Research Update

The Tart Cherry Integrated Orchard Management Project

From the Management Team

The Tart Cherry Integrated Orchard Management project, or TC RAMP project, is now heading into its fourth and final year of operation, having completed a third field season in 2006. The project was charged with the lofty goal of developing and delivering to the tart cherry industry effective and integrated management programs based around OP-alternatives and reduced risk insecticides and fungicides. Included in the ambitious work plan are investigations of reduced-risk controls and management programs, resistance management options, cherry tree host plant resistance, rapid and reliable measures of ecological consequences of orchard management changes, and pest action thresholds tailored to reduced risk compounds. Over the course of the project the team of investigators have experienced successes and worked through several challenges.

Our feature article reports on investigations into using copper (Cu) as a viable leaf spot fungicide and its role in managing fungicide resistance. A related project, spearheaded by Nikki Rothwell, examined the effects of Cu on tank mixed pesticides and revealed the incompatibility of Cu with Imidan (See the project updates section of this newsletter.).

The reduced risk insect management programs delivered through this project to date have worked well where pest pressure is low. With plum curculio and cherry fruit fly population pressures up in some regions, though, a few growers have needed to make rescue treatments with azinphos-methyl (AZM) in reduced risk blocks to avert impending control failures. Concerns over the inability to achieve excellent plum curculio control in reduced risk orchards has led the RAMP project Executive Committee to recommend that project investigators apply for a two year extension to seek viable and economic OP alternatives for this pest. Project researchers are looking at the gamut of options available, including insect growth regulators, oxadiazines, neonicotinoids and biologicals. This transition will be extremely challenging. Project researchers believe a multi-tactic program will need to be crafted to get the high level of control mandated by the zero tolerance for worms in harvested fruit. It will also take time to make the program cost effective, resolve potential resistance issues, address concerns with new invasive or rebound pests and explore the causes of cherry fruit fly population increases in major production areas.

Finding effective alternatives takes on added importance in light of the recent EPA regulatory decision to phase-out the use of AZM in tart cherry. Project investigators helped to organize three visits of EPA personnel to Michigan in 2006 to dialogue with growers, researchers and industry representatives on the AZM issue. The EPA has been very responsive to concerns raised on these visits regarding the loss of AZM by the initially proposed target date of 2010. The difficulties and high costs of pest control identified in this project, as well as the Management Team-supported effort to measure the real impacts of AZM on tart cherry ecosystems (See the article on ecological measures.) have had a very positive impact on the AZM phase-out decision-making process. In August,

Fall 2006
In this issue

Grower profile: Rodney and Jeanette Winkel 2

Researching copper and its role in tart cherry orchards 3

New ecological measures position the industry 5

Project updates 6

MSU's Nugent retires 8

Progress through RAMP .. 9

MSU hosts IPM school 9

EPA Assistant Administrator James Gulliford toured the state with several key personnel from the Office of Pesticide Programs, Biological and Economic Analysis Division. Project data supplied to the EPA bolstered the case for extending AZM use beyond 2010. The most recent EPA proposal (not finalized) for AZM would reduce the seasonal maximum application rate to 8 lbs total formulated maximum per acre in 2007, to 6 lbs total in 2008 and 2009, to 4 lbs in 2010 and 3 lbs total in 2011 and 2012.

The RAMP Management Team has also undergone some restructuring in 2006. Andrea Coombs completed her tenure as the RAMP Project Coordinator on September 15, 2006. The RAMP Executive Committee, in consultation with a large representation of the RAMP Management Team, reviewed the need for this position given progress and coordination of the RAMP project, current budget constraints and new developments, and concluded that the Coordinator position was no longer necessary for the completion of project.

Under direction of the RAMP executive committee, day-to-day management of the project was assumed by three of the project principal investigators, and specific project activities assigned to several project team members. Don Gregory, Cherry Bay Orchards and chair of the Project Management Team, agreed to facilitate communications among project growers to expedite feedback from the grower community for the decision-making process. The table below identifies the remaining changes to the management team day-to-day operations.

