Introduction

The Ohio IPM program continues to work in cooperation with Ohio Agricultural Research and Development Center scientists, Ohio State University extension personnel and others across the state and north central region to address the pest management challenges facing farmers and urban citizens. In order to assess IPM adoption on alfalfa and field corn, a survey was conducted in 2004. Results from the alfalfa survey showed that the average IPM score was 68% (our goal is to have all growers above 80%). Using seed treatments for Phytophthora root rot was the least used pre-plant practice (37%) and scouting for leafhoppers was the least used in-season practice (41%). The most used in -season practice was minimizing field traffic (90%) and harvesting on time (95%).

Ohio field corn growers had an higher average IPM score (77%) than alfalfa growers. Use of transgenics was the least used of the pre-plant practices (24%) and placing sticky traps in soybeans fields for western corn rootworm beetles was the least used in-season practice (14%). Nearly all Ohio corn growers (97%) maintained accurate records of corn planting dates, field locations and spray records. Information collected from these surveys is important to us so we can establish a baseline from which to measure future progress and to better focus the research and outreach efforts of the OSU IPM Program.

Benefits achieved through IPM Technologies or Strategies

Agronomic extension personnel, producers and agri-business personnel again monitored soybean fields in 2004 for first year corn rootworm. Most of the fields were in the northwestern part of Ohio where the problem is thought to more likely appear first. Overall, rootworm populations continue to be relatively low. However, some soybean fields did have populations sufficient to warrant treatment next spring, and suggest that perhaps first year western corn rootworm is increasing in soybean. Because of this possibility, the need to continue sampling for western corn rootworm adults in soybeans in 2005 is great. Harvest evaluations from transitional organic strawberry production research plots again showed that yield and quantity of berries was equivalent to conventional production, but production costs were higher. It was estimated that organic strawberry producers needed a price of at least 25-30% higher than conventional berries to be cost competitive.

Dissemination of IPM Knowledge

This year we supported publication of the new edition of the Midwest Small Fruit Pest Management handbook. Furthermore four weekly Ohio State newsletters continue to educate our end users of IPM technology. C.O.R.N. (Crop Observation and Recommendation Network), BYGL (Buckeye Yard and Garden Line), Ohio Fruit ICM News and VegNet provide Ohio producers with timely, useful tips on insect, disease and weed management, crop production, weather, control options, research results, and event information. In addition to these newsletters, IPM information was communicated at annual winter meetings (i.e. Ohio Fruit and Vegetable Congress), in online proceedings, and published research reports on the OSU IPM web site.

Enhanced Stakeholder Collaboration

Frequently at annual winter meetings IPM personnel formally and informally meet with our stakeholders. This year we completed IPM adoption surveys with 779 alfalfa and 637 corn

growers. We also conducted IPM research/demonstration in 105 grower fields (tree fruit, vegetable and soybean).

In 2004, the Ohio IPM program took the lead in forming one of the few working groups established in the North Central Region to address regional pest management issues. Jim Jasinski, an Ohio IPM program staff member, helped to organize and now leads the Great Lakes Vegetable Working Group. The goals of the working group are to facilitate communication between university research and extension personnel throughout the region who work on vegetable crops by establishing a listserv and a Great Lakes Vegetable Working Group website, assess IPM adoption in various vegetable crops and to meet with growers by commodity, to get their impressions of IPM adoption in those crops and help validate the survey data already collected.

Success story

Ohio State University Extension, OARDC Scientists Tackle Spread of Deadly Ash Tree Pest

Two years ago, it didn't even have a name. Today, emerald ash borer (EAB) is one of the most feared exotic tree pests in Ohio and North America — an insect so voracious it could wipe out native ash from the land and cause significant losses to the wood manufacturing, landscaping and nursery industries that rely on this tree.

Since EAB was found in Ohio on Feb. 28, 2003, Ohio State University Extension and the Ohio Agricultural Research and Development Center (OARDC) have been conducting research on the invasive beetle, collaborating with state agencies to contain its spread, and educating the public and industry about the danger ahead.

"This pest could have the same devastating effect as chestnut blight and Dutch elm disease, which pretty much eliminated native chestnuts and elms from Ohio forests," said entomologist Dan Herms, who is playing a leading role in the battle against EAB. "It can also have a big impact on the nursery industry, since any ash big enough to hold an insect (at least one inch in caliper) can be attacked by the borer."

