

Efficacy of Biological Control Against Sugar Beet Wireworms is Affected by Soil Type

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Wireworms, the larval stage of click beetles (Coleoptera: Elateridae), are a threat to both dryland and irrigated cereal production in the Pacific Northwest region of the USA. Neonicotinoid seed treatments, the only class of insecticides registered for application in cereals, have failed to provide acceptable levels of protection against wireworms. Therefore, there is a need for evaluating and developing alternative control options that would lead to a relatively more sustainable management of wireworms. Wireworms are continuously exposed to a wide range of underground organisms that are pathogenic to insects (i.e., entomopathogenic organisms). Identifying these natural enemies and determining their efficacy against wireworms would be important steps toward developing a biological control approach. In a greenhouse study, we evaluated the effectiveness of two commercially available entomopathogenic organisms, the nematode *Steinernema carpocapsae* (Fig. 1) and the fungus *Metarhizium anisopliae* (Fig. 2) in protecting wheat plants against wireworms. We also examined whether the addition of diatomaceous earth (DE) would improve the effectiveness of our biocontrol treatments. All evaluations were conducted in sand-dominated and peatmoss-dominated soil media. Treatments containing the entomopathogenic fungus resulted in the highest rates of wireworm mortality, indicating that the fungus may be more effective than the nematode at reducing population. However, results were impacted by soil media. In sand-dominated medium, treatments containing the entomopathogenic nematodes were more effective in reducing feeding damage than treatments containing the fungus. However, in peatmoss-dominated medium, treatments with the entomopathogenic fungus provided relatively better seedling protection. No consistent effect of diatomaceous earth was detected. Our results suggest that the effectiveness of wireworm biological control agents depends on soil media, such that the application of biological control against wireworms must be made with a knowledge of field soil type.

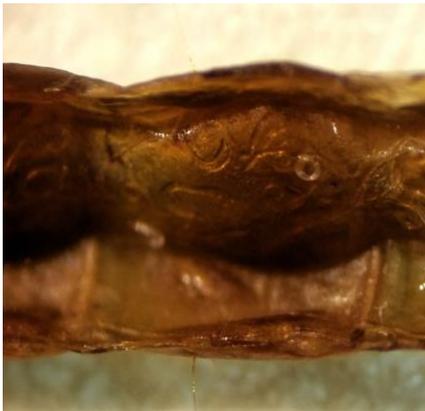


Figure 1. A sugar beet wireworm infested with the entomopathogenic nematodes, *Steinernema carpocapsae*.



Figure 2. A sugar beet wireworm infested with the entomopathogenic fungus, *Metarhizium anisopliae*.

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