

Mycorrhizae and Echinacea



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Abstract

Two species of Echinacea will be used for the experiment, Echinacea purpurea and Echinacea angustifolia. The treatments include MycoApply Soluble MAXX, MycoApply Ultrafine Endo/Ecto, and control. Regular measurements will be taken, such as germination rates, vitality ratings, height and true leaf number. This will show which treatment is the most effective in a nursery setting. The results showed that MycoApply Ultrafine Endo/Ecto as the most effective treatment.

Introduction

Mycorrhizae is the specific fungi that create symbiotic relationships with plants. Over 90% of plants are capable of building mycorrhizal relationships. There are several different kinds of mycorrhizae. Most are differentiated by the species of plants they connect with and how it interacts with root cells. The two biggest groups are endomycorrhizal and ectomycorrhizae. Plants rely on mycorrhizal relationships for many reasons. Mycorrhizae are thinner than plant roots and can access greater amounts of nutrients and water. Mycorrhizae also acts as a secondary immune system and carbon storage. Plants inoculated with mycorrhizae are shown to be more resistant to droughts and other stressors. For these reasons and more, it's beneficial to grow plants that have mycorrhizal connections.

Echinacea, also known as the Cone Flower, is a popular ornamental and medicinal plant. Many species are native to the North East. Echinacea builds connections with endomycorrhizal fungi. Inoculated Echinaceae are shown to grow faster, bigger, and with greater secondary metabolites.

Citations

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Materials and Methods

All items were procured before beginning the setup. The Echinacea seeds went through a cold stratification period of 4 weeks before use. First, it was important to measure and dilute the inoculants. I used a scale and weight boat to measure 6.4 grams of Ultrafine Endo/Ecto and added to a 2-liter beaker. A hot plate and magnet was used to thoroughly mix the solution.

This created 14 liters of solution with this process. We Repeated these steps but used 1.2 grams of Soluble MAXX for one liter of water.

I prepared 12 trays of simple potting mix and added five seeds to each plot of every tray. Echinacea purpurea seeds were used for six trays and Echinacea angustifolia seeds for six trays. The Ultrafine solution was applied to three trays of each species. Soluble MAXX solution was applied to three of each species. I Prepared another six trays with greenhouse potting mix and planted more three trays of each species.

The trials were kept in a greenhouse under standardized lighting and watering systems. I measured germination rates after two weeks and again at four weeks. At four weeks, I measured plant height, vitality, and leaf number. Then I used Analysis of Variance (ANOVA) in SAS using a general linear model (proc glm) with Tukey multiple comparison method to statistically analyze results.

Results

Echinacea purpurea had a notably higher germination rate and vigor compared to Echinacea angustifolia. The differences in germination were observed by the second observation and were significant for both species as well as for the different treatments. The control group had a considerably lower germination rate, vigor, and plant height when compared to the treatments. Furthermore, the Ultrafine treatment showed a significantly higher germination rate than the other two treatments by the second observation. Finally, it was discovered that Maxx treatment had the highest vigor, plant height, and number of leaves, while the control group had the lowest.

Species	Germ 1 (%)	Germ 2 (%)	Vigor	Plant Height	Number of Leaves
Species Overall					
<i>Echinacea purpurea</i>	40.3 A	98.1 A	2.1 A	1.8 A	1.1 A
<i>Echinacea angustifolia</i>	6.3 B	53.0 B	1.7 B	2.1 A	2.7 A
Treatment Overall					
Control total	19.5 A	62.3 C	1.5 B	1.5 B	0.96 A
Maxx total	26.0 A	77.7 B	2.1 A	2.4 A	3.6 A
Ultrafine total	24.5 A	86.7 A	2.0 AB	1.9 AB	1.2 A

Means with the same letter are not significantly different.

Results (cont.)

Species	Treatment	Germ 1 (%)	Germ 2 (%)	Vigor	Plant Height	Number of Leaves
<i>Echinacea purpurea</i>	Control	6.3	99.0	1.6	1.60	.77
<i>Echinacea purpurea</i>	Maxx	3.7	98.3	2.6	2.0	1.3
<i>Echinacea purpurea</i>	Ultrafine	9	97.0	2.1	1.7	1.5
<i>Echinacea angustifolia</i>	Control	32.7	25.6	1.4	1.39	1.15
<i>Echinacea angustifolia</i>	Maxx	48.3	57.0	1.6	2.7	5.7
<i>Echinacea angustifolia</i>	Ultrafine	40.0	56.3	2.0	2.1	.9
<i>Echinacea purpurea</i>		40.3 A	98.1 A	2.1A	2.07A	1.18A
<i>Echinacea angustifolia</i>		6.3 B	53.0 B	1.68B	1.8A	2.6A
Control total	Control	26.0 A	86.7 A	1.52B	1.49B	.96A
Maxx total	Maxx	24.5 A	77.7 B	2.1A	2.37	3.5A
Ultrafine total	Ultrafine	19.5 A	62.3 C	2.0AB	1.93AB	1.18A

Discussion

Overall, Echinacea purpurea had significant germination rates and vigor. Mycoapply Ultrafine treatments had significantly higher germination rates compared to MAXX and the control. The control had the consistently lowest rates of germination, vigor, plant height, and number of leaves. These results suggest that MycoApply Ultrafine creates a significant difference in germination rates. This information may suggest that the Echinacea seeds were able to create a mycorrhizal relationship with the inoculant, leading to better development. This information can be useful for growers hoping to increase germination rates of Echinacea seeds in nursery settings. There should be further observation on the future growth rates and root mass of the treatments. Other treatments may also be introduced for more thorough comparison, such as using harvested wild mycorrhizae

Conclusions

- The evidence suggests that MycoApply Ultrafine Ecto/Endo leads to higher germination rates in Echinaceae. This information is useful for nurseries and container growers.

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