NE IPM Grant Report
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Title: Trap Network for Insects that Attack Blueberry Fruit

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Cooperating Farmers: Most are u-pick operations.
Schuyler County: John Tamburello, Glenhaven Farm. *Chemung County*: Diane and Daryl Ackerman, Ackerman's Blueberries; George Kapral. *Tioga County*: Tom and Linda Gartung, TLC Blueberry Farm; Gary Phelps, Gary's Berries; Frank Wiles, Our Green Acres; Steve Mills, Mills' Blueberry Farm. *Tompkins County*: Cornell University Orchards; Dave and Ginny Farmer, Farmer's Choice Blueberries. *Cortland County*: Terri Perfetti, Cherry Knoll Farm
Other Cooperators: Cornell Orchards, Hugh Ink, 607-255-4542; Marvin Pritts, Professor of Horticulture, 607-255-1778, Greg English-Loeb, Assoc. Professor Entomology, 315-787-2345.

Non-technical report for Annual Report (Abstract):
There are three main fruitworm pests blueberry growers battle in order to produce high quality fruit. The insect populations, distributions, and damage caused are not well understood, and growers' approaches to managing these pests varies widely. Most blueberry growers want to reduce insecticide use not only to reduce their own exposure to pesticides, but also in response to customer demand.

For this project, a trap network on 10 farms in the program area was established to monitor pest levels and growers learned first hand how to identify the problem insects.

- Blueberry growers learned how to monitor for insect pests in their plantings and learned what economic impact the insects were having on their business. After the project, about 50% of the growers plan to use traps again next year, and the growers that spray for pest control sprayed 20% fewer insecticide sprays than normal. We discovered that two growers were spraying when they didn't need to, and these growers plan to use the traps to help reduce insecticide use in the coming years.
- Two fact sheets and a web resource were developed to help blueberry growers around the state learn to use the traps to monitor for their insect pests.
- Traps will be used on farms in the coming years to monitor insect pest levels to see if they vary over the years. Two growers who were not part of the project in 2006 have shown interest in being involved in the future.
- Further research priorities for blueberry maggot control were identified and a trial is planned for next year. In addition, blueberry nutrition was an area identified that needs more research, but pursuing that project is contingent on new funding.
- Working relationships between growers and extension were greatly strengthened and other pest control questions (diseases, weeds) were answered while on the farm. As a result, weed and disease control will improve on the blueberry farms in the coming years.

Technical Report:

Background and Justification:
The need: There are three main insect pests of blueberry fruit in the Southern Tier of New York, the cranberry and cherry fruitworms and blueberry maggot. Cranberry fruitworm was perceived to be the biggest problem. Blueberry maggot appears to be a major problem in some areas but entirely absent in others. The pest population levels and variability are not well understood.

For the most part, growers were not spraying insecticides for the control of these fruitworms based on information about the pests' presence or levels. They were spraying (or not spraying) out of habit instead of based on need.

Traps exist to monitor for the three main insect pests of blueberry fruit, but most growers in the South central NY region did not have experience using them, and many were not familiar with the life cycle of the pests.

The producer interest:
Blueberry growers want to reduce insecticide use not only to reduce their own exposure to pesticides, but also in response to customer demand. Most of the blueberry farms are u-pick and are face to face with the common "do you spray?" question from customers. Also, blueberry growers are interested in exploring alternative ways to manage pests. To do this effectively it is important for the growers to be able to identify the pests and know their life cycle.

Addressing commodity priorities:
NYS IPM Working Group has ranked research dealing with the biology and management of cranberry and cherry fruitworms as a priority in their 2005 ranking because management recommendations are based on research from other areas and have not been tested for validity under New York conditions.

