IPM Network Development

Identification, Management, and Information Sharing in Connecticut's Small Fruit Production

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Abstract

This past summer iPiPE interns worked in conjunction with UConn Extension to develop and implement a unique, crop-specific IPM network in the state of Connecticut. The focus was on grapes and other small fruit, including blueberries, strawberries and raspberries. A total of sixteen different farms and vineyards participated, all of which varied in level of experience and time in operation. All farms experienced pest infestations to some degree during the season. The largest challenges facing grape growers in Connecticut were the Grape Berry Moth, Phylloxera, and Powdery Mildew. Through scouting and the use of IPM, interns worked with growers to effectively prevent, mediate, and communicate pest problems throughout the state.

Introduction

Background & Reasoning

In Connecticut, small fruit production has become an increasingly attractive business model. Relatively low capital investment allows farmers flexibility in integrating small fruit into existing or new operations while a healthy consumer-driven demand guarantees a market throughout the growing season. Small fruit also plays a large role in the ever-growing agritourism market. Strawberries, blueberries, and raspberries are often the all-stars of pick-your-own operations, attracting flocks of families to farms all over Connecticut. In addition, Connecticut's growing wine industry has prompted increases in grape production and with-it growing interest in vineyards and tasting rooms as destinations for adults. However, even with reduced startup costs and a lucrative marketplace, small fruit production in Connecticut's unpredictable climate carries with it a host of pest-related issues.

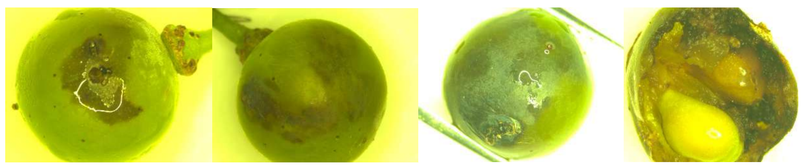
The allocation of more land to berry production in Connecticut has prompted an equally substantial increase in associated risks. The largest of these risks by far is weather, driven by human-influenced climate change and carrying with it an amalgam of downstream issues. Warmer springs encourage early pest emergence and rapid development. Longer growing seasons allow for increased generational cycles leading to massive pest populations late in the season. Fluctuating weather patterns exacerbate pest-related issues: increasing disease pressure and reducing plant vigor. All the while, long-term climatic changes have shifted the range and distribution of species, some invasive and some pests. These coupled with the general unfamiliarity of some farmers – who are either new to the crop or farming as a whole – can make this attractive business model a bit tricky to navigate at times. With this, there is an observable, growing need for both information and education in relation to small fruit production and integrated pest management (IPM).

IPM Network Development: The iPiPE & IPM

The iPiPE as a standalone technology provides growers access to a network of stakeholders and a range of IPM tools. However, successful network development and implementation are reliant on grassroots iPiPE representatives to explain the technology while building a trusting relationship with participants. Farmers are more likely to invest their time in a person over a technology, putting a face to the iPiPE network is essential. This ensures that farmers are more comfortable and willing to share accurate information with the network. The iPiPE plays a dual role for its stakeholders, offering support to those who may be facing serious issues. Oftentimes knowing that you're not alone in your struggles can alleviate unnecessary stress while a fresh pair of eyes may provide a more accurate identification or management strategy. Only from a well-informed and supported position can farmers truly employ a proper and timely IPM program.

Methods & Materials

Grape Berry Moth:



Progression of Infested Berry: First – Larval Entry Point; Second – Darkened Feeding Path; Third – Progression, Entire Berry Dark; Fourth – Shrunken, Eaten Out Berry,

GBM feeding damage

Young GMB larvae (Top) Mature GBM larvae (bottom)

GBM webbing

Sites were assessed for degree of risk. High risk areas, with at least 25% woodland perimeter, were given priority for population monitoring. At least 2 pheromone monitoring traps were set out per site (1C wing traps with Grape Berry Moth pheromone lure): one adjacent to woodland edge, one within the vineyard. Traps were checked once a week. Biofix date was set at date of first capture and degree day (DD) calculation began from biofix date. At 400 DD, scouting for presence of first generation of larvae began. Five vines were selected; 10 cluster per vine were checked. At 1620 DD, scouting for second generation of larvae began. Presence was used in conjunction with the NEWA model to determine management dates. All observations were uploaded to iPiPE.

Phylloxera, Phomopsis, Mildews (Downey/Powdery) & Rots (Bunch/Black):

Sites were assessed for degree of risk. High risk areas, with at least 25% woodland perimeter or a history of infestation, were given priority for scouting. Five vines were selected and tagged at each site. Tagged vines were checked once a week, 10 clusters per vine, for signs of pest presence. Hand lenses and field guides were used to properly identify pests. The UConn Plant Diagnostics Lab was used if pests were difficult to identify. Recommendations were given in accordance with the New England Small Fruit Grower's Guide. All observations were uploaded to the iPiPE.

