



Newsletter Extension

Fruit ICM News

Volume 7, No. 5
February 13, 2003

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Calendar

February 15-20: 46th Annual IDFA Conference in Syracuse, NY. For more information, see the International Dwarf Tree Association website: <http://www.idfta.org>

February 20-22: Viticulture 2003, Buffalo Convention Center, Buffalo, NY. Contact by e-mail: info@viticulture2003.org or web site at: <http://www.viticulture2003.org/> for more information.

March 6-7: Ohio Fruit and Vegetable Food Safety Workshop, Ohio Department of Agriculture Bromfield Building at Reynoldsburg. Contact John Wargowsky, 614-246-8286 or labor@ofbf.org, or Mary Donnell, 419- 354-6916 or donnell.8@osu.edu or visit <http://www.midamservices.org> and click on 'projects.'

Attention Ohio Apple Growers and Marketers - Apple Coloring Book

Source: Jennifer Hungerford, Program Assistant, Ohio Fruit & Vegetable Growers

The Ohio Apple Marketing Program (OAMP) is once again ordering the special version of the popular 32-page coloring book with the message *Ohio Apples - Favored for Flavor* which lists the Ohio Apple web address <http://www.ohioapples.org> on the back cover. Orders must be prepaid by Friday, March 21, 2003 and mailed to the OAMP. All Ohio apple growers subject to the OAMP assessment will receive an

order form in the mail. If you would like to obtain the order form over the Internet you may go to <http://www.ohioapples.org> and select 'What's New' from the left navigation. To receive the order form by fax or mail you may call the OAMP office at 614-246-8292.

If you would like to view this Internet link as a reference you may click on the link below:
[http://www.ohioapples.org/oamp/oampwebengine.nsf/\\$LookupPageID/CARE-4ZDHCF/?OpenDocument](http://www.ohioapples.org/oamp/oampwebengine.nsf/$LookupPageID/CARE-4ZDHCF/?OpenDocument)

Ohio River Valley Farm Marketing Conference

Agricultural leaders from Indiana, Kentucky, and Ohio have partnered to organize the Ohio River Valley Farm Marketing Conference, a valuable and affordable educational conference for growers and agricultural stakeholders. The conference is scheduled for February 25-26 at the Holiday Inn Lakeview in Clarksville, IN and is geared toward growers who are looking for strategies for marketing their products. The conference registration fee is only \$15 and includes all conference activities and 3 meals.

Jerry Hay, USDA Rural Development Cooperative Specialist, said, "This is a great opportunity to share the latest ideas on farm marketing. You may learn something at this conference that could make a significant financial difference in your operation." Joe Pearson, Indiana's Assistant Commissioner of Agriculture, Billy Ray Smith, the Kentucky Commissioner of Agriculture, and a representative for Fred Dailey, the Ohio Director of Agriculture will speak at the event. In addition, Ed Bell, a Hoosier storyteller with a farming background, will be the keynote speaker.

Feature presentations will include:

- Marketing Organic Products
- Making Agri-Tourism Your Business
- Identifying Your Market - Who Do You Plan to Sell To?
- Partnering Up - Using Your Local Resources
- Using the Web to Promote Your Business
- Aquaculture - Opportunities & Realities
- The Horticulture Market Today & Tomorrow
- How to Market an Agri-Tourism Enterprise
- ABC's of Selling to Distributors
- Niche Marketing for Livestock
- Marketing to Institutions
- Aquaculture & Prawns
- Challenges & Opportunities in Marketing New Crops
- Specialty Livestock Production Success Stories
- Planning Agri-Tourism Tours
- Wholesale Produce Auctions - What Works/What Doesn't?
- Considerations for Home Livestock Operations
- Community Supported Agriculture and Your Farm
- Is Cooperative Marketing in Your Future?
- Pastured Poultry & Hog Production
- Hospitality & Dealing with the General Public

For more information, please call 800-816-0019 or e-mail mdweber@sdg.us. Conference information is also posted at <http://www.sirdp.us>. The volunteer planning committee includes:

Southern Indiana Rural Development Project
Historic Hoosier Hills RC&D
Indiana USDA Rural Development
Purdue Cooperative Extension Service
Ohio Cooperative Development Center
Kentucky Cooperative Development Center
Indiana Farm Bureau
Kentucky Farm Bureau
Kentucky Department of Agriculture
Jennings County Growers Cooperative
Commodity Growers Cooperative
Southeastern Indiana Small Business Development Center

Highlights from the Ohio Fruit and Vegetable Growers Congress

Source: Pam Fisher, Berry Crop Specialist, Ontario Ministry of Agriculture and Food, The All Ontario Berry Grower, Volume #0.02, February 2003

The small fruit program provided a great update of small fruit work in Ohio.

