Overview

The Ohio State Integrated Pest Management (IPM) program is a comprehensive program that is designed to encourage collaboration and innovation among Ohio Agricultural Research and Development Center (OARDC) scientists and Ohio State Extension personnel to better address the pest management needs of the citizens of Ohio. The goal of the OSU IPM program is to reduce the environmental, economic and social risk associated with managing pests (insect, disease or weed). One way that we accomplish this goal is to provide funding to OSU collaborators through an internal IPM grants program to evaluate and disseminate new IPM information.

During 2006, the Ohio State University IPM grants program funded 13 projects from USDA Smith-Lever 3d funds. These projects ranged in size from $1,500 to $9,000 and totaled over $70,000. These projects encompassed all of the basic areas of IPM (monitoring, forecasting, and cultural, biological and chemical control) on many agricultural important crops in Ohio as well as urban pests. Projects included surveys on the distribution of weeds in soybeans, bee pollinators in fruit, and phenology calendars to improve soil pest forecasting in ornamentals. Some projects addressed alternative or organic pest control methods in tree fruit, vegetables, and soybeans. In addition, projects that addressed pests of concern to urban citizens such as lawn IPM, ornamental gardens and bed bugs were also funded. Some projects that were funded are early in their research phase such as finding natural herbicides and measuring the impact of CO_2 and light on floriculture pests, while other projects are ready for implementation. Reports on these Ohio IPM projects over the last two years were included in a OARDC special circular so that the IPM information from these funded projects can be used by all Ohio citizens, whether they are conventional or organic farmers or urban residents. It is our feeling that by having access to these innovative IPM reports, the vast majority of Ohioans will find IPM solutions to their pest management problems that are economically efficient, environmentally responsible and socially acceptable.

Budget Narrative

For 2007, there will be a $7,000 reduction in paraprofessional expenses because of a change in personnel. There also will be a reduction in prebaccalaureate students of $7,000 and $3,000 in travel because of other grant support. Materials and supplies will be increased to $20,000 for the purchase of high tunnels for the polyculture experiment. The remaining difference and any carryover will be applied to the OSU internal grants program.

A Vegetable IPM Success Story

Title

Developing a precision in-furrow insecticide applicator for cucurbits.

Who Cares and Why?

Cucurbits are a significant and expanding vegetable crop in Ohio, with over 13,000 acres of production, including 7,900 acres of pumpkin according to USDA NASS 2005 Quick Stats. There are several challenges to overcome in cucurbit production, including, diseases, weeds, and insects. One of the key pests to manage is the striped cucumber beetle. It is key to limit these insects feeding the seedlings between the cotyledon and 4th leaf stage due to their susceptibility to bacterial wilt vectored by the beetles.

Management tactics include adjusting planting date to miss peak beetle emergence and use of scouting and foliar insecticide sprays if thresholds are exceeded. Growers are increasingly using in-furrow systemic insecticides at seeding to control early season pests, primarily the cucumber beetle. Our research has shown that Admire (imidacloprid) used as an in-furrow systemic insecticide is very effective in controlling the striped cucumber beetles, but the product is quite expensive relative to other options. The multidisciplinary research team approached this challenge by developing a precision applicator that applies Admire insecticide directly over the seed in a 5 inch band instead of a continuous in-furrow stream.

What was done

The precision applicator was trialed for accuracy using three direct seeded crops; cucumber, zucchini, and pumpkin at speeds between 2 and 4 miles per hour. Each injection was calibrated to deliver 3 mills of water per 5 inch band. Accuracy was determined by the number times the seed landed in the band of injected material at the designated planting speed. In general, the precision bander ranged in accuracy between 90 and 97.5%, with accuracy increasing with larger seed size and decreasing at higher speeds.

Research trials were planted using the precision applicator of insecticides in comparison with seeds treated continuously in-furrow with insecticide, such as the case with a conventional application. Seedlings from these trials were subjected to bioassays. Plant stages ranging from cotyledon through the 4th leaf were cut from the seedlings and placed in clear deli dishes with one live striped cucumber beetle. The beetles condition, live or dead, was observed every 24 hours for a total of 72 hours. In the 12 trials conducted in 2005, there was no statistical difference in mortality between beetles fed tissue from precision banded Admire application and the continuously applied Admire treatment. In other words, both treatments killed beetles at equivalent rates regardless of application method.

