

Effect of Mycorrcin on foliar growth, root system development and Ectomycorrhizal colonization of pine seedlings

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Key words

Mycorrcin, ectomycorrhizal, pine seedlings, root system development

Overview

Five studies were conducted applying Mycorrcin as a single soil drench to pine seedlings planted in high and low fertility soils. The Mycorrcin applications were compared to a mycorrhizal inoculum treatment and control.

The Mycorrcin treatments led to improved root systems and increased EM, plus a large increase in above ground plant growth.



Trial set up

Seedlings were grown in a heated greenhouse (frost protected) from pine seeds (clone GF14), planting four seeds per pot in size 6 pete pots.

The soil drench was applied to the soil close to the stem base using a syringe. Only one single application was conducted. Seedlings were treated when the first leaf whirl was fully unfolded.

Various soils were used in a series of tests, with and without artificial inoculation with mycorrhiza fungi.

All plants remained in the greenhouse throughout the tests.

Assessment

For pine seedlings, the typical antler shaped mycorrhiza-roots were visible with the bare eye and could be counted directly.

Results

Study 1

Soil: commercial potting mix

Assessment: 160 days after planting

	Untreated	Mycorrhizal Inoculum	Mycorrcin
Height cm	13.4	12.4	12.3
Leaf whirl length cm	9.2	8.8	8.8
No. of main roots	2.6	2.8	4.3
No. of root branches	31.8	30.2	43.3
Combined root length cm	28.2	74.4	40
No. of active white roots	28	26.5	34.2
No. of mycorrhizal roots	2.9	7.1	11.8

Comments

When planted in rich purchased potting soil, the mycorrhizal inoculated plants were less well grown (above ground) than the non-inoculated control plants.

Comparing inoculated plants only, the Mycorrcin treated plants showed a clearly denser root system, with a measured increase in the number of main roots, in the number of root branches, in the number of active white roots, and in the number of mycorrhiza roots. The combined root length of the untreated control was a clear outsider, which makes it not feasible to compare this parameter.

Study 2

Soil: Unsterilised top soil

Assessment: 119 days after planting

	Untreated	Mycorrhizal Inoculum	Mycorrcin
Height cm	6.7	7.3	10.3
Leaf whirl length cm	2.9	3.7	5.9
No. of main roots	2.6	4.1	10.3
No. of root branches	6.1	9.9	15.7
Combined root length cm	34.8	28	56
No. of active white roots	6.2	12.1	35.3
No. of mycorrhizal roots	0.9	3.7	4.7

Comments

When planted in poor, non-fertilised top soil, the mycorrhiza inoculated plants were getting the benefit from the mycorrhiza, and were clearly better grown (above ground) than the non-inoculated control plants.

The Mycorrcin treated seedlings showed a very large increase of seedling height and leaf whirl length above ground, and below ground there was again a clearly denser root system increased number of main roots, number of root branches, combined root length, number of active white roots, and number of mycorrhiza roots.

Study 3

Soil: Unsterilised top soil

Assessment: 98 days after planting

	Untreated	Mycorrhizal Inoculum	Mycorrcin
Height cm	7.8	6.3	8.8
Leaf whirl length cm	4.3	3.7	5.0
No. of main roots	3.8	1.3	3.0
No. of root branches	15	8.5	21.8
Combined root length cm	20.5	11.0	30.9
No. of active white roots	5.3	4.0	11.3
No. of mycorrhizal roots	3.5	0.0	4.1

Comments

Confirming the previous data, Mycorrcin treatments led again to a very clear improvement of above ground growth, as well as a clearly improved root system. However, in this test most seedlings were taken by soil borne diseases, and only a very low number of replicates survived for assessment.

Study 4

Soil: Unsterilised top soil

Assessment: 98 days after planting

	Untreated	Mycorrcin
Height cm	7.8	7.9
Leaf whirl length cm	4.3	4.1
No. of main roots	3.8	3.7
No. of root branches	15.0	18.2
Combined root length cm	20.5	36
No. of active white roots	5.3	11.8
No. of mycorrhizal roots	3.5	11.0

Comments

Mycorrcin gave a large increase of natural mycorrhiza. Again, Mycorrcin has led to a much denser root system than the untreated control plants have.

Study 5

Soil: Commercial potting mix

Assessment: 162 days after planting

	Untreated	Mycorrhizal inoculum	Mycorrcin
Height cm	9.1	7.8	8.7
Leaf whirl length cm	4.8	3.9	4.7
No. of main roots	3.9	3.6	4.3
No. of root branches	39.8	36.8	49.4
Combined root length cm	42.5	44.0	54.1
No. of active white roots	24.4	17.8	23.5
No. of mycorrhizal roots	3.7	4.4	15.0

Comments

As seen before, in rich potting soil the differences caused by Mycorrcin in plant growth are less prominent than in poor soil. However, with Mycorrcin there is still a clear improvement of seedling growth, root system density and mycorrhiza colonization.

Study 6

Soil: Commercial potting mix

Assessment: 150 days after planting

	Untreated	Mycorrcin
Height cm	9.1	9.4
Leaf whirl length cm	4.8	5.4
No. of main roots	3.9	4.3
No. of root branches	39.8	52.4
Combined root length cm	42.5	32.4
No. of active white roots	24.4	31.9
No. of mycorrhizal roots	3.7	7.7

Comments

Using rich soil, Mycorrcin has again led to a clear improvement of seedling growth, root system density and mycorrhiza colonization.

Study 7

Soil: 50:50 mix of top soil and commercial potting mix

Assessment: 100 days after planting

	Untreated	Mycorrcin
Height cm	9.9	12.2
Leaf whirl length cm	5.6	8.1
No. of main roots	2.6	4.2
No. of root branches	40.5	48.9
Combined root length cm	30.8	36.5
No. of active white roots	15.2	32.1
No. of mycorrhizal roots	13.1	17.5

Comments

Mycorrcin has provided an exceptional increase in above ground growth of the seedlings, and in all measured root system quality parameters.

Conclusion

The tests show and repeatedly confirm the positive effects of Mycorrcin on the root system development and mycorrhizal colonization of pine seedlings after a single treatment.