

ECHINACEA

Purple Coneflower

General Information

Echinacea, (pronounced Ek-i-nay-see-a), commonly known as purple coneflower, is a herbaceous perennial plant with four species and six varieties all indigenous to North America, of which three, *E. pallida var pallida*, *E. pallida var angustifolia*, and *E. purpurea*, are grown commercially. Used in perennial borders for over 200 years, the species *E. purpurea* in particular is widely known. It has also been used historically in North America by indigenous people, along with American Ginseng, Golden Seal, Sassafras, Slippery Elm and Seneca Snakeroot, as their major medicinal herbs. Today, a move back to more natural tonics and medicines and our eclectic approach to health are contributing to a resurfacing of traditional uses of medical herbs such as echinacea. Some European countries, in particular Germany, are very familiar with echinacea and have many value added echinacea products in the marketplace.



E. purpurea 'Magnus' - Photo by Al Oliver

The traditional use of echinacea was considered helpful for the common cold, toothache, burns and external sores, sore throat, psoriasis, rheumatism, stomach cramps and to counter the effects of poison ivy and snakebite. It has more recently claimed to be a blood purifier, an anti-infection agent (viral and bacterial), an immune system strengthener, and snakebite antidote.

Echinacea species are found throughout central and Southeastern USA in open woods, prairies and along roadsides. The species *E. pallida var. angustifolia* makes its way up to South-eastern Saskatchewan and Southern Manitoba. This is quite tolerant of drought, though grows better in cultivation with adequate watering, and can tolerate fairly diverse soil types. The species *E. purpurea* enjoys moist areas and is often found along creeks and in seepage areas. Echinacea is generally indigenous to soils with a pH of 6.0-7.0. Selection of good sites will be important for this crop since it is a root crop and a deep well drained loam to sandy loam soil will be best for growing and harvesting. The extreme tolerances of physical and chemical soil characteristics are not known

Echinacea

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Echinacea generally has a deep fibrous root system and is harvested at three or four years old. All species have a spiny cone in the centre of the flower, (thus the name echinacea from echinos—meaning hedgehog in Greek) and generally have light to dark purple drooping ray flowers (petals), though some cultivars are red or white. The species *E. atrorubens* var. *paradoxa* has yellow ray flowers (petals). The coarse, generally hairy stems are mostly erect, either single or branched and from .5 m to 1.5 m (2-5 ft) tall. The basal leaves are generally slender with a long petiole (leaf stalk), to small leaves with no petiole at the top of the stem. It is important that you properly identify the species you grow and keep them separate as different parts are used from different species and they will cross pollinate. A reputation for proper identification is important to gain buyer acceptance.

(Individual species descriptions are in a separate section).

Culture of Echinacea

Plants are generally started from seed, which is often hard to germinate, with 50% or less in some cases. It is generally recommended that seed undergo a 30-90 day stratification period in peat or fine sand at 5°C, followed by seeding in a room at 40°C for germination. A soil mix of 1:1:1, peat, sand and soil by volume is suggested. Literature also suggests that surface or very shallow seeding gives better results as light has some influence on germination. Another procedure for greenhouse seeding is to give the seed 30 day stratification at 0°C then a 24 hour aerated water soak, followed by sowing on the surface of the medium in a room at 40°C.

If seeding outdoors, wait in the spring until the daytime temperature consistently reaches 17°C (70°F). Sow shallow, .75 cm (.3") and keep the soil surface moist. Use about .8 kg (1.75 lbs.) seed per acre. Mulch over the seed is considered essential for outdoor seeding and a depth of 2-3 cm (1 ") of clean straw should be effective.

There are about 257,000 seeds/kg (117,000 seeds/lb) in *E. purpurea* and up to 319,000 seeds/kg (145,000 seeds/lb) in *E. pallida* var. *angustifolia*. One-half kg (one lb.) of seed should be enough to provide transplants for an acre. *E. pallida* var. *angustifolia* seed needs to be air cleaned well, excluding non-viable seed, to increase the germination rate. Seed will keep in sealed containers in a freezer or in a cool dry room for several years.

Other seldom used methods of propagation include using root pieces 5-10 cm long, or dividing crowns with roots attached. As well, when harvesting roots the crown portion can be cut off about 2.5 cm (1 ") thick, divided, then planted upright. If this latter method is used, the cut crowns should be stored in damp peat, shavings, etc., over winter and planted in the early spring. A proper cooler where temperatures of 1-2°C (33-35°F) can be maintained would be necessary. If crowns are planted in the fall when harvesting occurs, a low survival rate is generally expected.