What is the Impact

Given the equivalent efficacy of these 12 trials across three cucurbit crops, significant reduction in the amount of chemical per acre in the environment and cost per acre can be realized if this technology is utilized. Percent reduction ranged from a high of 83.3% in pumpkins to 58.3% in cucumbers. The two factors most influencing the percent decrease are the initial Admire rate per acre and the in row seed spacing.

While there is no significant loss in efficacy, there is genuine reduction in the amount of insecticide applied per acre and a corresponding savings to growers. We would submit that this precision banding technique would work well to control early season insects for any direct seeded vegetable crop.

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Turf Success Story

Title
Implementation of Integrated Pest Management in Commercial Lawn Care

Who Cares and Why?
Lawns are a major component of urban landscapes and are highly valued for aesthetic, environmental, and recreational purposes. Lawn care carried out directly by homeowners or professional lawn care companies is estimated at over $25 billion in services and products in the USA. Unfortunately, the desire of many homeowners to achieve a 'perfect' lawn has resulted in the establishment of a lawn care system that heavily relies on routine, often calendar-based, applications of fertilizers, petrochemicals, and other pesticides, which are perceived as significant sources of environmental contamination, ambient ecosystem disruption, and human health risks. As a result the US environmental protection agency (EPA) has banned or imposed stringent restrictions on the use of some pesticides in urban settings, leading to fewer products available for use around homes. Therefore, there is a need for other approaches to lawn pest management that reduce the overuse of these inputs. One such approach is the integrated pest management (IPM) concept, which promotes the integration of multiple tactics including cultural practices and biological control agents. Pesticides and fertilizers are applied only when justified through adequate sampling. Thus, lawn care IPM relies primarily on judicious use of fertilizers, biological control agents and synthetic pesticides. Adoption of alternative management approaches in commercial lawn care has not been widespread due to several factors. First, studies designed to develop alternative approaches often deal with insects, weeds, or diseases independently and most often focus on specific pest problems within one of these major pest categories. While such studies provide important biological and pest management information, they do little to elucidate a coherent and conceptually broad approach to managing the entire turfgrasss system. Second, there is almost no information available regarding the cost-benefit relationships between various management programs. Thus, there is no economic basis for comparing or implementing low input management philosophies. Third, very few studies have attempted to address homeowner expectations about the aesthetics of lawns, and what constitutes an acceptable stand of turfgrass on their lawns. This lack of data addressing the more subjective aspects of urban lawn management further complicates and hinders the widespread adoption of alternative approaches in this system. Thus, there is a need for research to evaluate and compare the biological, aesthetic, and economic aspects of the different lawn pest management approaches. There is also a need to identify the social mechanisms underlying why urban homeowners manage their lawns the way they do, and their expectations about lawn aesthetics.

What was done
To enable the implementation of IPM in commercial lawn care, this study was conducted in collaboration with Buckeye Ecocare, a private lawn care company located in Dayton, Ohio, to compare biological, economic and aesthetic aspects of IPM and conventionally managed lawns.

By involving a commercial lawn care company and its customers, we think successful demonstration of IPM in commercial lawn care will foster realistic homeowner expectations about the aesthetics of lawns and will lead to rapid adoption of IPM in urban lawn care. Customer enrollment for this study was sought through the company, and letters containing information about the study were mailed out to customers. Twelve (12) Buckeye Ecocare customers enrolled in the IPM program and 11 customers from the company's conventional five step (non-IPM) lawn care program to facilitate comparison. Data were collected from IPM and conventionally managed lawns during June, August, and September in 2006 by conducting onsite surveys and evaluations. Insect damage, weed coverage, and disease incidence were evaluated and recorded along a single diagonal established across each lawn. The overall aesthetic effectiveness of the lawns was also evaluated.

What is the Impact

No significant differences were observed in either insect damage or weed and disease infestation between IPM and conventionally managed lawns. Likewise, no significant differences were observed in the aesthetics of IPM and conventionally managed lawns.

The results indicate that the IPM program did provide an acceptable level of pest control compared to the conventional five step program in terms of biological and aesthetic evaluations. However, data comparing the cost of services for each of the programs are not yet available. The IPM customer enrolment of 12 is a drop of approximately of 59% from the previous enrolment of 29 in 2005. This drop in customer enrolment raises some interesting questions, such as, 1) why did some customers decide to continue with IPM lawn care program and why did others opt out? 2) How does the proportion of IPM customers (those who re-signed and those who opted out) relate to demographic characteristics, such as income, age, and education level? 3) What is the perception of customers toward IPM lawn care? Therefore, a separate study will be conducted to try and answer these questions.