You are probably thinking a second Cherry RAMP newsletter is long overdue. And you are right! A lot of data has been collected since the inaugural newsletter was published in the winter of 2004. In light of this, we opted to provide a little more detail with respect to the project updates and to spotlight two areas of research, the use of copper in cherry for disease management and new ecological measures. This project is really about growing cherries, and depends on the willingness of cherry growers to share their orchards as outdoor laboratories. Thus, we appropriately begin this issue with a highlight on one of our Michigan grower-cooperators. – *Michigan State University: David Epstein, Entomology/IPM, Larry Gut and Mark Whalon, Entomology .*

Grower profile: Rodney and Jeanette Winkel, Grandview Orchards

As a diversified fruit and vegetable operation in southwest Michigan, Grandview Orchards benefits from a multitude of natural factors. Good soils, proximity to markets and Lake Michigan's moderating effect on temperature all combine to make southwest Michigan an excellent fruit growing area. As owners of Grandview Orchards, Rodney and Jeanette Winkel believe knowledge and continuous research also play an important part for today's farming operation.

Growing up on a fruit farm in Hartford, Michigan, Rodney developed a strong desire to stay in the fruit industry. After college he joined with his uncle, Alton Wendzel, in a farm partnership. Rodney and Jeanette became sole owners of Grandview Orchards in 1999, when Alton retired. Their farm now totals 950 acres of apples, peaches, tart cherries, grapes, asparagus and zucchini. About 260 acres are planted to tart cherries.

"Having been involved with MSU researchers for over 30 years, involvement in the cherry RAMP study was a natural," says Rodney. "With today's increased emphasis on food safety and the public's instant awareness of any food problems, we, as growers, have to promote the positive steps the cherry industry has made to use pesticides in an environmentally responsible manner, while producing high quality fruit." Rodney sees global competition as another challenge further threatening cherry growers' already low profits, "Only by combining resources of the private sector, university researchers and government will we be able to compete as an industry in the world market."

Participating with MSU researchers is one way that Rodney stays abreast of best pest management practices. "The RAMP program has certainly given us a better understanding of insect life cycles and has made us reevaluate our pesticide program. With society's increased emphasis on eating fruits and vegetables, our cherry industry's participation in the RAMP study is a definite plus for everyone."

2006-2007 Management structure for Tart Cherry RAMP

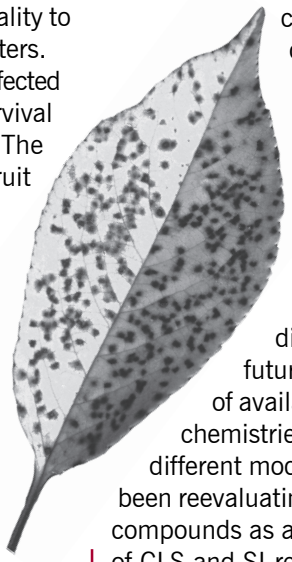
Name	Project role
Mark Whalon	Overall project management
David Epstein	Project communications
Nikki Rothwell	Field operations in northwest and west central Michigan
Michael Haas	Weekly monitoring program in southwest Michigan

Researching copper and its role in tart cherry orchards

Cherry leaf spot (CLS), caused by the fungus *Blumeriella jaapii*, is a disease that adversely affects production of high quality tart and sweet cherries on 100% of the commercial cherry acreage in Michigan and Wisconsin. Unmanaged CLS causes significant defoliation by midsummer, which causes fruit to be soft, poorly colored and low in soluble solids. Early defoliation reduces the potential of fruit buds and cherry wood to acclimate to cold temperatures in the fall, resulting in increased mortality to affected trees during severe winters. Even in milder winters, heavily infected trees have reduced fruit bud survival and fruit set the following year. The price received for poor quality fruit is sometimes so low that it is not profitable to harvest the crop. In seasons with weather favorable for infection, entire crops may be lost almost overnight. Such severe losses can only be prevented with highly effective fungicides. Leaf spot needs to be managed every year to prevent damage and economic loss.

The EPA's current regulatory focus on B2 carcinogens has resulted in the recent loss of Ronilan and limitation on the use of Rovral to the bloom period. Benlate (benomyl) was withdrawn by its manufacturer, resulting in the loss of another fungicide mainstay. In the future, other B2 carcinogens such as Bravo (chlorothalonil), captan and Topsin M (thiophanate-methyl) may have their use on cherries modified or cancelled. Fungicide resistance is further limiting the effectiveness of dodine and Topsin M and, in 2004, results from Michigan State University indicated that most Michigan strains of the CLS fungus have become resistant to sterol-inhibiting (SI) fungicides.