Strawberry herbicides:

Doug Doohan at Ohio State University has been working on the herbicide clopyralid, known to Canadians as Lontrel, and to Americans as Stinger. Doug reported that clopyralid has visible effects on strawberry plants, although yield is not usually reduced. Leaf twisting, precocious bloom, and a compressed harvest season can result from application of this herbicide.

Grad student Steve Polter at OSU has been working with the herbicide Sinbar to generate information for a revised label in the U.S. He looked at how growth stage of the plant and irrigation affected Sinbar injury symptoms on strawberry. Light irrigation (approx 1/2 inch) up to 3 hours after Sinbar application reduced the amount of leaf injury but did not reduce weed control. In the field, Sinbar applied to newly planted strawberries prior to new growth caused more injury than Sinbar applied to new plantings at the three leaf stage.

Plasticulture:

At Piketon Research Center in southern Ohio, Brad Bergeford is looking at the potential for plasticulture strawberry production, using southern varieties and plug plants grown from Canadian tips. They are conducting studies to determine optimum date of planting, and the use of row covers and straw mulch for winter protection.

Deer have become a pest of strawberry plants, especially in the plasticulture system. An electric fence, run by a solar panel and supported by T-posts angled away from the patch, helped keep damage in check. For research updates at Piketon, see <http://southcenters.osu.edu/hort/>.

Organic strawberries:

The biggest challenge in organic strawberry production may be weed control, according to Dr. Joe Kovach, after working with an organic plot for two years. In this trial, Botrytis damage was 1-2 % and tarnished plant bug damage was 6-7% in the organic plots, but weeds were the biggest challenge,

requiring many, many hours of hand weeding. There was also more slug damage in plots where composts were used. There was no difference in taste between the organic and conventionally grown strawberries in this study.

Site Specific Management for Strawberries:

Researchers Reza Ehsani and Matt Sullivan from the Ag Engineering department at OSU wondered if site specific management techniques used in field crops could be useful in strawberry production. They described site specific management as using the right amount of inputs at the right location at the right time.

The elements of site specific management include yield monitoring, establishing the relationship between crop inputs and yield, developing maps, and applying the right inputs on a site specific basis. In strawberries, this type of crop management is still in its infancy. The objective of this project was to find a low cost yield monitor, determine how variable strawberry fields could be, and determine the causes of this variability.

Several yield monitoring methods were tested. The best method was simply on-the-spot weighing of harvested berries, in conjunction with a GPS meter. Soil and leaves were analyzed for major and micronutrients. Soil moisture and compaction were measured. Aerial imagery and infra-red photography was used to further characterize the field.

Yields in a one-acre block of Honeoye ranged from 2800 to 7300 lb/acre. Nearly half of the variation in yield could be explained by the soil and plant characteristics.

2002 - CanAdapt Peach and Nectarine Cultivar Evaluation

Source: Ken Slingerland, OMAF, Project Coordinator, The Tender Fruit Grape Vine, Volume 7, Issue 3, January/February 2003

<http://www.gov.on.ca/OMAFRA/english/crops/hort/news/tenderfr/tf0703.htm>

This project is sponsored by the Ontario Fruit Testing Association (OFTA). OFTA's objective is to provide growers with the best and most up-to-date genetic stock available for fruit production. They will also help provide the forum to disburse information on new cultivars.

Other partners in the project are: Niagara Peninsula Fruit and Vegetable Grower's Association (NPF&VGA); the Ontario Tender Fruit Producers' Marketing Board (OTFPMB); Mr. John Zandstra, University of Guelph - Ridgetown; Mr. Ken Slingerland, OMAF Tender Fruit and Grape Specialist (project coordinator); and fruit growers, Mr. Ted Lizak and Mr. Jack Philbrick, who have planted and are growing the trees under "best management practices." They will also provide the locations for open houses for future grower meetings.