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Polyculture Success story

Title

Modular Ecological Design: A fruit and vegetable polyculture system

Who Cares and Why?

Carefully designed polyculture systems, grown on small farms or even in suburban yards, could self-limit pest problems and gross up to $90,000 per acre, says Joe Kovach, head of Ohio State University's Integrated Pest Management (IPM) program.

Kovach has planned and planted four different polyculture systems, or "modular ecological designs," each combining the same wide mix of high-value fruits and vegetables, annuals and perennials, tall crops and short ones, into 45-by-60-foot plots.

The goal: To see which system works best based on yield, economics and pest reduction — and to make, by selling retail, $10 per linear foot, or abut $90,000 per acre.

"We've known in pest management that polyculture systems seem to have fewer pest problems than monocultures, and when there are problems, they're usually less severe," Kovach said. "We wanted to see if we could come up with a primarily fruit-based system that, if we arranged it in the correct way, would see fewer pest problems."

At the same time, though, "With a goal of $10 per linear foot, we've got to be productive," he said. "We can't mess around."

Polycultures, as opposed to monocultures, grow two or more crops together, not just one.

What was done

Kovach's four designs, even more diverse than typical polycultures, combine apples, peaches, green beans, tomatoes, strawberries, blueberries, raspberries and edamame soybeans. But each design tests a different arrangement. The first has solid rows, with each row having a single crop, and the crop height switching from row to row: for example, a row of high apple trees, a row of low strawberries, a row of high peach trees, a row of low tomatoes.

"There's some hint that architecture might have an impact on insect pests that occur," Kovach explained, "so we decided we'd use tree and shrub crops alternated with lower-growing crops."

The second design mixes more than one crop within a row but keeps the high crops and low crops together in their own rows. Apples, peaches and raspberries, for example, would line up in a row, then green beans, strawberries and tomatoes in the next, as a way to roadblock infestations.

"The concept," Kovach said, "is that insect pests seem to move down rows. So if you're an apple pest, you might stop at the peaches. A peach pest might stop at the raspberries. A raspberry pest at the blueberries. And so forth."

The third design goes a step further. It mixes the crops within a row and also alternates heights in the row. A single row might grow apples then strawberries, peaches then green beans, raspberries then tomatoes. Kovach calls it the "checkerboard" system.

The fourth design adds raised beds to the equation — "kind of our souped-up future strategy," Kovach said — with mixed rows planted within.

All four designs employ drip irrigation, disease-tolerant and -resistant varieties, fencing against rabbits and woodchucks, staggered planting dates for the annuals and maturity dates for the perennials (allowing for early, mid- and late-season harvest and season-long production), and newer, less-toxic pesticides if and as needed, with sustainability, not 100-percent organic production, the goal.

“Once we find this optimum design — and this is where the ‘modular’ aspect comes in — we’ll know how much food you’ll get from one plot,” Kovach said. “Maybe one is all you need for personal use. Or maybe you run a roadside stand; you could have maybe three in a series. Or maybe you sell at a farmers’ market; you could have, say, six or eight.”

What is the Impact

Small farms near cities could gain from such setups, Kovach said. Fewer inputs, a steady lineup of high-value crops, and proximity to thousands of hungry consumers would make the farms even more successful.

Homeowners, whether for food, hobby or both, could use the modules too.

“We have a lot of these suburban houses that have five-acre lots,” Kovach noted. “People spend a lot of time mowing their lawn. This could be an opportunity to do something else.”

Finally, he said, the modules would ramp up local production, a plus in terms of tastier food and lower transportation costs.

Results from 2005 and 2006 indicated that the raised bed treatment was the most productive, had the fewest insect pests and the most biodiversity. Using local supermarket prices, tomatoes, strawberries and raspberries were the most profitable to date and were close to or exceeded the goal of producing a gross return of $10 per foot of row. Peaches and blueberries will begin producing fruit in 2007 and apple will begin production in 2008.

The project, funded from the USDA Smith-Lever 3d formula fund, North Central IPM Center, the university’s Ohio Agricultural Research and Development Center (OARDC), will continue for the next four or five years.

The test plots — 16 in all, four replications of all four designs, covering a total of 1.5 acres — lie on OSU/OARDC’s Wooster campus.