Because of SI resistance, cherry growers will be increasingly dependent on strobilurins (e.g. Cabrio and Flint) for leaf spot protection and strobilurins and SI's for brown rot protection. Overuse of these fungicides will lead to the quick development of widespread resistance in the leaf spot and brown rot pathogens. The availability of fungicides and use of anti-resistance strategies are critical for maintaining good disease control into the future. Due to the paucity of available fungicide chemistries that incorporate different modes of action, we have been reevaluating the use of copper compounds as alternatives for control of CLS and SI-resistant *B. jaapii* in Michigan orchards. Copper was widely used for tart cherry disease control in the 1930s and 1940s until its gradual replacement by modern synthetic fungicides. Successful efficacy of copper compounds aids both conventional growers, as copper extends the life of traditional fungicides, and organic growers because copper and sulfur are the only viable options for disease control in tart cherries. Copper fungicides are about one-third the cost of traditional fungicides, an attribute that lends appreciably to the economic stability of Michigan and Wisconsin orchards.



We have been testing copper for CLS control for the last three years at our test plots at the Northwest Michigan Horticultural Research Station (NWMHRS) and at the University of Wisconsin Peninsular Agricultural Research Station (UW PARS) near Sturgeon Bay, Wisconsin. These experiments are continuing in 2006, and we are also conducting trials at on-farm locations in Michigan. Preliminary results show that copper is a highly effective fungicide for CLS control. In seven of eight field trials on Montmorency and Balaton®, spray programs including one, two or three cover sprays of copper sulfate provided CLS control equivalent to or better than standard programs using conventional fungicides such as strobilurins and SI's. Data for some of these trials is presented in Table 1 (see page 4).

Thus far, copper looks like a viable CLS control tactic for cherry growers in Michigan and Wisconsin. The primary downfall to copper use is the potential for phytotoxic effects to tart cherry trees. When copper compounds are applied to trees in advance of hot weather (about 80°F), the trees can exhibit phytotoxicity symptoms such as bronzing on the undersides of leaves, large yellow and brown blotches on leaf upper surfaces or

continued on page 5

George Sundin

Patty McManus

Nikki Rothwell

Table 1. Cherry leaf spot incidence and defoliation in Michigan and Wisconsin, 2003 through 2005

Year, location cultivar	Treatment description	Cherry leaf spot rating[y] Incidence (%) Harvest	Incidence (%) Post-harvest	Defoliation (%) Harvest	Defoliation (%) Post-harvest
2003, WI		**1 Aug**	**3 Sep**	**1 Aug**	**3 Sep**
Montmorency	Control	43 a	96 a	2	87 a
	1 copper sulfate	1 b	28 c	<1	4 b
	2 copper sulfate	1 b	15 c	1	1 b
	3 copper sulfate	3 b	19 c	2	1 b
	Standard	<1 b	20 c	<1	2 b
	Standard	0 b	43 b	<1	9 b
2004, MI		**29 Jul**	**26 Aug**	**29 Jul**	**26 Aug**
Montmorency (block A)	Control	100 a	98 a	80 a	85 a
	2 copper sulfate	36 bc	26 d	5 b	4 c
	2 copper sulfate	26 cd	20 d	<1 b	2 c
	3 copper sulfate	30 cd	35 c	3 b	11 b
	Standard	28 cd	23 d	2 b	4 c
	Standard	39 b	49 b	<1 b	11 b
2004, MI		**29 Jul**	**26 Aug**	**29 Jul**	**26 Aug**
Montmorency (block B)	Control	98 a	95 a	39 a	54 a
	2 copper sulfate	5 c	12 c	1 b	1 b
	2 copper oxychloride/copper sulfate	3 c	6 cd	0 b	<1 b
	2 copper hydroxide	7 c	15 c	3 b	2 b
	3 copper sulfate	12 bc	25 b	<1 b	5 b
	No chlorothalonil	5 c	11 c	<1 b	3 b
	Standard	3 c	4 d	0 b	<1 b
	Standard	4 c	4 c	<1 c	2 b
2004, WI		**5 Aug**	**19 Aug**	**5 Aug**	**19 Aug**
Montmorency	Control	93 a	Defoliated	74 a	100 a
	2 copper sulfate	22 cd	32 bc	5 c	7 c
	2 copper hydroxide	19 cd	30 bc	4 c	3 c
	3 copper sulfate	11 d	19 c	4 c	9 c
	3 copper hydroxide	22 cd	35 bc	4 c	7 c
	No chlorothalonil	48 b	57 a	20 b	22 b
	Standard	30 c	35 bc	6 c	8 c
	Standard	30 c	39 b	9 c	8 c
2005, MI		**Preharvest, 28 Jun**	**12 Sep**	**Preharvest, 28 Jun**	**12 Sep**
Montmorency	Control	<1	39 a	<1	9
	2 copper sulfate	<1	0 b	1	5
	2 copper oxychloride/copper sulfate	0	<1 b	0	5
	2 copper hydroxide	0	0 b	<1	<1
	3 copper sulfate	0	2 b	0	8
	No chlorothalonil	0	<1 b	<1	0
	Standard	0	2 b	<1	<1