A native of China and other northeast Asian countries, emerald ash borer, Agrilus planipennis, belongs to a group of insects known as metallic wood-boring beetles. It was first discovered on July 2002 near Detroit, where it was presumably brought via infested wooden shipping materials some 10 years ago. From there it has moved to Ontario, Ohio, Maryland and Indiana. The beetle has killed or is killing more than 6 million trees in Michigan, the hardest hit state.

In Ohio, EAB was first identified in Whitehouse (Lucas County). Subsequent infestations have been detected between August, 2003 and May, 2004 in Hicksville (Defiance County), Antwerp and Payne (Paulding County), the Perrysburg/Rossford area and North Baltimore (Wood County), Toledo and the Oak Openings Preserve Metropark (Lucas County), and Swancreek Township (Fulton County). The Easton area of Columbus (Franklin County) is the only infestation site outside of northwest Ohio.

"This beetle seems to be behaving very similarly to other insects in the genus Agrilus, such as the bronze birch borer," Herms explained. "But unlike other wood-boring insects, which only

target weakened trees, the ash borer also attacks healthy ones. This is alarming because ash trees are very common both in natural forests and landscapes throughout Ohio and the eastern United States."

As part of Ohio State's efforts to contain the spread of emerald ash borer, Herms and OSU Extension entomologist David Shetlar have joined the Ohio Emerald Ash Borer Task Force, which includes experts from various state and federal agencies. The task force was appointed by the Ohio Department of Agriculture (ODA) to make recommendations on the department's regulatory response to EAB.

In April 2003, ODA had more than 8,000 ash trees cut, chipped and burned in the Whitehouse area in an attempt to stop the initial infestation. Similar eradication efforts took place this year in the other infestation sites, as recommended by the task force. More than 22,000 ashes have been removed in 2004.

In place is a quarantine that prohibits movement of ash trees, branches, firewood and other ash materials from the areas where EAB has been positively identified. It is also illegal to bring ash tree materials and firewood from Michigan into Ohio.

On the research front, Herms and Ohio State plant pathologist Enrico Bonello are trying to determine which species of ash, if any, are resistant to EAB. In collaboration with colleagues at Michigan State University, they established an experimental ash planting in Novi, Mich. to compare resistance of native and Asian ashes to the beetle, identify resistance mechanisms, and determine the effects of drought and other environmental stressors on borer susceptibility.

The planting includes white ash, green ash, Manchurian ash (with which EAB shares an evolutionary history in Asia), and Northern Treasure ash (a hybrid between native black ash and Manchurian ash).

"This research relates more to living with infestation in the event (the beetle) becomes established," Herms said. "Our working hypothesis is that the Asian ash will prove to be most resistant because of (its) natural defenses resulting from co-evolution with the insect. The inclusion of the native-Asian hybrid may provide insight into patterns of inheritance of resistance genes and facilitate their identification."

This information will help forestry, landscape and nursery professionals, as well and forest-health authorities, make more informed decisions when dealing with the wood-boring pest. Moreover, identification of resistant genotypes will be critical for reforestation as well as sustained market demand for ash in the nursery industry.

OSU Extension has also established a research planting in the Toledo area.

Educating the public about this new pest is also a key issue. In response to numerous calls from homeowners and tree-care professionals, experts with Ohio State's Extension Nursery, Landscape and Turf Team have drafted an insecticide recommendation that has been distributed to all Extension agents in an effort to better answer people's questions. According to the

document, no pesticide treatment is being recommended at this time. Details are available at http://ashalert.osu.edu/treatment.asp.

Extension experts have also met with citizens to explain the importance of ODA's eradication program and teach them about the pest. Additional informational sessions, training programs and educational materials are being planned and produced.

OSU Extension and ODA are asking citizens to watch out for the beetles and report any signs of infestation by calling (888) OHIO-EAB. A diagnosis check-off list and photos of EAB are available at http://ashalert.osu.edu.

Apples

This year a weather reporting system (15 orchard monitors) was established in partnership with Ohio Fruit Growers Society, Syngenta and the Ohio North Central Tree Fruit IPM program with the purpose of sharing weather data and disease pressures with the group through e-mail. Included with the twice-weekly e-mail was a summary of National Weather Service four-day forecasts for wind speeds, precipitation probability and amounts, and expected temperatures. Ten weather stations were used. A weekly summary of disease pressures was also published weekly in the Ohio Fruit ICM News.

