Northern New York Agricultural Development Program
2016 Project Report

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

Project Leaders:

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Cooperating Producers:

- Forrence Orchards, Peru, NY
- Northern Orchards, Peru, NY
- Banker Orchards, Peru, NY
- Chazy Orchards, Chazy, NY

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 has been a gap in knowledge in NNY due to lack of resources allocated to the area, distance from main experiment stations, and a gap in extension personnel in the area.

In addition, having information about insect activity in real time throughout the season is crucial to effective management of these insects on commercial orchards. Pest management, especially integrated pest management (IPM), practices are based very closely on knowing trap counts, degree days, and life stage of the insects. Tracking and reporting regional insect activity along with management recommendations is necessary to help growers more effectively execute insect control.

There are many resources available for farmers to identify the pest pressures in their orchards including trapping protocols developed by Cornell, web-based monitoring systems (NEWA), and advising by private consultants. However, many of the orchardists, especially the new generation of farmers and farm workers, 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 the 2015 growing season, Northern New York Agricultural Development Program funds were used to successfully collect data on the activity of key pests in 9 sites in commercial orchards. Data was used to advise grower cooperators on an IPM protocol.

Efficacy of the IPM protocol applied was determined by comparing insect damage to fruit at harvest between the 'IPM protocol block' and 'grower standard block' at each site.

Insect trap data was included in weekly e-alert newsletters distributed to ENY Tree Fruit enrollees. Two IPM Workshops in May 2015 provided 30 growers with information on key pests, insect biology, and recommended IPM practices. Workshops were extremely well received and growers asked that field workshops be offered in the future to help train farm workers and the younger generation.

The goals of this project were to:

- continue monitoring the key insect pests in NNY orchards;
- determine how they are changing over time, building on the data collected in the 2015 season; and
- provide education and real time pest information to assist growers and workers in making more-educated decisions on pest management as it changes over time.

Methods:

Insect Activity

Blocks were established at five sites on commercial orchards in NNY to trap and scout for key insects. These were the same sites monitored in 2015. Insects monitored included:

- codling moth (CM),
- Oriental fruit moth (OFM),
- obliquebanded leafroller (OBLR),
- apple maggot (AM), and
- mites, aphids, and scales.

Traps were monitored and sites were scouted weekly throughout the growing season. This data was compared to records from 2015 in Northeastern NY and with other apple production regions in NY State.

IPM Protocol Evaluation

In 2015, we evaluated an insect IPM protocol by establishing replicated blocks at each site for 'grower standard' and 'IPM treatment.' IPM is not a one-size-fits-all program. Each grower evaluates insect activity and pressure in the orchard and then uses the

models to inform his spraying program. Weekly recommendations were provided for the IPM treatment' blocks. Overarching goals of the IPM treatment included:

- Thresholds: Pesticide applications were only recommended once pests or damage was detected above a predetermined economic threshold (i.e. trap numbers or leaf/fruit damage specific to each pest).
- Timing: Pesticide applications were made based on insect activity to target most susceptible life stage.
- Materials: Pesticides used were considered more 'IPM-friendly,' i.e., more pest-specific, with lower mammalian toxicity, and of shorter persistence in the environment.

In 2016, efforts to replicate the 2015 trial for evaluating the efficacy of the insect IPM protocol was negatively impacted at all 5 trial sites due to:

- Grower collaborators already using the IPM protocol practices, such as trapping, using models to inform sprays) orchardwide as their grower standard for IPM and control treatments.
- Grower collaborators used the recommendations given for 'IPM treatment' blocks to make decisions about the 'control' blocks, therefore, paired blocks received the same treatments, eliminating comparative value.
- Growers in the Champlain Valley experienced extraordinary weather and disease challenges during the 2016 season. They were unable to provide labor, time, and/or more expensive materials necessary to implement the IPM treatments.

To determine if treatments applied in 2015 had a carryover effect for 2016 crop, insect damage was evaluated at harvest. One of the most significant concerns being damage from overwintering pest populations not adequately controlled in 2015. A sample of 600 fruit from each site (200 from the center of the orchard block, 100 from each side of the block) was evaluated for type of insect damage and packing line grade. Insect damage was compared to pesticide records and pest activity to determine which pests growers effectively managed, and which were not effectively controlled.

Results:

Insect Activity

Activity was assessed by trap captures that indicate first flights (biofixes) and peak flights. In general, timing of emergence in the Champlain Valley is delayed by approximately 7-14 days as compared to the warmer regions of Highland and Geneva (Table 4). Growing Degree Days (GDD) is used as an indicator for insect emergence and activity, but GDD Base50 at first flight was not very consistent across regions for 2015 and 2016 (Table 5).

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 (PC) 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 (AM) is the driver for late-summer insect management programs and continues to be, also evident from high trap captures. Flies emerge and migrate into orchards beginning in early July, and continue to be 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. The populations and pressures of these insects are extremely dependent on site, and therefore require site-specific pest management considerations. 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 at late dormant or green tip is an effective way to control soft bodied insects including 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.