1999 Plantings:

Cultivars that were planted in Spring of 1999 include Sugar May, Sugar Giant, PF #1, PF #24-007, PF #23, Coralstar, PF #5B, Risingstar, PF #15A.

Trunk measurements have been made annually to record and compare the growth. The growth in 1999 was only fair, due to the very dry season. Growth rebounded in 2000 because of all the rainfall during that season. The 2001 season had moderate growth, but 2002 growth slowed considerably, due to

another very dry growing season, as indicated in Table 1. The growth was the lowest for P.F. 15A (8.1%) and the highest for Risingstar (22.5%) for the trees planted in 1999.

Table 1. Change of Growth for 2002 growing season

Cultivar	% Change
Risingstar	22.5
Sugar May	22.1
Coralstar	18.4
P.F. 5B	18.1
P.F. 1	17.4
P.F. 24-007	16.1
Sugar Giant	11.1
P.F. 24-007	10.9
P.F. 15A	8.1

2000 Plantings

Cultivars that were planted in Spring of 2000 include Early Nectarine (grower selection), Late Peach (grower selection in Loring season), Redstar, Early Peach (grower selection), Firebrite (nectarine), Spring Ruby, Mid Nectarine (grower selection) and Risingstar.

The 2001 season had moderate growth, but 2002 growth slowed considerably for some cultivars, due to a very dry growing season as indicated in Table 2. The growth was the lowest for Risingstar (16.7%) and the highest for Early Nectarine (40.4%) for the trees planted in 2000.

Table 2. Change of Growth for 2002 growing season

Cultivar	% Change
Early Nectarine (selection)	40.4
Late Peach (selection)	38.7
Redstar	34.8
Early Peach (selection)	30.1
Firebrite	27.6
Spring Ruby	18.8
Mid Nectarine (selection)	17.9
Risingstar	16.7

Future harvests will include twilight grower meetings to observe these new cultivars under commercial conditions and hopefully provide Ontario growers with the information they need to select the cultivars for the future.

The Performance of Cherry and Peach Rootstocks in Ontario (Part 1)

Source: Dr. J. A. Cline, Dr. N. Miles, W. Lay, R. Guarnaccia, and D. Norton, University of Guelph, Vineland Campus, The Tender Fruit Grape Vine, Volume 7, Issue 3, January/February 2003

Choosing a suitable rootstock for a new orchard has economic and orchard management consequences. As with cultivars, there are a great number of rootstocks available for tender fruit producers, but many are not suitable for our climate, cultivars, or orchard systems.

The Tree Fruit Research program at the University of Guelph, Vineland and Simcoe campuses has been actively involved in rootstock research for peach, nectarine, plum, cherry, and apple production in Ontario. This long term research is to assess size controlling characteristics of a number of rootstocks from around the world. The information gathered from these experiments is extremely useful in determining the environment / genetic interactions rootstocks have on yield, precocity, tree performance, longevity, resistance to disease and winter injury, and tendency to sucker. This article will provide a brief summary of some of our most recent results from studies conducted in Vineland on tender fruit crops.

Sweet Cherry

New rootstocks are needed to keep the Ontario cherry industry competitive by reducing tree size, increasing productivity, and maintaining high fruit quality. A smaller tree can reduce expensive harvest labor costs, improve harvest efficiency & pest control, and facilitate new strategies to avoid rain-induced fruit cracking.

Ten trees each of Hedelfingen on 14 different rootstock (Edabriz, Gisela 195-20, Gisela 209-1, Gisela 4 (GI 473-10), Gisela 5 (GI 148-2), Gisela 6 (GI 148-1), Gisela 7 (GI-148-8), Mahaleb, Mazzard, Wieroot 10, Wieroot 13, Wieroot 158, Wieroot 53, Wieroot 72) were planted in 1998 at the Horticultural Experiment Station, Vineland at a spacing of 5.0 m within and 5.5 m between rows (364 trees/hectare; 147 trees/acre). The block, which completed its second year of fruiting in 2002, is not staked or irrigated, and is trained to a central leader with branch bending rather than pruning encouraged. Significant differences in yield, mean fruit weight, yield efficiencies, cumulative yield efficiencies, and tree growth (TCSA) have been observed. Apart from the loss of two trees on Mahaleb rootstock in the spring of 2001, all trees have generally grown very well.

