August 6, 2010 | Volume 14 | Issue

Ohio Fruit ICM News

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If you have articles for the newsletter that you would like to have considered to be included in upcoming issues, please submit to either Howard Siegrist at siegrist.1@cfaes.osu.edu or Melissa Swearingen at swearingen.34@cfaes.osu.edu

Horticulture Field Night at OSU Extension at Piketon South Centers

Julie Strawser-Moose
Ohio State University Extension

A new trial for currants and gooseberries at Ohio State University South Centers at Piketon will be featured at the upcoming OSU South Centers Horticulture Field Night Aug. 12, along with a demonstration of compost socks that are producing encouraging results for growing crops without soil.

Registration begins at 5 p.m. with a wagon-tour program following at 6 p.m. Derma scan viewings for sun damage will be available until 6:30 p.m. Dinner will be served at 8:30 p.m. when specialists will be available for questions. Registration is $10 per person. OSU South Centers is located at 1864 Shyville Road, Piketon, Ohio.

The highlight of the wagon tour will be the newly established Ribes trial where currant, gooseberry and jostaberry plants are being studied as a possible new commercial crop for Ohio's small fruit growers. Ribes were grown in the state in the early 1900s, but were banned due to the serious threat to the white pine industry from white Pine blister rust. Ribes are the alternate host for the fungus. The new studies are on improved varieties that are naturally resistant to white pine blister rust, and are available to consumers through commercial fruit nurseries.

The evening will also include a demonstration of the compost sock system with lettuce. Researchers at OSU South Centers are using compost socks as a growth medium and comparing the crop's performance to in-ground production. A trial was done earlier this year using this system to grow strawberries, and provided good results on performance and yield to that of in-ground high-tunnel strawberry production.

Other stops will include the three-year-old winegrape vineyard that is in its first year of fruit production, heirloom tomato research, primocane-bearing blackberry trials, strawberry production and a pumpkin trial update. The irrigation demonstration and training unit will also be showcased, which features technology that is practiced in Israel for fertilizer injection and drip irrigation. This unit is sponsored by the Cleveland-based Ohio-Israel Agricultural Initiative (OIAI) of The Negev Foundation.

Those interested in attending the field night are encouraged to register by Aug. 10. For more information, contact Julie Strawser-Moose at (740) 289-2071, ext. 223 or e-mail: strawser.35@cfaes.osu.edu .

North Central Ohio Tree Fruit IPM Program
Report Prepared by Cindy Crawford (Erie County Adm. Assoc.)

Mike Abfall – East District IPM Scout
(Erie and Lorain Counties)

Date – 7/19/10
Apples
Spotted Tentiform Leafminer – 212 (up from 144.2)
Codling Moth – 3.9 (up from 1.0)
Apple Maggot – 2.6 (up from .59)
San Jose Scale – 180 (up from 106.8)
Oriental Fruit Moth – 2.6 (up from 1.9)
Lesser Appleworm – 0(down from .5)
Dogwood Borer – 30.83 (up from 4.5)

Peaches
Oriental Fruit Moth – 0 (down from 0.3)
Lesser Peach Tree Borer – 0.7 (same)
Peach Tree Borer – 1.3 (down from 2)

Date – 7/26/10
Apples
Spotted Tentiform Leafminer – 105.8 (down from 212)
Codling Moth – 4.6 (up from 4)
Apple Maggot – 4.1 (up from 2.6)
San Jose Scale – 113.1 (down from 180)
Oriental Fruit Moth – 3 (up from 2.6)
Lesser Appleworm – .5(up from 0)
Dogwood Borer – 13.83 (down from 30.83)

Peaches
Oriental Fruit Moth – 1 (up from 0)
Lesser Peach Tree Borer – 1.8 (up from .7)
Peach Tree Borer – .8 (down from 1.3)

Ted Gastier – West District IPM Scout
(Sandusky, Ottawa, Huron and Richland Counties)

Date – 7/19/10

Apples
Spotted Tentiform Leafminer – 109 (up from 24)
Codling Moth – 2.3 (up from 0)
Apple Maggot – 0 (same)
San Jose Scale – 0 (same)
Oriental Fruit Moth – 11.2 (up from 7.7)
Dogwood Borer – 5.4 (up from 4.3)

Peaches

Red Banded Leafroller – 0 (same)
Oriental Fruit Moth – 0 (down from 0.5)
Lesser Peach Tree Borer – 1.3 (up from 1)
Peach Tree Borer – 1 (down from 3)

