Echinacea purpurea

Family: Asteraceae

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Editor's note: *In observance of* HerbalGram*'s 40th anniversary, ABC has chosen* Echinacea purpurea *as the subject of this issue's Herb Profile. The flower of* E. purpurea *is featured in ABC's logo.*

INTRODUCTION

Echinacea purpurea is a member of the daisy (Asteraceae) family and the genus *Echinacea,* which typically is considered to include nine[1,2] or 10 species.[3] The standardized common name for this species is "*Echinacea purpurea*" according to the American Herbal Products Association's (AHPA's) *Herbs of Commerce*, 2nd ed.[4]; other common names are "eastern purple coneflower"[2,5] or "purple coneflower."[6] The genus *Echinacea* is endemic to North America, and *E. purpurea* is native to the Northeast, Southeast, and Midwest regions of the United States, with populations being most common in the Ozarks and along the Mississippi River and Ohio River valleys.[1]

Like all members of the genus, *E. purpurea* is a long-lived, herbaceous perennial. It has fibrous roots and grows from 60 to 180 cm (24–71 in) tall.[7] Throughout the late summer and fall, *E. purpurea* produces showy, composite "flowers," which actually are not flowers at all but head-type inflorescences composed of many small ray and disc flowers called florets.[1,8,9] The inflorescence resembles a cone, which

Echinacea purpurea
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explains the common name "coneflower." When Swedish botanist Carl Linnaeus (1707–1778) first described this species in *Species Plantarum* in 1753,[8] he placed it in the genus *Rudbeckia* and gave it the specific epithet *purpurea*, meaning "purple," due to the color of the ray florets of the inflorescence. German botanist Conrad Moench (1744–1805)[9] placed the species in a separate genus, *Echinacea*, due to the spiny nature of the head, specifically the central disc florets. *Echina-* is from the Greek ἐχῖνος, meaning "hedgehog," "sea urchin," or something similarly prickly or spiny.[10]

Echinacea purpurea and other species of the genus are important medicinal plants that Native Americans have used in the treatment of a wide variety of illnesses and health conditions.[11] While *E. angustifolia* has greater documented traditional use[12] and was used as early as the late 19th century by physicians of European descent,[13,14] *E. purpurea* is now the primary species of commerce[15] because it is cultivated more easily.[16] After only three years, roots of cultivated *E. purpurea* can be harvested at 1,200 pounds per acre.[14] Broad awareness of *E. purpurea*'s potent medicinal effects and later commercialization emerged in the mid- to late-20th century.[17] Historically wild-harvested, it now is cultivated widely outside its native range for the international natural products market. It typically is sold as a dietary supplement component in the United States and as an herbal drug for use in medicinal products in other countries. Generally promoted as an immune-supportive botanical, *E. purpurea* is sold in a wide variety of forms (e.g., tinctures, teas, capsules, and tablets).[18,19] While traditional use indicates preparations of *E. purpurea* root, in recent decades the flowers and other aerial parts of *E. purpurea* also have been shown to be pharmacologically active. Products containing only aerial parts or their fresh-pressed juice are available commercially, particularly in Europe, where many clinical trials have been conducted.[19,20]

Unlike other *Echinacea* species, the commercial supply of both *E. purpurea* flowering aerial parts and root is derived almost entirely from cultivation. According to an AHPA survey, during the five-year period from 2013 through 2017, the organization's member farms produced an annual average of about 174,781 lbs. (79,279 kg) of cultivated *E. purpurea* roots (dry weight) and 130,068 lbs. (58,998 kg) of aerial parts. A minor amount also was reported as wild collected in the same five-year period. In 2017, AHPA members also reported harvesting a total of 255,924 lbs. (116,085 kg) of fresh *E. purpurea* aerial parts and a total of 8,044 lbs. (3,649 kg) of fresh roots.[15] In North America, much of the supply originates from certified organic farms in the Pacific Northwest (British Columbia, Oregon, Washington) but also the Midwest (Michigan, Minnesota, Wisconsin) and East Coast region (Maine, New York, North Carolina, Vermont), among other states.[21] The commercial supply in Europe is obtained mainly from farms in Germany, but also France, Italy, the Netherlands, Spain, Switzerland, and Ukraine, among others (J. Brinckmann personal communication with A. Jenks, March 25, 2023).