[y] In MI, treatments were replicated five times on single-tree plots or four times on four-tree plots. In WI, treatments were replicated five or six times on single-tree plots. Incidence was defined as the percentage of leaves with leaf spot on 10 (WI) or 20 (MI) terminal shoots on each tree. Percent defoliation was defined as [1-(number of leaves/number of nodes] × 100.

[z] Values followed by the same letter are not significantly different according to Fisher's protected least significant difference test ($P = 0.05$). No letter indicates that differences among treatments were not significant ($P = 0.05$).

New ecological measures help position the industry

Two efforts have been added to the RAMP project in order to gather data addressing EPA re-registration issues that impact the cherry industry: 1) functional ecology interpretation statistics and 2) natural enemy diversity comparisons between RAMP and conventional pest management strategies. These critical lines of investigation were brought about through the commitment and additional effort of the RAMP researchers, extension personnel, consultants and project summer student employees. A redirecting of RAMP resources will be needed to sustain this work in 2007.

A working understanding of **functional ecology** provides fruit growers with two advantages. First, as an indicator or measure of how "healthy" or "sustainable" a production system is, and secondly, as a means to help maintain pest management tools by developing data that can be submitted to the EPA in their mandated reregistration processes. With the passage of the Food Quality Protection Act and with heightened concerns for worker safety, pesticide residues and ecological impacts of pesticides, growers need functional ecology data to defend their safe and environmentally healthy practices and the pesticide tools critical to their economic competitiveness.

When growers with an ailment go to see a physician for a checkup, the physician takes their temperature and blood pressure, draws blood samples for labs, may push here, probe there and ask questions. Unfortunately, trees don't talk and cannot tell us, "Where it hurts." Instead, we can look at patterns that indicate condition and health of the orchard system. That is essentially what functional ecology does; but instead of collecting blood pressure and temperature samples to see if the patient is healthy, functional ecology collects measures of diversity for insects, mites and soil microbes, and samples trees for stress levels. By studying the patterns that result from these measures a grower can better understand the patterns associated with nutrient status of the trees, changes in pest pressure from surrounding areas, pesticide impacts on beneficial species and the overall sustainability of one set of practices versus another.

Anita Zurbrugg (American Farmland Trust) learns about mite diversity with MSU's Mark Whalon and Francis Otto of Cherry Bay Orchards, Leelanau, Mich.

MSU researchers are using four measures to assess the functional ecology of cherry orchards. Mite predator/prey ratios are ideal for this type of assessment. Researchers also are deriving a set of pheromones to monitor more than 30 species of leafrollers simultaneously. Leafrollers have biological traits such as mobility and a fairly broad host range that make them good ecological indicators of landscape effects. Along with nematode identification from routine soil samples or leaf samples sent in for nutrient analysis, these functional ecology indicators can individually, or collectively, provide an index of orchard health. Growers can then

continued on page 6

Researching copper from page 3.

blackening of veins on the underside of leaves. In severe cases, copper phytotoxicity can also cause leaf defoliation. Thus, our efforts now are directed toward examining the effect of using lower rates of copper on CLS control and decreasing phytotoxicity effects. Wisconsin researchers have begun to study the effects of copper phytoxicity on photosynthesis. Another potential concern regarding copper is that its use on all crops is being reassessed by EPA. We anticipate copper will still be permitted on cherries, but there may be limits to the amount permitted.

