



REFERENCE SUBSTANCES FOR HERBAL PRODUCTS

As one of the leading manufacturers internationally, **PhytoLab offers over 1,500 extensively documented herbal reference substances** of all classes of natural compounds. Our portfolio includes various reference substances applied in the analysis and quality control of ginseng, derived extracts and finished products thereof.

Genus *Panax*

The genus *Panax* (family: *Araliaceae*) comprises of several species, predominantly three of them being used in phytotherapy: ***Panax ginseng* C. A. Meyer**, known as Asian, Korean or Chinese ginseng, occurs mainly in Korea, northeastern China and Siberia, but is also cultivated in Europe, Australia and the Caucasus. ***Panax quinquefolius* L.**, known as American ginseng, occurs in North America and is also being cultivated in China. ***Panax notoginseng* (Burkill) F. H. Chen ex C. Y. Wu & K. M. Feng** (synonym: *Panax pseudoginseng* Wall. var. *notoginseng* (Burk.) Hoo et Tseng), known as notoginseng or Tienchi (from the Chinese name tiánqī) ginseng grows naturally in China and Japan. The botanical name *Panax* means all-heal in Greek. The word ginseng derives from the Chinese term rénshēn, rén meaning “person” and shēn meaning “root”. Thus ginseng describes the man-like appearance of the ginseng root.

Medicinal use

Ginseng root has been used for more than two thousand years in traditional Chinese and Korean medicine and became popular in Europe in the 17th century. *P. ginseng* and *P. quinquefolius* are known as **adaptogenic herbs**, while *P. notoginseng* has been used extensively in the **treatment of blood disorders**.

Depending on the processing method – which strongly influences the phytochemical composition and thus also pharmacological activities – two types of ginseng roots are commonly applied: **red ginseng**, prepared by steam treating the roots of *P. ginseng* C. A. Meyer prior to drying, and **white ginseng**, obtained by dehydration

without the heating step. **The European Union herbal monograph on *Panax ginseng* C. A. Meyer radix** describes the traditional use of the comminuted or powdered root of white and red ginseng, besides various ethanolic or methanolic liquid, soft or dry extracts thereof, for the purpose of **treating symptoms of asthenia such as fatigue and weakness**. Korea ginseng is also widely **consumed as a food product**, e.g. in form of soups or beverages, liqueurs, cookies or candies, or as an ingredient of ginseng coffee.

phyproof® reference substances for the analysis and quality control of *Panax sp.*

Reference Substance	Product #
Ginsenosides (derived from protopanaxadiol)	
Ginsenoside Rb ₁	89208
Ginsenoside Rb ₂	89209
Ginsenoside Rc	89210
Ginsenoside Rd	89211
TLC markers	
Escin	89871
Arbutin	89510
Ginsenosides (derived from protopanaxatriol)	
Ginsenoside Re	89212
Ginsenoside Rf	89213
Ginsenoside Rg ₁	89214
Ginsenoside Rg ₂	89680
Notoginsenoside R ₁	89743



Chemical composition

Ginseng contains typical tetracyclic terpenes known as **ginsenosides**. According to the nature of the underlying aglycone the ginsenosides can be further classified into compounds with **protopanaxadiol or protopanaxatriol skeleton**. Besides these dammarane-type saponins also pentacyclic oleanane-type ginsenosides occur, e.g. Ginsenoside Ro. Ginsenosides usually bear up to four glycosidic moieties in one or more side chains attached to various positions of the aglycone. The content of ginsenosides depends on the origin, the age and the root parts analyzed. All other parts of the plant also contain ginsenosides but in different ratios. The ginsenoside pattern also allows **differentiation between white and red ginseng, and the various *Panax* species**. Ginsenoside Rf, for example, is present in *P. ginseng*, but absent in *P. quinquefolius*. Roots of *P. notoginseng* and *P. quinquefolius* have a high content of ginsenoside Rb₁. The dominant ginsenoside in *P. notoginseng* is Rg₁, while ginsenoside Ro is completely absent.

Pharmacopoeias

In **European Pharmacopoeia**, the monographs on **ginseng root** (*P. ginseng*, white or red), **ginseng dry extract** and **notoginseng root** specify contents of

ginsenosides calculated either as the sum of Rb₁ and Rg₁, or expressed as Rb₁ considering ginsenosides Rb₁, Rb₂, Rc, Rd, Re, Rf, Rg₁ and Rg₂. **Arbutin and escin** are used as analytical markers in the TLC identification tests. Zones and peaks due to the various ginsenosides are described in TLC as well as HPLC chromatograms.

United States Pharmacopoeia has monographs on **Asian, American and Tienchi ginseng**, describing the dried roots as well as powders and extracts prepared thereof. These monographs specify contents of ginsenosides, either individually for e.g. Rb₁, Rg₁ or notoginsenoside R₁, or as the sum of several compounds including e.g. Rb₁, Rb₂, Rc, Rd, Re and Rg₁, or Rb₁, Rd, Re and Rg₁ as well as notoginsenoside R₁. Peak area ratios, e.g. between Rb₂ and Rb₁, or between Rg₁ and Rb₁, descriptions of signal intensities, or absence of certain components are used for species authentication purposes.

Reference Substances

For a reliable quantitative analysis and quality control of ginseng products well characterized reference substances are essential. **PhytoLab offers all reference substances described in EP and USP. All of them are characterized as primary reference substances** and supplied together with a comprehensive certificate of analysis. **Many other natural products that have been described to occur in ginseng are available as well (e.g. Panaxadiol, Panaxatriol, Pseudoginsenosides and many more)**. For a full listing and up-to-date information on prices and specifications please contact us or visit our webshop at phyproof.phytolab.com.

Ginsenoside	R ₁	R ₂	R ₂
Rb ₁	β-D-Glc-β-D-Glc	H	β-D-Glc-β-D-Glc
Rb ₂	β-D-Glc-β-D-Glc	H	β-D-Glc-α-L-Ara
Rc	β-D-Glc-β-D-Glc	H	β-D-Glc-α-L-Araf
Rd	β-D-Glc-β-D-Glc	H	β-D-Glc
Re	OH	CH ₂ -O-β-D-Glc-α-L-Rha	β-D-Glc
Rf	OH	CH ₂ -O-β-D-Glc-β-D-Glc	OH
Rg ₁	OH	CH ₂ -O-β-D-Glc	β-D-Glc
Rg ₂	OH	CH ₂ -O-β-D-Glc-α-L-Rha	OH
Notog. R ₁	OH	O-β-D-Glc-β-D-Xyl	β-D-Glc

Structure of ginsenosides

