SEED YIELD RESPONSE OF *ECHINACEA ANGUS TIFOLL4* TO APPLIED SULFUR

Peter Sexton and Rhonda Bafus

Introduction

Echinacea angustifolia is a medicinal herb valued for enhancing the immune system (Tyler, 1993). While there is some literature on seed dormancy and cultivation for this species for herb production (e.g., Baskin et al. 1992, Shalaby et al. 1997), there is no literature that we are aware of regarding seed yield response to soil fertility. The objective of this study was to evaluate the seed yield response of *Echinacea angustifolia* application of sulfur as gypsum.

Methods

Initial available soil sulfur was 20 lbs/acre. Seeds of *Echinacea angustifolia* were pretreated with ethephon (1 mM solution), allowed to dry, and planted on 11 May 1999. Sowing rate was 130,680 seeds/acre. Seeds were dropped in rows (2 ft. apart) on the surface by having the shoes of the planter out of the ground Immediately following planting the field was rolled perpendicular to the row direction using a cultipacker. Plots were irrigated as often as required to keep the seedbed moist until emergence. After emergence, sulfur treatments of 0, 10, 20, 30, and 40 lbs S/acre were applied. Sulfur was applied as gypsum by hand. Plots consisted of six rows 20 ft. long. Weeds were controlled by hand. No herbicides and no other fertilizers besides gypsum were applied. The plots did not set seed the first year. The plots set seed in the second season and two inner rows from each plot were combined on 24 August 2000 using a Wintersteiger small plot combine to estimate seed yield. The plots were end-trimmed 2.5 ft. from each end of the plot ahead of harvest. Harvest samples were allowed to air dry for 2 wks and then cleaned by hand and weighed. Data was subject to analysis of variance using the PROC GLM routine of SAS statistical software (SAS Institute, Cary, NC).

Results and Discussion

A large investment in labor was required for weed control, especially in the first year of the study as the *Echinacea angustifolia* was very slow to grow and form a canopy. Plant stand at the end of the second season was 41,000 plants/acre. Seed yield was not responsive to S application (Table 1). Average yields were close to 100 lb/acre. None of the plots showed deficiency symptoms. Apparently, in our circumstances, (20 lbs per acre of available S) S fertilization does not enhance growth or seed yield (Table 1). If anything, there was a trend for seed yield to decline with applied S. It may be that with application of N, the plants might have required more S, and a response might have become apparent. In this trial, application of N was avoided to keep the plots organic, and no response to S addition was observed.

Seed of this species retails at $150-300 per pound; however, we were unable to find a buyer for our seed. This is an instructive example of the need to have marketing worked out before investing in production of medicinal herbs.

Literature Cited

C.C. Baksin, C.C., J. M. Baskin, and G.F. Hoffman 1992. Seed dormancy in the pararie fork Echinacea angustifolia variety. Angustifolia (Asteraceae): after ripening pattern during cold stratification. Int. J. Plant Sci. 153:239-243.

V.E. Tyler 1993. The honest herbal. 3rd. Haworth Press. New York, New York.

A.S. Shalcby, E.A. Agina, S.E. E-Gengaihi, A.S. El-Khayat, and S.F. Hindawy. 1997. Response of Echinacea to some agricultural practices. Journal of Herbs, Spices, and Medicinal Plants 4: 59-67.

Table 1. Response of seed yield to applied sulfur in *Echinacea angustifolia* grown at Madras, Oregon. Plots were established and treatments imposed in 1999. Plots set seed and were harvested in 2000. Full stands had 41,000 plants/acre.

Applied sulfur	Yield	Biomass	Flowers	Height	Stand	100 Seed weight	Harvest index
(lb/acre)	(lb/acre)	(lb/acre)	(heads/acre)	(in)	(%)	(g)	
0	103	4540	470900	20.9	84	0.326	0.023
10	105	4890	551650	20.9	85	0.318	0.021
20	99	4620	491100	20.1	85	0.318	0.021
30	89	4000	450750	21.8	80	0.304	0.021
40	90	4560	484350	20.8	89	0.304	0.019
mean	97	4520	489750	20.9	84.4	0.314	0.021
LSD	NS	NS	NS	NS	NS	NS	NS
CV (%)	34.0	14	21	10.0	4.0	8	15