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EFFECTS OF PEAT-VERMICULITE MIXES ON INCREASED GROWTH RESPONSE WITH *TRICHODERMA*

T. Paulitz and R. Baker[1]

Use of *Trichoderma harzianum,* strain T-12, in different amounts, added to various combinations of peat moss and vermiculite, resulted in enhanced growth of radishes when the medium was 50-50 peat moss-vermiculite.

Trichoderma spp. are well-known fungal biocontrol agents, effective against such diseases as Pythium damping off, Fusarium wilts, and Rhizoctonia damping off. Recent research showed that *Trichoderma harzianum* can also benefit plants by increasing plant growth independent of any pathogen involvement. For example *T. harzianum* increased the number of flower buds, fruit set, shoot dry weight; and hastened flower development (1-4). Some of these experiments on bedding plants were done in local commercial greenhouses. Baker, et al. (1) reviewed *Trichoderma* growth enhancement and its potential for application in *CGGA Bulletin 451.*

THE QUESTION — How does soil mix composition affect this growth response?

Before any biological technology can be commercially utilized, we must determine the conditions under which the biological agent can function most effectively. Unlike chemical agents, biological agents are influenced by environmental factors like temperature, soil pH, moisture, etc. Windham, et al (5) examined the effects of soil pH, length of incubation in soil, isolate variability, and the use of benomyl on *Trichoderma* growth response. The purpose of this research was to investigate the effects of soil mixes on *Trichoderma* growth response, and to determine which soil mix would be best for growth enhancement.

Mixes were formulated with various ratios of two commonly used components — Canadian sphagnum peat moss and #3 vermiculite which were obtained from W.R. Grace Co. These components were mixed in the following ratios — 100% peat-0% vermiculite; 80% peat-20% vermiculite; 60% peat-40% vermiculite; 40% peat-60% vermiculite; 20% peat-80% vermiculite; and 0% peat-100% vermiculite. Mixes were not steam-sterilized or treated with any other chemicals. *Trichoderma harzianum* (strain T-12) was used in these trials. Dry *Trichoderma*-peat bran amendment was added to the mixes at 0, 0.1, 1.0, and 10% volume to volume. This is the equivalent of adding between 10^6 and 10 colony forming units of *Trichoderma* per gram of mix. Radishes were used as indicator plants to measure growth response. Shoot dry weight was measured on harvested plants at three, four, and five weeks. These experiments were carried out at the Lake Street Research Facility, and were watered daily with a complete nutrient solution.

The Results

The maximum growth increase was seen after five weeks when the radishes were near maturity **(Fig. 1, 2).** At three and four weeks, little or no effect was observed. Adding just 1% *Trichoderma*-peat bran amendment increased shoot dry weight 7 to 32% after five weeks. *T. harzianum* increased plant growth in all mixes, although some were better than others. The 100% peat and the 100% vermiculite mixes were consistently worse than the others. The 80% peat-20% vermiculite and 20% peat-80% vermiculite mixes were best. The 60% peat-40% vermiculite and 40% peat-60% vermiculite mixes were intermediate. These results are summarized in **Fig. 3.**

[1]*Visiting Scientist and Professor, Dept. of Plant Pathology and Weed Science*

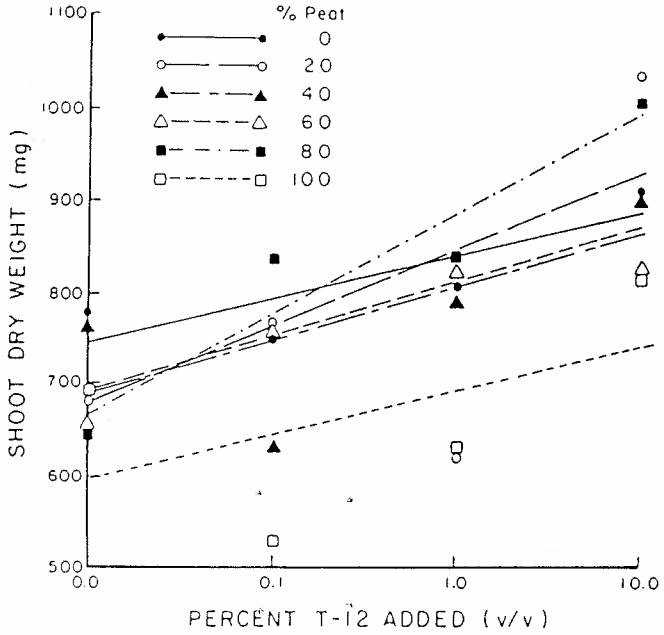

Fig. 1: Effect of peat-vermiculite mixes and *Trichoderma harzianum* on shoot dry weights of radish after 5 weeks.

