MYCOFUMIGATION: A NOVEL ALTERNATIVE TO METHYL BROMIDE

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The discovery of an endophytic fungus, *Muscodor albus*, which produces volatile gases toxic to a wide range of fungi has led to preliminary studies investigating its' use as a "mycofumigant". It has activity against soilborne fungal genera currently controlled with methyl bromide-chloropicrin mixtures including; *Fusarium, Phytophthora, Pythium, Aphanomyces, Rhizoctonia, Verticillium and Sclerotinia*. It shows no phytotoxicity/pathogenicity to a wide range of plants including barley, sugarbeet, eggplant, tomato, peppermint and spotted knapweed.

A bioassay for testing the ability of the mycofumigant to kill pathogens in infested soil was developed using sugarbeet pathosystems as models. In separate experiments, autoclaved soil was infested with the fungi *Rhizoctonia solani, Pythium ultimum, Aphanomyces cochlioides,* and *Verticillium albo-atrum.* For the first experiment on control of *Rhizoctonia* seedling disease, four different formulations of the mycofumigant were prepared and included pesta (Connick et al., 1991), alginate (Walker and Connick, 1983), stabileze (Quimby, et al., 1999), and colonized ground barley. 2g of formulated mycofumigant was placed on the soil (375g in a 10cm pot) and covered with an additional 50g infested soil. An additional mycofumigant treatment was also included where 4 0.5cm wide strips of colonized agar were placed in the top layer of soil. Pots were placed in plastic bags, 100 ml water was added, and bags were sealed. Pots were incubated for 7 days at room temperature. After incubation and removal from plastic bags, 25 untreated sugarbeet seeds were planted per pot. Two weeks after planting, emergence of sugarbeets was recorded (Table 1).

Table 1. Percent emergence of sugarbeet two weeks after planting into *Rhizoctonia solani* Ag 2-2 infested soil that had been mycofumigated with different formulations of *Muscodor albus*

	Percent Emergence	
Treatment	Non-Inoculated	Inoculated
Untreated Control	88a[1]	
Rhizoctonia Control		38d
M. albus Agar	91a	82ab
M. albus Pesta	83a	57c
M. albus Alginate	92a	65bc
M. albus Barley	83a	83a
M. albus Stabileze	84a	80ab

[1]Means followed by the same number are not significantly different ($LSD_{0.05}$=17.2).

Similar experiments were performed with *P. ultimum* (Table 2), *A.. cochlioides* (Table 3), and *V. albo-atrum.* Alginate and pesta formulations were dropped in later experiments due to poor efficacy and cumbersome production methods.

Table 2. Percent emergence of sugarbeet two weeks after planting into *Pythium ultimum* infested soil that had been mycofumigated with different formulations of *M. albus*

Treatment	Percent Emergence
Untreated Control	77a[1]
Pythium Control	8cd
A3-5 Agar	22c
A3-5 Pesta	5d
A3-5 Barley	58b
A3-5 Stabileze	67ab

[1]Means followed by the same number are not significantly different ($LSD_{0.05}$=17.1).

Table 3. Percent emergence of sugarbeet two weeks after planting into *Aphanomyce cochliodes* infested soil that had been mycofumigated with Stabileze and ground barley formulations of *M. albus*

Treatment	Percent Emergence
Untreated Control	85a[1]
Aphanomyces Control	20c
A3-5 Stabileze	54b
A3-5 Ground Barley	34c

[1]Means followed by the same number are not significantly different ($LSD_{0.05}$=16.7).

In an experiment with *V. albo-atrum* infested soil, mycofumigation reduced soil propagules to undetectable levels. After 7 days of mycofumigation, soil dilution plating revealed no detectable *V. albo-atrum* in the infested mycofumigated soils, 8.1×10^5 cfu/g soil in the *V. albo-atrum* infested, non-mycofumigated soil and none in the non-infested, non-mycofumigated soil.

These preliminary results show that mycofumigation with *M. albus* may offer an alternative to chemical fumigation and that further study is warranted. We have received the necessary permits to conduct small-scale field trials on soil-borne diseases of strawberry and these will begin next year.