

中国樟树精油资源 与开发利用

主编 李飞



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ESSENTIAL OIL RESOURCES OF SECT. CAMPHORA AND UTILIZATION IN CHINA

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内 容 简 介

樟科樟属樟组植物,俗称樟树。本书在综合分析国内外对樟组植物精油资源研究和开发利用成果及有关资料的基础上,系统、全面地阐述了樟科樟组植物的地理分布、主要化学型、标志特征、遗传、育种及精油形成、积累、分布规律;并以市场为导向,分析了它们的应用前景,合理地布局了精油原料林生产基地,论述了精油提取及加工方法等。

本书是林业、林产化学及轻化工等行业科技人员从事于精油资源研究、开发利用的常备手册;并可供高、中等农林和轻化工院校有关专业师生参考。

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编著者及分工

主 编 李 飞

副主编 管正学

编 委 (以姓氏笔画为序)

李 飞 张宏志 赖世登 管正学 廖俊国

编写人员

第一章 李 飞 管正学

第二章 李 飞 廖俊国 张宏志 张宪洲

第三章 赖世登 杨太兴 程必强 袁克侃

第四章 赖世登 程必强 袁克侃

第五章 张宏志

第六章 管正学

第七章 李 飞

第八章 管正学

附 录 廖俊国 张宏志

前 言

樟科樟属樟组植物俗称樟树*。樟组植物的器官中富含多种精油成分，如樟脑、黄樟油素、柠檬醛、龙脑、芳樟醇等。这些种类繁多的精油是重要的化工原料，它们在轻化工、医药、食品等工业上有着广泛的用途，并且是我国重要的出口创汇物资之一。此外，樟组植物的树冠美丽，枝叶浓密，干形挺拔，材质坚硬、芬芳，耐腐蚀，抗虫蛀。因此，樟组植物不仅是重要的经济林木，也是优良的绿化和用材树种。

樟组植物是我国重要经济树种之一，主要分布于我国长江以南的广大地区。我国南方气候条件优越，山地丘陵面积辽阔，适宜樟组植物的生长，选择立地条件良好的丘陵山区建立樟组植物精油生产基地，不但可为我国的相关产业提供丰富的原料，而且能活跃山区经济和发展高效林业，加强林业产业化建设。

为了促进我国樟组植物精油资源的合理开发利用，我们开展了“樟树生理化学型的鉴别技术及其开发利用研究”课题（国家林业局科技司“九五”期间重点课题）的研究；在此基础上，结合长期的知识积累，并借鉴了国内外有关研究资料，撰写了《中国樟树精油资源与开发利用》一书。本书介绍了樟组植物的地理分布、主要化学型、标志特征、遗传、育种及精油形成、积累、分布规律；并前瞻性地对樟组植物精油资源的应用前景进行了论述；结合中国的资源状况及自然、社会经济条件，以市场为导向，合理布局了樟组植物精油生产基地；同时，阐述了樟组植物精油的提取及加工方法等。

* 本书中的“樟树”特指樟科樟属樟组植物；“樟”则是樟组植物中的一个种，其学名是 *Cinnamomum camphora* (L.) Presl.

在这里特别向为本书和相关课题提供经费资助的国家林业局以及热心支持该项工作的祝光耀、寇文正和杨锋伟等同志表示谢忱。在本书的写作过程中引用了杨太兴、程必强、袁克侃、李文瑞等人的文献资料，原中国轻工总会香料香精协会刘树荃先生提供了宝贵资料，在此，一并表示感谢。

虽然我们尽其所能，力图使本书能全面系统地反映出我国樟组植物精油资源状况，科学总结开发利用的经验，深入浅出地阐述樟组植物化学型的特征与机理，为合理开展利用我国樟组植物精油资源尽自己微薄之力。但由于水平有限，再囿于资料和时间的不足，书中的缺点、错误在所难免，敬请读者不吝指正。

李 飞

1999年5月于北京

ABSTRACT

Sect. *Camphora* is a kind of economic forest woods with an important using value which belongs to Lauraceae, *Cinnamomum*. It is not only one of excellent green and timber tree species, but also one of significant material of fragrant plants.

There are about 20 species of Sect. *Camphora*, including 18 species and 2 varieties in China. Essential oils are contained in the organs of the plants, such as leaves, branches, fruits, tree-trunks and roots. There are more than 60 fragrant components in the essential oils, such as camphor, safrole, linalool, borneol, citral, 1,8-cineole, nerolidol, isonerolidol, farnesol, methyleugenol, t-methyl-isoeugenol and so on. All the chemical components are important materials for chemical industry. They have been widely used in light-chemical industry, medicine-drug and food industry. Besides that, Sect. *Camphora* are important export goods.

