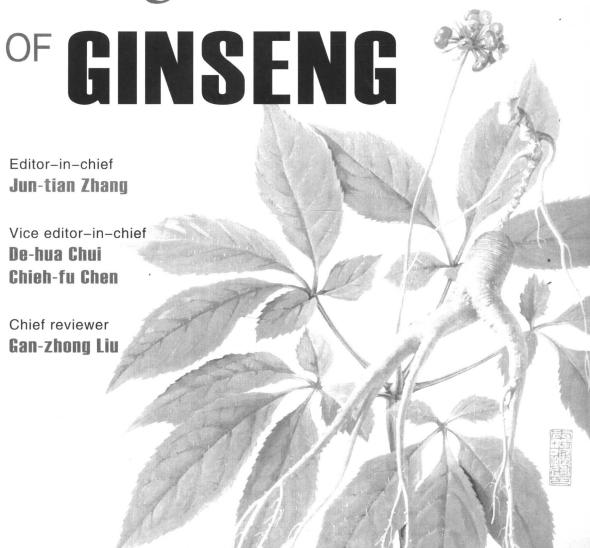
THE Chemistry, Metabolism AND Biological Activities

OF GINSENG Editor-in-chief Jun-tian Zhano Vice editor-in-chief De-hua Chui Chieh-fu Chen Chief reviewer **Gan-zhong Liu**

THE Chemistry, Metabolism and Biological Activities



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Preface

Ginseng, the root and rhizome of *Panax ginseng* CA Meyer has been used as a tonic remedy in Chinese traditional medicine for over 2000 years. In 200 AD when this herb was described in the oldest Chinese material medica book, *Shen Nong Ben Cao Jing*, the author depicted many pharmacological functions of ginseng including improving cognition and thought, invigorating body, harmonizing energies, removing toxic substances and prolong life and so on. So, it has been used as a tonic or a remedy individually or in combination with other medicines for treating a certain kinds of diseases.

In the past decades, scientists not only in Asian, but also in the Western countries paid great attention to ginseng research. Every year, there are hundreds of papers published and new uses for ginseng discovered.

This monograph is aimed at to review the recent advances in chemistry, metabolism and biological activities of ginseng. The invited authors are engaged in ginseng research for a long time and accumulated rich experience. My friend, Mr W J Zhao is a enterpriser and is now studying in Jilin University for PhD degree. He works on ginseng research with great enthusiasm and contributes a lot. I appreciate him not only for providing us two articles, but also for giving us generous support. Indeed, their articles are full of new idea, new thought and new technology as well. Some finding of new use is the new discoveries for the first time in the world.

More than thirty years ago, nothing was known about the chemical structure of active principles of ginseng. Today, ginsenosides and non-saponin constituents have been isolated and identified. Some proteins, peptides and polysaccharides were proved as active principles. According to the world-wide research, ginseng and ginsenosides were shown to have miraculous effects. One of noticeable effects is delaying aging, dysfunction appeared in age-related disorders such as aging and AD induced cognition impairment, stress induced low sexual function, estrogen-deficient induced osteoporosis, etc. were improved much better with ginseng. Interestingly, the declining of vital functions could be restored to normal level by ginseng or its active principles. In addition, there are two prominent features in ginseng's pharmacology. First, ginseng exhibited effects on multiple targets simultaneously. But ginseng showed almost no toxic and without any noxious side effects. Second, ginseng effect is characterized by increasing

neural plasticity or mobilizing endogenous protective mechanism (e. g. increase of neurotrophins and neuroprotective gene products as well as antioxidant enzymes). These characters of ginseng are different from western medicine but fit the conception of Chinese traditional medicine. For metabolism of ginseng, there are two questions about ginsenoside metabolism arose from academic field. That is, whether ginsenosides can pass through blood-brain barrier or not? Ginsenoside exert its effect is in its prototype or in the form of metabolites? The chapter of ginseng metabolism in this book will answer these questions.

At present, ginseng research situation is just like the stage of steroid hormone and prostaglandins whose multiple biological activities and clinical application were proved and recognized generally. Therefore, the tasks in the future should carry out extract, total or semi-synthesis of ginsenosides and other principles with industry-scale. The further study on the mechanism of action, pharmacokinetics and clinical trail with design of double-blind and placebo control is also needed.

At last, I wish to thank all authors for their providing us interesting and informative date and sending papers in due time. I also extend my thanks to Chemical Industry Press for their patience in dealing with of organizing and editing this book. In addition, I'd like to extend my thanks to my wife for her understanding, taking care of and providing me with time and encouragement.

Jun-tian Zhang

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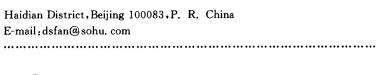
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Section I Chemistry of Ginseng



1 Chemical Study on Ginseng

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Abstract

This review covers the isolation and determination of chemical constituents including ginsenoside, polyacetylene, sesquierpenoid, flavonoid, dencichine, polyamine, and polysaccharide from *Panax ginseng*. The literature from 1976 to 2005 is reviewed and 38 references are cited.

Key words

Panax ginseng, ginseng, chemical compounds, saponin, dammarane, non-saponin

Panax ginseng C. A. Meyer is one of the most important oriental medicinal plants. And now it may be the most well known traditional Chinese medicine which has been extensively studied.

Panax ginseng is processed in two forms, White Ginseng and Red Ginseng. The former is the dried root, whose peripheral skin is frequently peeled off, and the latter is the steamed root, which shows a caramel-like colour and resists invasion of fungi and worms.

Chemical studies on ginseng and its congeners were first made by Garriques in 1854. Since then, numerous chemical, biochemical and pharmacological investigations have been made on ginseng.

1.1 Saponin

Saponins are the major constituents isolated from Panax ginseng. There have been extensive chemical studies reported on it and almost all the ginseng saponins were isolated and the chemical structures were established from root, stem, flower buds and fruit of Panax ginseng.

By now, more than 30 ginsenosides have been isolated from Panax ginseng as showed in table1. 1. Except ginsenoside-Ro, all the other saponins isolated from Panax ginseng are tetracyclic triterpenoids and could be divided into two groups of compounds: protopanaxatriol(Ppt) type and protopanaxadiol(Ppd) type.