The patterns of insect activity were predictable in some instances as compared to ‘normal’ activity in other regions, but sometimes were not. Activity was both region- and site-specific. OBLR is the primary target of pesticide programs targeting summer lepidoptera in the Champlain Valley of NY, while CM exhibits low pressure in the region. However, in the Champlain Valley of Vermont, CM drives insect management programs and OBLR is less of an issue. Within the region, pests followed similar activity patterns, but actual flights were specific to site and year (Appendix: Figures 1, 2). Of the five locations observed in this work, four were located in Peru. Yet, the difference in emergence date varied up to 14 days and between sites in the same year and trap captures at peak flight varied by as much as 27 insects/trap between sites. Despite this, insect damage at harvest was very similar between sites.

IPM Protocol Evaluation
In 3 of 5 sites, OBLR pressure (% terminals infested of 600 terminals rated) was higher in the control than in the IPM block (Appendix: Table 1). In only two locations was damage greater than 5% in either control or IPM treatment. On average, OBLR-infested terminals were 2.4% in IPM blocks and 2.7% in control blocks. These low infestation rates indicate that overwintering and early season OBLR activity was not impacted differently by the application of either the grower standard or IPM protocol treatments.

In fruit evaluated at harvest, average insect damage at all sites in both treatments was less than 2.0% for any particular insect (Appendix: Table 2). On average 100% of fruit from control blocks and 96.4% of fruit in IPM blocks were clean (no insect damage at all). Both of these values are below 5%, considered acceptable damage levels in commercial packing. These data indicate that treatments did not differentially affect insect damage.

99.4% and 96.6% of fruit rated at harvest met 'Extra Fancy' grade (Appendix: Table 3). Again, this was below the acceptable threshold of 5% damage, typically allowed in commercial packing and indicated that fruit grade was not affected by treatments.

Fire Blight
One of the biggest unexpected benefits of this project in the 2016 season was in response to fire blight, which growers have extremely limited experience in managing. A 'perfect storm' of weather events in Spring 2016 caused an epidemic of fire blight, an extremely destructive disease of apples, in the Champlain Valley. While fire blight has previously been reported in this region, in most seasons conditions are not conducive to infection. Because we were regularly visiting the 5 study sites in this work, we were well equipped to assist growers with management by:

- identifying the infections shortly after they occurred and tracking how the disease progressed in specific locations and across the region,
- providing disease biology, activity, and management recommendations in at least 16 e-alerts and newsletters,
- providing immediate, site-specific management recommendations through 20-plus site visits
- soliciting collection of numerous plant samples sent to Dr. Kerik Cox, Associate Professor of Plant Pathology and Plant-Microbe Biology at Cornell University, for diagnosis and antibiotic resistance testing
- initiating new research projects on commercial farms and at the HVRL to address grower concerns and management strategies
- offering a Fire Blight Workshop on August 2 in Plattsburgh, NY, for 35 participants, with Dr. Srdjan Acimovic and Dr. David Rosenberger, pathologists at the Hudson Valley Research Lab, providing a detailed overview of season conditions, pest biology, and management recommendations.

Conclusions/Outcomes/Impacts:
We continued to monitor and characterize the orchard pest complexes in the Champlain Valley in 2016. As expected, the major pests in the 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. Despite excellent understanding of the biology of many of these insects, activity continues to vary greatly between year, region, and site, making it important to continue monitoring as many insects as possible due to the dynamic nature of the pests, the climate, and the Northern New York orchard landscape.

The insect IPM protocol provided excellent control of economically-significant pests, resulting in on-average 96% clean fruit or more at harvest in both 2015 ratings and in 2016 ratings for carryover effects.

Most of the growers that participated in the study were very enthusiastic about the IPM protocol and many implemented it in other blocks on their orchard.

Despite the positive results, growers continue to have hesitation about the efficacy of the IPM protocol due to the variation in insect activity and pressure between years, regions, and sites as demonstrated by this project in 2015-2016. Growers also have a concern about the significant amount of highly skilled labor it takes to effectively monitor pests and use the online models to determine specific management recommendations. Additional research would help identify whether the IPM protocol can be consistently cost-effective for growers to implement.

Outreach:

Information about pest activity and recommended control measures were communicated to growers in a weekly 'e-alert' email distributed to growers enrolled in the Eastern NY Commercial Horticulture (ENYCH) tree fruit program. Growers have repeatedly reported that these e-alerts with pest activity reports are one of the most valuable pieces of programming implemented by CCE ENYCHP. A 'Navigating NEWA Workshop' in March 2017 provided training for growers on the online pest forecasting and management tools available. Unfortunately, very warm early conditions led to the prediction of early pest activity.

Next Steps:

Based on the considerable variation in insect activity and pressure between years, regions, and sites, monitoring should continue to allow extension to provide growers with accurate information about activity and recommendations for management. Skilled labor is required to effectively implement IPM. To facilitate this, extension will need to offer appropriate training on pest biology, monitoring techniques, IPM protocols, and online systems (NEWA).

For More Information:

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