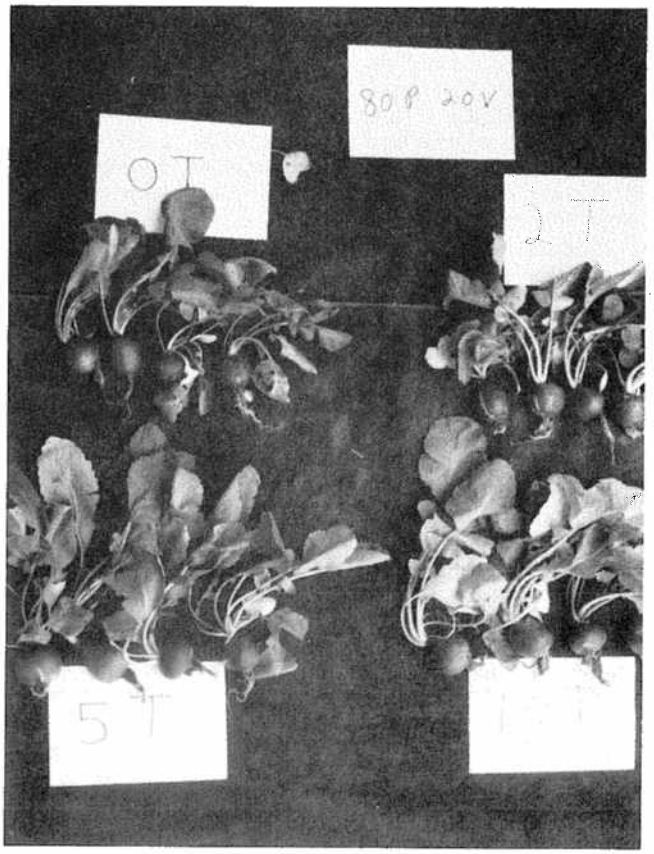

Fig. 2: Effect of various levels of *Trichoderma harzianum* on radishes after 5 weeks. Plants were grown in 80% peat-20% vermiculite mix. *Trichoderma*-peat bran amendment added at 0, 2%, 5%, and 10% (v/v).

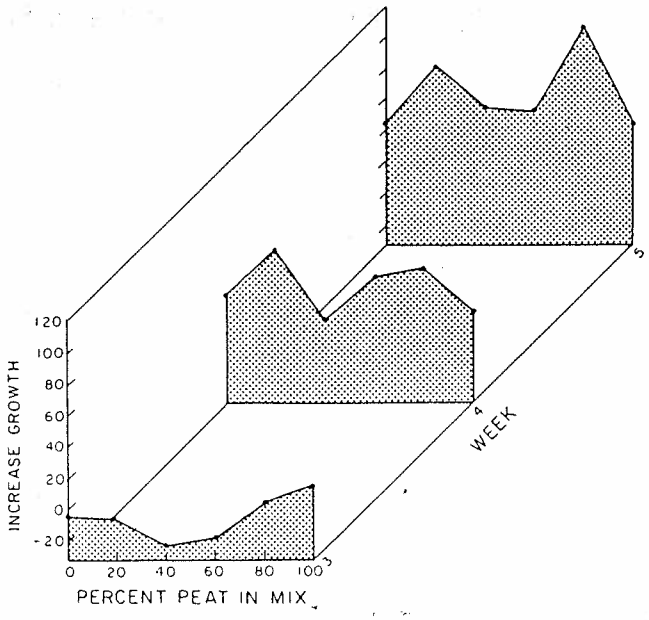

Fig. 3: Increased growth of radishes in comparison with media not containing *Trichoderma harzianum.* Vertical units = increase in dry wt. (mg) of radish per log% T-12 added.

