Medicinal Herb Production Guide

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Narrow Leaf Purple Coneflower (*Echinacea angustifolia DC.)*

Introduction

Botanical Information

Echinacea angustifolia DC. is an herbaceous perennial and a member of the Asteraceae family. Commonly called narrow leaf purple coneflower, it has a natural range in North America that includes most of the mid-western states east of the Rocky Mountains. *E. angustifolia* grows at a rate of six to eight inches a year to a mature height of twelve to twenty-eight inches. The leaves are lanceolate to linear-lanceolate, and the flowers are cone-shaped disks with purple, pale pink, or rarely white spreading ray flowers. The plant has one or more stems that are mostly unbranched, and flowers bloom from June to July. The taproot of cultivated *E. angustifolia* is harvested three-to-four years after planting from seed. It is the root that is believed to contain most of the plant's medicinal value, although the herb is also used.

Bioactive Components

The main bioactive components of *E. angustifolia* are flavonoids, such as echinacoside and cynarin, alkylamides such as dodeca-2E,4E-8Z, tetracetyl isobutylamide, and caffeic acid derivatives. Of the three Echinacea species used for medicinal purposes (*E. purpurea, E. angustifolia, and E. pallida*), *E. angustifolia* is regarded as the most chemically active possessing antibacterial, antiviral, and antifungal properties.

Uses and Treatments

E. angustifolia has a long tradition of use among the native people of North America. It continues to be the most widely used herbal remedy in native cultures. In modern cultures of North America and Europe, *E. angustifolia* is primarily used in medicines believed to stimulate the immune system. Table 1 summarizes *E. angustifolia*'s uses.

Table 1. Modern and traditional uses of echinacea angustifolia.

Modern Uses	***Traditional/Folk Uses***
- Stimulate the immune system	*- Blood poisoning*
- Antibacterial agent	*- Fevers*
	- Acne
	- Infections and sores

Cultivation Practices

Site Selection

E. angustifolia can be grown almost anywhere within the temperate zones and is quite cold hardy. It prefers a well-drained alkaline soil in a sunny location. Recommendations for pH range from 6.5 to 7.5. *E. angustifolia* can tolerate hot and dry conditions but extensive drought can reduce size and yields. Raised beds are highly recommended, especially for moist or clay soils. Poorly drained soils should be avoided. *E. angustifolia* is known to be a much harder and slower grower than *E. purpurea* and *E. pallida*.

Planting

Propagation of *E. angustifolia* can be from direct seed or transplants. Seed germination can be slow, often yielding only 50% germination rates. This makes direct seeding inappropriate, even if high plant stands are desired. Johnny's Selected Seed Co., Winslow, Maine, recommends the following guidelines for starting seeds indoors to produce transplants: *E. angustifolia* requires light as well as cold stratification (pre-chilling) for seed germination. Using deep containers to allow for good root development, fill with a prepared soil mix, and plant seeds in flats or pots, barely covering the seed with soil. Moisten, cover, and refrigerate at 40-50^{0}F for one month. (*E. angustifolia* requires *at least* twenty-one days of cold stratification to germinate.) After stratifying, expose flats or pots to warmer temperatures (68^0-77^{0}F) to allow for emergence of the seedlings. Germination generally occurs ten to twenty days after seeds are exposed to warm temperatures.

When plants are several inches tall (usually eight to twelve weeks after germination), transplant seedlings in well-prepared, permanent, planting beds, during late spring or early summer. Space plants eight to fifteen inches apart, making rows eighteen to thirty inches apart. Weed control is very important, as *Echinacea angustifolia* grows very slowly and does not compete well with weeds. Plants will benefit from the use of mulch.

Seeds can be sown directly in the ground in fall or early spring, but a fine seedbed needs to be prepared. Plant seeds just under the soil surface spacing them two inches apart. Keep bed moist and weed-free. When seedlings emerge (at least twenty-one days), thin to the recommended spacing mentioned above. Weed control is critical during the first two years of growth.

The challenge to medicinal herb growers is finding a consistent source of seed true to the particular species, since Echinacea can cross-pollinate easily. Growers should buy from a reliable seed source that specializes in selling seed for the medicinal herb industry.

Insects and Diseases

Diseases that affect echinacea include the leaf spots *Cercospora rudbeckii* and *Septoria lepachydis*. A root rot, *Phymatotrichum omnivorum*, has also been identified. Another disease called "aster yellows disease" is a virus that is transmitted by a leafhopper feeding on echinacea. Other insects that feed on echinacea include Japanese beetles and thrips.