Echinacea purpurea
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HISTORY AND CULTURAL SIGNIFICANCE

Many Native American groups have used *Echinacea* species (*E. angustifolia*, *E. pallida*, and *E. purpurea*) medicinally for centuries, predating European awareness of them,[11,12] but the earliest known documentation is by Europeans. Linnaeus first described *E. purpurea* in the mid-18th century,[8] but it had been brought into cultivation in Europe more than 50 years earlier by Virginian naturalist John Banister (1650–1692), according to English botanist William Townsend Aiton (1766–1849),[22] and possibly earlier. The first known record of the medicinal use of *E. purpurea* appears in 1762 and mentions its external use for saddle sores on horses.[18,23] Early European references also mention its reported ability to cure syphilis[24] and describe it as pungent,[25] aromatic, and carminative (flatulence-relieving).[26] However, the identity of the *Echinacea* species in these early references is debated.[18,27-29]

Native Americans are the primary sources of traditional knowledge of the medicinal uses of *Echinacea* species. The documented ethnobotanical history of *E. purpurea* is relatively sparse, and its traditional medicinal use by Native Americans is overshadowed by the greater volume of recorded uses of *E. angustifolia*.[12] The preponderance of literature regarding *E. angustifolia* continued through the mid-20th century.[17] Despite many documented Native American names for *E. angustifolia*,[11,18,30] there appear to be no known Indigenous names for *E. purpurea*. Nevertheless, the cultural significance of *Echinacea*, including *E. purpurea*, should not be underestimated. *Echinacea* is considered the most important and widely used medicinal plant in the Great Plains and Midwestern regions of the United States.[5,31] *Echinacea* roots dated from 1600 to 1800 were excavated from a Pawnee earthen lodge near Guide Rock, Nebraska.[32]

Explorers and settlers of the Great Plains encountered many groups of Native Americans who widely used *Echinacea* species and revered the plants for their ability to aid in the healing of many diseases. US government-sponsored explorers Meriwether Lewis (1774–1809) and William Clark (1770–1838) observed the use of *Echinacea* species in 1804 and 1805 during their travels through the region.[5]

As with most plants traditionally used as medicine by Native Americans, the healing power of *Echinacea* cannot be separated from its spiritual power. In some traditions, the "Spirit" initiates healing and, through the agency of the plant, can promote wellbeing and provide the power to heal. It is thus considered important to attend all harvesting, processing, and ingestion of *Echinacea* with decorum (i.e., ceremony and reverence) to render the plant most efficacious.[5,33]

Besides the relatively well-known *E. angustifolia*, the medicinal use of other *Echinacea* species is far less documented,[11,12] perhaps due to patterns of European settlement. *Echinacea angustifolia* is found from the Mississippi River to the Rocky Mountains, while the range of *E. purpurea* is primarily east of the Mississippi, along the Ohio River valley and Appalachia.[18] Therefore, due to earlier European settlement and displacement of Native Americans and the resultant loss of traditional knowledge, documented traditional medicinal uses of *E. purpurea* are extremely limited.[12]

Traditional use of *E. purpurea* by Native Americans is documented for only three groups: the Delaware, Choctaw, and Yuchi.[12] An elder of the Delaware tribe reported that *E. purpurea* was used medicinally and called "horse-hobble weed."[34,35] An infusion of the root was used to treat gonorrhea, and it was claimed that even difficult cases of venereal disease could be cured in seven days with this infusion. *Echinacea purpurea* also was reported to be taken with staghorn sumac (*Rhus typhina*, Anacardiaceae) for venereal disease, and that the afflicted individual should drink ample water and avoid eating greasy or sour foods. The Delaware elder also reported that the Yuchi used *E. purpurea* for gonorrhea,[34] but it is unclear if this was reported accurately.[5]

One of the earliest records of medicinal use of *E. purpurea* was by American physician and naturalist Gideon Lincecum (1793–1874), who lived in Mississippi and Georgia between 1818 and 1848.[18] He recorded his observations of many medicinal plants and their uses and made herbarium specimens of his collections.[36] One of these was *E. purpurea* root and its use by the Choctaw.[37] After observing the Choctaw chew the root and swallow the resultant saliva over extended periods of time (it is a potent sialagogue, causing profuse salivation) to treat cough and dyspepsia, Lincecum later reported that a tincture of the root was effective for treating those same symptoms.[33,37] Even so, this went widely unnoticed by the settlers and others of European descent in the Great Plains and the Midwest, and because they were largely unaware of *E. purpurea*, they did not begin to use it widely for its medicinal and health benefits until the late 19th century.