Objectives:
1. Evaluate the feasibility and usefulness of a region-wide monitoring system for insect pests of blueberry fruit in the southern tier (cranberry and cherry fruitworms and blueberry maggot).
2. Enhancing pest identification and monitoring skills of growers in the study region and in the northeast resulting in improved decision making to better control pests with a lower environmental impact, and higher profitability for their business.
3. Evaluate the success of the project

Procedures:
Traps were placed on 10 blueberry farms in the southern tier, NY. See the attached map for the farm locations. Growers were given Michigan State's fact sheets on the identification and life cycles of the pests, and pest life cycle and appearance in the traps was discussed during farm visits. Traps to monitor the appearance of cranberry and cherry fruitworm adults were placed in fields before bud break, in early May. Growers

were given sheets to record the numbers of moths trapped and were encouraged to check the traps biweekly or more often. When the first cranberry fruitworms were found on a farm the sample was brought to all the rest of the farms to show them first hand what to look for. At one farm with high numbers of trapped cranberry fruitworms we scouted for eggs laid on fruit as instructed by the Michigan State fact sheets to determine spray timing. On every farm just as the first berries turned blue we sampled five 50-foot sections of blueberry row per farm to determine the amount of fruit damage in the planting.

Traps to monitor for blueberry maggot flies were put in the fields just as the first fruit were turning blue (June). When the first maggots were found on a farm, the sample was shown to the rest of the farmers so they would have a better idea of what they were looking for in the traps. At any farm where flies were found, 750 fruit were sampled from throughout the planting and held on a screen over sand. More than a month later the sand was sieved and the pupae counted to give an estimated percent fruit infestation for the planting.

Results:
In retrospect, we put the traps into the fields much earlier than necessary, before the leaves were even expanded. Next year we will put them out at the beginning of bloom because we did not catch moths until well into bloom last year, and if the traps are out for a shorter time we will only need one cranberry fruitworm lure per season (lasts 4 weeks) per farm.

We determined that the population levels of the pest insects were so variable over the region that each farm should have traps on their own premises instead of relying on trap catch numbers and timing from neighboring farms.

Trapping for fruitworms on the 10 project farms gave us a picture of the need for fruitworm control in the Southern Tier in 2006. Only one farm, in Barton, had cherry fruitworms present (tentative identification of adult moths on traps, but the worms were found in the fruit). Six of the ten farms had cranberry fruitworm. Therefore the rest of the fruitworm results will focus on cranberry fruitworm.

Fruitworm Findings:
Based on trapping in 2006, it seems that our main pest is cranberry fruitworm, and cherry fruitworm is a very minor player. However, the relative abundance of these pests is known to vary by year in Michigan, so we need to have traps on blueberry farms for several more years in NY before we conclude that trapping for cherry fruitworm is a waste of time.