Wieroot 10, Mahaleb and Mazzard rootstocks continued to produce the largest trees, based on trunk circumference. Edabriz, Gisela 209-1, and Gisela 4 rootstocks have been the most dwarfing - 26, 22, and 22% of Mazzard, respectively. Cumulative yield efficiency has been greatest on Gisela 4 and Gisela 7, while the lowest on Mazzard and Mahaleb. Root suckering has only been minor to date.

Sour Cherry

The standard rootstock for sour cherry is Mahaleb. This rootstock is productive; however, an understock is needed with greater tree longevity where Phytophthora root rot and other soil-borne diseases exist, or when trees are planted in heavy or shallow soils. Ten trees each of Montmorency on 12 different rootstock (Edabriz, Gisela 195-20, Gisela 209-1, Gisela 5 (GI 148-2), Gisela 6 (GI 148-1), Gisela 7 (GI-148-8), Mahaleb, Wieroot 10, Wieroot 13, Wieroot 158, Wieroot 53, Wieroot 72) were planted in 1998 at the Horticultural Experiment Station, Vineland, at a spacing of 5.0 m within and 5.0 m between rows

(400 trees/hectare; 162 trees/acre). Trees were not staked or irrigated and were trained to a central leader orchard system. Although fruit was light because of spring frost, growth performance was good in 2002.

Significant differences in tree size exist between rootstocks. Mahaleb and Wieroot 10 continue to produce the largest trees; Gisela 209-1, Edabriz and Wieroot 53 are the most dwarfing, all around 5% of Mahaleb.

All trees are showing minimal leaning and require no additional support. There has been nominal rootstock suckering in Gisela 195-20, Gisela 6, and Mahaleb

Cumulative yields (precocity) have been greatest for Gisela 7, followed by Gisela 195-20, Wieroot 10, Wieroot 158, Gisela 6, Wieroot 13, and Mahaleb. Gisela 209-, Edabriz, and Gisela 209-1 have been the least precocious.

Concluding Remarks

New options for reducing the tree size of sweet cherry trees is now becoming a reality. A dwarf tree will provide new prospects for rain covers, bird netting, and pedestrian orchards for pick-your own operations. Our preliminary results suggest that the Gisela and Wieroot series offer some distinct advantages for size control. However, one of the overriding concerns with the Gisela rootstocks, in particular, is that excessive over cropping in the first one to two years of fruiting can result in reduced fruit size. This problem may be accentuated when self-fruitful scions such as Vandalay and Tehranivee are used. Growers and nurseries should be aware that the new clonally propagated cherry rootstocks can be more susceptible to prune dwarf virus (PDV) and Prunus necrotic ringspot virus (PNRSV). Despite the concerns, these rootstocks deserve serious consideration.

Editor's note: Two figures were omitted. They can be viewed at <http://www.gov.on.ca/OMAFRA/english/crops/hort/news/tenderfr/tf0703.htm>.

Canadian and American 2002 Plum Pox Survey Results

Source: Michael Celetti, OMAF, Plant Pathologist - Horticulture Crops Program Lead, Guelph, The Tender Fruit Grape Vine, Volume 7, Issue 3, Jan./Feb. 2003

Since the discovery of PPV in Ontario, the CFIA together with Agricore and the University of Guelph have been surveying and testing all Ontario peach, plum, nectarine, and apricot orchards to identify and eliminate all sources of infection. Similar surveys are being conducted in the United States. Every year, scientists and extension personnel involved with PPV from the US and Canada meet to discuss the latest survey results. The following are a few highlights of the PPV survey results presented at a recent US/Canada PPV Update meeting held December 16-17, 2002 in Shepherdstowne, West Virginia.

A more intensive sampling and survey procedure was used in the Niagara quarantine zones of Ontario to detect all infected trees during 2002. Consequently, 323,225 samples were tested for PPV in 2002 compared to 137,117 in 2001. Results indicate 215 blocks tested positive for PPV, compared to 211 positive blocks in 2001. A few more trees tested positive in the Fonthill and Bleinhem quarantine zones, but no new positives were found for the 2nd consecutive year in the Vittoria quarantine zone.

Under the rules of the North American Plant Protection Organization (NAPPO), a region that tests negative for three consecutive years is considered to have eradicated the pest. Due to the intensity of sampling in 2002, it was anticipated that many more positive blocks would be discovered in the Niagara

quarantine zones. It is encouraging that the number of PPV infected blocks remained relatively constant in 2002 compared to 2001. Furthermore, most infected blocks found in 2002 had a disease incidence of <1%, and few blocks had incidence levels of >3.23%. All positive trees have been removed and the CFIA, together with Agricore, will continue to survey for PPV in 2003.

