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CONTROL STRATEGIES FOR BLUEBERRY MAGGOT USING MULCH IN HIGHBUSH BLUEBERRIES

Interim Research Report E2008-44

BACKGROUND

Blueberry maggot (also called blueberry fruit fly) (*Rhagoletis mendax* Curran) is a significant pest of both lowbush (*Vaccinium angustifolium* Aiton) and highbush (*V. corymbosum* L.) blueberries. As with all fruit-feeding pests, there is low tolerance for maggot in fresh fruit. Meeting customer satisfaction requires maintaining low maggot thresholds; there is a quarantine requiring zero-tolerance for maggot in fruit exported to uninfested areas.

Adult blueberry maggot flies first emerge from beneath host plants in late June and early July, coinciding with the fruiting period of the blueberry. Identification is made by noting characteristic, dark, 'F-shaped' markings on the wings (Figure 1). Apple maggot flies (*Rhagoletis pomonella* Walsh) are very similar to blueberry maggot flies but are larger and rarely found in blueberry fields. Flies can be captured on baited traps; *Pherocon AM* traps (yellow, sticky boards containing a protein lure) are commonly used and most effective when placed in a downwards-facing V position within the top 15-cm of the highbush canopy. Aphid honeydew is a common food source, as flies require sugars for longevity and proteins for sexual maturation. Mating occurs on the leaves and fruit of the blueberry plant and a single egg is deposited just below the surface of ripening fruit. Under optimal conditions, each fly can lay 300 eggs per season.

First-instar larvae (maggots) are found in berries in mid-July and develop by feeding on fruit pulp causing disfiguration and reduced saleable yield. Third-instar larvae exit from fruit in early to mid-August. These larvae return to the upper 2-5 cm of the soil and form pupae. The pupae enter an overwintering period (diapause) until spring when they emerge as adult flies.

The range of blueberry maggot extends from northern Florida, through North Carolina, New Jersey, and Maine and west to Michigan. In Canada, blueberry maggot persists in Nova Scotia, New Brunswick, and Prince Edward Island, as well as a few isolated, highbush blueberry-growing regions in southern Quebec and Ontario. Conventional control of blueberry maggot flies has always been chemically intensive; historically, control was achieved with aresenicals and DDT before the advent of organophosphates and carbamates. Recent research has found that baited spheres treated with products including organically approved GF-120 (a spinosad) may effectively control flies.

Previous research has explored the use of different mulches in highbush blueberry production for weed management and as nitrogen sources. Mulch may provide secondary benefits that could enhance biological control of blueberry maggot (Figure 2). Ground-dwelling predators (such as ground beetles, rove beetles, ants) may be limited if habitat or an ample food supply is not available. Mulching may provide better habitat and increased food sources for predatory insects, which can increase the predator population and improve the diversity of the insect community.

Figure 1. Adult blueberry maggot fly depicting characteristic wing pattern (courtesy CFIA; www.inspection.gc.ca/english/sci/surv/data/rhamene.shtml)

Research Plans and Objectives

Reduced yield from insect damage and low consumer tolerance for blueberry maggot infestations mean that maggot control measures are essential for most highbush blueberry producers. Rather than solely focusing research on synthetic chemicals, this research program will explore the capacity of natural predators to provide biological control of blueberry maggot.

While increased biodiversity is the buzzword for managing pests in organic agricultural systems, there may be limits to predator diversity. Predator interference, where a large predator preys on a small predator, could potentially reduce biological control. Such possibly limiting factors will be explored in the mulches.

Our **main objective** will be to evaluate application of mulch to highbush blueberries as a means to increase abundance and diversity of natural enemies for control of blueberry maggot pupae. We will characterize the ecological relationships linking mulches to natural enemy and blueberry maggot population sizes. We will also examine how abiotic properties of mulches (i.e. moisture levels) directly effect pupal development and survival.

Our **secondary objective** will evaluate the efficacy of GF-120 (spinosad) applied as a border spray to highbush blueberries where blueberry maggot flies immigrate from field edges. An optimum border width for protection of an entire field will be suggested.

Expected Results

It is hoped that the use of mulches in highbush blueberry production will diversify and augment the community of ground dwelling predators, and help reduce blueberry maggot populations. In addition, mulch moisture levels and temperature may serve to decrease survival of overwintering pupae. We expect to show that use of mulch by highbush blueberry growers is a multifaceted tool not only beneficial for weed management and as a nitrogen source, but also as a means to increase biological control of blueberry maggot. Secondarily, we hope to demonstrate that a border application of GF-120 can augment blueberry maggot control when necessary.

Figure 2. Composted pulpmill mulch thickly applied to young highbush blueberries

Credits

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