

USDA RAMP PROJECT – New York 2007
DEVELOPMENT OF COST-COMPETITIVE PROGRAMS USING
REDUCED-RISK TACTICS TO MANAGE ARTHROPOD PESTS
IN EASTERN APPLE AND PEACH PRODUCTION REGIONS
Art Agnello, Harvey Reissig, and Jan Nyrop, Entomology, NYSAES, Geneva

I. Whole-farm apple arthropod management using reduced-risk tactics and IPM sampling and monitoring

Abstract

A demonstration project was conducted in NY as part of a multi-state USDA-RAMP grant to evaluate IPM strategies and control technologies that are effective and economically viable options for reduced-risk (RR) pest management programs in apples, using provisional action thresholds for specific major pests based on previous studies involving reduced-risk tactics. Our primary objective was to determine the effectiveness of whole-farm approaches for managing the arthropod pests of apple orchards that rely on mating disruption and/or RR and OP-replacement insecticides for pest control. Six growers participated in a full-season RR management program (one employing mating disruption in addition to RR pesticides), committing a total of 216 acres (113 acres of which constituted the entire farms two of the growers). The full-season RR program resulted in clean fruit levels ranging from 92.0–98.0%, with late-season obliquebanded leafroller (OBLR) accounting for the largest category of insect damage (1.2–6.2%), and smaller amounts of damage being caused by plum curculio (0.2–3.2%) and tarnished plant bug (0.2–1.5%). Where available, fruit grown on the same farms using conventional practices ranged from 92.9–98.2% clean, with other damage being 1.3–5.6% (OBLR), 0–1.1% (tarnished plant bug) and 0–1.2% (rosy apple aphid). Future OBLR management programs on the most affected farms should be modified according to guidelines developed from some specific OBLR trials conducted in 2007 at other sites. A small-scale trial conducted on one farm to assess the efficacy of pink bud sprays for prevention of TPB damage gave no evidence for the value of this tactic.

Objectives of this component of the project addressed in NY were:

- 1) To evaluate new IPM strategies and control technologies that are effective and economically viable options for reduced-risk (RR) pest management programs in apples, using provisional action thresholds for specific major pests based on previous studies involving reduced-risk tactics.
- 2) To determine the effectiveness of whole-farm approaches for managing the arthropod pests of apple orchards that rely on mating disruption and/or RR and OP-replacement insecticides for pest control.

Six growers participated in a full-season RR management program (one employing mating disruption in addition to RR pesticides, in response to the grower's preference), committing a total of 216 acres (120 acres of which constituted the entire farms at three sites, Oakes, Endres and Knight). The specifics of each grower's site are:

- Russell, 20A (R. Del., G. Del., Empire, Jonagold, McIntosh, Crispin)
- Oakes, 42A (Cortland, Jonagold, Crispin)
- Hance, 29A (Gala, R. Del., Cameo, Ginger Gold, Empire, Jonagold, Pioneer Mac, Idared)
- Endres, 33A (Crispin, Jonagold, Empire, Idared, R. Del. McIntosh)

- Burnap, 11.6A (Empire, Gala, Cortland)
- Knight, 45A (R. Del., G. Del., Empire, Jonagold, Macoun, Gala, Honeycrisp, Cortland, N. Spy)

Each research site received a seasonal program of reduced-risk (RR) selective insecticides, including insect growth regulators, antibiotics, microbials, nicotinoids, and oxadiazines. Where available, a comparison block, which had the same varieties and tree training, was also monitored at each site. These blocks all contained at least one fresh fruit variety such as 'Empire' that might be selected for marketing in Europe or some other market outlet that may eventually demand IPM protocols for market access.