Around 1871, a German patent medicine salesman, H.C.F. Meyer, from Pawnee City, Nebraska, began popularizing *Echinacea*.[5,11] In 1885, Meyer reportedly sent samples to Lloyd Brothers, Pharmacists Inc., who identified the samples as *E. angustifolia* in 1886.[18,38] *Echinacea angustifolia* was introduced to the medical profession in 1887,[39] after John Uri Lloyd (1849–1936) sent some preparations of it to the well-known Eclectic physician John King (1813–1893). Although King had previously noted the medicinal value of *E. purpurea* (then called *Rudbeckia purpurea*) for syphilis,[40] it was not until his endorsement of *E. angustifolia*[41] that the Eclectics and other physicians began to use *Echinacea*.[11,18,33]

Through the Eclectics' adoption and medicinal use of *E. angustifolia*, its popularity spread, and it came to be known outside of Native American healing traditions. In 1916, it was included in the fourth edition of the *United States National Formulary* (NF).[42] Homeopathic doctors also had begun using *E. angustifolia* and introduced its medicinal use to Europe.[43,44] German medical journals began reporting on its medicinal value,[45] and due to a scarcity of the herb,

German physician Gerhard Madaus (1890–1942) traveled to the United States to bring back plant material to cultivate. He was unable to obtain cuttings from any botanical gardens and instead purchased seeds from Vaughan's Seed Store in Chicago. Upon his return to Germany and the germination of the seeds, it was discovered that he had brought back *E. purpurea* seeds, not *E. angustifolia* seeds as intended. However, this proved fortuitous because *E. purpurea* was easier to cultivate, and as a result, by the 1930s, studies on *E. purpurea* were being conducted in Germany.[18]

By 1938, the first known commercial *E. purpurea* product was on the market in Germany, produced by the firm Madaus AG and named Echinacin®. Instead of using the roots (the part traditionally used in North America), this product contained only the flowering aerial portions of the plant, expressed as a juice and stabilized with alcohol. A flurry of research on Echinacin and other preparations containing *E. purpurea* aerial parts commenced. These products included injectable and topical preparations, in addition to ingestible products. From the 1930s to the present, research on *E. purpurea* has continued in Germany, and hundreds of studies have been published.[18]

By 1984, Echinacin was sold in the United States, and thereafter products containing *Echinacea* roots and aerial parts were available internationally.[18,29] This use is reflected by the inclusion of both aerial parts and roots of *E. purpurea* in both the *European Pharmacopoeia* (PhEur)[46,47] and the *United States Pharmacopeia* (USP).[48,49] It should be noted that before the late 1980s, the identification of *Echinacea* used in European research should be questioned due to adulteration and frequent misidentification at the species level (i.e., *E. angustifolia* was probably *E. pallida*).[50]

Today, Native Americans continue to use *E. purpurea*, which has also been widely adopted by Western medicine and incorporated into many other traditional systems of healing on a global scale.

