



Institute of Materia Medica, Chinese Academy of Medical Sciences  
Chinese Pharmaceutical Association

Acta Pharmaceutica Sinica B

[www.elsevier.com/locate/apsb](http://www.elsevier.com/locate/apsb)  
[www.sciencedirect.com](http://www.sciencedirect.com)



## REVIEW

# Research progress in the phytochemistry and biology of *Ilex* pharmaceutical resources

Dacheng Hao<sup>a,b,\*</sup>, Xiaojie Gu<sup>a</sup>, Peigen Xiao<sup>c,\*</sup>, Zhanguo Liang<sup>a</sup>,  
Lijia Xu<sup>c</sup>, Yong Peng<sup>c</sup>

<sup>a</sup>Biotechnology Institute, School of Environmental and Chemical Engineering, Dalian Jiaotong University, Dalian 116028, China

<sup>b</sup>Department of Metabolic Biology, John Innes Centre, Norwich Research Park, Norwich NR4 7UH, UK

<sup>c</sup>Key Laboratory of Bioactive Substances and Resources Utilization of Chinese Herbal Medicine of Ministry of Education, Institute of Medicinal Plant Development, Chinese Academy of Medical Sciences, Beijing 100193, China

Received 16 September 2012; revised 2 November 2012; accepted 30 November 2012

## KEY WORDS

*Ilex*;  
Chemical components;  
Pharmacology;  
Chemotaxonomy;  
Phylogeny;  
Pharmaceutical and  
food resource

**Abstract** *Ilex* is a botanical source for various health-promoting and pharmaceutically active compounds that have been used in traditional Chinese medicine and food for thousands of years. Increasing interest in *Ilex* pharmaceutical and food resources has led to additional discoveries of terpenoids, saponins, polyphenols (especially flavonoids), glycosides, and many other compounds in various *Ilex* species, and to investigation of their chemotaxonomy, molecular phylogeny and pharmacology. In continuation of our studies on *Ilex* pharmacology and phylogeny, we review the phytochemistry, chemotaxonomy, molecular biology and phylogeny of *Ilex* species and their relevance to health-promotion and therapeutic efficacy. The similarity and dissimilarity between *Ilex paraguariensis*, the source plant of mate tea, and the source plants of large-leaved Kudingcha (e.g., *Ilex kudingcha* and *Ilex latifolia*) are discussed. It is essential to utilize emerging technologies in non-*Camellia* tea studies to promote the sustainable utilization of *Ilex* resources and the identification and development of novel compounds with potential health and clinical utility. Systems biology and “-omics” technologies will play an increasingly important role in pharmaceutical and food research on the bioactive compounds of *Ilex* species.

© 2013 Institute of Materia Medica, Chinese Academy of Medical Sciences and Chinese Pharmaceutical Association. Production and hosting by Elsevier B.V. All rights reserved.

\*Corresponding authors.

E-mail addresses: hao@djtu.edu.cn (Dacheng Hao); xiaopg@public.bta.net.cn (Peigen Xiao).

Peer review under responsibility of Institute of Materia Medica, Chinese Academy of Medical Sciences and Chinese Pharmaceutical Association.



Production and hosting by Elsevier

## 1. Introduction

*Ilex*, whose common name is holly, is the only living genus of almost 600 species in the family Aquifoliaceae<sup>1</sup>. The species are evergreen and deciduous trees, shrubs and climbers from tropics to temperate regions worldwide. Various *Ilex* species are utilized by worldwide ethnic groups to make non-*Camellia* tea drinks for daily consumption and health promotion<sup>2</sup>. Mate tea from *I. paraguariensis* originated from the southern part of South America (Brazil, Argentina, Uruguay and Paraguay) and is now a popular health-promoting drink in western countries<sup>3</sup>. Large-leaved Kudingcha (bitter spikeleaf tea) is made from *I. kudingcha* and *I. latifolia* and has been consumed as a functional food in southern China for about 2000 years<sup>2</sup> (Table 1). Various compounds have been isolated from *Ilex* plants since the 1980's, and their chemistry and pharmacology has been reported<sup>2,4</sup>. Poly-

phenol constituents of green tea, mate tea and large-leaved Kudingcha are listed in Table 2. Studies on the chemotaxonomy and molecular phylogeny have been carried out to facilitate further conservation and exploitation of *Ilex* pharmaceutical and food resources<sup>1,5</sup>. In this brief review, we summarize the recent progress in phytochemical and biological research of *Ilex* plants.