Weeds

Echinacea is not weed tolerant, thus weeding is an important factor. There are no herbicides registered for field grown echinacea in Canada, only ornamental and none are applied for, as the industry prefers to grow organically. One of the best ways to reduce weed problems in echinacea plantings is to prepare the land at least one year in advance. This should rid the soil of perennial weeds and reduce the annual weed population. This should also reduce the population of insects, such as cutworm and wireworm. The straw mulch suggested for outdoor seeding will not reduce weed occurrence to any extent, while weed infested straw may increase it.

Insects

Insects, diseases, slugs, snails, nematodes, etc., are not mentioned to any extent in any available literature. As with weeds above, no chemicals are registered for these pests on echinacea and if the industry wishes to use organic products, (such as BT, pyrethrum, rotenone, etc.) these will have to be registered and receive a PCP No. before they are legal. The dense plantings mentioned previously may increase the incidence of fungal problems, especially if plantings are protected causing poor air circulation.

Diseases

Diseases such as fusarium, sclerotinia, pythium, phytophthora, and verticillium have been found on echinacea. The disease aster yellows is a problem on echinacea and is spread by leafhoppers. There is no control for leafhoppers so rouging out infected plants is about the only thing you can do.

Alberta Agriculture has a good factsheet on this disease. See www.infobasket.gov.bc.ca and click on special crops, then search for echinacea.

Harvesting

Plantings on small acreages are generally from plugs or transplants grown in a greenhouse. On a large acreage, this would be expensive but would give the most even results. Information suggests that plants can be as little as 30 cm (12 in) apart in beds. If a bed 120 cm (4 ft) wide was used, it would allow for 5 rows/bed giving approximately 74,000 plants/ha, (31,000 plants/acre). If beds were spaced with 213 cm (7 ft) centres, this would give walkways 90 cm (3 ft) wide. The above is probably a maximum density and for the more vigorous species or if plants are kept over four years but the *angustifolia* variety may be planted down to a 15cm (6 in) spacing. If you have mature plants and are harvesting flowers, this should yield approximately 5000 lbs. of fresh product/acre. Raised beds are suggested by one author, but are probably not necessary in the interior of BC.

This arrangement would allow digging with equipment available to the ginseng industry. This industry may also be able to dry the product, although for late harvests of root there may be an overlapping problem for dryer space. At the very least, the types of dryers used for ginseng in BC should be very adequate for drying this crop.

Nutrient Requirements

Nutrient requirements are another area where little information is available. A soil in the pH range of 6-7 is suggested as best. This will also give the best release of soil available nutrients and make the most effective use of applied nutrients. A general nutrient balance for root crops should be sufficient. Literature suggests that lower nitrogen levels give higher essential oil production, so this would be one element to pay attention to. It is also suggested that nitrogen be applied in three applications, not all at one time. We also read that some species grow in limestone base soils in its natural areas, so the interior of BC should be well suited. Because we are growing and harvesting roots and flowers, attention needs to be paid to phosphorous and potassium to ensure adequate amounts are available. A soil analysis done before applying any nutrients or soil amendments is necessary, and will at least show major deficiencies.

Drying

Plant parts are harvested and dried with a moderate drying time. Very slow or very fast conditions are to be avoided. A dryer with forced air is preferred but the product can be dried in open air under shade. The

root will range from pencil to 2.5 cm (1") in size and will dry a grey to reddish brown colour. Whole dry root will keep the best and has a storage life of up to two years if held in proper conditions. Sealed brown glass containers in a cool place is best for long term storage of small quantities. Larger amounts would be stored in cardboard boxes or barrels with plastic liners.

Roots are dug in the fall after two or three hard frosts have occurred as this, according to literature, will give the best chemical components as well as maximum dry matter content. Flowers are harvested at approximately 20% bloom. This is approximately when the ray flowers start to droop or when the pollen on the cone has reached 20% of the way to the top. Harvesting of the flowers generally includes about 15 cm (6 in) of flower stalks and are dried under shade outdoors or at 35C° in an airflow dryer, or sold fresh directly to the processor. Your buyer may also have an influence on this or other decisions.