China perfume industry has got a mushroom growth for recent decades and played a significant role in the national economy. Plant perfume including the essential oils of Sect. *Camphora* has been a fancy to the people over the world.

Therefore, speeding up exploitation of the essential oil resources of Sect. *Camphora* will play a significant role for developing high-benefits forestry, adjusting construction of forestry industry and promoting development of relative industries.

There is an affluence of the essential oil resources of Sect.

Camphora in China and Chinese have exploited and used them for a long history. Because of unreasoningly deforesting which include unplanned and unconfined cutting, no planting after cutting and extracting oils using trunks and roots, oil resources of Sect. *Camphora* have being suffered from damaging and the resource amounts are less and less. Several species have been in the danger of extinguishing and the environment has been destroyed. Therefore, it is very important to protect and exploit the valuable resources by means of effective identification.

There is a remarkable feature for the essential oil resources of Sect. *Camphora* that is existence of chemotypes. Because of different genetic characteristic and various environment, a species can have several different essential oils types which some contain different main components. For example, *Cinnamomum camphora* have 7 chemotypes of essential oils that are camphor-type, d-borneol-type, 1,8-cineole-type, linalool-type, citral-type, sundry-type and isonerolidol-type. *Cinnamomum tenuipilum* have 11 chemotypes of essential oils. Other species almost have the same situation. Furthermore, the essential oils from different parts of the same tree also exists distinct chemotypes. This situation brings about some difficulties to exploitation and utilization of the essential oils. China scientists have carried out many investigations and researched for chemotypes of the essential oils and made a great achievement in analysis of components of the essential oils, identification of chemotypes, search of new resources, formation mechanism of the essential oils, inheritance and variation and so on. Owing to complexity and diversification of the essential oils, the regularity of chemotypes for essential oil

of Sect. *Camphora* has not been made clear. It is necessary to carry out further investigation from physiology, ecology, biochemistry and molecular biology to Sect. *Camphora*.

On the basis of synthesizing research results of other investigators and authors' work in this book, it is analyzed for chemotypes and their characteristic markers of Sect. *Camphora*, that are some characters of isoenzyme (POD, SOD, CAT and Est etc.), were studied. heredity and breeding of the plants were made researched from theory and practice. Distribution, accumulation and dynamic change of the main essential oils were systematically summarized. Exploitation and utilization of the main essential oils resources were expounded and the ways and measure of exploitation and utilization were put forward from macroscopy and microscopy.

In this book, it is put forward for some useful suggestion on the productive arrangement, the technical system of fast growing and highyield, the base construction and management of the Sect. *Camphora* resource. In the last part, extraction and machining technology about the essential oils was illustrated in details, correct operation rules of different extraction methods were given for the reference to smaller factories. The book also introduced some usage of ultra-critical CO₂ extraction technology in production of the essential oils.

The essential oils are a type of very important natural resources and have a wide prospect in exploitation and utilization. Their exploitation is a complicated project. Although it tries that systematically and entirely state the research results and sum up the exploitation on the essential oil resources of Sect. *Camphora*

in this book, because of limiting capacity of authors and data, some shortcoming and errors are not avoided. It pleases to give authors some advances from readers.

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第一章 绪 论

樟树是樟科樟属樟组植物的俗称，系我国南方丘陵地区广为分布的集经济林、用材林和风景林于一体的重要林木资源。樟组植物的根、茎、叶、花、果及树皮等器官中均富含芳香油。芳香油是植物细胞原生质体分泌物，它们大多具有挥发性，并具令人愉快的芳香气味，故又称挥发油；在香料工业中称之为精油。开发利用樟组植物精油资源，不但有助于活跃农村经济，为经济发展滞后的山区拓展脱贫致富的生产门路，而且可促进我国轻化工业和创汇林业的发展，对于建立高效的多功能的林业生产体系具有重要意义。同时，合理开发利用我国樟组植物精油资源还可改善生态环境，有助于可持续林业的形成和发展。

第一节 樟组植物精油资源在国民经济中的作用

经科学工作者多年的研究，樟组植物精油主要成分可大致归为下列几种：即樟脑 (camphor)、芳樟醇 (linalool)、1,8-桉叶油素 (1,8-cineol)、 α -松油醇 (α -terpineol)、黄樟油素 (safrole)、柠檬醛 (citral)、d-龙脑 (d-borneol)、橙花椒醇 (nerolidol)、异橙花椒醇 (iso-nerolidol)、t-甲基异丁香酚 (t-methyl-isoeugenol)、甲基丁香酚 (methyl eugenol)、 α -水芹烯 (α -phellandrene)、香叶醇 (geraniol) 以及金合欢醇 (farnesol) 等 (详见第二章、第六章)。

樟组植物体中含油率及成分和数量不但随树种和部位而异，而且在同一树种的同一器官中也会有所差异，往往因所含主要成