Date – 7/26/10
Apples
Spotted Tentiform Leafminer – 127 (up from 132)
Codling Moth – 3.2 (same)
Apple Maggot – 0 (same)
San Jose Scale – 0 (same)
Oriental Fruit Moth – 5.4 (down from 10.7)
Dogwood Borer – 9.7 (up from 6.9)

Peaches

Red Banded Leafroller – 0 (same)
Oriental Fruit Moth – 2 (up from 0)
Lesser Peach Tree Borer – 2.7 (up from 1.3)
Peach Tree Borer – 1 (same)

Wayne County Insect Trap Reports

Ron Becker - Program Coordinator

Week of 7/19
Codling Moth-Avg /trap , 3 traps per block
Wayne-5.67 down from 7.56
Medina-2.25 up from 1.22
Holmes-2.33 up from 1.5

Week of 7/26
Codling Moth-Avg /trap, 3 traps per block
Wayne-13.44 up from 5.67
Medina-3.58 up from 2.25
Holmes-4.83 up from 2.33

Week of 8/3
Codling Moth-Avg /trap, 3 traps per block
Wayne-19.89 up from 13.44
Medina-4.33 up from 3.58
Holmes-3.0 down from 4.83

Week of 7/19
Oriental Fruit Moth-
Medina – 0 down from 2.0

Week of7/26
Oriental Fruit Moth-
Medina – 0 down from 2.0

Week of 8/3
Oriental Fruit Moth-
Medina – 0 same

No apple maggot adults have been caught in traps and no maggot damage has been found.
Still some bronzing due to European Red Mite. Apple aphids are light to moderate.

Entrepreneurial Farm Tour to Western Michigan

Dan Rossman, Extension Educator
Michigan State University Extension

A two-day farm tour to western Michigan is planned for August 25-26.

This year's tour will showcase farm families who have successfully explored and seized opportunities to enhance the profitability of their operations. The stops will feature sustainable farming systems, diversified enterprises, organic operations, livestock for specialty markets, farmer-owned retail markets, cooperative ventures, value-added enterprises, and direct marketing strategies, as well as many other examples of how family farmers are finding ways to be more profitable while enjoying it as well. Stops are tentatively scheduled for on-farm cheese making, tree fruit production, sheep and poultry operations, large scale vegetables, blueberries, deer farm, tree farm, on-farm ethanol operation, soybean processing, and more.

This tour is sponsored by MSU Extension, Project GREEEN, NCR-SARE, Greenstone Farm Credit Service, and SunOpta. The cost will be reasonable ($50 or less). Please call the Gratiot MSU-Extension office at 989-875-5233 for details and to sign up by August 16, 2010.

Learn How to Start a Commercial Vineyard at Free Workshop

Maurus Brown, Extension Specialist BioEnergy and Specialty Crops OSU South Centers at Piketon
Ohio State University Extension

Commercial grape growers, or those interested in starting a commercial vineyard, are invited to attend a free viticulture workshop at Ohio State University's South Centers at Piketon on Aug. 13.

The event, sponsored by the Ohio Grape Industries Committee and OSU South Centers, will take place from 9:30 a.m. until 4 p.m. OSU South Centers is located at 1864 Shyville Road, Piketon, Ohio.

Topics to be covered during the event include updates on pesticide spray programs, black rot control, updates on grape root borer, herbicide drift, winter hardiness, and the Vineyard Expansion Assistance Program (VEAP), plus information on the Ohio Wine Industry.

For more information, or to register, contact Julie Strawser-Moose at 740-289-2071, ext. 223 or e-mail strawser.35@cfaes.osu.edu.

Managing Apple Fruit Maturity in an Early Growing Season

Dr. Jim Schupp, Fruit Research Extension Center Pomologist
Penn State University Extension

The 2010 growing season is running about 400 degree days ahead of the five-year average, both at Biglerville and at Rock Springs. Fruit maturity of stone fruit is also running about 10 days early in 2010. The forecast at the time this is written predicts that temperatures will continue to be at or above normal, suggesting no slowing of development in the near future.

Based on these observations it is likely that maturity of early-season apple varieties will also be advanced by a similar extent. Growers who intend to use ReTain sprays and/or Fruitone pre-loading sprays for harvest management of Gala or Honeycrisp should initiate these sprays earlier to account for the advanced 2010 season.

2010 Upcoming Events:

August 19-20, 2010 - Apple Crop Outlook Conference, US Apple Association, Ritz-Carlton Hotel, Chicago**.**
See **www.usapple.com** for details.