When over wintering echinacea don't remove the leaves and stems in the fall as this gives a natural protection to the crown of the plant. If you feel there is too much waste, remove it in the early spring.

Echinacea Classification

There are four species and six sub species of echinacea, three of which are grown commercially. There is considerable genetic variation within species which will show up most visibly in ray flower (petal) colour, ray flower length and amount of curve. Other differences within species populations will be in root size and type, internal chemical variations, leaf shape and other often very subtle changes. The variation of most concern is the chemical content, and recent work has been done to determine what species/sub species and what plant parts have what chemical. Harvest dates and growing conditions could affect the production of and/or content of various chemical components in the plant.

Commercial Echinacea Varieties

NOTE: (√ - denotes most common name for each species or variety below)

Echinacea purpurea

Purple coneflower √
Coneflower

This species is the one most commonly grown as a medicinal herb. It is native to Eastern USA, has a

2.5-5 cm (1-2") high flower cone and yellow pollen. The ray flowers (petals) up to 18 cm (7") across vary from rose to deep purple. The pales (pointed parts on the cone) are bright orange. There are white cultivars of this species as well.

E. purpurea has a fibrous root system which is used for herbal sales. The tops (foliage and stems) of this species are also commonly used as well as the flower and seeds. *E. purpurea*, uncommon in the wild, prefers cool moist climates compared to other species and is a vigorous grower often giving flowers the first season. It grows from .5-1.5 m (2-5 ft) tall, has broad lance shaped lower leaves, with coarse irregular teeth. This species is the easiest one to grow and seed is readily available. *E. purpurea*, which flowers from June through October is sometimes wrongly sold as *Rudbeckia purpurea*, a name which has lingered from an 1841 name change. Seed (germplasm) from most northerly sources are considered to handle direct sun better.

Some cultivars of *E. purpurea* available are:
 'Bravado' 'Magnus'
 'Ruby Giant' 'The Kings Mophead'
 'Kings Knee high' 'Alba/White swan'



E purpurea 'White swan' - Photo by Al Oliver

Echinacea pallida* var. *pallida

Pale purple coneflower ✓
Pale purple echinacea

Care must be taken when purchasing this plant that you are not purchasing *E. angustifolia*. This tap rooted plant has narrow leaves, grows to 1 m (39") tall, and flowers early June through July. It has flowers with drooping pale purple to purple ray flowers (petals) which are 3.75-8.75 cm (1.5-3.5") long. This is the only species of echinacea with white pollen, a good distinguishing characteristic. This species, while easy to grow and quite vigorous, is the

least in demand medicinally, compared to *E.pallida* var. *angustifolia* and *purpurea*. It is considered equal to *E. angustifolia* by some, but this is not well accepted. It is not clear whether any part of the tops are a saleable item in this variety, so caution would be in order for large plantings. It is said that this species does not like spring seeding.

There is one cultivar of *E. pallida* called 'Hula Skirts'
Echinacea pallida* var. *angustifolia

Narrow leafed purple coneflower ✓
Narrow leaf echinacea
Coneflower
Purple coneflower

This species is considered by the industry to be the most medicinally active, and produces the most numbness or tingly feeling on the tongue when root pieces are held in your mouth. The root of this species is a deep tap root and is the part commonly used. The foliage and flowers may not be saleable items. This species is often confused with *E. pallida* but has very narrow leaves which are long and lance shape and have no teeth. This species has stems 15-50 cm (6-20") long and is slow growing compared to the other two commercial species. The ray flowers (petals) do not droop as much as other species and are 2-3.25 cm (.75-1.25 ") long. This species grows well in open, hot areas and is found in the Great West Plains of the USA, up into the extreme southern parts of Saskatchewan and Manitoba. It is suggested this variety as well does not like spring seeding and is considered harder to grow than *E. purpurea*. If this species is grown from crowns do it in late summer. It will not tolerate standing water so raised beds might work best for this species.



