

CAMPBELL, L. G.^{1*}, G. A. SMITH¹, J. D. EIDE¹, and L. J. SMITH², ¹USDA, Agricultural Research Service, Northern Crop Science Laboratory, Fargo, ND 58105-5677, and ²Northwest Experiment Station, University of Minnesota, Crookston, MN 56716. *Metarhizium anisoplaie* as a biocontrol agent for sugarbeet root maggot.

ABSTRACT

Only a few insecticides are available for controlling the sugarbeet root maggot (*Tetanops myopaeformis* von Röder). These could become less effective because of the development of resistant root maggot strains or become unavailable because of environmental concerns. An effective biocontrol agent would provide an alternative and, perhaps, more consistent control method. Laboratory results and a 1995 field trial prompted further testing of the entomopathogenic fungus *Metarhizium anisoplaie* (Metschn.).

Field trials were conducted near Crookston, Minnesota from 1996 through 1998. The experimental design was a randomized complete block with 6 replicates. *Metarhizium* inoculum was prepared by culturing the fungus on heat-killed barley. The inoculated barley was spread evenly over field plots in the fall preceding the sugarbeet crop, in the spring prior to planting, or both in the fall and spring.

Root yields ranged from 49.5 Mg ha⁻¹ when no insecticide was applied to 59.2 Mg ha⁻¹ when Lorsban (chlorpyrifos) was used to control maggots. The fall, spring, and fall plus spring applications of *Metarhizium* yielded 51.5, 50.9, and 58.9 Mg ha⁻¹, respectively, in 1996. The 1997 trials included the same three *Metarhizium* treatments with an additional application of *Metarhizium* in the spring of 1996 (prior to planting barley). Root yields for the *Metarhizium* treatments ranged from 51.4 to 57.5 Mg ha⁻¹, compared to 57.6 Mg ha⁻¹ when Lorsban was applied and 48.7 Mg ha⁻¹ in the absence of maggot control in 1997. Yield differences between treatments were not significant in 1998 because of reduced root maggot pressure, but appeared to follow the pattern observed in the 1996 and 1997 trials. Results, to date, have been encouraging; however, additional information on application rates and timing, formulations, and the effectiveness of *Metarhizium* in more environments will be required before commercialization is feasible.

Although biocontrol agents are generally considered to be safer than most chemical insecticides they should not be handled recklessly. *Metarhizium* can cause eye irritation and the need for eye protection when handling inoculum became apparent early in our research program. While toxicity to healthy humans, and other mammals, is low, *Metarhizium* has been implicated as a complicating factor in individuals with suppressed immune systems. The broad insect host range of many *Metarhizium* strains may be both a benefit through control of other crop pests and a detriment in reducing populations of beneficials and other nontarget organisms. As with all pesticides it should be used judiciously and with appropriate precautions.