Residential, native, and ornamental plants have also been surveyed in the Niagara quarantine zones over the past two years. Five plants of dwarf flowering almond at one rural residential site near Niagara on the Lake (NOTL) in 2001, and 2 blue plum trees at one residential site in Stoney Creek in 2002, tested positive for the virus. Infected trees have been removed from both sites. The dwarf flowering almond positive shrubs originated from cuttings taken from a homeowner's plant in Beamsville. The original plant was destroyed soon after the cuttings were moved to the site near NOTL many years ago. They exhibit uniform and obvious disease symptoms in both leaf and flowering tissues, and the strain was type D.

Unfortunately, the isolate of PPV infecting the blue plum trees found at a Stoney Creek resident was very unusual and could not be typed to a known strain. The infected blue plum trees were apparently brought in as seed from the former Soviet Union several decades ago, but we do not know if this strain of PPV came with the PPV. No PPV was found in any native weed species or in ornamental Prunus species growing in nurseries. Results from these surveys are encouraging as we proceed to eradicate PPV from Ontario. For more information on the 2002 PPV survey results please visit:

<http://www.inspection.gc.ca/english/plaveg/hort/ppv/survey11e.shtml>.

In the U.S., PPV was detected at 7 sites (7 trees) in Pennsylvania during 2002. The disease was found in 2 additional townships in Pennsylvania, instigating the implementation of 2 new quarantine areas. The virus was also found on one residential property in 2002. Unfortunately, the property was within 500 meters of a commercial orchard, which had to be destroyed under the Pennsylvania PPV Eradication Protocol. Sentinel potted plum and peach seedlings, placed in previously infected Pennsylvania orchards that had been removed, all tested negative for the virus. However, occasional suckers and root shoots that emerged in these orchards tested positive for the virus. To date, 1394 acres of stone fruit have been destroyed in Pennsylvania, which accounts for approximately 17% of the industry.

Stone fruit trees sampled in all other states tested negative for the virus in 2002, including California. Unfortunately, only California nurseries were tested in the survey. Extensive testing in the New York counties of Niagara, Orleans, and Chautauqua yielded no positives.

Researchers at Pennsylvania State University reported on the results of a native weed and prunus host survey conducted around infected orchards and homeowner sites in Pennsylvania. PPV could not be detected in any of the 10,214 native weeds and 134 prunus hosts tested at nine infected sites over the past three years.

OFM Mating Disruption Demonstration Project Final Season

Source: Neil Carter, Tender Fruit and Grape IPM Specialist, The Tender Fruit Grape Vine, Volume 7, Issue 3, January/February 2003

The summary from this year's report on the demonstration component of the oriental fruit moth mating disruption project is reproduced below. For anyone who doesn't know about this technology, synthetic pheromones (species-specific insect communication chemicals) are used in an orchard, preventing male oriental fruit moths from finding mates. If female moths aren't mated, they don't lay fertile eggs, and there are no larvae to attack shoots or fruit. The product used in this part of the project was Isomate

OFM Rosso season-long lasting, fixed-point dispensers resembling large 'twist-ties.' Other methods of dispensing the pheromone, such as different types of dispensers, sprayable formulations, and automated spray 'stations,' may be available in the future.

Two thousand two was the third and final year of the demonstration project for mating disruption (MD) of oriental fruit moth (OFM) in the Niagara Peninsula, funded in part through CanAdapt. The final season and the three year project overall were very successful, with effective control of OFM achieved using Isomate-OFM Rosso (CBC America Corp.) fixed-point pheromone dispensers. Grower cooperators gained valuable experience using MD on over 400 acres of peaches.

Pheromone traps in the pheromone treated orchards indicated that a high degree of MD was sustained throughout the 2002 growing season. Trap catches of some moths on borders of MD areas emphasize the need for regular pest scouting. Average peach shoot damage ('flagging') was very low at MD sites for both first and second generation OFM, but a few sites had small areas or 'hot spots' of flagging, which again demonstrated the value of monitoring. Average fruit damage from OFM was almost nonexistent for early season peaches (0.005%), similarly low for mid season peaches (0.02%) and for late season peaches (0.07%). Only 5 of 85 samples of fruit (500 fruit per sample) had 1.0 2.2% OFM damage.