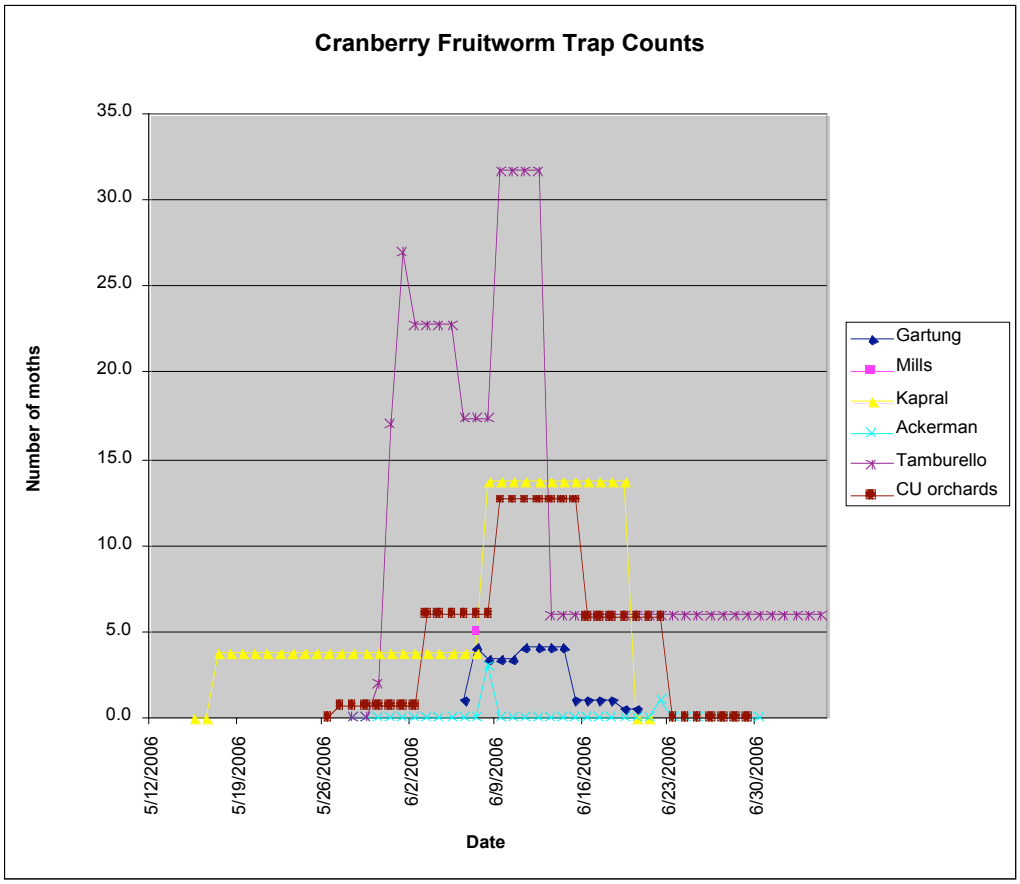

Figure 1. Cranberry fruitworm catches varied widely over the region. The graph shows the average moths trapped per day, and intervals vary because some growers checked their traps more regularly than others. Farms not listed on this graph had no cranberry fruitworms in 2006.

The recommendation from Michigan State is to use the traps to determine when to start scouting for eggs laid on the fruit, and to scout for eggs to determine when the optimal spray time is. The egg scouting gives a more reliable spray timing than trap counts alone. At one farm that had a history of high cranberry fruitworm damage we did scout for eggs and found that nearly 30% of the clusters had eggs on them. At this farm we got practice at determining when the eggs were almost ready to hatch (the eggs change color), which pinpoints the optimal first spray coverage timing.

We sampled fruit before harvest to determine how much fruit was lost due to fruitworm damage. Figure 2 shows the fruit damage caused by fruitworms on each farm. Not all damage is cranberry fruitworm, since minor unidentified damage was found on farms that had no cranberry (or cherry) fruitworms in their traps, but the majority of these losses were from cranberry fruitworm larvae feeding making the whole fruit cluster unmarketable.

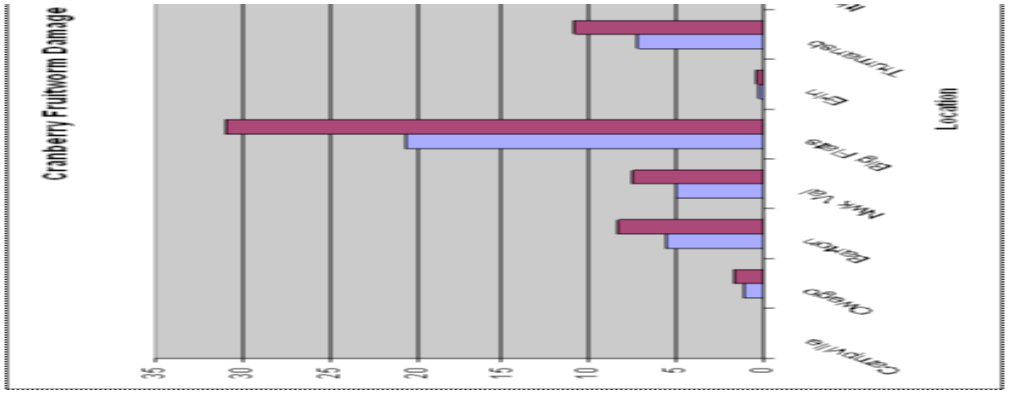

Figure 2. Fruit damage is shown both in quantity of damaged fruit and in lost income. Not all damage is cranberry fruitworm, since minor unidentified damage was found on farms that had no cranberry fruitworms in their traps.

Monetary losses were relatively minor considering that a single insecticide spray typically costs $30-50 in insecticide alone. It is interesting to note that even in Dryden and Owego where no cranberry or cherry fruitworm moths were trapped there was a little bit of fruit damage from unknown sources, while at Marathon and Campville where the growers sprayed even though they didn't have moths in their traps there was zero damage, suggesting that the insecticide sprays may be effective against other very minor fruit pests or that cranberry or cherry fruitworms can cause a very low level of fruit damage without showing up in the traps.