In several of our field trials we included a spray program in which Bravo (chlorothalonil) was omitted. Chlorothalonil survived its last reassessment by EPA, but as a potential carcinogen, this fungicide will forever be scrutinized. We wanted to see if we could substitute other fungicides for Bravo and achieve good CLS control. In 2004, disease pressure was very high, and substituting Elite (tebuconazole) for Bravo reduced CLS control. In 2005, disease pressure was light owing to the lack of rain, and using Elite in Michigan or Pristine (pyraclostrobin + boscalid) in Wisconsin in the place of Bravo resulted in CLS levels similar to other treatments.

Even though phytotoxicity may present occasional problems in the orchards under temperature extremes, our preliminary experimentation with copper compounds has shown success in controlling CLS, as a way to help growers manage fungicide resistance, and as a method to improve grower profitability. We will also be investigating the potential for copper to enhance fruit quality. – *Michigan State University: George W. Sundin, Plant Pathology; Nikki Rothwell, NWMHRS/IPM Program; Tyre J. Proffer, Plant Pathology. University of Wisconsin-Madison: Patty S. McManus, Plant Pathology.*

Project updates

Reduced risk insect management in Michigan

The MSU team of entomologists continued their evaluation of reduced risk insecticides on ten commercial orchards around Michigan. Growers primarily relied on three reduced risk options for managing key insect pests: Avaunt®, Actara™ and Provado®. Early season and harvest plum curculio damage, and harvest and post-harvest cherry fruit fly damage was measured in blocks with reduced risk sprays and in nearby blocks with conventional spray programs. At four of the nine farms sampled, no plum curculio damage was detected and three of the farms had less than 0.1% damage in either block. Early season samples indicated that two farms had significantly higher damage in reduced risk blocks versus conventional

A pyramid trap collects plum curculio in a cherry orchard.

blocks, with over 1.5% damage in the reduced risk blocks. By the harvest sample, however, no farms exceeded detection thresholds and the cherries were acceptable. The two farms with over 1.5% damage early in the season yielded less than 0.5% damaged fruit (stung) with no larvae at harvest, indicating that infested fruit either dropped or that the larvae were killed by subsequent Guthion rescue applications.

Like plum curculio, cherry fruit fly pressure appears to be on the rise in Michigan cherry production regions. A few cherry fruit flies were reared from fruit collected in both RAMP and conventional blocks prior to harvest. Consultants, who were initially reluctant to evaluate the impact of trapping height on fly captures, each developed a unique approach to making the high canopy placement workable. Fly captures were substantially greater when traps were placed high compared to low in the tree canopy. Monitoring revealed that the vast majority of adults were present in

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Ecological from page 5.

begin to compare one orchard to another in a meaningful way.

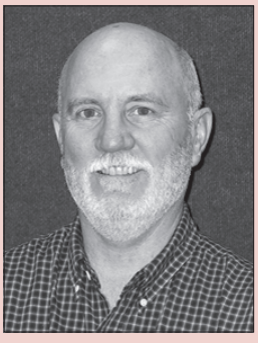
Functional ecology data when compiled across time, orchards and areas can also be a very powerful tool for diagnosing the environmental and ecological condition of our orchards collectively. Better yet, these data can be summarized to provide a counterpoint to the EPA's theoretical environmental impact models, which, by design, overestimate pesticide impacts in order to keep risk management favorable to the environment. These data are exactly the type of field-truth that EPA needs to make good decisions about a pesticide's environmental impact. Recently, the apple and cherry industries used preliminary functional ecology data from MSU research to defend several reregistration processes involving key pesticide tools for both industries. Data from this study has been summarized in table form for incorporation into the 2007 Michigan Fruit Management Guide: web1.msue.msu.edu/pestpubs/E154/