August 19-21, 2010 - North American Fruit Explorers - Midwest Fruit Showcase. Best Western Motel/ Conference Center, Lafayette, IN. To view the program and registration form, check: **http://web.extension.illinois.edu/edwardsvillecenter/foodcrophort3031.html** . For additional details or questions: contact Ed Fackler at **cefackler@gmail.com** or 812-366-3181.

August 26, 2010 - Peach Variety Showcase and Penn State FREC Open House. Penn State Fruit Research and Extension Center, Biglerville, PA. See Flyer on Page 12.

November 8-10, 2010. Southeast Strawberry Expo, Wyndham Hotel, Virginia Beach, VA. Workshops and farm tour on Nov. 8, educational sessions and trade show on Nov. 9-10 For more information, visit www.ncstrawberry.com or contact the NC Strawberry Association, 919-542-4037, info@ncstrawberry.com . Exhibitor inquiries welcome.

December 7-9, 2010. Great Lakes Fruit Vegetable and Farm Market EXPO, DeVos Place Convention Center, Grand Rapids, Michigan. For more information: **http://www.glexpo.com** .

Central Ohio Poison Control Number
(800) 222-1222
TTY # is (614) 228-2272

Editor: Howard J. Siegrist, Extension Educator, Ohio State University – Licking County
771 E. Main Street, Suite 103, Newark, OH 43055. Phone: 740-670-5315
Email address: siegrist.1@cfaes.osu.edu

We gratefully acknowledge the continued help and financial support of our local county commissioners. We appreciate their input and participation in our programming efforts.

Ribes Trials to Evaluate Resistance and Immunity to White Pine Blister Rust

Maurus Brown, Small Fruit Specialist , OSU South Centers at Piketon
The Ohio State University Extension

The small fruit industry in Ohio is quickly expanding beyond blueberries, brambles and strawberries.

The market now exists for Ribes, perennial woody shrubs that produce a variety of edible berries, such as gooseberries, currants and jostaberries (a black currant and gooseberry hybrid).

Maurus Brown, an Ohio State University Extension small fruit specialist of OSU South Centers at Piketon, said that the niche specialty crops can be sold at markets as fresh berries, in baked goods, for jams and jellies, and even the wine industry. But growers can't produce just any variety in Ohio. Ribes varieties must be resistant to white pine blister rust, a devastating disease of white pine trees of which Ribes are a host.

Brown and his colleagues have launched trials at OSU South Centers at Piketon to evaluate disease-resistant varieties and determine which ones grow best in Ohio.

"The selections we chose are either labeled as showing immunity or show high resistance to the white pine blister rust," said Brown. "Our primary interest is to evaluate the varieties and determine their ratings for white pine blister rust based on the local growing conditions in Ohio. That means if they are rated as immune then they shouldn't show any signs or symptoms of the disease, and if they are rated as highly resistant, then they should have little, if any, disease issues."

To protect white pine forests, several states, including Ohio, have enacted laws concerning planting black currants that do not show immunity or high resistance to white pine blister rust. Ohio law does not prohibit the planting of red currants or gooseberries.

The three-year trial at OSU South Centers will focus on 18 Ribes varieties. They include Consort, Coronet, Crusader, and Titania—all black currants; Rovada, a red currant; Primus, a white currant; Josta, a jostaberry; and Captivator, Jahns Prairie, Invicta, Poorman, Black Velvet, Hinnonmaki Red, Red George, Tixia, Jewel and Pixwell—all gooseberries.

"There are more resistant varieties, but some are just very difficult to get a hold of," said Brown. "We wanted to evaluate varieties that growers can easily find. These varieties are not only from the U.S. Department of Agriculture Germplasm Repository, but they can also be purchased from commercial fruit nurseries."

Researchers will be studying several characteristics of each Ribes variety, including overall plant growth, vigor, winter hardiness, disease and insect resistance, total fruit yield, fruit size and quality, and overall horticulture characteristics.

The trial, which was planted in June, will be part of the tour at the OSU South Centers Horticulture Field Night on August 12. The program begins at 5 p.m. with dinner served at 8:30 p.m. Registration is $10 per person.

Those interested in attending the field night are encouraged to register by Aug. 10. For more information, contact Julie Strawser-Moose at (740) 289-2071, ext. 223 or e-mail strawser.35@cfaes.osu.edu.

For more information on white pine blister rust on currants and gooseberries, refer to the OSU Extension fact sheet at http://bit.ly/94kn8o.