CURRENT AUTHORIZED USES IN COSMETICS, FOODS, AND MEDICINES

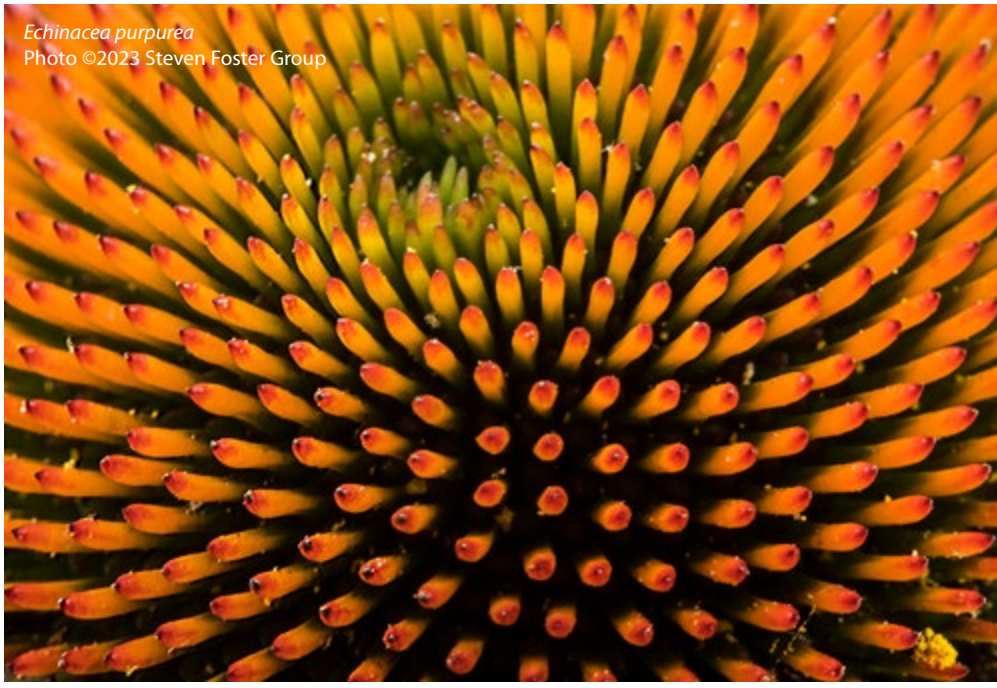
Although *Echinacea* root (rhizome and root of *E. angustifolia* and/or *E. pallida*) was an official drug monographed in the NF of the United States from the fourth edition (NF IV 1916)[42] until its omission from the ninth edition (NF IX 1950),[51] the official compendial history of *E. purpurea* did not begin until the late 20th century.

In March 1989, the Commission E of the German Federal Health Agency (BGA) published a labeling standard monograph for authorized medicines containing preparations of the fresh pressed juice (liquid or dried juice) of the flowering aerial parts of *E. purpurea*. It was indicated for internal use as a "Supportive therapy for colds and chronic infections of the respiratory tract and lower urinary tract, and topical application for treatment of poorly healing wounds and chronic ulcerations."[52]

In June 1997, Canada's Therapeutic Products Directorate (TPD) published an "Echinacea Root" labeling standard monograph, applicable to licensed medicines containing rhizome or root of *E. angustifolia*, *E. pallida*, and/or *E. purpurea* as an active ingredient, in dosage forms of herbal tea infusion or decoction, fluidextract (1:1) or tincture (1:5), powder or extract, in capsules or tablets. The permissible indications were "For relief of sore throat due to cold" or "For the symptomatic relief of mild skin conditions and eruptions."[53]

WHO Monographs on Selected Medicinal Plants, Volume I (World Health Organization, 1999), includes a monograph for *E. purpurea* flowering aerial parts. This monograph could be used as the basis of a quality specification and provides descriptions, tests, and limits for determining the botanical identity, composition and content, and purity of the raw material to be prepared as expressed juice or semi-solid preparations containing at least 15% pressed juice. The WHO's *Echinacea* root monograph, however, did not include *E. purpurea*.[54]

With the passage of Canada's Natural Health Products Regulations of 2003, pre-marketing authorization and labeling of traditional herbal medicinal products (THMPs) transferred from Health Canada's TPD to the new Natural Health Products Directorate (NHPD), which published a revised *Echinacea* labeling standard monograph in 2004.[55] In 2018, the current, revised version of the monograph was published by the Natural and Non-prescription Health



Echinacea purpurea
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Products Directorate (NNHPD), to which the NHPD was renamed. The NNHPD *Echinacea purpurea* monograph is a guide for the preparation of product license applications and labels for market authorization. The monograph includes the flowering tops in dried or juice form, as well as the dried root and/or dried root and herb tops prepared in non-standardized dosage forms, specifically dry extract, fluidextract or tincture, herbal tea decoction or infusion, or powder.