The population density *T. harzianum* was also assyed each week, to see if the biological agent was surviving **(Fig. 4.).** Two conclusions were made. 1) The population of *T. harzianum* was not influenced by the soil mix composition. *T. harzianum* multiplied equally well in all of them. 2) *T. harzianum* populations increased 10-fold over the five week period. *T. harzianum* was using the nutrients in the peat-bran amendment as a food base.

These results show that *T. harzianum* will enhance plants grown in nursery mixes of approximately 50% peat-50% vermiculite, which are widely used in the industry today. Further research is now needed to look at the effects of other factors on this promising biological agent.

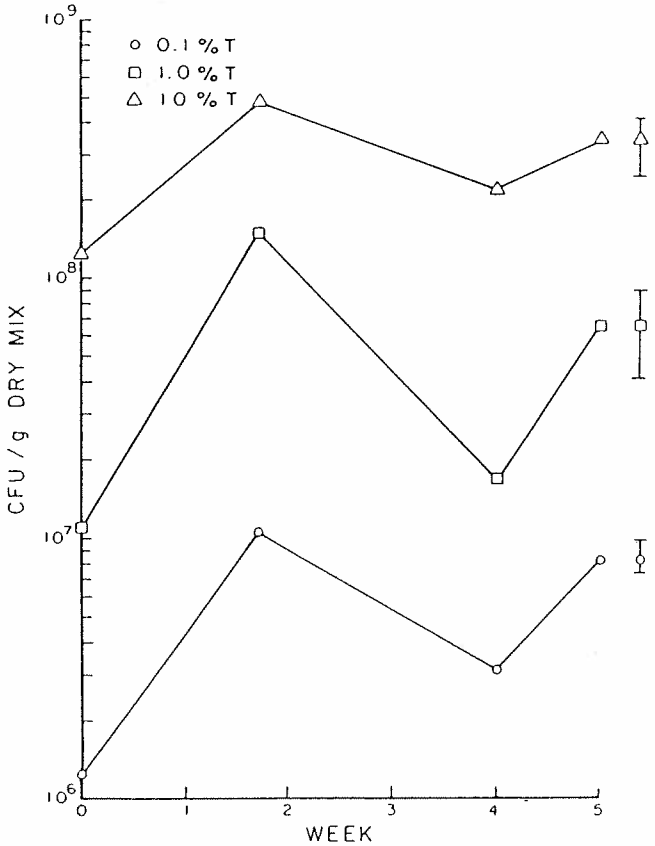

Fig. 4: *Trichoderma harzianum* isolate T-12 population densities over time. Population densities were averaged among peat-vermiculite mixes. Bars represent standard errors. Cfu/g = colony forming units per gram.

Literature Cited

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4. Windham, M.T., Elad, Y., and Baker, R. 1986. A mechanism for increased plant growth induced by *Trichoderma* spp. Phytopathology 76:(in press).
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FORT COLLINS GREENHOUSE CLIMATOLOGICAL SUMMARY FOR FOUR WEEKS, BEGINNING MARCH, 1986. (See Bulletin 426 for details.)

	Week beginning							
	Mar. 30		April 6		April 13		April 20	
	Day	Night	Day	Night	Day	Night	Day	Night
Average outside temperature (°F)	51	41	54	43	49	38	61	51
Maximum outside temperature (°F)	79	66	71	24	63	43	81	72
Minimum outside temperature (°F)	30	28	41	32	34	31	37	32
Degree-days of heating	49	84	39	77	56	94	14	49
Average hours in the period	11	13	11	13	12	11	12	16
Accumulated total solar radiation (MJ/sq.m.)	95	1	101	1	129	84	111	1
Average relative humidity (%)	49	64	59	80	42	73	48	62
Maximum relative humidity (%)	100	100	97	100	97	87	98	100
Minimum relative humidity (%)	8	17	22	48	10	56	17	0
Average absolute vapor pressure (mb)	6	5	8	8	5	6	9	8
Average wind speed (mph)	4	5	2	.9	6	1	4	2
Maximum wind speed (mph)	27	38	26	13	40	8	28	20
Average CO_2 concentration (Pascal)	25	—	21	—	20	—	19	—
Maximum CO_2 concentration (Pascal)	69	—	33	—	33	—	25	—
Accumulated gas consumption (cu.ft./sq.ft.)	11	43	14	37	19*	44	11	22

*Momentary power interruption, lost data for one-day period.

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