are arranged according to the importance of the characteristics. "A" and "B" represent the observation results under bright microscope and polarizing microscope respectively.

6. The magnification of each photograph in this publication is specified with a measuring scale and the content is compiled according to the original data in the experiments. All the photographed items are kept in the HKBU Bank of China (Hong Kong) Chinese Medicines Centre, School of Chinese Medicine, Hong Kong Baptist University.

7. The measurement units adopted in this publication are official and universally adopted. For example, miters (m), centimeters (cm) and millimeters (mm) are used to describe the length of the CMM. Micrometer (μm) is used to describe the photographs of the transverse section and powder characteristics.

编写说明

1. 本书共收载常用中药材126种。在对现今中药材市场实际流通情况的调查基础上,选录了《香港中药材图鉴》和《中华人民共和国药典》(以下简称《中国药典》)2005版中的部分品种。

2. 本书按照药材拉丁名的顺序编排。附有药材中文名称、汉语拼音名称及原植物拉丁名索引。

3. 每种中药材收录的主要内容有:

   i. 名称,包括药材拉丁名、中文名、汉语拼音名;

   ii. 基原,包括植物科名、学名及药用部位;

   iii. 原药材照片;

   iv. 药材横切面简图;

   v. 药材横切面组织详图;

   vi. 药材粉末特征图;

   vii. 图注说明。

4. 本书按照药材特点收录了主要的有鉴别意义的显微特征图,其中11种药材因为不适宜做横切面片观察,编者收录了其表面片的特征图。图注说明中的文字同时参照了《中药材粉末显微鉴定》(徐国钧主编,1986)、《中药材外形组织粉末图解》(赵达文主编,1998)中有关内容。

5. 本书收录的所有照片,均来源于鉴定准确的药材,经实验观察,拍摄所得。横切面组织图均包括简图与详图两部分。组织简图为墨线图,用以表示各类组织的分布和排列顺序,各组织名称直接标注于图旁;组织详图为数码照相的显微照片,显示显微特征,编号基本按自上而下的顺序排列。粉末照片收录了主要的鉴别特征,标号按特征主次顺序排列,"A" "B" 分别表示在明视野显微镜与偏光显微镜下的观察结果。

6. 本书中所有照片均附有比例尺,所载内容均为实验原始资料。全部药材标本及实验样品均保存于香港浸会大学中国银行(香港)中药标本中心。

7. 本书所用的计量单位均为法定计量单位,以国际通用单位符号表示,组织详图与粉末照片均以50μm或100μm墨线表示。

Standard Operation Procedure (SOP)

(VCD is attached)

Microscopic Identification is an important method to determine the authenticity and quality of Chinese Materia Medica (CMM). This method makes use of microscope to identify crude drug slides of transverse or longitudinal sections, powder, surface and disintegrated tissue and patent medicines slides. The main characteristic is quick and accurate.

I. Making Specimen Slides of CMM

1. Sampling

The validity of sampling would directly affect the accuracy of identification results; therefore the procedures of sampling should be followed in detail. Samples are mainly from reference samples (R.S.) and test samples (T.S.).

R.S., with reference to T.S., is essential for microscopic identification. The standard R.S. should be used after strict botanical taxonomy identification with the original plant for reference. Apart from accurately identifying the original plants of CMM, it should be noted that the microscopic features of the test object might show variation by growth period and environment. Therefore the productive place, collection time and processing methods should be recorded.

For T.S., origins, place of production, specification, grade, packaging style should be noted, and integrality of package, hygienic level, water trace, extent of being mildewed and rotten and polluted by other materials should be also checked and recorded in detail.

The average quantity of samples should be no less than 3 times as required for test, as 1/3 of the sample is taken for experimental analysis, 1/3 for verification while the other 1/3 is retained for at least a year.

2. Making Specimen Slides

Quality of tissue slides is essential to microscopic identification. Methods of making specimen slides should be chosen according to the nature of test object. There are four main methods including bare hand mounting, gliding mounting, cryology mounting and paraffin mounting.