Acceptable indications for use of licensed *E. purpurea* natural health products (NHPs) in Canada include "Traditionally used in Herbal Medicine to help relieve cold symptoms," "Traditionally used in Herbal Medicine to help relieve symptoms of upper respiratory tract infections," "(Traditionally) used in Herbal Medicine to help fight off infections, especially of the upper respiratory tract," "Supportive therapy in the treatment of upper respiratory tract infections (e.g., common colds)," "Helps to relieve the symptoms and shorten the duration of upper respiratory tract infections," and "Traditionally used in Herbal Medicine to help relieve symptoms of colds and upper respiratory tract infections."[56]

A quality standard monograph for *E. purpurea* root entered the 26th revision of the USP (USP 26) in 2003[49] and another for *E. purpurea* aerial parts entered the 29th revision (USP 29) in 2006.[48] Monographs also were developed for processed forms such as powder and dry extract, as well as the dosage forms of capsules and tablets. Also in 2006, quality standard monographs for both "Purple Coneflower Herb" (Echinaceae purpureae herba) and "Purple Coneflower Root" (Echinaceae purpureae radix) entered the sixth supplement to the fifth edition of the PhEur (PhEur 5.6).[57] These monographs served as the basis for quality specifications of *E. purpurea* starting materials that are to be prepared as active ingredients of herbal medicinal products for marketing in the European Union (EU).

In 2008, the European Medicines Agency (EMA) published a labeling standard monograph for "fresh purple coneflower" aerial parts for preparation as expressed juice or dried expressed juice. In 2015, a revised final monograph superseded that monograph. If used as the active ingredient of a licensed well-established-use herbal medicinal product (WEU-HMP), the permitted indication for oral use is "For the short-term prevention and treatment of common cold." If used as an active ingredient of a registered THMP, the permitted indication for topical use is "For treatment of small superficial wounds."[58]

The EMA's first labeling standard monograph for purple coneflower root was published in 2011 and was superseded by a revised final monograph in 2017. The permitted indications are "THMP for the relief of symptoms of the common cold" (for oral use) and "THMP for the relief of spots and pimples due to mild acne" (for topical use).[59] Two new quality standard monographs entered the 11th edition of the PhEur (PhEur 11.0) in 2022: "Purple coneflower herb expressed juice, stabilised with ethanol" and "Purple coneflower herb expressed juice, stabilised without ethanol."[6]

For use in cosmetic products in the EU, both Echinacea Purpurea Root Extract and Echinacea Purpurea (whole plant) Extract are permitted for moisturizing, skin conditioning, and tonic functions. Echinacea Purpurea Leaf and Root Extract is permitted as an ingredient of cosmetic products for skin-conditioning function, and Echinacea Purpurea Root Water (aqueous solution of the steam distillate obtained from the roots) is permitted for both "skin conditioning — humectant" (increasing the water content of the top layers of the skin) and "skin conditioning — miscellaneous" (enhancing the appearance of dry and/or damaged skin by reducing flaking and restoring suppleness) functions. Echinacea Purpurea Flower/Leaf/Stem (expressed) Juice is permitted for oral care (providing cosmetic effects to the oral cavity [e.g., cleansing, deodorizing, protecting]) function, and Echinacea Purpurea Flower/Leaf/Stem Water (aqueous solution of the steam distillate) is permitted for both fragrance and skin-conditioning functions.[60]

MODERN RESEARCH

Constituents and Pharmacological Effects

The phytochemical constituents and pharmacological effects of both the aerial parts and root of *E. purpurea* are well-researched. The aerial parts contain alkylamides (isobutylamides), caffeic acid derivatives (mostly cichoric acid and caftaric acid), flavonoids, and polysaccharides.[61,62] Roots also contain caffeic acid derivatives (cichoric acid and caftaric acid) and alkylamides (isobutylamides), which are found in higher concentration in the roots[63] compared to the aerial parts. Other constituents in the roots are glycoproteins and polysaccharides.[64] Preparations of *E. purpurea* aerial parts and roots have demonstrated anti-inflammatory,[65,66] antimicrobial,[67,68] antiviral,[69-71] and immunomodulatory properties.[63,72,73] Alkylamides have the ability to bind to cannabinoid receptors,[74] which may explain some therapeutic effects of *E. purpurea*, such as its immunomodulatory properties.[62]

In an animal allergic inflammation model, an *E. purpurea* aerial extract complex demonstrated anti-inflammatory activities. A significant decrease was reported in specific airway resistance in vivo and lower histamine concentrations in vitro.[65] An ethanolic *E. purpurea* root extract and high-alkylamide-containing fractions were evaluated and reported to inhibit both mast cell degranulation (inflammatory cellular tissue response) and calcium influx.[66]