A survey of **natural enemy diversity** was also added to the 2006 work plan to provide the EPA with data to evaluate whether or not the RAMP reduced-risk insect management program was truly more ecologically sustainable than the standard conventional program. This study has already had a positive effect for the cherry industry's attempt to support the re-registration of azinphosmethyl (Guthion®) for at least another three years. Natural enemy surveys were conducted three times through the growing season, before bloom, after bloom (mid-June to early July) and after harvest. Two sampling methods were used; yellow sticky (Sticky) traps hung in each orchard and a limb-jarring sample of ten trees in each orchard. Insects caught on sticky traps or those that fell onto the beating tray were identified, counted and recorded for analysis.

A species diversity index was developed for each of the comparison and reduced-risk blocks during the 2006 season. High diversity is considered to be indicative of a well-functioning biological system, thus higher indices would indicate a healthier orchard (e.g. 2.5 is better than 1.5). Diversity indices were calculated for all nine cherry growers and the total average values were compared for reduced risk and conventional blocks using the two sampling methods. Natural enemy populations were relatively equal under both management programs. The only significant difference found was a higher diversity in conventional compared to RAMP blocks based on natural enemy catches on sticky traps during one sampling period, post-bloom. – *Michigan State University: Mark Whalon and Larry Gut, Entomology; and David Epstein, Entomology/IPM.*

David Epstein

Mark Whalon



orchards after harvest. This is in contrast to much earlier fly catches in unmanaged cherry orchards. This pattern of increased activity after harvest has been detected in previous years; thus, a post-harvest application of Provado was made at the four sites with significant fruit fly pressure. Sampling uncovered only a single infested cherry in one of the four Provado-treated RAMP orchards. In contrast, cherry fruit flies were reared from fruit left on the tree after harvest in all four conventional blocks, with an average infestation of just under 1%. – *Michigan State University: Mark Whalon and Larry Gut, Entomology.*

Cost analysis of RAMP vs. conventional insecticide spray regimes

The 2006 average spent per acre on nine Michigan farms for RAMP blocks was $99.67. The average spent per acre for conventional was $47.38/acre. A three-year analysis of the cost difference between reduced risk and conventional spray regimes shows the RAMP costs to be significantly higher (p=0.0042) than costs for comparison blocks. – *Michigan State University: Mark Whalon, Entomology.*

Utah research: western cherry fruit fly management

The efficacy of GF-120, with differing concentrations of ammonium added to increase attraction, was compared in reducing fruit fly densities and preventing fruit injury in one research station trial. Preliminary results suggest that increasing the concentration of ammonium in the bait spray to 10% slightly increased trap catch, but effects on fruit protection weren't significant. Both basic and acidic sources of ammonium performed equally, but pH of spray solutions varied from 5.2 to 8.7.

Table 1: Cost summary for 2006 Michigan spray regimes

Grower	RAMP block	Comparison block	Actual difference	Ratio
1	$147.64	$67.65	$79.99	2.18
2	$121.18	$26.90	$94.28	4.50
3	$107.54	$59.86	$47.68	1.80
4	$112.10	$86.47	$25.63	1.30
5	$61.63	$36.00	$25.63	1.71
6	$60.43	$23.94	$36.49	2.52
7	$106.36	$43.40	$62.96	2.45
8	$114.35	$32.08	$82.27	3.56
9	$65.77	$50.16	$15.61	1.31

Table 2: Reduced risk vs. conventional insecticide costs from 2004, 2005 and 2006

Year	Per acre insecticide cost		c. Per acre increase in cost for reduced risk insecticides	d. Cost factor
	a. Reduced risk	b. Conventional		
2004	$91.64	$40.52	$51.12	2.51
2005	$84.14	$41.90	$46.89	2.53
2006	$99.67	$47.38	$52.28	2.37

a. The average of the sum of the cost spent per RAMP acre of all 9 growers.
b. The average of the sum of the cost spent per Conventional acre of all 9 growers.
c. The average of the differences between RAMP and Conventional costs/acre of all 9 growers.
d. Calculated as the average of RAMP/Conventional ratios of all nine growers.