The WeatherTracker units measures, records, and displays daily high and low temperatures, hours of leaf wetness, and degree days for up to three bases. The unit also displays the scab infection probability ranging from none to heavy using the Modified Mills Chart. Leaf wetness hours were also tabulated manually for prediction of fly speck. The degree day feature was used by some growers to fine-tune spray schedules for codling moth and Oriental fruit moth.

Examination of scab predictions, as indicated by records from the WeatherTrackers for 15 locations, are useful in verifying what growers have learned from previous years about conditions for scab infections. No one would suggest, nor would we be in a position to suggest, that growers rely only on the instrument for scab management. Rather, the instrument can help justify grower decisions.

One orchard experienced more than acceptable scab. In this case, monitoring did not begin until after considerable green tissue was present. Due to cold weather after the initial flush of leaf material, no spray applications were made and heavy scab infection took place. From this, we recommend that the instruments need to be placed in the orchards before any green tissue is visible. Growers will find the instruments more useful as they become more aware of their potential uses

Growers found the wind predictions as supplied by the educator (and available at http://www.nws.noaa.gov/mdl/forecast/text/state/OH.MRF.htm http://www.nws.noaa.gov/mdl/forecast/text/state/OH.MRF.htm) useful in planning spray windows. As growers move away from the organophosphates and use newer materials which need to be more precisely timed, the ability to directly read accumulated degree days will become more useful for insect management.

Observations from orchards, where mating disruption was used during the last two growing seasons, showed that complete "trap shut-down" was experienced when using pheromone traps. This was true in monitoring both the Oriental fruit moth and the codling moth in apple AND peach blocks. (Positive IDs of Oriental fruit moth larva in damaged fruit of both apple and peach have been made. No codling moth have been found in peaches.) In addition to standard pheromone lures, "Combo" lures for codling moth were utilized in an apple block having a historic high level of CM damage. We found we need to become more effective in gender determination so that we can better monitor the females. The 2005 season will see the use of a "homebred" mixture of terpenyl acetate and grain to attract female Oriental fruit moths for a better way to monitor the movement of fertilized females into fruit blocks.

Pumpkins

In 2004, the IPM program was involved in both demonstration and research projects addressing pumpkin, zucchini, and cucumber production. One major research project focused on using a precision in-furrow insecticide injector to reduce the amount of Admire (imidacloprid) used per acre by up to 85% with little or no reduction in efficacy.

There were summary presentations of the precision in-furrow injector research at the Western Ag. Research Station Pumpkin field day in South Charleston and at the North Central Ag. Research Station Vegetable crops field day in Fremont, OH. This project was also covered in both a poster and presentation at the annual Fruit and Vegetable Growers Congress in Toledo.

This was the last year for the pumpkin production systems demonstration project between Ohio State University, Cornell University and University of Massachusetts. This project centered on demonstration of four production systems in cucurbit plantings. One goal of the project is to set up on-farm trials to educate growers, Extension agents, and industry representatives, on the various methods used to raise cucurbits. These production systems included Conventional techniques, IPM present, IPM future, and also Organic techniques. A summary report was generated by the lead institution, Cornell University, detailing trends found in the four production areas of the demonstration project.

In 2004, Ohio recruited 2 Conventional growers, 4 IPM present growers, 1 IPM future grower, and 1 Organic grower to the demonstration project. By having growers demonstrate various production systems and specific practices, we hope to encourage them and other growers to continue to adopt new IPM techniques and reduce reliance on chemically intensive, high input systems. Most growers who participated in the cucurbit demonstration project have been in the program for 2-3 years and indicated they have benefited from the experience of trying different production practices.

Delivery of both the research and demonstration work was possible through two August field days. The Pumpkin field day held at the Western Ag. Research Station had over 83 growers attend to hear information concerning variety trials, fungicide programs, herbicide and mulch interactions, precision in-furrow injector demonstration, and see the differences in the IPM present and IPM future demonstration production systems. The Vegetable field day at Fremont had approximately the same number of participants. At the annual Ohio Fruit and Vegetable Growers Congress over 10 growers attended a poster session detailing the design and results of

the precision in-furrow injector project. In addition to the poster, a presentation on this project was made in the truck crops session that over 60 producers attended. Various sections of the precision injector project and on-farm cucurbit demonstration project have been published on the OSU IPM web site and web based VegNet newsletters available for all vegetable clientele.

