the nature network®

PhytoLab



Reference Substances for Herbal Products

Ginkgo biloba L.

As one of the leading manufacturers internationally, PhytoLab offers over 1,100 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 ginkgo leaves, extracts and finished products.

The genus *Ginkgo* (family: *Ginkgoceae*) is composed of only one species, *Ginkgo biloba* L. The ginkgo tree, a „living fossil" originally occurred throughout the world, but survived as an endemic species only in Southeast China. In the early 18th century it was introduced to Europe. Today, ginkgo is widely cultivated as an ornamental tree in Asia, Europe and North America, not only because of its general beauty but also due to its strong resistance to pollution, insects and plant diseases in general. Ginkgo trees can become well over 1000 years old.

Cooked or roasted ginkgo seeds, or more precisely the gametophytes, are a traditional part of the Asian cuisine. Seeds are also used in traditional Chinese medicine. Ginkgo leaves can be consumed as a tea, but usually powdered leaves or special extracts are applied in medicinal products. The European Union herbal monograph on *Ginkgo biloba* L. leaves describes the well-established use of a dry extract, prepared with 60 % aqueous acetone, for the pupose of improvement of (age-associated) cognitive impairment and of quality of life in mild dementia. The traditional use of powdered ginkgo leaves is described for the relief of heaviness of legs and sensation of cold hands and feet associated with minor circulatory disorders, after serious conditions have been excluded by a medical doctor.

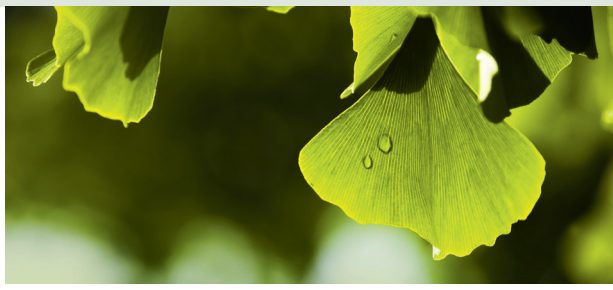
phyproof® reference substances for the analysis and quality control of *Ginkgo biloba* L.

Reference Substance	Product #	Reference Substance	Product #
Sesquiterpenes and Diterpenes		**Flavonoids**	
(-)-Bilobalide	89167	Isorhamnetin	89314
Ginkgolide A	89204	Kaempferol	89235
Ginkgolide B	89205	Quercetin (dihydrate)	89262 (89263)
Ginkgolide C	89206	**Pyridoxine derivative**	
Ginkgolide J	89329	Ginkgotoxin hydrochloride	82638
Ginkgolic acids		**TLC markers**	
Ginkgolic acid C13:0	89678	Chlorogenic acid	89175
Ginkgolic acid C15:1	89522	Rutin	89270
Ginkgolic acid C17:1	89207		
Ginkgolic acids RN (mix of the three individual ginkgolic acids)	89480		

phy|proof®

Proof of Quality for Markers





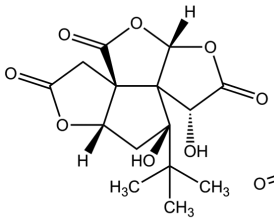
Ginkgo contains some unique terpene lactones, i.e. bilobalide and ginkgolides A, B, C and J. Other typical constituents are various flavonol mono- and diglycosides, e.g. the 3-glucosides and the 3-rutinosides of quercetin, kaempferol and isorhamnetin. Due to their complex mixture the flavonol glyosides are usually analyzed only after hydrolysis, which results in a more simple HPLC profile dominated by the respective aglycones. Ginkgo also contains various alkylphenols, i.e. gingkolic acids (6-alkylsalicylic acids) and urushiols (3-alkylcatechols) which have a known allergenic potential. Ginkgotoxin is a toxic vitamin B_6 analogue.

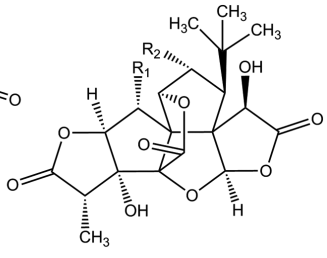
In **European Pharmacopoeia**, a specification for flavonoids, expressed as flavone glycosides, is given in the monograph on **Ginkgo leaf**. Chlorogenic acid and rutin are used in the TLC identification test. In the assay, the sum of the peaks due to quercetin, kaempferol and isorhamnetin (and other peaks eluting between those compounds) is determined by HPLC. The monograph on **Ginkgo dry extract, refined and quantified** additionally defines a content for bilobalide and ginkgolides A, B and C and a maximum content is set for ginkgolic acids.

In **United States Pharmacopoeia**, the dietary supplements monograph on **Ginkgo** specifies a minimum content for flavonoids, calculated as flavonol glycosides, and for terpene lactones, calculated as the sum of bilobalide and ginkgolides A, B and C. Unlike in EP, only the signals due to quercetin, kaempferol and isorhamnetin are considered in the calculation of of total flavonoids. Terpene lactones are quantified by HLPC with ELS detector. In the HPTLC identification test, zones due to quercetin, chlorogenic acid, bilobalide and all four ginkgolides are described. Similar to EP, the monograph on **powdered Ginkgo extract** additionally defines a content for bilobalide and ginkgolides A, B and C and a certain ratio of the flavonols peaks is demanded in HPLC analysis.

For a reliable analysis and quality control of ginkgo 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 ginkgo are available as well. For a full listing and up-to-date information on prices and specifications please contact us or visit our webshop at **http://phyproof.phytolab.de**.

Structure of bilobalide and ginkgolides


(-)-Bilobalide



Ginkgolide	R_1	R_2
A	H	H
B	OH	H
C	OH	OH
J	H	OH

PhytoLab GmbH & Co. KG
phyproof® Reference Substances
Dutendorfer Str. 5-7
91487 Vestenbergsgreuth
Germany
Phone: +49 9163 88-395
Fax: +49 9163 88-456
ref-substances@phytolab.de
http://phyproof.phytolab.de