The trap network showed that insect control decisions were not being made based on pest pressure in many instances. There were three classes of growers:

1. Growers who spray every year assuming they'll have a problem, but who never see insect damage in the harvest. The two growers in this group realized that they could use the traps to decrease their insecticide applications.
2. Growers who have variable levels of damage, and would spray if in a particular year had a high number of moths showed up in traps. There were three growers in the study in this group.
3. Growers who do not spray insectides at all, no matter what the damage. Whether for personal safety reasons or philosophical convictions, they will not apply insecticides. There were 5 growers in the study in this group.

The growers in group 1 and 2 can make good use of the traps to monitor insect levels. The growers in group 3 might as well not spend the time and money to trap, since the trap catches do not affect their management decisions.

During summer 2006, only one fruit farm had cranberry fruitworms and sprayed for them based on scouting for eggs (Trumansburg). Two of the 10 farms sprayed for fruitworms

because they always do, but they had no fruitworms in their traps and no damage at harvest (Endicott and Marathon). As a result of this project, these 2 farms will continue to trap next year and if they do not get moths in their traps, they will leave at least a block of berries unsprayed. They are realizing that their current spray regime may be unnecessary and uneconomical.

Two of the farms had no cranberry or cherry fruitworms and did not spray for them (Owego and Dryden), which makes sense as a management decision.

Four farms had low levels of cranberry fruitworm moths found in their traps, and decided not to spray because they avoid insecticide applications out of principle. In addition, the levels of damage on these farms in 2006 was low, and in a u-pick situation spraying to prevent this damage was not necessary. The remaining farm also avoids insecticides because the farmer advertises his berries as "no spray," but the level of damage was high because he had a high population of cranberry fruitworm moths (Big Flats).

In the future, growers in groups 1 and 2 plan to use traps on their farm. In addition, two blueberry farms in the region that were not part of the 2006 trial have shown interest in using the traps next year.

Maggot Findings:
Blueberry maggot was found to be present at 2 of the 10 farms in the study. Figure 3 shows the percent maggot infestation in sampled berries for the two locations. At one location, we took an early and a late sample, and the late sample had the most maggot infestation, which fits with the grower's perception that maggot is mainly a late season problem.

	Cortland 8/4/06	Cortland 9/18/06	Big Flats 8/3/06
% infestation	1.73	4.5	1.6

Figure 3. The percentage of fruit with maggots in them is shown for different dates and locations.

Neither grower is willing to spray for maggot because that involves spraying ripe fruit and they are concerned with insecticide residues present at harvest. Instead, both of these growers are interested in trying to "trap out" blueberry maggots over several years. The word on the street is that it is possible to deplete the population of blueberry maggots in a planting over several consecutive years of intensive trapping but this has not been scientifically tested in NY. We will attempt this eradication starting next summer (2007) on at least one of these farms.

Project Deliverables:
To help other blueberry farmers learn how to use the traps effectively two fact sheets and a web site were created. These resources show how using the traps benefit a farm and detail how to set the traps and identify the pest insects. The project was carried out in 5 South Central NY counties (Schuyler, Tompkins, Tioga, Cortland and Chemung), and the fact sheets created would be useful for any blueberry grower in the northeastern United States.

Project Structure Success:
The structure of this project was found to be very successful with the growers in this region. They had frequent contact with cooperative extension through farm visits during the summer but they were also required to do some trap monitoring on their own so they would learn how. The frequent visits built strong working relationships with extension and facilitated information exchange about many other topics ranging from weeds, diseases, and marketing to blueberry propagation and nutrition. In addition, a fall meeting was held where all the growers involved in the project got together and toured two of the farms, went over project results, and brainstormed about future projects. This meeting ended up being a valuable opportunity for growers to learn from one another.

Samples of the fact sheets developed are included, but are awaiting final review before being released.

The web page will be linked from CCE Tioga's Agriculture page (http://counties.cce.cornell.edu/tioga/tcag.php**), and eventually from the Cornell Berry page.**