Method of Collecting Information

Between the research and demonstration work being done in cucurbits in Ohio, we are working closely with at least 8 growers, and have made presentations to 250-300 growers through field days and other educational venues. Additionally, this research has been requested and presented to neighboring states at their annual vegetable and winter meetings and published in trade magazines circulating as far west as Washington State. Many growers currently access our information on pumpkins and other vegetable crops via our website http://vegnet.osu.edu/ and VegNet newsletter.

School IPM

In cooperation with Indiana University scientists, we implement the Monroe IPM Model in three Westerville City Schools. The implementation team visited these schools 15 times – (introduction/initiation, technical assessment, pilot school staff training, monthly "on-site IPM Coordinator" inspections, Superintendent briefing and district training). Team personnel monitored traps in all locations and the "Pest Press" newsletter was distributed on a regular basis. Because of the WCS IPM program, there was a 90% reduction of pesticide applications in the pilot schools, the savings realized for the three schools implementing the IPM program was $4113.95 representing over a 52% reduction in pest control costs for the pilot schools and a 66% reduction in pest complaints since the initiation of the IPM program in the pilot schools. Because of the successful implementation of this program, Westerville city schools committed to internalizing their pest management and attached this responsibility to their custodial supervisor and one staff member

There are 23 Westerville City Schools with approximately 13,800 students. It is our goal to expand this program to remaining 23 schools in the district. Finally, we are in negotiation to develop a coalition of school districts wishing to implement real IPM. Currently, Akron, Cleveland, Columbus and Cincinnati district personnel have been contacted.

Field crop

Personnel from Ohio State University Extension sampled for first-year, western corn rootworm adults (FYWCR) in soybean fields for the eighth year (2004). The number of FYWCR adults per 100 sweeps ranged from 0 to 51. Although populations were not as high as fields in states to our west, they were higher in 2004 than 2003 in Ohio. This is an overview of the results from that survey. Research indicates that catches in soybean of 5 or more beetles/trap/day during any trapping week indicates a potential problem with rootworm in the field the following year.

The trapping data from 2004 had the following results: Three fields had an average > 5 beetles/trap/day; Seven fields had an average between 4 and < 5 beetles/trap/day; Six fields had an average between 3 and < 4 beetles/trap/day; Eight fields had an average between 2 and < 3 beetles/trap/day; Twenty fields had an average between 1 and < 2 beetle/trap/day; Thirty-four fields had an average < 1 beetle/trap/day.

The fields that had > 5 beetles/trap/day were in Allen, Defiance, and Hancock Counties. Last year, none of the fields surveyed ever had > 4 beetles/trap/day.

Based on the potential treatment level of 5 beetles/trap/day during any trapping week, if any of the three fields with over 5 beetles/trap/day are planted to corn in 2005, a treatment of either a soil insecticide or transgenic corn should be considered for control of rootworm. These data from both sampling procedures do not mean that other fields in a county that were not sampled do or do not need treatment but it does give good information about the fields that were sampled and about the abundance of the beetles this year. Overall, rootworm populations continue to be relatively low. However, some soybean fields did have populations sufficient to warrant treatment next spring, and suggest that perhaps first year western corn rootworm is increasing in soybean. Because of this possibility, the need to continue sampling for western corn rootworm adults in soybeans in 2005 is great.

Methods

Sampling was done using Pherocon® AM yellow sticky traps placed in 78 fields in 19 counties. Six traps were placed in the soybeans on metal posts at canopy height and located at least 100 feet from the field edge and evenly spaced in the field. The traps were initially placed in fields as early as July 20 and removed as late as mid September. Traps were serviced once a week throughout the 6 to 7 week survey. A new, clean trap was installed to replace the insect and debris covered, week old trap at the end of each week of trapping. After each trapping week, the number of beetles collected were summed and divided by the number of traps (6) and the number of days the traps were in the field resulting in the average number of beetles collected per trap per day.In addition to sampling with the sticky traps, this was our second year to sweep soybean fields in 9 counties along the Ohio-Indiana border for FYWCR adults during the 2nd week of August. Twenty sweeps in 5 places in 2-3 fields per county were taken. The contents of the nets were bagged and then counted in the lab. Sweep net samples do not tell us if a field has a high enough FYWCR adult population to warrant treatment the next year, but they do tell us the relative abundance of the beetle population.