## 2. Molecular taxonomy, molecular phylogeny, and genomics

The evolutionary history and diversification of the genus *Ilex*, comprised of 108 species, is deduced by analyzing two nuclear (ITS and *nepGS*) and three plastid (*rbcL*, *trnL-F* and *atpB-rbcL*) sequences<sup>1</sup>. Nuclear and plastid trees are highly dissimilar and the nuclear tree is more attuned with current taxonomic classifications. Many Chinese species, including *Ilex cornuta*, *Ilex zhejiangensis*, *Ilex integra*, *Ilex hylonoma*, *I. latifolia*, *Ilex pernyi*

**Table 1** Traditional use of green tea and four kinds of non-*Camellia* teas

| Name                                                                         | Original region                    | Use history         | Main application region                                                     | Traditional use                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------|------------------------------------|---------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Camellia sinensis</i> (green tea)                                         | South of the Yang Tze River, China | Around 3000 years   | Worldwide, raw materials for drink, food, cosmetic and health care products | Sweet and bitter taste, cool in property, refreshing, reduce stress and thirst, reduce phlegm, help digestion, diuresis, detoxify, treat headache, blurred vision, somnolence, dyspepsia, dysentery                                                                                                                                                                |
| <i>Ilex paraguariensis</i> (Mate tea)                                        | South America                      | 300–400 Years       | drink and health care products in America, Europe and Asia                  | Hepatic protection, help digestion, anti-rheumatism, arthritis and inflammation, anti-obesity, hypertension and hypercholesterolemia                                                                                                                                                                                                                               |
| <i>I. latifolia</i> , <i>I. kudingcha</i> (large-leaved Kudingcha)           | South of the Yang Tze River, China | Around 2000 Years   | Tea drink in China and southeast Asia                                       | Sweet and bitter taste, cold, liver meridian, lung meridian and stomach meridian, heat clearing, relieve summer-heat, smooth the liver, dispel wind, improve eyesight, help produce saliva, treat sunstroke and high fever, headache, toothache, red eye, aphtha, polydipsia, diarrhea, dysentery, mastitis, relieve swelling and pain, astringency and hemostasis |
| <i>Ligustrum robustum</i> ( <i>L. purpurascens</i> , small-leaved Kudingcha) | Southwest China                    | Since ancient times | Tea drink and health care products in China and southeast Asia              | Slightly bitter taste, sweet, slightly cold, heat clearing, detoxifying, stress-reducing, relieve swelling and pain, anti rheumatism and scald, furuncle and arthralgia therapy                                                                                                                                                                                    |
| <i>Litsea coreana</i> (eagle tea)                                            | Guizhou, Sichuan Of China          | Since ancient times | Southwest China                                                             | Detoxify, detumescence, improve eyesight, help produce saliva, decrease thirst, prevent sunstroke                                                                                                                                                                                                                                                                  |

**Table 2** Polyphenol constituents of green tea, mate tea and large-leaved Kudingcha

| Name                   | Total polyphenol                                             | Caffeine                       | Total flavonoid(%) | Total saponin |
|------------------------|--------------------------------------------------------------|--------------------------------|--------------------|---------------|
| Green tea              | 30%                                                          | 1–4%                           | > 0.4              | NR            |
| Mate tea               | More abundant than green tea 178.32 mg/g spray-dried extract | 0.7–2%                         | > 1                | 0.35 g/L      |
| Large-leaved Kudingcha | 2–6%                                                         | No or trace (0.228–0.436 µg/g) | 9–12               | > 20%         |
| Small-leaved Kudingcha | 20–30%                                                       | NR                             | > 5                | –             |
| Eagle tea              | > 30%                                                        | NR                             | > 10               | > 1%          |

Modified from Ref. 2. NR: not reported.

Download English Version:

<https://daneshyari.com/en/article/2474837>

Download Persian Version:

<https://daneshyari.com/article/2474837>

[Daneshyari.com](https://daneshyari.com)