A 65% ethanolic extract of freshly harvested aerial parts with 5% of roots of *E. purpurea* (Echinaforce®; A. Vogel AG; Roggwil, Switzerland) was evaluated for antibacterial (bactericidal) and anti-inflammatory activity via cytokine pathway, with a focus on bronchial epithelial cell cultures and cytokine pro-inflammatory infection responses. Echinaforce inactivated the respiratory bacteria *Streptococcus pyogenes*, *Haemophilus influenzae*, and *Legionella pneumophila*. Less sensitive bacteria in the study included both *Staphylococcus aureus* and *Mycobacterium smegmatis*. Echinaforce inhibited pro-inflammatory

cytokine secretion of interleukin-6 (IL-6) and interleukin-8 (IL-8) in the respiratory bacterial models of *S. pyogenes*, *S. aureus*, *H. influenzae*, and *L. pneumophila*.[67] Additionally, Echinaforce had a normalizing effect on the pro-inflammatory cytokine response of IL-6 and IL-8 in a similar cytokine model specific to skin fibroblasts and the bacterium *Propionibacterium acnes*.[68]

Echinaforce also showed antiviral activity against influenza viral strains in cell culture assays[69] and demonstrated antiviral activity against viruses with membranes.[75] More recently, an in vitro study using Echinaforce also showed antiviral activity against four human coronaviruses (HCoV-229E, SARS-CoV-1, SARS-CoV-2, and MERS-CoV).[70,71]

In a stress-induced immunosuppression model in BALB/c mice, *E. purpurea* (pressed juice powder) demonstrated immune supportive properties, with an increase of NK cell activity and regulation of T lymphocyte subsets (CD^{4+} and CD^{8+} lymphocytes) and cytokine levels.[70,73] In a mouse influenza model, an *E. purpurea* aerial (polysaccharide) extract demonstrated immunomodulatory effects through cytokine modulation in echinacea-treated mice, with a decrease in interleukin-10 (IL-10) and IFN-γ cytokines.[72]

Toxicity

Echinacea purpurea preparations generally are considered to be well-tolerated in humans.[76] In clinical studies of mono-preparations of *Echinacea* species (*E. purpurea*, *E. angustifolia*), adverse events have been reported to be typically mild to moderate.[76]

Authoritative references include contraindications, such as that both internal and external uses of *E. purpurea* are cautioned in individuals with hypersensitivity to plants in the Asteraceae family. Individuals with autoimmune or other immune system disorders also are cautioned against *E. purpurea* use,[61,64] and atopic individuals should consult with their health care practitioner before using echinacea-containing products.[61]

Human Clinical Studies

Multiple meta-analyses and reviews have assessed the efficacy and safety profile of *Echinacea* species in the prevention and/or treatment of symptoms related to the common cold and respiratory tract infections (RTIs).[77-81] These reviews primarily evaluated *E. purpurea* and *E. angustifolia*. However, these meta-analyses and clinical studies used products made from various plant parts (e.g., aerial parts and/or roots) and different herbal extract preparation methods, leading to different phytochemical compositions.[82] Despite these limitations, a 2007 meta-analysis concluded that supplementation with *Echinacea* species lowered the onset of the common cold by 58% and decreased the cold duration time by one to four days.[78] A separate meta-analysis published in 2015 found the risk of recurrent common colds and RTIs decreased with the use of *Echinacea* compared to placebo, and ethanolic extracts appeared to demonstrate better effects.[80] *Echinacea* also demonstrated effectiveness in prevention of and supportive treatment for common cold infections, according to a 2021 review article.[70]

Clinical research performed in the past decade specifically with Echinaforce has provided more data on *E. purpurea*'s role in the prevention and treatment of RTIs.[83] Large clinical trials have showed significant benefits, with the reduction of episodes of the common cold and participants reporting less associated co-medication use.[84] Echinaforce in the form of a hot drink in combination with European elder berry (*Sambucus nigra*, Viburnaceae) was reported to be as effective as oseltamivir (Tamiflu®; Roche; Switzerland) with early treatment of influenza symptoms and demonstrated a better safety profile.[85]