2.1 Bare Hand Mounting

This method is mainly for making temporary slides. It takes the advantages of convenience, quickness and practicality, but the proper thickness of slides is difficult to master. General procedures are as follows: use three left fingers to fix the material; hold a blade with right hand; put the blade against the material and slice smoothly from the left outward to the right inward. Avoid front and back cutting and keep lubricating the blade with water.

It is also commonly used for slides of surface by tearing bare-handedly.

中药显微鉴别操作规程(SOP)

(附光盘)

中药显微鉴别是鉴别中药材真伪、优劣的方法之一。此法一般指借助于显微镜对药材的切片、粉末、解离组织或表面制片及成方制剂进行鉴别,具有快速、准确的特点。

一、中药材组织制片

1. 取样

取样的可靠性直接影响到结果判断的准确性,因此必须重视取样的各个环节。样品主要来自对照品和供试品。

对照品是检定供试品的参照物,其制备是显微鉴别的先决条件。经过严格的植物分类学鉴定后有原植物标本对照的方可作为标准对照品。在鉴定好中药材基原的同时,还应注意有些药材的显微特征受生长条件的限制及环境的影响,会产生一定的变化,所以对于供试品的产地、采收期、加工方法等也应当认真记录。

供试品要注意原药材的基原、产地、规格、等级及包件式样,检查包装的完整性、清洁程度以及有无水迹、霉变或其他物质污染等情况,并详细记录。

平均样品的收集量不少于测试样品的3倍,其中1/3用作测试,另1/3用作复核,最后1/3则为留样保存,保存期限至少1年。

2. 制片

高质量的切片是鉴定的基础。根据鉴别的对象不同,可选用徒手制片法、滑走制片法、冰冻制片法和石蜡制片法等方法。

2.1 徒手制片法

主要用于临时制片。本法简便、迅速、实用,但切片厚薄不易掌握。具体操作方法如下:左手3只手指固定材料,右手持刀,刀口轻接材料,自左前方缓慢向右后方下滑,注意不可前后拉割,刀面要不断加水润滑。

表面片的制作常用徒手撕片法。

2.2 Gliding Mounting

This method is suitable for lignum, ligneous roots, stems or some other solid materials. The slides could be complete but not continuous. Gliding mounting machine is directly used in slicing and the thickness of slides could be adjusted well.

2.3 Cryology Mounting

Mainly used in slides of animal tissue, fresh and young plant tissue. The steps are as follows:

i) Preparation of samples: Cut the sample; embed them with cryomatrix on a crycasste.

ii) Freezing of samples: Place the crycasste with embedded specimen on the peltier in the freezing chamber for some time until the cryomatrix is solidified.

iii) Specimen sliding: Transfer the crycasste on the specimen head and held by a specimen clamp. Then, adjust the position and angle of blade and anti-roll plate and select proper forward distance. Choose manual or automatic mode to slice.

iv) Specimen mounting: use a brush to transfer the slide sheet onto a clean slide carefully. Adjust the position and flatten the specimen.

v) Slide sealing: Take the mounted slides out of chamber. Seal the slide after the defrost of cryomatrix. Then label the slides with name, serial number and date before storing.

2.4 Paraffin Mounting

Paraffin slicing is the method that acquired paraffin as an invading agent. The steps are as follows:

i) Sampling: Cut the chosen materials into cubes of 0.5~1.0 cm^3

ii) Immobilization: Immobilize the materials with fixation reagents (e.g. FAA) to kill the bioplasm and maintain the fine tissue so that it will be suitable for slicing.

iii) Rinsing: Rinse with 50% ethanol for 2-3 times to get rid of deposit and the fixation reagent in the material.

iv) Dehydration: Replace the water in the tissues by low to high gradient concentration of ethanol.

v) Vitrification: Use vitrification agent (e.g.xylene) to replace ethanol gradiently from low to high concentration.

vi) Olefin immersion: Load scraps of paraffin into bottles with xylene. Place the bottles into an oven with temperature of little higher than the melting point of paraffin for over 6 hours. Replace paraffin 2~3 times to ensure paraffin is completely immersed.