

Final Report on the Effect of Greenex on Root Health in Greenhouse Grown Tomatoes

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September 1995

Experiment 1

Introduction:

Greenex is a microbial inoculant containing several strains of the bacterium *Bacillus subtilis*. This bacterial genus is well known for its suppressive effects on many plant pathogens. Greenex is a particularly interesting bacterial formulation it has a long shelf life (Bacilli are spore formers) and already has GRAS approval as well as California approval for use as a soil amendment. Greenex has previously been used to treat recreational turf and water features. The material has also been used in commercial composting processes.

This study investigates the effect of Greenex on root pathogens and parasites in greenhouse grown tomatoes.

Materials:

Standard fumigated UC potting mixes were used. Soil was placed in 6 inch pots in an environmentally controlled greenhouse (day 27°C, night 18°C). To the soil various treatments were added as follows:

- A, Root knot nematodes (*M incognita*) at 3000 juveniles per pot (N).
- B, *PJzizoctonia solani* ~ one complete colonized petridish per pot (R).
- C, *Phyt ophthora parasitica* @ one complete petridish per pot (Chlamydosporic culture XP).
- D, Greenex @ 1.5 gram per pot (150g per M³), incorporated into the media (RG).
- E, Pre-plant Namacure (0.5 g IOG/pot) and Captan (0.5g 8OWP) per pot and watered in (NeICp).
- F, Control (C).

The Treatment combinations were as follows:

- 1, NRP
- 2, N+RG
- 3, NRP+Ne/Cp
- 4, N
- 5, NRP+RG
- 6, P+RG
- 7, P
- 8, R
- 9, R+RG
- 10, RG
- 11, Control

Tomato seedlings(CV. Bigboy) were planted as plugs when they were approximately 3 inches in height. Plants were watered automatically by drip once per day. The experiment was laid out a randomized block experiment with 8 replicates. Plants were grown for 6 weeks after which the dry root mass of each plant was assessed and the treatment effects analyzed.

Results:

There was a significant difference between treatments at the 10 % probability level.

Treatment rankings are as follows:

Treatment	Average Dry Root Mass(g)	Statistical grouping(P=90 ⁰ /o)
3, NRP	4.45	a
1, NRP+NeICp	4.5	a
7, P	4.78	ab
8, R	5.21	ab
4, N	5.34	b
2, N+RG	5.37	b
6, P+RG	5.61	b
9, R+RG	5.63	bc
LO, RG	6.12	c
5, NRP+RG	6.25	cd
11, Control	7.2	d

Conclusion:

Greenex exhibited a suppressive trend on root diseases and nematodes. Interestingly the nematode/Rhizoctonia/Phytophthora plus Greenex treatment increased root growth slightly more than the Greenex alone and this may be due to the nutrient content of the culture media that the fungi were grown on. Greenex significantly suppressed the effects of the mixed pathogens in the media. The material did suppress the effects of the root knot nematodes but not significantly. In these trials we did not observe an increase in root growth by the addition of Greenex to the media in the absence of disease as compared to the control. However the UC soil mixture used in these trials is nutritionally complete with good elemental availability. From these experiments, Greenex primarily seems to inhibit the effect of pathogens and nematodes on roots and hence it would appear that with further investigation the material may be of value in situations where these organisms limit production.

Experiment 2

Materials and methods:

Similar treatments were established as in Experiment 1 except paired comparisons were made between Greenex treatments on diseased and non-diseased root systems. The experiment was set up as above also on tomato with identical treatments. The trials were established in a greenhouse for 6 weeks after which the foliage was cut off at the soil line, dried and weighed. The experiment was designed as a randomized block with 7 replicates. The results are summarized below:

Treatment	Average Dry Shoot Mass without Greenex	Average Dry Shoot Mass with Greenex
Phytophtkora	18.6	19.9 ns
Rhizoctonia	19.9	20.8 ns
Root Knot nematodes	18.9	21.3 ns
Root Knot Phytophthora Rhizoctonia	18.3	22.5*

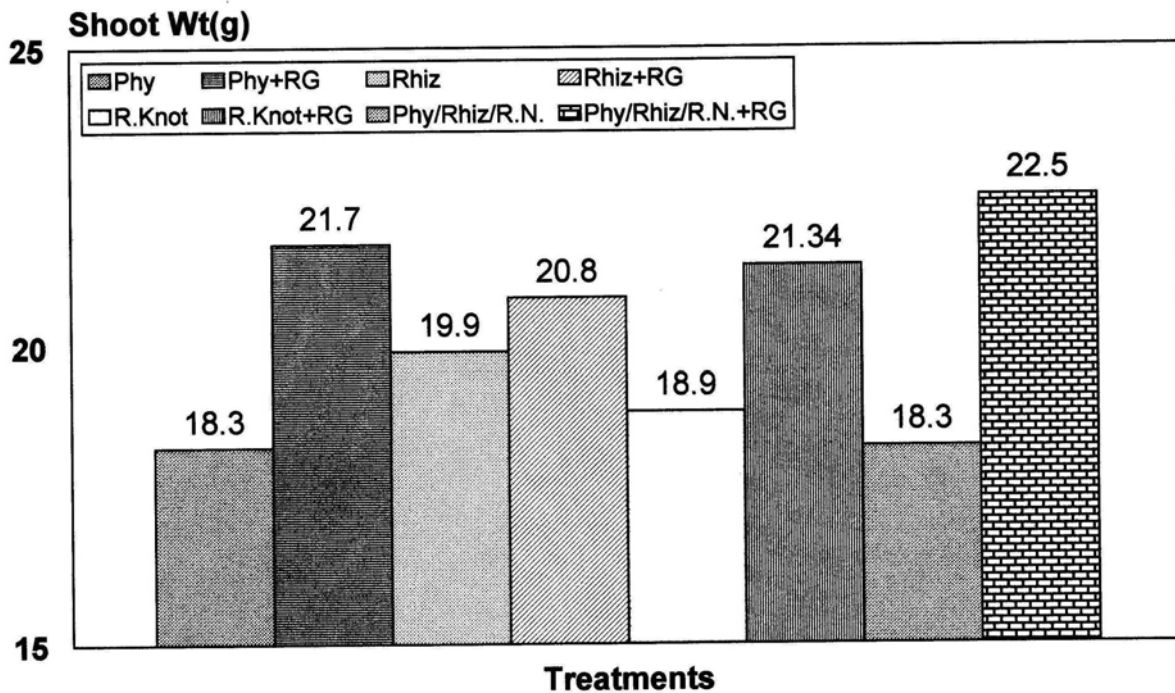
*Statistically different at P=0.1. I
ns = non significant

Conclusion;

The addition of Greenex to soil media infested with mixed populations of Nematodes, Phytophthora and Rhizoctonia resulted in statistically better growth of tomato shoots as compared to soil that did not have Greenex added to it. All other treatments showed a trend towards higher shoot masses when Greenex was added to the media.

The Affect of Greenex, Root Disease and Nematodes on Tomato Shoot Growth.

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Summer 1995