Other *Echinacea* studies have focused on inflammatory dermatological conditions such as atopic dermatitis (a type of eczema). A clinical study of people with eczema demonstrated that a topical *E. purpurea* root extract (CO_2-extraction) water-in-oil (W/O) emulsion improved skin symptoms and improved epidermal lipid skin barrier function.[86]

Echinacea purpurea
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ADULTERATION AND SUBSTITUTION

Current quality standard monographs in the USP 45[87] for *E. purpurea* aerial parts and *E. purpurea* roots provide a thin-layer chromatography (TLC) identification method, with the presence of cichoric acid and the absence of echinacoside as indicators. A quality standard monograph in the current PhEur 11.0[6] for "Purple coneflower root" provides identification methods to differentiate *E. purpurea* root from the roots of other *Echinacea* species as well as the known historical adulterant *Parthenium integrifolium*, also in the Asteraceae family. The American Herbal Pharmacopoeia's *E. purpurea* root monograph[28] reviewed macroscopic and microscopic diagnostic differences between commercial *Echinacea* species and *P. integrifolium*. According to Steven Foster's article "A Brief History of Adulteration of Herbs, Spices, and Botanical Drugs," in *HerbalGram* issue 92, the adulteration of *Echinacea* with *P. integrifolium* has been documented since the early 1900s, during the Eclectic medical era.[88]

Today, *E. purpurea* is not a commonly adulterated species,[29] as most of the commercial supply of both *E. purpurea* flowering aerial parts and root is primarily cultivated. However, Gafner et al (2023),[89] in a review article published in the *Journal of Natural Products*, noted that whole extract preparations from both the herb and root may be adulterated by diluting the ingredients with substantial amounts of undisclosed excipients.[89]

SUSTAINABILITY AND FUTURE OUTLOOK

Echinacea purpurea is not subject to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)[90] and not listed in Canada's Species at Risk Act[91] or the US Endangered Species Act.[92] It also has not been assessed according to International Union for Conservation of Nature (IUCN) Red List categories and criteria. At the US state level, *E. purpurea* has a state-protected status of "endangered" in Florida and "probably extirpated" in Michigan.[93] The nonprofit organization NatureServe, a source for North American biodiversity data, assessed and ranked the conservation status of *E. purpurea* in the United States at N4 ("Apparently Secure — At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors"). The NatureServe ranking of *E. purpurea* in Canada is NNA ("Not Applicable — A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities").[94] Another non-profit organization, the United Plant Savers (UpS), lists "Echinacea — *Echinacea* spp." as at-risk. Using its At-Risk Assessment Tool, UpS assigned an overall at-risk score of 44 (out of 80).[95] However, Castle et al (2014) wrote that UpS' score of 44 was limited to only *E. angustifolia* and that the ranking was not meant for all *Echinacea* species collectively.[96]

Although *E. purpurea* is a native North American species, commercial cultivation began in Germany in the 1930s.[29] Large-scale commercial cultivation did not begin in the United States until the 1980s. Today, the commercial supply of *E. purpurea* aerial parts and root is almost entirely produced from cultivation, while wild collection of *E. angustifolia* continues to some extent.[15] Commercial cultivation of *E. purpurea* occurs not only in its native Canada and the United States, but also in parts of Latin America (Argentina, Chile, Costa Rica, Mexico), Europe (Bulgaria, Finland, France, Germany, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Romania, Russia, Spain, Switzerland, Ukraine), Africa (Egypt, South Africa), and Asia (China, India, Iran, Israel) — much of it produced according to sustainable production methods and organic cultivation.[21,97] There are also Fair for Life (a standard for Fair Trade and responsible supply chains) certified growers of *E. purpurea* in France and South Africa[98] and FLOCERT Fairtrade certified growers in Egypt.[99]

The fact that commercial cultivation of *E. purpurea* has scaled up on nearly every continent coupled with the NatureServe assessment (that its wild populations in the United States are "apparently secure") indicate a relatively low risk for industry to access sufficient raw materials. While the current scenario for access to *E. purpurea* raw materials appears stable, experts have recommended evaluating crop adaptation to climate change, the impact of climate change on secondary metabolites, and genetic diversity status.[100] HG

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