Grape Phylloxera (Right), Powdery Mildew (Middle), and Black Rot (Left)

Grape Nutrition:

Nutrition studies had been underway at UConn Extension for multiple years. Participants were selected based on their past involvement. However, new stakeholders were able to participate in the nutrition study as an additional provided service for their participation in the iPiPE program. Testing occurred twice throughout the growing season, once at bloom and once again at verasion. For sap testing, 10 petioles per sample were washed and pressed using a hydraulic press. Macro- and micronutrient tests were carried out with Horiba LAQUAtwin meters and a LaMotte Trace Element Plant Tissue Kit. For tissue testing, 80-100 petioles were rinsed and dried. Samples were sent to the UConn Soil Testing lab for nutrient tissue analysis. Soil samples corresponded to each sap and tissue sample. Soil samples were evaluated at the UConn Soil testing lab

iPiPE Stakeholder Engagement

Scouting session from Mary Concklin at CT Growers Twilight Meeting.

Stakeholder engagement cards (flyers) were created prior to the start of the iPiPE internship and used to convey the intent of the internship as well as to introduce the iPiPE technology to stakeholders. Cards were provided to stakeholders during their initial meetings with interns, along with fact sheets on pests of interest and contact information. Interns participated in a range of Extension events throughout the summer in order to cultivate relationships with growers and introduce the iPiPE technology to other potential stakeholders. Interns participated in the CT Fruit Grower's Twilight Meeting, assisting in training growers to scout for pests and giving a short presentation on the iPiPE. Networking continued at the summer CT Grape Growers Dinner. Here, interns listened to presentations on viticulture, concerns from the grape growing community, and continued to foster relationships with stakeholders.

Interacting with local farmers at FarmAID 2018.

After the summer ended, engagement continued with regard for the following year's internship. Interns manned a table at the 2018 Farm Aid Festival, answering questions about IPM, sharing sentiments from the summer internship, and promoting extension to the farming community. The table was shared with UMass Amherst's iPiPE team, who fielded questions about IPM, tree fruit, and their summer internship. More recently, the iPiPE was featured in UConn Extension's RMA Newsletter for its utility at reducing and mediating risks associated with farming.

Strawberry scouting workshop with local growers at Bishop's Orchards in Connecticut.

Findings

- Grape Berry was the most widespread pest, found at all sites. However, webbing from the GBM larvae was only found at one site. This site was the only to report damage from larvae.
- Grape Phylloxera was found at 60% of sites. Phylloxera outbreaks were observed as early as May 22, 2019 through August 2, 2019. 30% of these sites suffered repeat infestations.
- Powdery Mildew was found at 60% of sites. Presence of Powdery Mildew was correlated with rainfall in late June through late July.
- The western half of the state had higher pest diversity. Phomopsis was found at over 70% of western sites, 60% experienced repeat infestations. Phomopsis infestations were isolated, occurring within 25 days in June. Black Rot was also prevalent in western sites, with over 50% presence.
- Anthracnose was only observed at eastern sites, with 50% presence.

Conclusion

The widespread distribution of the Grape Berry Moth in the state was a bit concerning. When growers were asked about the history of the pest at their farms, most of them said that they were either not aware of the pest or that they did not have a problem in the past and yet the GBM was captured at each farm. More concerning was the number of individuals being caught in each trap, sometimes upwards of 50 individuals in a week. However, GBM webbing, which signifies the presence of the damage causing larvae, was only found at one farm. This same farm was the only one to report damage from GBM. Regular biweekly spray schedules at most of the farms were most likely the reason that the pest, although present in great numbers, was never able to establish a large enough population of larvae to cause damage. The large numbers of adults caught early suggested one of two things. Either GBM has been more of a problem than thought in the past and this is the first time the pest was noticed, since it never gets to a point to cause noticeable damage or warming temperatures have shifted the cycle of the pest to earlier in the season and what were thought to be first-generation adults were second-generation adults.

Phylloxera proved to be a much bigger problem than anticipated. The Extension Center saw some of the worst Phylloxera infestations that they have ever seen this year. New farmers, poor cultural practices and non-resistant rootstock were found to be the main contributors to the widespread Phylloxera infestations. Some of the infestations, mostly at sites with repeat occurrences, led to measurable loss in yield. Powdery Mildew was correlated to the wettest times during the growing season. Overgrown rows and late pruning seemed to exacerbate the issue for some farms. Farms with vigilant pruning and well-manicured rows had less of a problem with Powdery Mildew throughout the season. Pruning tended to be one of the tasks that growers would push back when another issue requiring their attention arose. However, the Powdery Mildew did not present the growers with any measurable loss in production.

Side Projects; NEWA Validations, Brown Marmorated Stink Bug and Spotted Wing Drosophilla

The iPiPE grant allowed interns the ability to participate in three separate NEWA pest model validations. Many of the farms that participated in the iPiPE project also had the means to participate in the NEWA model validations. Model validations were for Blueberry Maggot, Cranberry Fruitworm, and Botrytis and Anthracnose of Strawberry. Both the Blueberry Maggot and Strawberry models will go live in 2019. The Cranberry Fruitworm model still needs more data.

UConn Extension has a running monitoring program for both Brown Marmorated Stink Bug and Spotted Wing Drosophila. Sites that participated in the iPiPE and had the appropriate crops, also had the opportunity to participate in scouting for these two pests.

BMSB nymphs found on a grape leaf