

# A Panoramic Review on Ethnobotanical, Phytochemical, Pharmacological and Homeopathic Uses of *Echinacea angustifolia*

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## ABSTRACT

**Background:** *Echinacea angustifolia* is traditionally used polychrest remedy and known since 18<sup>th</sup> century due to many medicinal properties. It is also well known homeopathic medicine that is useful for various diseases. Traditionally it is used in various ailments.

**Objective:** In present study, attempt has been made to review the literature of the botanical, ethnobotanical, taxonomical, chemical constituents, and homeopathic uses of *E. angustifolia*.

**Study design:** This is a narrative brief review in which information was collected from various search engines and text books.

**Conclusion:** It is concluded from present study that that *E. angustifolia* could be an alternative to immunomodulatory, antibacterial, antioxidant and anti-inflammatory agents.

**Keywords:** *Echinacea angustifolia*, polychrest, homeopathic uses.

### Authors' Contributions

1 Conception & Study Design, Data Collection, Data Analysis, Drafting, Critical Analysis.

2 Conception, Data Analysis, Critical Analysis.

3 Conception, Drafting.

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## INTRODUCTION

*Echinacea angustifolia* is a hard, erect, herbaceous perennial plant gaining height of 30-60 cm, having one to several stems. Leaves are simple, alternate, oblong to lance-shaped, almost linear of 8-20cm and all are all mitigate at base. Flower heads are light pink to purple in color and solitary at the end of branches [1]. Figure 1 is the pictural representation of *E. angustifolia*. Table 1 described the systematic taxonomy of *E. angustifolia*.

Table 1. Systematic taxonomy.

Source	Vegetable kingdom
Order	Asterales
Family	Compositae
Genus	<i>Echinacea</i>
Species	<i>E. angustifolia</i>
Synonyms	English: Echinaceae, purple cone flower black sampson echinacea
Part used for preparation of homeopathic mother tincture	Whole plant
Homeopathically proved by	Dr. J.C. Fahnestock and contributed by T.C. Ducan

### Distribution of Plant

It is found in United States, Canada and central parts of U.S.A. [1].

### Active Principle

*Echinacea angustifolia* roots have 6 alkamides which are lipophilic in nature such as Dodeca-2E,4Z-diene-8, Dodeca-2E-ene-8,10-dienoic acid isobutylamide, 10-dienoic acid isobutylamide Dodeca-2E,4E,8Z,10E/Z-tetraenoic acid isobutylamides, Dodeca-2E,4E,8Z-trienoic acid isobutylamide, Undeca-2E/Z-ene-8, Dodeca-2E,4E-dienoic acid isobutylamide [2], Cichoric acid echinacoside, 10-dienoic acid isobutylamides, chlorogenic acid, cynarin, caffeic acid and caftaric acid were also identified and quantified from *E. angustifolia* root [3]. Cynarine is major constituent among all of them [4]. Figure 2 showed the structures of some important constituents of *E. angustifolia*.



Fig. 1. Different parts of *Echinacea angustifolia*.

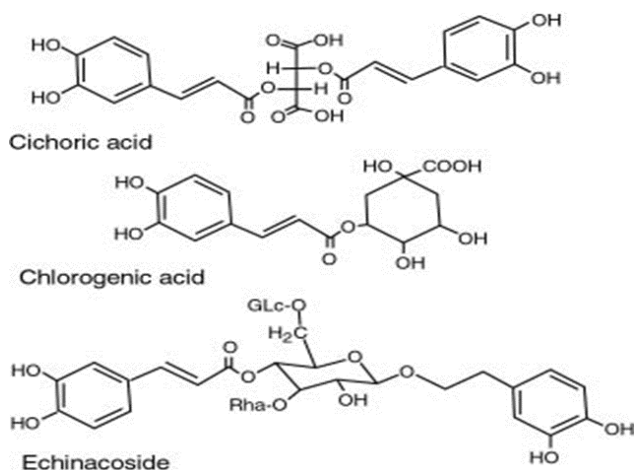


Fig. 2. Structural formulas of Cichoric acid, Chlorogenic acid and Echinacoside.

### Traditional Uses of *E. angustifolia*

Traditionally *E. angustifolia* was used to stimulate immune system to treat common colds, respiratory

tract infection and lower urinary tract infections [2]. It was also used for treating infections, such as ulcers and wound infections, snake biting cases as an “anti-toxin” and septicemia. Echinacea was also suggested for bacterial and viral infections, pyorrhoea, nasopharyngeal catarrh, tonsillitis, minor septicaemia, furunculosis and other skin conditions such as abscesses, boils, carbuncles and wound healing [4].

### Method for Preparation of Mother Tincture

Whole plant of *E. angustifolia* is used to prepare its mother tincture. 100 gram of *E. angustifolia* in coarse powder, 200 ml of purified water and 825ml of strong alcohol are required for preparation of 1 litre of mother tincture [1].

### Homeopathic Uses

*E. angustifolia* is a significant remedy for treating blood poisoning and septic conditions of the body. Homeopathically it is used to treat malignant ulcers, stomatitis, erysipelas, gangrene, recurring boils, carbuncles, puerperal fever septicaemia, typhoid diarrhoea, snake bite, meningitis, ulcerated sore throat, sting of poisonous insects, tendency to malignancy, irritation from poisonous plants, Goitre with exophthalmic symptoms and pains of cancer at last stage. All these conditions must expressed by following symptoms for calling *E. angustifolia* as a remedy, tongue, lips, and fauces feel pricking, fear of heart pain, fever with flushed face, full head, and accelerated pulse, laziness, neuralgic, darting, sharp, shifting pains, digestive and respiratory tracts catarrhal affections, lymphatic inflammation, copious sloughing offensive discharges, drowsiness, emaciation, chilliness with nausea and abdominal sensitiveness. The symptoms were aggravated after eating; in evening; after physical or mental exertion and ameliorated by lying down, and by rest [5-7].

