

Growing *Echinacea*



Everyone is talking about *Echinacea*! More than 7 million Americans are using it to boost their immune systems. Retail sales of *Echinacea* in 1997 in the U.S. totaled \$4,000,000. In 1998, large pharmaceutical companies entered the *Echinacea* market. Wild species are being, and have been, over harvested. In northeastern Montana alone, an estimated 100,000 pounds of wet *Echinacea angustifolia* roots (approximately 700,000 plants) were harvested and sold to out-of-state manufacturers this past year. Fortunately, *Echinacea* is relatively easy to cultivate and commercial growers are beginning its production.

We have a lot to learn about the optimum growing, harvesting, quality control, and storage techniques for *Echinacea*. Researchers are studying such things as:

- when is the best phenological point at which to harvest *Echinacea*;
- what methods of watering and fertilizing enhance concentrations of the active constituents;
- what parts of the plant are these constituents highest in;
- what is the difference among species when comparing their levels of active constituents;
- how do cultural techniques affect these differences?

This paper summarizes *Echinacea* production techniques relevant to Montana.

The genus *Echinacea* (*Asteraceae*) includes nine species that are indigenous to North America. Three species - *E. angustifolia*, *E. purpurea*, and *E. pallida* - are traded on herbal markets with *E. angustifolia* and *E. purpurea* as the star performers (there is less demand for *E. pallida*). The marketed plant parts include wet and dry roots, leaves, and flowers. In general, roots are the most sought after. Flowers, rather than leaves, usually contain greater quantities of medicinally-active ingredients.

Echinacea angustifolia grows to 30 inches in height (shorter in drier locations). It is a taprooted perennial found on open, dry prairies in Minnesota, Kansas, Nebraska, Iowa, Oklahoma, Texas, Wyoming, the Dakotas, eastern Montana, eastern Colorado, and parts of Canada.

E. purpurea is native to the Midwestern U.S., but has been cultivated as an ornamental throughout the United States. It grows from two to five feet in height, and has a more fibrous root. *E. purpurea* occurs in open, moist woods, and in meadows and prairies. It is more robust than *E. angustifolia* with markedly longer rays on the flowers. It's also the most widely distributed and adapted species.

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MOISTURE REQUIREMENTS: *Echinacea* is known to be exceptionally drought tolerant. In many production areas, ambient rainfall may be sufficient after the establishment year. *Echinacea* thrives where annual precipitation is from 12 inches to 32 inches per year. *E. purpurea* thrives in the higher precipitation zones and responds well to added irrigation (it has not yet been determined whether increases in above and below ground biomass due to added water results in diminished medicinal constituents). *Echinacea angustifolia* usually responds negatively to excess irrigation. The

soil surface around plants should be dry before water is added. Irrigation depends upon local conditions. For optimum growth, *E. angustifolia* may require added irrigation during the growing season in areas with less than 20 inches annual precipitation - especially during extended hot, dry spells. *Echinacea purpurea* requires regular irrigation for best production. Drip irrigation systems are best, especially for *E. angustifolia*, but overhead sprinkler irrigation can also be used as long as over watering is avoided. In some instances, once seedlings are established the second year, irrigation may not be necessary.

LIGHT REQUIREMENT: Full sun. *E. purpurea* tolerates some shade but will grow taller and lankier as a result.

SOIL PREFERENCE: *E. angustifolia* and *E. pallida* do best with good drainage in light- textured or gravelly, clay -type soil. *E. angustifolia* will not tolerate wet feet, and does best at an alkaline pH (will tolerate highly-alkaline soil). *E. pallida* and *E. purpurea* tolerate somewhat acid soil (down to 5.5 pH), but prefer a higher pH (up to 7.5). *E. purpurea* is adaptable to most soil types but prefers a sandy loam and a pH near 7.0. All species do well in raised beds due to enhanced drainage and aeration.