Private crop consultants (J. Misiti, R. Paddock, J. Eve) played a leading role in the interactions with most growers, being responsible for general communication with cooperating growers, and in ensuring that recommended insecticide sprays were applied to the plots. Materials used in the blocks receiving a RR pesticide program included: Esteem or dormant oil for mites and San Jose scale; Actara, Avaunt, Assail, and Calypso for post-petal fall pests such as plum curculio, internal Lepidoptera and apple maggot, plus Intrepid, Dipel and SpinTor for leafrollers. All sprays were applied by the grower. In an effort to reduce the intrinsic cost of implementing the RR program in commercial orchards, we used sampling and monitoring-based decisions to implement some of the following recommended tactics: border sprays for some plum curculio and apple maggot treatments, omitting pink bud sprays where no threat of rosy apple aphid, spotted tentiform leafminer, or tarnished plant bug exists, omitting petal fall leafroller materials in low-pressure blocks, and monitoring OBLR and apple maggot populations during the summer as a basis for making treatment decisions. The grower (Russell) using pheromone mating disruption applied Isomate CM/OFM TT ties in the research orchard at bloom.

Procedures

From 4–10 May, Trécé Pherocon VI pheromone traps were hung in all plots at each RR orchard site as follows: one codling moth (CM) trap was hung in the top of the tree canopy using a bamboo pole, and one oriental fruit moth (OFM) and lesser appleworm (LAW) trap was placed at head height in separate trees in each of six interior orchard locations regularly spaced throughout the research site. All traps were checked and cleaned weekly until late August; all lures were changed at the end of June, and CM lures were additionally changed again at the end of July. Between 6–8 volatile-baited apple maggot sphere traps were deployed along the most likely borders of each orchard site for AM immigration during late June and early July; these were also checked weekly until late August.

All plots were sampled for representative arthropod pests throughout the season. Ten blossom terminals from each of 10–30 trees were inspected during the tight cluster-pink bud period for rosy apple aphid infestations; overwintered obliquebanded leafroller populations were assessed by sampling 25 blossom clusters and shoots on each of 40 trees during the bloom period; 1st brood spotted tentiform leafminer (STLM) mines were counted on 10 fruit cluster leaves on each of 30–40 trees in mid-June; green aphid infestations were assessed on 10 foliar terminals per each of 30 trees between late June and early July; OBLR terminal infestations were evaluated on 300–600 terminals per plot during the first week of July; and internal Lepidoptera feeding damage was assessed by inspecting 10 fruits on each of 30 trees in early July and followed up weekly for up to 5 weeks by inspecting 10 fruits on each of 10 trees in 2–3 sites per

farm. Mite populations were assessed 2–3 times during the summer at each farm by collecting four 25-leaf samples from each block and brushing them in the lab to count motile forms of phytophagous and predacious mites. Shortly before the respective harvest date in each orchard, 10 batches of 100 fruits (in 25 fruit/tree-subsamples) were picked from each plot: 600 from trees in the interior of the plot, and 100 from trees on each of the 4 outside edges. All fruits were inspected for damage caused by diseases and insects, including the three internal Lepidoptera species.

Results

Pheromone trap catches from around the state revealed population patterns similar to those seen during previous seasons for the different species, but relative numbers were somewhat lower than normal. As seen in Fig. 1, codling moth levels were fairly low in all but one of the blocks (located in western NY), where catches exceeded 10 moths per trap per week three times. Levels of the remaining two species were also relatively low, depending on location, with LAW generally more abundant than OFM, and showing peak numbers of 15–25 moths per trap on only two or three dates per site. (CM and OFM trap catch numbers at Russell, where mating disruption was used, are taken from a non-disrupted orchard on the same farm.) Apple maggot numbers were also lower than typical levels, with 2 sites catching less than 2 flies per trap on a weekly basis during the entire summer; at the remaining 4 sites, peak numbers of 3–5 flies per trap occurred between the first and second weeks of August.