### Pharmacological Activities

In a research study, Echinacea herb and root crude powder and its preparations were evaluated for their pharmacological effects murine macrophages and human peripheral blood mononuclear cells (PBMCs). Echinacea raw material as well as its commercially offering preparations was investigated for their anti-inflammatory, immunostimulatory and antioxidant effects [8-11].

### Antibacterial Activity of Echinacea

Different ethanolic concentrations of *E. angustifolia* and seven other plants were evaluated for their antibacterial potential against human four gram-negative pathogen including *Pseudomonas aeruginosa*, *Salmonella enteritidis*, *Klebsiella pneumoniae*, *Escherichia coli* and four gram-positive pathogen including methicillin resistant *Staphylococcus aureus* (MRSA), *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Streptococcus pyogenes*. Micro broth dilution method and standard well assay were used to evaluate extracts of 50, 70, and 90% ethanolic concentration of all medicinal plants. *E. angustifolia* did not expressed significant antibacterial potential as compare to other medicinal plants extracts [12, 13].

### Antioxidant Property of Echinacea

*In vitro* study results expressed that murine macrophage cytokine excretion were stimulated by crude powder of Echinacea herb and roots and human PBMCs proliferations were also significantly increased by crude powder of Echinacea herb and roots. Whereas Echinacea preparations were not exhibited immunostimulatory effects but show antioxidant and anti-inflammatory effects of variable grades [10, 14, 15].

In a comparative study, three species of Echinacea (*E. purpurea*, *E. angustifolia* and *E. pallida*) were evaluated for their specific chemical constituents by using electrospray mass spectrometric detectors and HPLC combined with ultraviolet absorbance along with antioxidant activity of their alcoholic extracts. The lipid peroxidation test and free radical scavenging test were displayed antioxidants effects of alcoholic extracts of three Echinacea species roots and leaves [16, 17].

In another study, three Echinacea species (*E. purpurea*, *E. angustifolia* and *E. pallida*) were evaluated for analysis of their phenolic compounds and radical scavenging activity. Cichoric acid, echinacoside, cynarin, caffeic acid, chlorogenic acid and caftaric acid were identified and quantified in Echinacea roots. Analytical results revealed that roots of *E. angustifolia* contains 10.49 mg/g, *E. pallida* have 17.83 mg/g and *E. purpurea* have 23.23 mg/g of phenolic compounds. Commercial herbal preparations of Echinacea displayed variable concentration of phenolic contents. DPPH (2, 2-diphenyl-1-picrylhydrazyl) reduction based

Spectrophotometric method was used to evaluate antioxidant potential of Echinacea methanolic extracts. Results revealed the highest antioxidant activity of pure echinacoside while lowest of caftaric acid. So, Echinacea roots were considered best source of natural antioxidants [18, 19].

By using a number of assays, evaluation of ethanolic extracts from some medicinal plants including *Glycyrrhiza lepidota* (roots), *E. angustifolia*, *Polygala senega*, *Arctostaphylos uva-ursi* (leaves) and two varieties of *Equisetum* spp. (aerial parts) were conducted for their antioxidant potential and free-radical scavenging capacity. Evaluated results expressed that extract from the leaves of *Arctostaphylos uva-ursi* show highest antioxidant potential as well as free radical-scavenging ability due to presence of polyphenolic constituents in extract [20, 21].

Echinacea (*E. angustifolia*, *E. pallida*, and *E. purpurea*) roots, after drying and freezing were used to make its methanolic extracts. These extracts were used to evaluate their antioxidant potential and free radical scavenging capacities. Significant results of all varieties of Echinacea expressed its antioxidant as well as free radical scavenging activity [22, 23].

### Anti-Inflammatory Effects of Echinacea

In a study, Echinacea polysaccharidic fraction (EPF) from roots *Echinacea angustifolia* was evaluated for its anti-inflammatory effects. After the 8 h of introduction of EPF (0.5 mg/kg I/V), carrageenan-induced edema started to reduce and almost inhibited. Croton oil induced ear edema of rat was inhibited after topical application of EPF. These resulted were evaluated by histological examination and peroxidase activity. It was concluded that *E. angustifolia* have anti-inflammatory potential due to its polysaccharide content [14, 20].

### Echinacea for Ailment of Upper Respiratory Tract

In a randomized, double-blind placebo-controlled study, Echinacea compound herbal tea was evaluated for its efficacy in severity and time duration of upper respiratory tract symptoms. The results of 90 days study on 95 subjects expressed that Echinacea Plus® tea reduce the severity of symptoms in short time as compared to placebo [24-26].

### Immune Modulatory Action of Echinacea

In an *in vivo* study, *E. angustifolia* and *Hydrastis canadensis* (golden seal) were evaluated for their effects on antigen-specific immunoglobulin G and M production. Antigen keyhole limpet hemocyanin (KLH) was injected in rats then treated with extracts of *E. angustifolia* and *Hydrastis canadensis* for 6 weeks. ELISA test was conducted for monitoring immunomodulatory potential of tested extracts after re-exposure to KLH. Significant results were expressed primary and secondary IgG response against antigen in group treated by Echinacea extract. Primary IgM response was increased in group treated by *Hydrastis canadensis*. So, it was concluded that tested plants have immunomodulatory potential [27, 28].

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### CONCLUSION

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It is concluded from above panoramic review that *E. angustifolia* is traditionally used for various ailments and pharmacologically contains antibacterial, antifungal, anti-inflammatory and antioxidant agents as well.

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