



Northern NY Agricultural Development Program 2014-2015 Project Report

Identification and Grower Education of Key Pests in Apple Orchards in Northern New York

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Background:

Changes in the landscape of northern NY orchards over the past decade have influenced the key economically significant pests of these orchards. Changes have included predominant choice of cultivars and rootstocks, implementation of new training systems, and restrictions on availability of chemical controls, as well as climate change and introduction of new pests through world trade. While there is a wealth of knowledge about key pests in western NY over many decades, there is a gap in knowledge in northern NY due to lack of resources allocated to the area, distance from main agricultural experiment stations, and a gap in extension personnel in the area.

There are many resources available for farmers to identify the pests in their orchards including trapping protocols developed by Cornell, web-based monitoring systems (for example, the Network for Environment and Weather Applications (NEWA)), and advising by private consultants. However, many of the orchardists lack extensive knowledge of the biology of these pests and expertise in using these resources, often relying heavily on private industry consultants with limited resources. In addition, a

thorough insect IPM (integrated pest management) protocol was developed by Art Agnello and Harvey Reissig in the early 2000s using web-based resources, but changes in the orchard landscape (especially the chemicals available), technology barriers, and training time required have prevented many farmers from adopting the system.

By better understanding the key pests in Northern NY orchards, growers and advisors can focus efforts on key issues, using limited time and resources more efficiently. Using the insect IPM protocol and the online resources to target the pests in their orchards, growers can make more directed management decisions, potentially saving time and money by eliminating unnecessary pesticide applications, or applying treatments at critical times to better control pests and increase the quality and value of their crop.

The goals of this project were to identify the key orchard insect pests in northern NY orchards as compared to other regions and historically significant pests, and to test the web-based insect IPM protocol for use in commercial orchards. Results were shared with growers through meetings and publications.

Methods:

- 1) **Identify key orchard pests:** In January-March 2015, growers, consultants, and other specialists were informally interviewed to collect anecdotal information about current and historically economically significant insect orchard pests. Following this collection of information, blocks were established at five sites on commercial orchards in northern NY to trap and scout for key insects. These insects included codling moth (CM), oriental fruit moth (OFM), obliquebanded leafroller (OBLR), apple maggot (AM), mites, aphids, and scales. Traps were monitored and sites were scouted weekly throughout the growing season.
- 2) **Test the efficacy of the insect IPM protocol in northern NY orchards as compared to the grower standard:** At each of the five trapping sites, two complimentary blocks were established. Each block was approximately one spray-tank volume in size for ease of grower management. Dwarf or semi-dwarf trees of similar age and rootstock/scion combination were selected at each site, with preference for blocks including both Honeycrisp and McIntosh, the primary cultivars grown in the region. One block was considered the 'grower standard' and received the insect management the grower typically used. The second the block was considered the 'IPM' block, and growers were given weekly recommendations based on the IPM protocol. Fruit in each block was evaluated mid-summer and at harvest for insect damage (600 fruit total, 100 from each side and 200 from the center). Spray data was collected for each block to compare time and money spent in grower standard vs. IPM blocks.

Results:

1. Identify key orchard pests. Economically significant insect pest and management strategies currently and historically employed were characterized through conversations

with growers and specialists. Trap catches throughout the summer confirmed anecdotal information. A brief summary:

- **Early season insect pests:** Plum curculio is considered the driver behind early season insect pest management programs. Lesser insects (chewing and sucking insects such as leafhoppers and apple sawfly) are typically controlled by sprays targeting PC.
- **Summer insect pests:** OFM and CM have not historically been significant pest in the Champlain Valley, and continue to be of low concern, evident from very low trap captures in 2015. OBLR is an increasingly significant pest in the region, but it has not always been. In the past 10-15 years, many growers in the Champlain Valley have seen a sudden increase in OBLR in their orchards and have had to adjust their management strategies. In 2015, significant counts were recorded at all locations.
- **Late pests:** Apple maggot is the driver for late summer insect management programs and continues to be, as evident from high trap captures. Flies emerge and migrate into orchards beginning in early July, and are active until harvest. AM trap captures reached action thresholds within 2-3 weeks in most orchards. In certain blocks, trap captures were >200/trap and required aggressive control.
- **Other insects of significance** include European red mite, rosy apple aphid, wooly apple aphid, and San Jose scale. European red mite can be managed by predator mites in many cases, which have established populations in most orchards practicing conservation of predator mites like choosing materials less toxic to predators. Applying dormant oil is an effective way to control mites, but requires excellent weather and slow application, is not always accomplished on large acreage orchards. San Jose scale is increasingly a problem in Northern NY orchards, where it has not been previously.

2. Test IPM protocol in commercial orchards. In 2015, at the five study sites, the IPM protocol was found to be as effective as the grower standard and typically saved the grower time and money by reducing the total number of sprays in the season.

- **Fruit Damage:** The percent of damaged fruit was not different in the IPM block than the grower standard. For both, the total number of damaged fruit was on average less than 3%, well below the 5% damage typically tolerated in the packing line (Table 1). In addition, fruit was evaluated for 'grade' (clean, fancy, #1, or cull). Nearly all fruit were classified as 'clean' in both the grower standard (96.3%) and the IPM (96%) treatments (Table 2). Only about 2% of fruit did not meet the standard for 'fancy' for both the grower standard and IPM treatments. The most significant damage that was observed was caused by Tarnished Plant Bug (TPB), and early season insect that feeds on developing fruitlets leaving a deep dimple in mature fruit. The number of fruit with TPB damage was not different for grower standard (2.4%) or IPM (2.3%) treatments. One grower reported more OBLR damage in the IPM fruit at harvest due to a delayed summer insecticide application, but this was not reflected in our fruit evaluation.

- **Number of Insecticide Applications:** Growers made between 1 and 5 fewer insecticide applications in the IPM blocks than the grower standard blocks during the 2015 season. Typically this was because the IPM protocol eliminated an insecticide application at ‘pink’ and reduced the number of mid-summer insecticide applications targeting OBLR and AM. Despite increased resources required to train workers in IPM protocol, and time spent checking traps and scouting, growers likely saved a significant money by using the IPM protocol.
- **Targeted Insecticide Applications:** In addition to making fewer insecticide applications, the timing of the applications was also different in the IPM blocks than grower standard. Typically, the grower standard management decisions were made on a calendar basis (14-day interval), while IPM management decisions were made based on computer-based systems and scouting/trapping data. Insecticide applications targeted specific insects and life stages, and were only made when a pest population reached an action threshold, determined as the threshold at which economically-significant damage would occur.

Table 1. Average Insect Damage at Harvest in 5 Commercial Orchards in Northern NY (% of 600 fruit sampled)

Damage Type	Grower Standard (%)	IPM (%)
Deep	0.0	0.0
Sting	0.0	0.0
Early	0.1	0.2
Late	0.1	0.4
AM	0.0	0.0
PC	0.5	0.7
TPB	2.4	2.3
RAA	0.0	0.0
SJS	0.1	0.0
EAS	0.0	0.2
SB	0.5	0.0
Scab	0.2	0.2

Table 2. Average Fruit Grade at Harvest (% of 600 fruit sampled)

Packing Grade	Grower Standard (%)	IPM (%)
Clean	96.3	96.0
Fancy	1.9	1.8
#1	1.6	1.9
Cull	0.3	0.4

Conclusions/Outcomes/Impacts:

Through trapping and conversations with growers during the 2015 season, we were able to characterize the orchard pest complexes in the Champlain valley. As expected, the major pests in Champlain Valley are similar to other orchard production regions in New York. Exceptions include certain lepidoptera such as OFM and CM, which are lower in pressure presumably because they do not overwinter well in the Champlain Valley and/or have not yet migrated to the area. Other insects, including OBLR, were not historically a problem, but in recent history have become economically significant pests. It is important to continue monitoring as many insects as possible due to the dynamic nature of pests, climate, and orchard landscape.

