



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 relevant reference substances applied in the analysis and quality control of *Echinacea sp.*, derived juices, tinctures or extracts, and finished products thereof.

Genus Echinacea

The genus Echinacea (family: Asteraceae) comprises - according to the most recent taxonomic evaluation - of nine species. Three species are used as medicinal herbs: *Echinacea purpurea* (L.) Moench, known as purple coneflower; *Echinacea angustifolia* DC., known as narrow-leaved purple coneflower; *Echinacea pallida* (Nutt.) Nutt., known as pale purple coneflower. The native habitat of all species is eastern and central North America only, but nowadays they are grown in gardens worldwide as ornamental plant and cultivated for medicinal use in the US and various European countries. The botanical name *Echinacea* derives from the Greek word *ἐχῖνος* (*echinos*), which means sea urchin and refers to the spiny central disk of the flowers.

Medicinal use

Echinacea sp. have a long tradition of medicinal use. North American Plains Indians used the plant for the **treatment of coughs, sore throat and tonsillitis**. In the 20th century echinacea became a popular herbal medicine in Europe and the US. There is a total of four European Union herbal monographs on *Echinacea sp.* The traditional use of dry extracts of the radix of *E. purpurea* (L.) Moench is described for the purpose of **supportive treatment of the common cold**. The same therapeutic indication applies to dry extracts and tinctures of the radix of *E. pallida* (Nutt.) Nutt and *E. angustifolia* DC, respectively. The community monograph on the *E. purpurea* (L.) Moench herb (the expressed juice or dried expressed juice is used) describes the well-established oral use for the short-term prevention and treatment of common cold, and the traditional cutaneous use for **the treatment of small superficial wounds**.

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

Reference Substance	Product #
Caffeic acid derivatives	
Caffeic acid	89547
Caftaric acid	89170
Chicoric acid	89177
Chlorogenic acid	89175
Cynarin	89179
Echinacoside	89188
Further reference substances	
Dodeca 2E,4E,8Z,10E,Z-tetraenoic acid isobutylamide (DTIBA)	89187
β-Sitosterol	89283
3,4-Dicaffeoylquinic acid	80425
Verbascoside	89289
3,5-Dicaffeoylquinic acid	80426
4,5-Dicaffeoylquinic acid	80427
Kaempferol	89235
Quercetin	89262

phyproof® Reference Substances

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Chemical composition

Echinacea sp. contain compounds that belong to the group of **alkylamides** (e.g. dodeca 2E,4E,8Z,10E,Z-tetraenoic acid isobutylamide (DTIBA)), **caffeic acid derivatives** (e.g. caffeic acid, caftaric acid, chicoric acid, chlorogenic acid, cynarin, echinacoside and verbascoside), and **sterols** (e.g. β -sitosterol). Furthermore, **chlorogenic acid isomers**, **dicafeoylquinic acids**, **glycine betaine**, **flavonoids** (mainly from kaempferol and quercetin), as well as **polyacetylenes** and **polysaccharides** have been described.

Pharmacopoeias

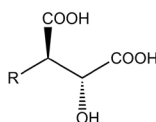
In **European Pharmacopoeia**, the monographs on **purple coneflower herb** and **root** specify a minimum content for the sum of caftaric acid and chicoric acid. Caffeic acid, chlorogenic acid, cynarin, echinacoside, DTIBA and β -sitosterol are used in TLC tests. For **narrow-leaved coneflower root** and **pale coneflower root** a minimum content of echinacoside is specified. In the HPLC profiles, caftaric acid and chicoric acid are the predominant peaks in purple coneflower herb and root, echinacoside dominates in pale coneflower root, and cynarin and echinacoside prevail in narrow-leaved coneflower root.

In **United States Pharmacopoeia**, all dietary supplements monographs on *E. purpurea*, *E. angustifolia* and *E. pallida* specify a content for total phenols, i.e. caftaric acid, chicoric acid, chlorogenic acid, cynarin and echinacoside, but only selected constituents are considered in the calculation depending on species and plant parts described. For *E. purpurea* and *E. angustifolia* a minimum content of DTIBA is defined as well. Species authentication is achieved by testing for the presence of echinacoside and cynarin in *E. angustifolia* and for the presence of echinacoside but absence of cynarin in *E. pallida*. Echinacoside is absent in the TLC test, and barely or not visible in the HPLC profile of *E. purpurea* aerial parts.

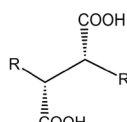
phyproof® Echinacea Standards

For a reliable analysis and quality control of echinacea products well characterized reference substances are essential. **PhytoLab offers all reference substances described in respective EP and USP monographs. All of them are characterized as primary reference substances** and supplied together with a comprehensive certificate of analysis. In addition, our portfolio includes many additional natural products that are relevant to coneflowers. For a full listing and up-to-date information on prices and specifications please contact us or visit our webshop at phyproof.phytolab.com.

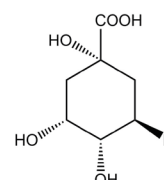
Structures of typical caffeic acid derivatives in Echinacea



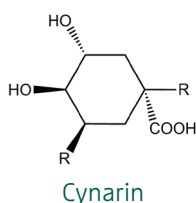
Caftaric acid



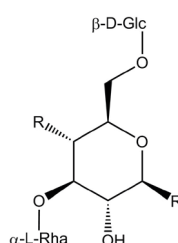
Chicoric acid



Chlorogenic acid



Cynarin



Echinacoside

R = Caffeic acid ester

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