The Effectiveness and Extent of Root Lesion Nematode (*Pratylenchus penetrans*) and Root Knot Nematode (*Meloidogyne hapla*) Suppression in Strawberries Following Mustard cv. Cutlass, Marigold cv. Crackerjack and Canadian Forage Pearl Millet 101 Compared to Vapam (380 g/L metam sodium) and Fallow

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INTRODUCTION

Root lesion (*Pratylenchus penetrans*) and northern root knot nematodes (*Meloidogyne hapla*) can cause significant damage to many crops and have a wide host range including many weeds native to Ontario. Strawberries are particularly sensitive to damage cause by these nematodes. Nematodes can also provide infection sites for disease causing fungi which further reduce yields. Planting cover crops such as marigolds, pearl millet, and certain hot mustard cultivars has been shown to reduce plant parasitic nematode soil populations below economic thresholds without affecting beneficial soil-borne organisms or the environment. Although these cover crops reduce nematode populations, some are difficult to seed, manage and the reduction in nematode populations may not last over the period a perennial crop such as strawberries is grown.

OBJECTIVE

The objective of this project is to evaluate the effectiveness and extent of nematode reduction in strawberries following Mustard cv. Cutlass, Marigold cv. Crackerjack and Canadian Forage Pearl Millet 101 compared to the nematicide Vapam (380 g/L metam sodium) and an untreated fallow plot.

MATERIALS AND METHODS

Marigold cv. Crackerjack, Oriental Mustard cv. Cutlass and Canadian Forage Pearl Millet 101 were planted in separate plots, replicated four times and arranged in a Randomized Complete Block Design during 2006. The oriental mustard was established early in the spring, incorporated into the soil as a green manure in mid summer and re-established on the same plots and incorporated into the soil in early fall. Marigold and Canadian Forage Pearl Millet were established in the late spring and allowed to grow the entire season and incorporated into the soil in early fall. Fallow plots in the spring and plots fumigated with Vapam in the early fall were established for comparison.

Soil was sampled from each plot prior to establishing the cover crops in the spring 2006, after cover crop incorporation or soil fumigation in the fall 2006, at the time of planting strawberry transplants cv. Mira in the spring 2007 (April 26)

and again (October 3) after one seasons growth in the fall 2007. Roots of strawberry plants cv. Mira were sampled from all plots in mid summer 2007 (July 30) to assess the root population levels of nematodes. Nematodes were extracted from the soil and root samples using the Baermann funnel method, identified to genera and enumerated at the University of Guelph Pest Diagnostic Laboratory. Data was transformed using log (x+10) to normalize data before statistically analyzed using Statistix 8. Soil samples taken from each plot in the spring 2007 were also assessed for soil organic matter at the University of Guelph Soils Laboratory. The heights of strawberry plants were measured at 10 location/plot on August 14, 2007 to assess the impact of previous cover crop or fumigant treatment.

RESULTS AND DISCUSSION

Fallow and all cover crops suppressed root lesion nematode populations during the year the cover crops were grown (Figure 1). Root lesion soil populations continued to be suppressed throughout 2007 following Marigold, and Oriental mustard. Although fallow and Pearl Millet suppressed root lesion nematodes during 2006, the soil populations increased in these plots throughout 2007 when strawberries were grown. Fumigation with Vapam in the fall 2006 provided complete control of root lesion soil populations which was also observed throughout 2007. There was not significant effect of the previous cover crop or treatment on populations of root lesion nematodes in strawberry roots by mid summer (figure 2), however, strawberry plant were significantly taller in plots that were fumigated with Vapam the previous fall (figure 3).

Figure 1. Effect of cover crops on soil populations of Root Lesion Nematode (actual data with log (x+10) transformation).

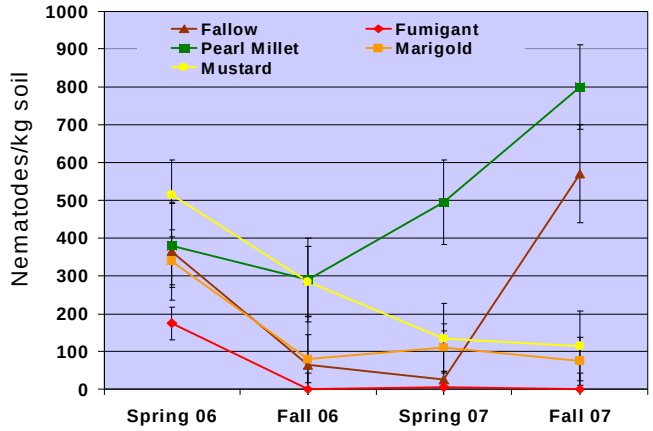


Figure 2. Effect of cover crops planted in 2006 on root populations of Root Lesion Nematode in strawberries cv. Mira in 2007 (actual data with log (x+10) transformation).