Echinacea species usually grow on relatively poor soil without fertilizer. Nutrient requirements have not yet been established, but most reports indicate that *E. purpurea* responds to nitrogen fertilization more aggressively than does *E. angustifolia*. However, high nitrogen fertilizer is not recommended, especially when growing *Echinacea* for root harvest. There are reports that excessive nitrogen fertilization results in a weakened root system.

WEED CONTROL: Development of first-year *Echinacea* plants can be slow except *E. purpurea*, which often flowers the first year if started early enough in a greenhouse and transplanted into the field. Peak vegetative growth of first-year seedlings is attained six to ten weeks after germination. First-year seedlings are unable to compete with weeds, so keep them weed free the first year. Cultivation or mulching is suggested. Straw, bark or plastic mulches can be used for weed control and for moisture management. *Echinacea angustifolia* does better with plastic rather

than organic mulches. Organic mulches can hold too much water at the crown, which results in poor root development.

DISEASES: Very few disease problems exist, but the following have been reported:

- Fungal Leafspot - *Cerospora rudebeckii* and *Septoria lepachydis*
- Fungal Root Rot - *Phymatotrichum omnivorum*

Several viral pathogens have also been reported, including cucumber and bean mosaics and broad beanwilt virus. Aster Yellows has been observed on *Echinacea* in western Montana. This is caused by a mycoplasma-like organism (phytoplasma) which overwinters in perennial weeds and is spread by leafhoppers.

PESTS: No major pests have been reported. Minor pests include leafhoppers, gophers, grasshoppers, and a nematode (*Pratylenchus penetrans*).

THINNING/SPACING: Depending upon soil quality, spacing can be as little as six inches per plant for *E. angustifolia* and up to 18 inches per plant for *E. purpurea*. Most growers recommend 12 inches between plants within rows, and two feet between rows. Larger spacing between plants might help prevent fungal leafspot and root rot diseases.

PLANTING: Both growers and researchers report poor stand establishment using field-sown seeds. Establishment of transplants has been very successful, especially with *E. purpurea*. It is recommended that seeds be started in containers in a greenhouse, or other protected structure, and then transplanted to the field. Pre-germination treatments are recommended. Store dried seed for several weeks before initiating pre-germination techniques (unless you purchase seed that has already experienced this after-ripening period). *Echinacea purpurea* germinates easily, but germination rates are improved by giving seeds a one-to-four week cold, moist stratification in peat moss or sand at 32°F. to 41°F. *Echinacea angustifolia* prefers a longer, cold, moist stratification period (three weeks to 12 weeks). There are reports that seed treatment with Ethephon (a synthetic form of the growth regulator ethylene), may increase

E. angustifolia seed germination. Some researchers report a response to light quantity and quality. Therefore, cover *Echinacea* seeds lightly, if at all, during germination. Germinate at 65°F. to 79°F., and transplant within 20 days to 30 days after sowing seed. Do not let *E. angustifolia* get past the first true leaf stage before transplanting. Their deep taproot is established early and is difficult to transplant. Sow seed in January or February to ensure well-rooted transplants by May or June, *Echinacea angustifolia* has a lower germination rate, and seedlings grow much more slowly than *E. purpurea* seedlings. Using pre-germination techniques, a germination rate of 60% to 80% can be achieved consistently. However, it is advisable to do a pre-sowing germination test on each batch of seeds in order to predict what the germination rate will be. Poor germination rate may be due to aborted embryos (dead seed). Pre-sowing tests will help you establish a seedling rate if you direct sow into containers. Some growers sow pre-germinated seed only.

One pound of *E. angustifolia* contains about 128,000 to 145,000 seeds. One pound of *E. purpurea* contains about 90,000 to 128,000 seeds. Field seeding rates have not been determined and depend on the percentage of viable seed in each seed batch. The average 1998-1999 seed cost per pound is \$28.00 to \$35.00 for *E. purpurea* and \$75.00 for one-quarter pound of *E. angustifolia*. Organically-grown seed is more costly.

