Stolon Decay of Peppermint

I. Regional Project Title: Managing Plant-Microbe Interactions in Soil to Promote Sustainable Agriculture

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Fall planting of peppermint in the Flathead Valley of Montana typically results in poor emergence the following spring. The resulting loss of stand leads to lower oil production and a greater requirement for weed control measures. Rhizoctonia, Fusarium, Sclerotinia, and Pythium have been isolated from stolon decay lesions. Research at Montana State University's Northwestern Agricultural Research Center (NWARC) has demonstrated the effectiveness of fungicide application at fall planting of mint stolons.

Replicated plots were established at the NWARC on October 27, 2004, to evaluate fungicides and biocontrol agents for control of mint stolon decay. Plots consisted of four rows 15 ft long and 1 ft apart, with four replications. Stolon segments (3 lbs, 4-6 in. long) were coated with 300 ml of the designated treatment and laid in furrows 4-5 in. deep. The viability of biological inocula was confirmed by dilution plating.

Treatment	Active	Label or test rate product/acre	Stand plants/ft row	Dry Matter lbs/a	Oil Yield lbs/a
Gem	trifloxystrobin	8 oz	5.3	4849 *	79.4
Prevail	carboxin/ PCNB/ metalaxyl	1 lb/100 lb	6.1 *	4336	63.0
GB34	Bacillus pumilus	0.013 g/2 gal	3.7	3676	61.2
Tilt	propiconazole	10 oz/a	3.6	4902 *	73.4
Plant Helper	Trichoderma atroviride	2.3 g/2 gal	3.5	3215	55.8
Champ 2	CuOH	2 oz/cwt	3.3	3996	68.5
Control	water		3.3	2728	42.6
Tops MZ	thiophanate methyl /mancozeb	1 lb/100 lb	2.8	4781 *	66.4
Medallion	fludioxonil	0.5 oz/1000 sq ft	2.6	3729	54.2
Quadris	azoxystrobin	15.4 fl oz	2.6	3619	55.5
T-22	Trichoderma harzianum T-22	2 lb/a	1.7	3587	55.7
LSD (0.05)			2.3	1777	
P =			0.032	0.042	ns

* = significantly different from control by LSD ($P \leq 0.05$).

Only the fungicide Prevail increased emerged plant stand in the spring of 2005 over the water-only control, and Gem, Tilt and Tops MZ increased dry matter production over the control. Oil yield was not significantly influenced by treatment, but was highly correlated with dry matter ($r^2 = 0.89$, P = <0.0001). The relationships between stand and dry matter ($r^2 = 0.25$, P = 0.0807) and stand and oil yield ($r^2 = 0.29$, P = 0.0565) was weaker due to the ease of spread of the mint plant from stolons.

Gem and Prevail, fungicides that were most effective in improving plant stand, are primarily labeled for control of Rhizoctonia diseases. Tops MZ and Tilt are also labeled for this pathogen. Tops MZ and Prevail increased dry matter and/or oil yield in previous studies of stolon decay in Montana. We can speculate that Rhizoctonia had a greater impact in this planting than did Pythium, Fusarium, and Sclerotinia, other genera of pathogenic fungi that have been isolated from decayed mint stolons.

The biocontrol agents *Trichoderma atroviride, Trichoderma harzianum,* and *Bacillus pumilus*, did not increase stand and yield of peppermint under these conditions. *Trichodeerma harzianum* is labeled for *Rhizoctonia* diseases and *B. pumilus* has activity against *Rhizoctonia solani* (Kanjanamaneesathian, World J Microbiol Technol 16:523, 2000). *Trichoderma atroviride* is also effective against *Rhizoctonia* (McBeath, personal communication).

Conclusion

Stolon decay of peppermint reduces over winter survival of fall-planted peppermint stolons in northwestern Montana. *Rhizoctonia, Fusarium, Sclerotinia,* and *Pythium* have been isolated from stolon decay lesions. Replicated plots were established at the Northwestern Agricultural Research Center in Kalispell in October of 2004 to evaluate pre-plant stolon treatment with three biocontrol agents (*Trichoderma atroviride, Trichoderma harzianum,* and *Bacillus pumilus*) and six fungicides. The fungicides Gem (trifloxystrobin), Prevail (carboxin/ PCNB/ metalaxyl), Tilt (propiconazole), and Tops MZ (thiophanate methyl /mancozeb) increased peppermint stand and/or dry matter yield over the water-only control, but none of the biocontrol agents were effective.