

Evaluation of Coneflower (*Echinacea*) Species for Nursery Production under Field Conditions.

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Nature of Work

There are nine species of coneflower (*Echinacea*), all native to central or eastern North America. Only purple coneflower (*Echinacea purpurea*) is extensively cultivated in nurseries. Coneflowers are hardy herbaceous perennials in the Asteraceae. They produce large, terminal composite flowers with an outer ring of showy ray florets. These florets can be various shades of purple, white or yellow. The numerous, inner central disk florets form the characteristic "cone" for this genus and are subtended with a stiff bract that is usually pigmented yellow and provides an interesting contrast with the showy ray florets. Plants bloom over a long period in the summer. Purple coneflower has been used in formal and informal perennial plantings and is the mainstay of naturalized prairie wildflower mixtures. They are also effective as cut flowers.

Coneflowers are also the main ingredient in the medicinal herb preparation sold as Echinacea. It is currently the top selling over-the-counter herb supplement in a multi-million dollar industry. Echinacea is touted for its immunostimulatory and antibacterial properties. Although all parts of the plant contain the pharmaceutical compounds, the dried root has the most commercial value for drug extraction.

The objective of this study was to evaluate the cultural requirements for production of coneflower species under field conditions in Kentucky either for nursery production or drug extraction. The species evaluated in this study are listed in Table 1.

Materials and Methods

Seeds for all species were stratified between 2 and 8 weeks prior to sowing in plug flats under standard greenhouse conditions. Eight week-old seedlings were transplanted to the field on raised beds with drip irrigation in May. Plants were spaced 8 inches apart on center with two rows of plants per raised bed. Each raised bed was on a 2 foot spacing to facilitate mechanical weeding between beds. Weeds were removed by hand from raised beds. Plants received approximately one inch of water per week. Plants were harvested in October and evaluated for biomass production.

Treatments included fertilizer application and flower bud removal and were applied only to the *Echinacea purpurea* open pollinated and *Echinacea purpurea* cv. Magnus. For the fertilizer treatment, half the plants were fertilized once in May with 20-20-20 Peter's soluble fertilizer through the irrigation line, while the other plants were fertilized twice with the second application in July at the same fertigation rate. Within each of these fertilization groups, plants were either allowed to flower normally or the flower buds were removed as they appeared once a week.

Results and Discussion

All species and cultivars evaluated in this study produced plants of acceptable size and commercial quality except *Echinacea angustifolia* (Table 1). This species did not establish as robustly as the other species and experienced the greatest mortality. In this group, two species currently not widely available in the nursery trade stood out for their unique horticultural qualities. These were *Echinacea tennesseensis* and *Echinacea paradoxa*.

Echinacea tennesseensis produced more flowers than any of the other species tested. These were similar in size, color (more mauve than purple) and shape as flowers in purple coneflower (*Echinacea purpurea*), but they were produced on long, wiry stems that appear to be heliotropic (follow the sun). The vegetative portion of the plants were also more spreading and low growing compared to the other species in this trial, but in flower plants reached a height of three feet. We feel that this plant has enormous commercial potential for the herbaceous perennial market. Not only does it have numerous ornamental qualities as a garden and cut flower plant, but it is also a Kentucky native plant that is on the Federal Endangered Species list which should add to the marketability of this species.

Echinacea paradoxa is the most unusual member of this genus. It is the only *Echinacea* with yellow flowers. It is the least recognizable of the coneflowers and is not usually listed in even comprehensive herbaceous perennial references. It produces a clear yellow flower on strong erect plants that reach between 2.5 and 3 feet tall. Its market appeal should be in its unique color, its flowering time and strong growth habit that should separate it from other coneflowers and near relatives like *Rudbeckia*.

Within the *Echinacea purpurea*, all cultivars produced commercially acceptable plants. 'White Swan' is a white flowering purple coneflower and it produced the smallest plants, while 'Clio' and open pollinated derived plants had the highest biomass. By preventing plants from flowering, there was a significant increase in root biomass. Plants responded to the first fertilization, but there was no significant increase in biomass associated with the second fertilizer application.

Significance to the Industry

Several species of *Echinacea* not usually found in production nurseries were evaluated for growth under field conditions. Two (*Echinacea tennesseensis* and *Echinacea paradoxa*) have potential for mass production. These plants have unique horticultural characteristics not found in the commonly cultivated purple coneflower (*Echinacea purpurea*) and could exploit a market niche for nurseries interested in new plants native to North America.

Table 1. Root biomass in field grown *Echinacea* species after one season.

Coneflower species	Overall plant dry weight (grams per plant)
<i>Echinacea purpurea</i> (open pollinated)	124.3
<i>E. purpurea</i> cv. Bravado	115.6
<i>E. purpurea</i> cv. Bright Star	122.5
<i>E. purpurea</i> cv. Clio	122.4
<i>E. purpurea</i> cv. Magnus	115.6
<i>E. purpurea</i> cv. White Swan	87.5
<i>Echinacea angustifolia</i>	26.6
<i>Echinacea pallida</i>	79.1
<i>Echinacea paradoxa</i>	65.5
<i>Echinacea tennesseensis</i>	120.0