Seed Sources:

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| Abundant Life Seed Foundation P.O. Box 772 Port Townsend WA 98368 | Alpains 32315 Pine Crest Court, Box 489 Kiowa Co 80117 | Beauty Beyond Belief 1730 S. College Ave. #104 Fort Collins CO 80525 |
| Glenwale Naturals 540 White Birch Lane Kalispell MT 59901 406-752-1141 | High Altitude Gardens P.O. Box 1048 Haily ID 83333 | Johnny's Selected Seed 1 Foss Hill Road RR1, Box 2588 Albion ME 04910-9731 800-457-4290 |

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| Richters Herbs Goodwood, Ontario, Canada LOC-IAO | Wildseed Farms P.O. Box 3000 Fredericksburg TX 78624-3000 | Prairie Moon Nursery Route 2, Box 373 Jefferson City MO 65109 |
| Western Native Seed Box 1463 Salida CO 81201 719-539-1071 | Horizon Herbs P.O. Box 69 Williams OR 97544 | Garden City Seeds 778 Highway 93 North Hamilton MT 59840 406-961-4877 |
| Wind River Seed 3075 Lane 51 1/2 Manderson WY 82432 307-568-3364 (grow seed from Montana origins) | | |

Harvesting, Processing & Storing Echinacea

EQUIPMENT: Potato diggers, sub-soil plows, or specialized root diggers such as those used by commercial carrot growers, have been used for harvesting. *E. angustifolia* roots are longer and more fragile, and not as well suited to tractor digging. Hand harvest, or use a tractor-mounted mower bar, for harvesting leaves and flowers of *E. purpurea*.

TIMING: Generally roots are harvested in the fall after the first frost when vegetative growth is dry and brown. Research is being done to determine productivity of two, three, or four-year old plants, and the best time for harvest. Leaves are harvested in the summer when plants are in or near full bloom.

Fresh leaves and flowers of *E. purpurea* contain active constituents which can be lost if exposed to sunlight for even short amounts of time. If dried

leaves are to be harvested, cut near or in full bloom and dry in a dark, well-ventilated area. Check with your buyer to see if there is a preferred form, or time, to harvest.

CLEANING: Commercial potato brushes and root vegetable washers can be used. It is suggested that the roots be washed before drying.

DRYING: Roots usually dry in two to four days under optimum conditions without artificial heat or drying. If using forced air dryers, avoid temperatures exceeding 110°F. Drying can be done on racks, screens, or boards. Weight loss is estimated at approximately 75% during drying. Roots must be dry before storage to avoid fungal and bacterial problems. Dry storage in heavy-gauge poly bags in fiberboard-closed barrels has been successful. Protect stored plant material from rodent and insect infestation. Maximum storage time is one year.

YIELD: The estimated yield for dry roots is reported to be 1,000 pounds to 5,000 pounds per acre in two to four years after planting. Dried leaf yield for *E. purpurea* is estimated at 1500 pounds to 2000 pounds per acre in two years after planting, and can maintain at this level for several years.

MARKETING: This should be an initial consideration prior to planting the crop. It is recommended that growers contract with manufacturers before considering production. As more and larger growers begin production, prices will probably fall due to competition. So those entering the *Echinacea* production market should do so cautiously.

The current market price for *E. angustifolia* root is \$15.00 per pound to \$18.00 per pound. Wild harvesters may receive as little as \$4.00 per pound. *E. purpurea* sells for \$2.50 per pound to \$12.00 per pound. Markets are developing in Montana, but at present, larger quantities are sold to out-of-state manufacturers.

MAKING MONEY FROM GROWING ECHINACEA This is a most commonly asked question! As with many speciality crops, most highly-successful entrepreneurs have quickly determined how to produce and market their crop without much "how to" information. Once established, they are very busy and perhaps a little reluctant to have other producers join their

market. Nevertheless, there is a growing interest in producing and marketing *Echinacea*, and other herbal crops, and there are several resources to assist you.

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