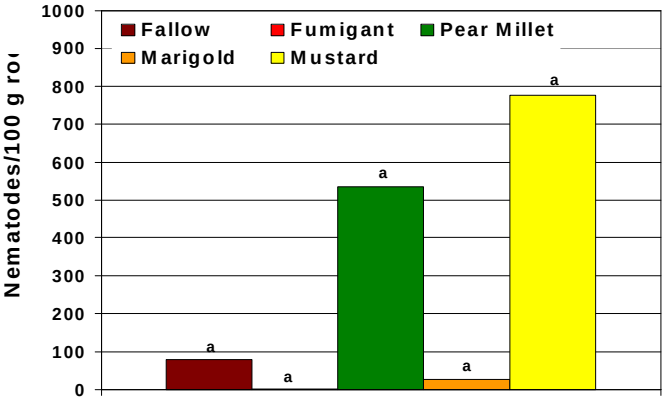
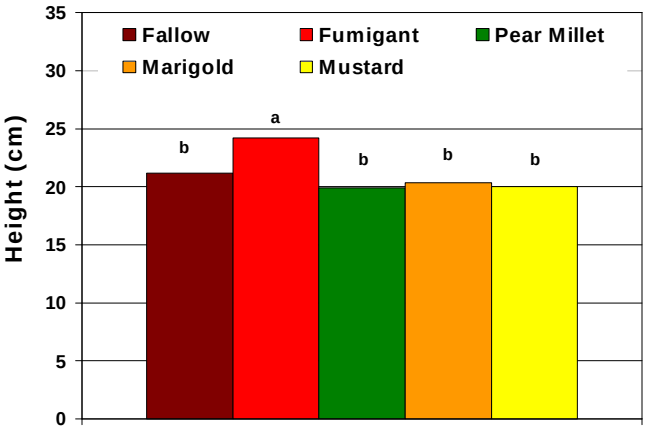


Figure 3. Effect of cover crops planted in 2006 on plant height in strawberries cv. Mira during the summer in 2007.



Root knot nematode soil populations were suppressed during 2006 in plots planted with marigolds, oriental mustard cv. Cutlass or left fallow (figure 4). Fumigation with Vapam in the fall 2006 provided complete control of root knot soil populations which was also observed in the spring 2007. Root knot populations in strawberry roots were variable but tended to be lowest in plots that were previously fumigated with Vapam or grown with oriental mustard (figure 5). By the end of the 2007 season, root knot nematode soil populations increased significantly in all plots regardless of the previous cover crop or treatment applied in 2006 (figure 4). Populations particularly increased in plots that were fumigated the previous fall with Vapam. Fumigation with Vapam in the fall of 2006 not only eliminated root knot nematodes from soil but may have also eliminated natural microbial competitors and antagonists. When root knot nematodes were reintroduced into the plots either on contaminated equipment used to cultivate the trial or in the strawberry transplants in the spring 2007, populations were observed to increase significantly in the fumigated plots without the competition or antagonisms from other microbes. Root knot nematode soil populations increase slowest in plots that were previously grown with either Canadian Forage Pearl Millet 101 or oriental mustard cv. Cutlass (figure 4).

Figure 4 Effect of cover crops on soil populations of Root Knot Nematode (actual data with log (x+10) transformation).

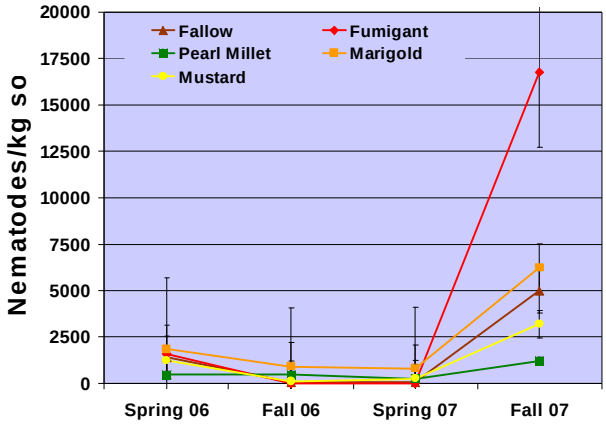


Figure 5. Effect of cover crops planted in 2006 on root populations of Root Knot Nematode in strawberries cv. Mira in 2007 (actual data with log (x+10) transformation).