E. pallida var. *angustifolia* - Photo by Al Oliver

Other Species and Varieties

E. atrorubens var *atrorubens*

- to 1 m (3') tall
- short petals (rays) but very curved, touching stem
- rays generally dark purple to dark red

E. atrorubens var *paradoxa*

- yellow coneflower
- yellow flowers
- to 1.2 m (4') tall
- flower mid May through July



E. atrorubens var. *paradoxa* - Photo by Al Oliver

E. laevigata

- similar to *E. purpurea*
- rare Appalachian plant
- close to endangered species status
- almost smooth stems & smooth leaves
- forked tap root

E. pallida var *sanguinea*

- dark blood red and rarely white ray flowers (petals)

E. pallida var *pallida*

E. pallida var *simulata*

- very similar to *E. pallida* but has yellow pollen

E. pallida var *tennesseensis* – Tennessee coneflower

- endangered species plant (on list, June 6, 1979)

- similar to *E. angustifolia*
- upturned ray flowers (petals)
- flower May through July

NOTE: The taxonomy in this revision (2003) is markedly different from earlier editions. The editor has chosen to use the work of Dr. Shannon Binns et al. from a doctoral thesis published in Systematic Botany (2002) titled 'A Taxonomic Revision of Echinacea (Asteraceae:Heliantheae).

The last taxonomic revision was done in 1968 by McGregor who did not have access to today's technologies, though is still a valuable resource.

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Available on InfoBasket @

<http://infobasket.gov.bc.ca> and choose Special Crops

Bibliography

Foster, Steven. "Echinacea, the Purple Coneflowers" 7 pgs. *American Botanical Council, Botanical Series - 301* - P.O. Box 201660 Austin Texas 78720 1 -800-373-71 05

Foster, Steven. Echinacea, *Nature's Immune Enhancer*. 150 pgs. ISBN 089281 -3865 (paper), Healing Arts Press, One Park Street, Rochester VT 05767. Available in Canada from Richter's Herbs, Goodwood ON, L0C 1 A0

Hobbs, Christopher. *Echinacea, the Immune Herb*. 40 pgs., Botanica Press, Box 742, Capitola CA 95010. May be available in some local health food stores, or in Canada is available from Richter's - see No. 2 above.

Hobbs, Christopher. *The Echinacea Handbook*. 118 pgs, 1989. Eclectic Institute Inc., 2545 N.W. Division, Gresham OR, 97030 503668-4120

Mowrey, Daniel B., Ph D. *Next Generation Herbal Medicine*. 157 pgs., Keats Publishing Inc., Box 876, 27 Pine Street, New Canaan CT 06840

Plus various health periodicals, newspaper articles, gardening books and other bits and pieces.

Sources of Seeds &/or Plants in N. America

	E. Pallida var pallida	E. palida var angustifolia	E.purpurea	Other Species/variety
Botanical Specialties , Box 3000, Cultus Lake BC V2R 5H6 604 824-2833 hbstroble_botanicals@telus.net		√	√	
Cariboo Ginseng , Box 4563, Williams Lake BC V2G 2V6 250 747-8402	√	√	√	
Dominion Seed House , Box 2500, Georgetown ON L7G 5L6				
Park Seed Company , PO Box 1051, Ft. Erie, ON L2A 5N8		√	Several Cultivars	paradoxa
Richters , 357 Highway 97, Goodwood, ON L0C 1A0	√	√	√	
Saltspring Seeds , Box 33, Ganges BC V0S 1E0 604 537-5269			√	
Ward, James , Box 439, Thompson River Drive, Savona BC V0K 2J0 250 373-0093	√	√		
Westcoast Seeds , 206-8475 Ontario St. Vancouver BC V5X 3E8			√	
William Dam Seeds , PO Box 8400, Dundas ON I9H 6M1			√	
Abundant Life Seed Foundation , PO Box 772, 1029 Lawrence, Port Townsend WA	√	√	√	tennesseensis
Elixer Farm Botanicals , General Delivery, Brixey MO 65618	√	√	√	tennesseensis paradoxa
Gettel, Richard , RR 1, Box 1483, Langby MN 56651 218 935-2497 seeds@sawpalmetto.com				
Horizon Herbs , Box 69, Williams OR 97544 503 846-6804	√	√	√	tennesseensis atrorubens paradoxa
Missouri Wildflowers Nursery , 9814 Pleasant Hill Rd., Jefferson City MO 65109		√	√	
Prairie Moon Nursery , Rt 3 Box 163, Winona MN 55987	√	√	√	
Prairie Ridge Nursery , RR 2, 9738 Oberland Rd, Mt.Horeb WI 53572		√	√	
Johnnys Selected Seed 955 Benton Avenue Winslow Main 04910 207-861-3900	√	√	√	tennesseensis paradoxa