The insect IPM protocol provided excellent control of economically significant pests, resulting in on average 96% clean fruit at harvest. This is well within the acceptable level for most packing lines and not significantly different than grower standard protocol (96.3% clean fruit). Overall growers saved time and money when using the IPM protocol, because of the reduced number of sprays. Most of the growers that participated in the study were very enthusiastic about the IPM protocol and several planned to implement it in other blocks on their orchard. They requested field workshops to train their workers in the protocol, so they could implement it more broadly.

Despite the positive results, there are still several reasons to doubt the efficacy of the IPM protocol. Having only run the trial for one year, it is hard to know whether it will be consistently as effective as a long term management plan. This is especially true for ‘clean’ orchards, such as the blocks included in the project, where insects have been well managed for many years and populations have not been allowed to build up in the orchards. In 2015 in particular, bloom period was extremely short (3-4 days). This is ideal for the IPM protocol, in which the first insecticide application is made at petal fall. In many standard management plans, an insecticide is applied at pink. If there is a long bloom period, early season insects have more time to develop and cause damage, and a petal fall treatment may be too late to provide adequate control. For these reasons, it is necessary to test the IPM protocol in multiple years with various conditions, and as a long-term strategy.

Outreach:

Two Apple IPM Workshops were held in Northern NY in April 2015, attended by 30 participants. Workshops were 5-hour, classroom-style programs, providing information on IPM theory, insect and disease pest biology and control, NEWA ‘Real Time IPM’, tree row volume, and an example IPM plan. Presentations were given by Dr. Art Agnello, Dr. Julie Carroll, Dr. Kerik Cox, Dan Donahue, and Dr. Harvey Reissig.

Trap captures were provided to growers enrolled in the Eastern NY Commercial Horticulture Program (ENYCHP), through E-alerts and newsletters. E-alerts are emails sent to growers about twice weekly during the growing season, and include up-to-date information on topics including pest management considerations and upcoming events. The ENYCHP newsletter is a monthly publication produced during the growing season, with more in-depth articles and formatting on relevant topics.

Results of the IPM protocol experiment were presented at the New England, New York, and Canadian Fruit Pest Management Workshop, Burlington, VT, October 20-21, 2015, and Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA, December 4, 2015.

Next Steps:

We have received continued funding from the Northern New York Agricultural Development Program to replicate the insect IPM protocol experiment in 2016, using the same five orchard sites. Insect activity and management recommendations will again be reported to growers through ENYCHP E-alerts and newsletters.

Reports/articles in which results of this project have been published.

Wallis, A. and Agnello, A. "Hands On IPM Project on Northeastern NY Orchards." *2015 Cumberland-Shenandoah Fruit Workers' Conference Report*. December 4-5, 2015

For More Information:

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Figure 1. Damage from summer feeding of obliquebanded leafroller at an orchard in Clinton County, NY. This insect has become an economically-significant pest in the Champlain Valley in the past 10-15 years. Photo: Anna Wallis



Figure 2. Apple maggot (AM) sticky red sphere trap with volatile apple essence lure in an orchard in Clinton County. Lures are deployed at the beginning of July near the orchard edge, near other host trees (i.e. Hawthorne), if present. Apple insect IPM protocol considers 5 AM flies per trap ‘threshold’ and an insecticide application is recommended. Photo: Anna Wallis



Figure 3. Cornell University entomologist Art Agnello presents information on IPM theory and insect pest biology to growers at an Apple IPM Workshop, April 2015. The workshop included presentations on disease management, NEWA, tree row volume, and a sample IPM plan, by Dr. Kerik Cox, Dr. Julie Carroll, Dan Donahue, and Dr. Harvey Reissig. Photo: Anna Wallis.