Growers saved 1 to 4 insecticide sprays in MD treated orchards. Damage by secondary pests, especially plant bugs and plum curculio, was generally low but significant in localized areas of some orchards. Fruit damage by obliquebanded leafroller was less than 0.5%, but rose steadily through the three year project. Conventional spray programs for OFM may or may not have controlled these secondary pests, depending on the timing of the various control measures needed; the demonstration portion of this project did not include conventionally treated orchards as comparisons to the MD orchards.

Most grower cooperators had generally positive comments about the MD program and were grateful for the opportunity to gain experience with the Isomate OFM Rosso product. Other insect pests, cost of product, and labor requirements for installing pheromone dispensers were paramount in grower concerns. Benefits of the program as identified by growers were effective control of OFM, better management for orchard work including irrigation scheduling, elimination of re-entry intervals for workers, potential improvements in food safety, and a positive marketing feature for their produce.

The bottom line on OFM mating disruption is that it generally worked very well over the course of this three year project. However, there were a few localized areas where the results were not completely satisfactory, just as there are always a few areas where regular spray programs are not as effective as planned.

New Jersey Study Shows Reduced Plant Bugs with Managed Sod Groundcover

Source: Neil Carter, Tender Fruit and Grape IPM Specialist, The Tender Fruit Grape Vine, Volume 7, Issue 3, January/February 2003

Tarnished plant bug (*Lygus lineolaris*) is a common pest of many fruits, including peach, apple, pear, plum, apricot, and cherry. It can also be a pest of flowers, vegetables, field crops, tobacco, and berries, especially strawberry. The success and persistence of this small (5 mm) bug may have something to do with the fact that it has over 300 host plant species, including many common broadleaf weeds.

Early season feeding on fruit can produce deformed fruit; this damage is called 'cat-facing.' Later season damage can include water-soaked spots and surface blemishes on fruit. Tarnished plant bug (TPB) is only one of many bugs that may attack fruit, but it is one of the most common culprits causing fruit damage. There are over 1750 species of plant bugs (family Miridae) in North America, and while most feed on plants, few of them are actually economically important pests. TPB is a brownish color, mottled with various shades of yellow and reddish brown, and has a Y-shaped mark on its scutellum (the forward part of its back).

TPB can be controlled with insecticides, but there are effective alternatives to that approach. It has been suggested for many years that a combination of ground cover management, TPB monitoring, and carefully timed groundcover cutting can reduce damage from, and numbers of, orchard resident TPB.

An article in the *Journal of Economic Entomology* in August, 2002 by Atanas Atanassov, Peter Shearer, George Hamilton, and Dean Polk gives some indication of how well a managed sod groundcover can reduce plant bug pressure. In "Development and implementation of a reduced risk peach arthropod management program in New Jersey" Atanassov et al. explain their approach using a combination of mating disruption (MD) for control of oriental fruit moth and ground cover management to reduce plant bug damage. The New Jersey project is one of many in our region of the world examining the efficacy of mating disruption for OFM [for example, Trimble et al. (Ontario), Agnello et al. (New York), Gut et al. (Michigan), Hull et al. (Pennsylvania), etc.] and they have had, as other researchers have, good success using MD.

In the New Jersey study, ground cover in conventional orchards was naturalized, weedy vegetation, including many common broadleaf weeds such as white sweet clover, dandelion, shepherd's purse, mayweed, and redroot pigweed. This groundcover was maintained by periodic disking and mowing. In the reduced risk orchard blocks, sod was established with either hard fescue or tall fescue and was also mowed periodically. Bare soil strips in tree rows were maintained with spring herbicide applications.

During the two years of the study, TPB populations were significantly lower in managed sod orchards, with only one-fifth as many TPB as in the conventional orchards. TPB were scarce in the sod areas because there were fewer of their preferred weed hosts. In the conventional orchards, however, there were plenty of broadleaf weeds, so the TPB were much more abundant. In the first year of their study, Atanassov et al. found less plant bug damage on fruit where managed sod was the ground cover, but in the second year, they found no significant difference between the two different ground cover approaches.