On-farm trials were conducted in eight RAMP orchards to compare Provado and GF-120 with Guthion and Imidan for fruit fly control. The RAMP project provided thorough monitoring of adult activity (16 border and interior Pherocon AM traps were checked 1 to 2 times per week in each orchard.) and fruit sampling (1,000 fruit per orchard per week was placed on larval emergence trays). Adult densities were the same or less in RAMP than conventional blocks. A single fruit fly pupa was detected on June 15 from one of the RAMP orchards. There were no other fruit fly detections. Mite densities on leaves were assessed in June and August. The western orchard predatory mite was moderate to abundant in most orchards and spider mite densities were generally low, but no differences between RAMP and conventional orchards were detected. – *Utah State University: Diane Alston, Biology.*

Utah research: biological control of plum curculio with nematodes

Plum curculio (PC) field sites treated for two or three consecutive years with a native population of the nematode, *Heterorhabditis bacteriophora*, have suppressed adult PC densities as compared to untreated sites. Viable nematodes have been recovered from field soil 8 to 12

Larry Gut

Diane Alston

weeks after inoculation, suggesting that recycling in insect hosts is occurring. Lab bioassays to assess life stage susceptibility are in progress. Preliminary results suggest that although newly formed pupae and teneral (newly emerged) adults are modestly susceptible to nematodes, the larvae are much more likely to be infected in the field.

Copper at a field rate of 7 lb/acre (1.2 lb actual Cu) is highly efficacious against CLS, but under hot, dry conditions, copper may cause phytotoxicity. To minimize copper's phytotoxic effects, we recommend mixing copper with lime at a rate of 6 lb of lime/acre. Although the copper and lime combination have shown good control of CLS, some insecticides such as Imidan are pH-sensitive and when lime is added to a tank mix, the pH of water is altered. In 2006, we conducted a laboratory assay to determine if copper/lime would reduce the effectiveness of standard cherry insecticides against field-caught plum curculio. When the compound Imidan was mixed with a field rate of copper/lime, the insecticide becomes completely ineffective. In other words, lime changes the pH of the water in the spray tank so drastically that Imidan loses all of its insecticidal properties. – *Utah State University: Diane Alston, Biology.*

Cherry leaf spot resistant cultivar development

In the third year of the RAMP project, we concentrated on moving the resistances previously identified in 2004 and 2005 into commercially acceptable tart cherry cultivars. In particular, we previously identified high levels of resistance to cherry leaf spot (CLS) in plant material derived from two species sources, *Prunus maackii* and *P. canescens*. We had also used in the breeding program tolerance provided by sweet cherry and the tart cherry cultivar Northstar. In 2006, we made crosses between these resistant sources and Montmorency and Balaton® to begin the process of transferring these resistances into commercially acceptable cultivars. In addition, five tart cherry selections previously identified as having tolerance to CLS and acceptable fruit quality were planted at the Northwest Michigan Horticultural Research Station to provide plant material to determine the potential for a reduced CLS spray program. – *Michigan State University: Amy Iezzoni, Horticulture.*

Economic analysis under development

An in-depth economic analysis is currently underway for RAMP grant participants using 2006 spray records. Costs for chemical inputs have been obtained for most compounds, but some are still being collected. We anticipate that the final comparison of 2006 RAMP and conventional blocks will include an estimate of application expenses in addition to aggregated chemical expense.

On May 29, 2006, the Japanese Ministry of Health, Labor and Welfare (MHLW) introduced a new regulation governing maximum residue limits (MRLs) for pesticides (also feed additives and veterinary drugs) in all food imports, including cherries. Since Japan is an important export destination for Michigan tart cherries, a list of the relevant compounds in the regulation has been compiled for RAMP participants. – *Michigan State University: SuzanneThornsbury, Agricultural Economics.*

Amy Iezzoni

Suzanne Thornsbury

Jim Nugent is "bagging it" as director of MSU's Northwest Station after several decades serving the fruit industry.

Nugent retires from MSU

James E. Nugent, coordinator of the Northwest Michigan Horticultural Research Station and district horticultural agent for Michigan State University Extension has announced his retirement. Jim has dedicated his career to advancing the cherry industry, especially in cherry research. He not only helped bring university researchers to the Northwest Station, but he also guided them into research projects that benefited cherry growers. Jim has been a key leader in statewide MSU Extension programming and has provided strategic planning information to the cherry industry for many years.

