WHOLE FARM MATING DISRUPTION APPROACH TO MANAGE FRUIT PESTS

G. Krawczyk, L. A. Hull and M. E. Reid
Penn State University Fruit Research and Extension Center
290 University Drive, Biglerville, PA 17307
e-mail: gxk13@psu.edu

INTRODUCTION: Growers are looking for alternative pest management options beyond the solitary use of pesticides in order to continue the production of high quality fruit. Some growers decide to adapt new methods to meet consumer demand while others simply want to use new methods with lesser impact on the environment. Mostly, growers look to reduce their production costs in order to increase their profitability. Mating disruption (MD) technology represents a valuable choice for some growers in search of new pest management methods. As MD for fruit pests is strictly a species-specific tool and does not control all pests in the orchard, pesticides continue to be needed at appropriate times throughout the season.

The whole farm mating disruption (WFMD) program started in 2006 as a part of the PA area-wide mating disruption project supported by the PA Department of Agriculture and the State Horticultural Association of Pennsylvania. This program specifically focused on the efficacy of control against codling moth *Cydia pomonella* L. (CM) and Oriental fruit moth *Grapholita molesta* (Busck) (OFM). The main goals of this program were to educate the grower how to incorporate available mating disruption products into existing pest management practices, and how the intensity and choice of other compounds applied to the orchard would be altered as a result.

The WFMD program started in 2006 with a single grower and over the next three years expanded to include more than twenty growers across Pennsylvania (2009 season). While each orchard was unique, the commonality for all involved growers was that each functioned as a direct marketing operation in the form of farm markets, farmer's markets, pick-your-own, or roadside stands.

MATERIALS AND METHODS: In the 2009 season, the WFMD program placed over 1,000 acres of pome and stone fruit under mating disruption throughout various fruit growing regions of Pennsylvania. The size of each individual farm varied from 6.5 acres to 116 acres. The mating disruption products used for CM and OFM in apple blocks included CheckMate CM/OFM Duel (Suterra LLC) placed at 150 dispensers/acre or Isomate CM/OFM TT (CBC America) placed at 150-200 dispensers/acre. The mating disruption products used for OFM in peach blocks included Disrupt OFM mats (Hercon Environmental) placed at 10 mats/acre, CheckMate OFM (Suterra LLC) placed at 100 dispensers/acre, or Isomate M-100 (CBC America) placed at the rate of 100 dispensers/acre. Each grower was responsible for purchasing most of the MD product and applying the MD material to the orchard.

Each apple block in the WFMD program was monitored with one set of insect pheromone traps. One set of traps consisted of one trap each for CM, OFM, tufted apple bud moth (TABM), and obliquebanded leafroller (OBLR). Apple maggot, *Rhagoletis pomonella* (AM) was monitored in all orchards using red sphere trap baited with ammonium carbonate as attractant (Great Lakes IPM, Inc.). In the stone fruit blocks growers monitored OFM, TABM, OBLR, peach tree borer

(PTB) and lesser peach tree borer (LPTB). All traps (excluding AM) were white, large plastic delta (LPD) Pherocon VI traps (Trece Inc) and were checked by the grower at a weekly interval. Mid-season and harvest fruit injury evaluations were conducted in most orchards for each season.

As the growing season progressed, insecticide application decisions for each site were made based on local pest observations utilizing pheromone traps and fruit injury evaluations. The insecticide application record during the WFMD growing season was compared against the insecticide spray schedule from the year prior to the start of the mating disruption program.
SUMMARY OF RESULTS: An evaluation of results from this project proved difficult as it was a challenge to assign uniform judgment criteria across such individualized operations and environments. Each orchard possessed an unique ecosystem and contained pre-existing conditions different from the others. As a result, it was decided that since each grower was exposed to its own version(s) of success and challenges, therefore growers should not be directly compared against other participants in the program.

Through the WFMD program, the combined effort of detailed pest population monitoring and the incorporation of MD products into routine pest management strategies allowed for a significant reduction of the number of insecticide applications while maintaining effective pest control and high quality fruit. No grower experienced an increase in the number of injured fruit, and all growers reduced insecticide applications except for the Grower 2 operation (Table 1). All growers maintained regular insecticide schedule of 1-3 insecticide applications until petal fall stage to control rosy apple aphid, plum curculio, first generation oriental fruit moth, tarnished plant bug, and European apple sawfly present during the spring season. The application of CM and OFM MD materials during and after bloom provided an effective tool to successfully manage CM and OFM populations, and thus allowed growers to reduce insecticide applications normally applied throughout the remaining of the growing season. Pheromone traps for TABM and OBLR and red sphere traps for AM guided the assessment of needs for additional insecticides. The targeted applications against other pests were applied only if the control was warranted based on monitoring.

Although insecticide application needs varied significantly among participating growers, the average number of insecticide application was reduced by about 35 percent during the first year of using WFMD program (decrease ranged from 10 to 60 percent). In only one instance, for Grower 2, despite incorporation of MD materials, it was still necessary to apply more insecticides than during the previous season, when MD was not applied (Table 1). Intensive monitoring, a part of the WFMD program, detected the troublesome CM population and forced this increase in insecticide usage.

The two primary leafroller pests for fruit, TABM and OBLR, continued to be present in all orchards but no population difference was observed when comparing population numbers prior to and after the start of the WFMD program. The apple maggot traps on average caught less than five apple maggot flies throughout the season in all evaluated orchards suggesting that this pest population continued to be adequately controlled through existing pest management strategies. Apple maggot continues to be carefully watched for altered population trends.

The WFMD program has received very positive comments from participating growers who have utilized the concepts surrounding the practical aspects of mating disruption technology. Mating disruption of fruit pests takes conventional pest control methods one step further and applies concepts involving biology, ecosystems, and weather factors into the practice of pest management. The growers who have worked with the WFMD program have had the opportunity to practically learn how to integrate the mating disruption into their own pest management system. Understanding the challenges and possible pitfalls associated with mating disruption technology leaves the grower better equipped for success when making pest management decisions.

TABLE 1. Comparison of intensity of insecticide treatments (as complete sprays) applied after bloom in participating orchards. If multiple blocks within a site received different number of applications, the average number was used for the comparison. Pesticide insecticide application data based on grower's records from 2006-2008 seasons. PSU FREC 2009.

	Before MD	*1st year MD*	*2nd year MD*
Grower 1	4 (2005)	2 (2006)	3.5 (2007)
Grower 2	6.5 (2006)	8 (2007)	8.5 (2008)
Grower 3	10 (2007)	4 (2008)	
Grower 4	4.5 (2007)	2 (2008)	
Grower 5	6 (2006)	3 (2007)	2.5 (2008)
Grower 6	5.5 (2007)	3.5 (2008)	
Grower 7	7.5 (2007)	5.5 (2008)	
Grower 8	9 (2006)	5 (2007)	6 (2008)
Grower 9	7 (2007)	5 (2008)	
Grower 10	7 (2007)	5 (2008)	
Grower 11	5 (2006)	4.5 (2007)	4.5 (2008)
Grower 12	7 (2007)	3 (2008)	
Average	6.6	4.2	5