There is more to minimizing fruit damage from TPB than just ground cover type. Timing of cutting of ground cover is also important for reducing TPB injury on fruit. In the spring, overwintered adults will often feed on fruit buds and lay some eggs, especially during the pink and blossom periods of apple. After that, TPB migrate to weeds, especially mustards, and become scarce in trees. More eggs are laid on their weed plant hosts, and the majority of the developing young (nymphs) can be found there for several weeks.

The key to timing of ground cover cutting is to mow when the majority of the plant bugs are still nymphs. Cutting at that time will kill some nymphs outright because they cannot yet fly away, and will deprive others of their food source as the cut vegetation dries out. If mowing is delayed until most TPB are adults, the TPB will fly up into the trees when disturbed by mowing and they will then cause more damage to the fruit.

There are many variables to the amount of fruit injury caused by TPB. Sometimes they will have a

"good year." Hot weather early in the year, before alfalfa and other alternative hosts have grown much, will cause plant bugs to move into fruit trees and cause damage. Cold, rainy weather early in the year reduces feeding and movement, while early hot weather improves the chances of a higher population of TPB. Hot, dry weather later in the year can dry up weeds and force TPB into the trees. The amount of local alternative plant hosts is always a factor in plant bug abundance. Late season damage can occur, after mowing in or outside of the orchard sends TPB up into the trees. Very large local migrations of adult TPB can occur when hay is cut.

There are several ways to know when is the best time to cut groundcover in order to minimize plant bug pressure. The first and best way is to have your orchard monitored regularly by a trained pest scout. Monitoring services train scouts in how to recognize plant bugs, especially TPB, and how and when to monitor for them (sweep net surveys, fruit assessments, sticky traps in some cases, etc.) Trained scouts can inform the producer when to take action. Growers can also learn monitoring techniques, how to identify TPB, and how to assess plant bug injury on fruit so they can incorporate that information into their own monitoring programs.

More information on TPB biology and management can be found in "Insects and mites in tender fruit," pages 154-158 in OMAF Publication 360, *Fruit Production Recommendations*, 2002-2003, and at: <http://www.gov.on.ca/OMAF/english/crops/facts/92-108.htm>.

Preparing Agricultural Operations According to Homeland Security Advisories

Risk Levels	Recommended Actions
LOW (Green)	Get certified in CPR and first aid Develop an emergency plan for your family and farmstead Establish "neighborhood watches" Keep an updated inventory list of all feeds and chemicals Store chemicals in a locked location Be able to document sales of restricted use pesticides according to regulations
GUARDED (Blue)	Be alert to suspicious activity Stock up on supplies for use in an emergency Establish a family meeting place away from your farmstead Lock and/or secure chemical application equipment when not in use Invite local authorities to producer meetings to discuss agricultural security issues and disaster procedures
ELEVATED (Yellow)	Have updated contact information (phone & email addresses) for local authorities Develop alternate driving routes and practice using them Assist others in the neighborhood with their disaster plan, especially elders and those with special needs Invite local law officials to your farm to review your security measures Be suspicious of unusual purchases or odd behavior of employees or farm visitors
HIGH (Orange)	Be cautious while traveling Have an emergency shelter in place with supplies available Donate blood if there is a need

	Check on others in the neighborhood, especially elders and those with special needs Determine need to restrict access to farm facilities Be sure water supply system is secure
SEVERE (Red)	Listen to TV or radio reports for instructions and information Adhere to any travel restrictions Walk the perimeter of any chemical storage areas daily, looking for signs of tampering Restrict deliveries and unknown visitors to your farm Work with local officials and emergency management agents to meet immediate needs of agricultural situations

The Department of Homeland Security establishes the level of risk for the United States. This publication describes the recommended actions for agricultural operations. As levels of risk increase in severity, farm operators should also complete the recommendations at the lower advisory level(s).

Authors: Dee Jepsen, Stephanie Simstad, & John Bishop, Dept. of Food, Agricultural, and Biological Engineering, (614) 292-6008

The Ohio Fruit ICM News is edited by:

Ted W. Gastier
 Extension Agent, Agriculture
 Tree Fruit Team Coordinator
 Ohio State University Extension Huron County
 180 Milan Avenue
 Norwalk, OH 44857
 Phone: (419)668-8210
 FAX: (419)663-4233
 E-mail: gastier.1@osu.edu

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Keith L. Smith, Associate Vice President for Ag. Adm. and Director, OSU Extension.

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