Data on European red mites and phytoseiid predators were averaged to determine the mean density of each for the dates when samples were collected from each plot. There were no cases in which mean European red mite numbers surpassed the designated treatment threshold levels during the season, except in one block at the Endres site during the 17 July sample. Overall farmwide maximum counts of ERM averaged 0.12–1.64 motiles per leaf during the season (Table 1). Phytoseiid predator mites were generally low as well in all sites, with farmwide maximum levels ranging from 0.1–0.9 motiles per leaf. Most phytoseiids identified were *Typhlodromus pyri*, except at Knight, where they were exclusively *Amblyseius fallacis*.

Most in-season insect sampling sessions showed low levels of incipient pest species, both fruit- and foliar-feeding. As a summary of sampling results:

Rosy Apple Aphid, TC-Pink – infested clusters. Russell: 9%; Oakes, 4.5%; Endres, 1%; remainder zero.

Obliquebanded Leafroller, Bloom/Summer – infested clusters/terminals. Russell, 0.2% / 1%; Oakes, 0.05% / 0%; Knight, 0.6% / 3.3%; Endres, 1.4% / 0.4%; Burnap, 0.1% / 0%; Hance, 0.1% / 1%.

Spotted Tentiform Leafminer, June – leaves with 1st gen mines. Russell, 0; Oakes, 0.7%; Knight, 0; Hance, 1%; Endres, 3%; Burnap, 3.7%

Aphids, Summer – % infested terminals. Russell, 55%; Oakes, 0; Knight, 0; Hance, 0; Endres, 63%; Burnap, 0.3%.

Spray records from the RR sites were able to be compared with those from conventional (STD) blocks at four of the six grower farms. Spray program costs were generally comparable between the two treatments, with combined insecticides and miticides in the RR sites averaging \$270 per acre, or about \$16 more than the STD programs; numbers of spray applications made

during the season averaged between 7.5-8.0 for both programs. Only one grower (Knight) substituted border-row or selective planting applications for full-block or farmwide sprays for specific treatment decisions; i.e., at first cover for plum curculio, and the final apple maggot spray in August. However, at least two growers made selective block (as opposed to farmwide) miticide applications in response to recommendations made after foliar samples were taken. Interestingly, although the STD programs differed by the inclusion of organophosphate and pyrethroid products, both programs relied to a similar extent on products with microbial (Spintor), insect growth regulator (Esteem and Intrepid), and nicotinoid (Actara, Assail, Calypso, and Provado) active ingredients, indicating the level of adoption of these "newer" types of materials across our production area (Appendix 1).

The full-season RR program implemented on the six growers' farms resulted in clean fruit levels at harvest ranging from 92.0–98.0%, with late-season OBLR accounting for the largest category of insect damage (1.2–6.2%), and smaller amounts of damage being caused by plum curculio (0.2–3.2%) and tarnished plant bug (0.2–1.5%) (Table 2). Where available, fruit grown on the same farms using conventional practices (STD) ranged from 92.9–98.2% clean, with other damage being 1.3–5.6% (OBLR), 0–1.1% (tarnished plant bug) and 0–1.2% (rosy apple aphid).

An additional small-plot trial was conducted at Knight to assess the value of including a preventive pink bud treatment against tarnished plant bug damage to fruit. A 2.5-A block of Macoun was divided into three equal sections, one of which received an application of Asana at pink, one was sprayed with Actara, and the third was left untreated. At harvest, 1000 fruits on at least 10 trees in each plot were examined for TPB damage, with the following results: Asana, 0.8%; Actara, 0.4%; Untreated, 0.7%. This indicated little, if any, evidence in support of the effectiveness of a pink bud insecticide application for this pest.

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The following **Objectives** of this project were addressed in separate component studies in New York in 2007, which are included as individual reports on subsequent pages:

3) Optimized mating disruption tactics in apple production systems, by assessing the effectiveness and economics of different pheromone delivery systems.

4) Improved obliquebanded leafroller (OBLR) management through a more complete understanding of its biology and infestation behavior on a whole-farm basis.