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Harvesting, Cleaning, and Drying

Echinacea root is harvested in the fall after the plant has gone dormant, usually the second to fourth growing season, depending on which planting method is used - direct seeding or transplanting. A spading fork or other digging tool can be used to harvest very small plantings. Harvesting large plantings will require some mechanized digger to undercut the roots and bring them to the soil surface, such as a modified potato digger. As roots are dug out of the planting beds, be careful to not damage or break the taproot. Shake the roots free of dirt and carefully sort out any roots that are not echinacea. Keep the roots in the shade until harvesting is complete. When ready for processing, it is recommended to wash echinacea roots with a high-pressure water hose or a drum-style root washer. Richo Cech, author of *Growing At-Risk Medicinal Herbs*, recommends processing the echinacea as soon as possible after washing to minimize oxidation.

If the roots are not processed fresh, they should be dried immediately. *E. angustifolia* roots need low heat and high airflow to dry properly. Special driers can be built for drying herbs and roots. Tobacco kilns can easily be modified for that purpose. If a drier is not available, a greenhouse or rooms in a barn can be modified for drying. The roots should be spread on non-aluminum screens and arranged so that air circulates freely. According to Cech, "Dry for one day at 70^0F, then turn the temperature up to 110^0F, drying the roots until they snap." Cech recommends, "storing the dried root in light-proof sacks or drums and in a cool, dark, and dry location for up to one year." Yield estimates after three growing seasons average 1125 pounds of dried root per acre.

Marketing and Economics

Annual Consumption and Dollar Value

In 1997, about 55,000 pounds of *E. angustifolia* were sold on world markets. Consumption increased to almost 241,000 pounds in 2001. The dollar value of consumption in 2001 was almost $3.8 million, which was 20.6% higher than year 2000.

Supply and Demand

E. angustifolia is traded at a higher price than the two more common species used as medicinals, *E. purpurea and E. pallida*. Most of *E. angustifolia* on the market is wild-harvested, and populations are declining. Demand for cultivated *E. angustifolia* will depend on whether it has the same bioactive content as wild harvested material. Improper harvest and storage protocols, particularly in the case of wild harvested material, greatly diminish its bioactive content.

Pricing

During 2001, the price of cultivated *E. angustifolia* traded in the range of $14-$16 per pound of dried root, which is 15% to 20% lower than high-quality, wild harvested material. In 2002, prices stabilized to a moderate-to-high price band ($16-$20 per pound of dried root). High-quality, wild harvested product still trades in a higher, but more erratic, price range due to

the low volumes of available product and inconsistent harvest cycles. Many medium-to-large buyers are not interested in paying a premium price for this material as it compares to *E. purpurea*, since many do not differentiate the species from the genus in the advertising of their Echinacea products. However, a few, relatively large buyers, are trying to build product differentiation by endorsing *E. angustifolia* as superior to *E. purpurea*. Buyers who are willing to pay a premium price for echinacoside content require levels testing between 1.8% and 2.8% echinacosides.

Distribution Channels

Suppliers of wild harvested material are located throughout the plant's natural range, particularly in the mid-western United States. A small quantity of wild product also emanates from Canada. Cultivation is currently occurring in the United States, Canada, Australia, New Zealand, Chile and Costa Rica. Some growers have become integrated with larger producers, but many small growers and gatherers are still moving material through brokers and specialized sourcing companies.

Commercial Visibility

Echinacea has a worldwide customer base consisting of large, medium, and small processors. Of the top nutraceutical/botanical companies in North America and Europe, 25% offer *E. angustifolia* as a stand-alone product and 51% offer this material as either a stand-alone product or as part of a multi-ingredient supplement.

Conclusion

E. angustifolia will grow under normal row crop procedures provided soil conditions are adequate. However, seed costs are very high in relation to other botanicals. A great deal of skill is required to successfully cultivate *E. angustifolia*, as it is more difficult to grow than the two other Echinacea species also grown as medicinals. If growing conditions are not ideal for the production of high bioactives, the market value of the crop will be adversely affected. Weed control is a major issue when cultivating any strain of Echinacea, but particularly for *E. angustifolia*. Poor weed control will lead to a significant reduction in yields.

Overharvesting in several western states has led to bans and severe restrictions on the collection of natural *E. angustifolia* populations. According to ATTRA (Appropriate Technology Transfer for Rural Areas), national sustainable agriculture information service, in many states, conservation measures have been passed to protect native populations of the Echinacea species.

E. angustifolia continues to gain market share in European and Asian markets as manufacturers add it to their product lines. It trades at a substantial premium to *E. purpurea*. Customer requirements and expectations for a threshold level of bioactives are vital to this material's viability as a candidate for cultivation.

This Medicinal Herb Production Guide includes excerpts from, Analysis of the economic viability of cultivating selected botanicals in North Carolina. Strategic Reports. 2002.

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