

MANAGEMENT PRACTICES FOR CONTROL OF EUROPEAN WIREWORM IN CANADA

Interim Research Report E2008-37

BACKGROUND

Significant losses in crop yield, quality, and marketability have been attributed to wireworms, a pest of growing concern and widening distribution across Canada. While the Atlantic Provinces harbour native wireworm species, three species introduced to North America from European ship ballast cause the lion's share of damage. These three species, *Agriotes lineatus*, *A. obscurus*, and *A. sputator*, have a short-lived adult phase, commonly known as click beetles, that seldom cause substantial crop damage. The destructive larvae of these species persist in the soil for several years, feeding on the roots of host plants and causing significant reductions in the yield and quality of economically important crops.



Larval wireworm feeding on barley (J. Nelson)

WHAT WAS DONE

In 2007, the Organic Agriculture Centre of Canada began working toward the development of cultural management strategies targeted at the larval wireworm and adult click beetle. Crop damage from wireworm feeding may be mitigated by deterring adults from laying eggs in crop fields or reducing viability of eggs and young wireworms, developing methods to deter feeding on cash crops, and using unattractive or ill-suited plants in a crop rotation.

Crop Rotation for Wireworm Control:

Rotational crops may be used to create an inhospitable soil environment for wireworms. A 3-year crop rotation trial was established at the Brookside NS research site in 2007. The trial includes crops which may have a detrimental effect on wireworms. These include brown mustard, which releases glucosinolates, buckwheat, which is quick-growing and frequently tilled, flax, which has low nutritional quality, alfalfa, which is deep rooted and can dry out soil, and a control of barley underseeded to clover. These crops will be grown for two seasons, after which a carrot or potato cash crop will be grown and evaluated for wireworm damage. Wireworm population levels will be monitored in the rotation plots from 2007-09.

Wireworm populations in the plots seeded with the various crops were monitored from June to November 2007. To date, no significant differences in wireworm abundance due to the crop planted have been detected. There is, however, an emerging trend towards high levels in the barley underseeded to clover plots and lower levels in the flax and brown mustard plots.



Brown mustard growing in the crop rotation trial (J. MacKenzie)

Click Beetle Crop Preference: The crop preferences of adult click beetles were examined in 2007 at the Brookside research site. Plots were arranged as a Latin-square and seeded with barley, buckwheat, brown mustard or flax. Beetles of the three *Agriotes* species commonly found in Nova Scotia were captured prior to the trial, sorted by species and marked. The marked beetles were then released into the plots at points lending each crop an equal opportunity of visitation. Pitfall traps in each plot allowed the recapture of the marked beetles and provided insights into crop preference.

No consistent trends in crop preference of the adult click beetles were seen in the field trial. This may be attributed to changes in click beetle behaviour over time, climatic conditions or changes in the habitat types offered by the various cover crops as they developed.



Click beetles awaiting marking and release (J. Nelson)

Development of a Push-Pull-Immobilize Strategy: Evaluations are being made of a push-pull-immobilize strategy, based on pushing wireworms away from a cash crop using feeding deterrents, pulling wireworms from the cash crop using attractive bait crops and immobilizing wireworms through the use of damaging of soil amendments. The effectiveness of these strategies will be first evaluated in the lab. Potential bait crops, including wheat, red-skinned potato, corn and dandelion have been evaluated. The relative attractiveness of four carrot varieties has also been examined. Future lab trials will examine the effectiveness of plant-derived feeding deterrents (such as extracts of marigold and brown mustard) for preventing crop damage and the potential for organic soil amendments (such as diatomaceous earth, neem oil, and wood ash) to immobilize or control wireworms.

In order to serve as an effective bait, a crop must be more attractive to wireworms than the cash crop it is protecting. Lab trial results suggest that germinating wheat is more attractive to wireworms than carrot, and may thus serve as an effective trap crop (Figure 1). Red-skinned potato, dandelion, and corn did not prove to be sufficiently attractive to wireworms to merit use as trap crops in carrot production. An evaluation of four carrot varieties (Chantenay, Scarlet Nantes, Yaya and a processing variety) revealed no significant differences in the relative attractiveness of these varieties.

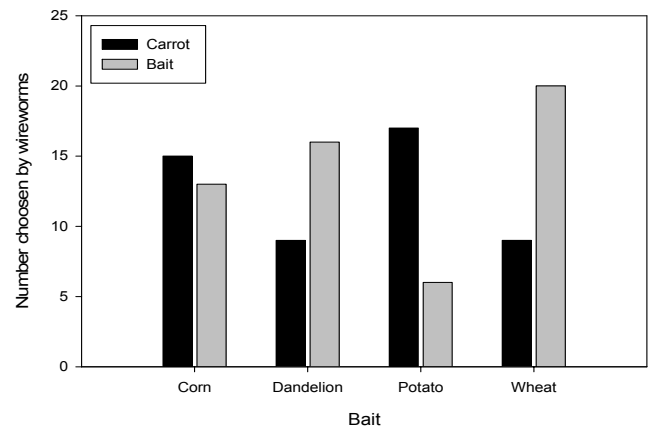


Figure 1. Number of wireworms choosing carrots or various baits in a laboratory trial of the 'pull' strategy

CREDITS

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