Jim took a leadership role in Integrated Pest Management (IPM) long before it became popular. He has utilized IPM techniques in his own farm business, and he has encouraged many growers to try new IPM strategies that have resulted in economic savings by more efficiently using crop protection tools.

Jim and his wife, Toddy Rieger, have a cherry farm in Leelanau County. They have three children: Colin, Johanna and Ele. Jim plans to spend retirement farming and traveling with Toddy.

Progress for the cherry industry through RAMP

As I write this article today to the U.S. cherry growers, I wonder where we would be without a strong research program. This grant (RAMP) has paid great dividends for every grower across the country. It has been pro-active and really geared towards bringing together the cherry researchers across the country to address the needs of the future. In a sense, it has provided a focus and discipline to address the critical needs of American growers.

On October 25, I was asked to participate on a conference call hosted by the Environmental Protection Agency (EPA) to discuss the needs for azinphos methyl (AZM). It was an opportunity for me to discuss with EPA all of the things growers have done with their own money to look for alternatives for AZM. We discussed the partnership with U.S. cherry researchers and how industry dollars tie together with federal dollars to address industry priorities. We discussed the crop protection tools we have tested and new chemistries being used by researchers on the RAMP farms. Finally, it was an opportunity to speak about the industry's strong commitment to Integrated Pest Management (IPM) and the IPM positions that have been funded by the industry to keep our growers on the cutting edge.

We expect our efforts to aggressively seek out and use new alternatives based on science will pay-off for cherry farmers across the country as they continue to try to grow high quality crops and live with the FDA mandate of zero tolerance for worms.

Special thanks to everyone who is a part of this research project,

especially the growers who have allowed their farms to be test sites and the researchers who have invested so much to truly move the cherry industry forward. — *Phil Korson, President of the Cherry Marketing Institute.*

MSU hosts tree fruit IPM School January 29-31

January 29-31, 2007
Kellogg Biological Station on Gull Lake, Michigan.
Sponsored by:
MSU Extension IPM Programs

Michigan State University

Join us for MSU's 2007 Tree Fruit IPM School. This year's program will take an in-depth look at our most problematic reoccurring pests in Michigan orchards and some new and exciting control strategies. The school will explore current, innovative and critical techniques to manage the ever-changing complexes of tree fruit diseases and insects. We have gathered researchers and extension specialists from across the state and country to discuss pest management tactics with growers, consultants, scouts and chemical company field representatives.

The program is organized with speakers giving a presentation followed by a short question and answer session. In addition, there will be three longer discussion times that are call-in radio style sessions with the entomology and plant disease experts. We hope these discussions will increase interaction between researchers, growers and consultants, with the scheduled talks delivering current information, and the discussions providing an opportunity for open conversation on a variety of topics.

Program content

- **Plum curculio**: Three good experts -- one bad weevil.
- **Codling moth**: Is this pest worse than ever?
- **New chemistries**: What's coming down the pipeline.
- **Cherry fruit fly:** New twist on CFF life cycle across Michigan.
- **Cherry leaf spot**: Copper's potential for tarts #1 disease.
- **Fungicide resistance in apple**: New York pro imparts his advice.
- **Post-harvest disease:** How to get rid of those rotten apples.
- **Management of *Armillaria***: Is controlling this disease impossible?
- **Fungicide resistance in brown rot**: Can this be true? Stay tuned!
- **Cherry RAMP Project**: Assessing the scene after 3 years.
- **Update on the governmental front:** EQIP, CSP, MEAP, and AZM.
- **Insecticide activity**: A look into how insecticides tick.
- **Tank mixes**: What you can and can't toss into the tank.
- **Evening pub quiz**: Having fun the Irish way! Bring all your IPM knowledge to compete in the first IPM School Quiz.

More information

Registration with lodging is $375 or $300 as a commuter. For more information or to request a registration form, call course coordinator Nikki Rothwell at 231-946-1510. A registration form is also available on the Internet at: http://ipm.msu.edu/pdf/FruitIPMSchool07.pdf
Please register by January 4.

Tart Cherry Integrated Orchard Management Project

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