Beware of Blueberry Leaf Rust

Annemiek Schilder, Plant Pathology
Michigan State University Extension

Be on the look-out for blueberry leaf rust, particularly in fields that have had a problem in previous years. While this disease is relatively rare in Michigan, it can be severe in fields that are affected. Rainy periods in the middle of the growing season are conducive to disease development. It also occasionally pops up on blueberry plants in greenhouses. Leaf rust is caused by the fungus *Pucciniastrum vaccinii*. Yellow spots appear on leaves by mid-season and eventually turn reddish-brown (Photo 1). On the lower leaf surface, yellow to orange spore pustules (uredia) are present, which may turn rusty red with age (Photo 2). You have to turn the leaf over to see the orange pustules. The disease is not systemic in blueberries. Leaf rust can rapidly increase towards the end of the season. It generally has little impact on yield, but may cause premature defoliation. It is possible that severe defoliation could affect winterhardiness of the canes.

The alternate host of the rust fungus is hemlock (*Tsuga* spp.), which explains why the rust is more severe in the vicinity of hemlock trees (up to a half mile). Airborne aeciospores from hemlock needles infect blueberry leaves in early summer. Yellow uredospores (Photo 2) then develop on blueberry leaves and spread the disease among blueberries. The uredospores are airborne and spread easily from leaf to leaf and bush to bush. In fall, teliospores (the overwintering stage) form in the rust pustules on blueberry leaves. The teliospores produce basidiospores, which are airborne and infect hemlock needles in early spring. In areas where green leaves are present all year (in the southern United States or in greenhouses), hemlock trees are not needed. On green leaves, the fungus will continue to perpetuate itself via the orange/yellow uredospores.

For management, a recommendation to remove hemlock trees within a half mile may neither be desirable or practical. However, it would remove the alternative host, which would break the life cycle in cold climates. Raking up blueberry leaves after leaf fall and burning them can also help to reduce inoculum carry over. Other things that can be done: limit overhead irrigation to reduce leaf wetness and apply effective fungicides during periods of high risk (usually starting before or shortly after harvest). Though we have not evaluated any fungicides for rust control in blueberries in Michigan, the sterol inhibitors are usually quite effective against rust fungi, and both Indar (30-day PHI) and Orbit (30-day PHI) are labeled for rust control. Bravo also lists rust on the label – just remember the PHI is 42 days and sprays are not recommended after full bloom due to potential phytotoxicity. However, all of these fungicides can be sprayed after harvest provided that the maximum number of sprays per season is not exceeded. Sonata (*Bacillus pumilis*), a biofungicide is also labeled for blueberry rust control and has a zero-day PHI. Adding NuFilm as a spreader-sticker improves activity of Sonata. Abound does not have rust listed on its label and the labels of Pristine and Cabrio list "suppression" of rusts only, which indicates that they are only moderately effective against rust.

Photo 1. Yellow spots appear on leaves by mid-season and eventually turn reddish-brown.

Photo 2. On the lower leaf surface, yellow to orange spore pustules (uredia) are present, which may turn rusty red with age. Photo credit: Bill Cline.

Fumigation Update

Rob Welker, Methyl Bromide Alternative Project Coordinator
Frank Louws, Associate Professor of Plant Pathology and Extension Specialist
North Carolina State University

Things are still changing in the world of fumigation. Prices seem to have stabilized this year and methyl bromide is up to about $5.90 per pound. This is not a huge jump in price like we have seen in past years. The biggest change is going to occur when labels appear on fumigant cylinders with the new EPA requirements for fumigants that we have talked about for the past year or so. Things like new personnel protective equipment requirements, good agricultural practices and the Fumigant Management Plans will all show up on labels this year. The good news is that they will not be in place before strawberry growers fumigate this year! EPA has finished its label reviews and most of the labels are now in State review for approval. Once that is complete, labels can be printed and put on containers. EPA has put a deadline of having new labels in place by December 1, 2010. That also means that fumigations starting next spring will fall under the new label restrictions.

We continue to look at all methyl bromide alternatives and in the past year we have worked with PicClor 60 under different mulches, MIDAS, Vapam and Telone C-35. We have also continued our work with drip applying fumigants with very good results. In all studies, we were able to produce equal, or in some cases superior yield to methyl bromide fumigation. We also used a new compost mulch sock that many of you saw at the Strawberry Expo last November, and had good success with that product in an organic high tunnel. We will also be investigating using no fumigant and drip-applying fungicides during the year in a trial to start this fall. Another bit of good news is that Paladin fumigant has gained EPA approval and is now going to state regulators for approval. This fumigant might be something to consider in the future.

We still have a lot of options for strawberry growers in the Southeast, and we will continue our research into alternatives, There is, however, a lot to learn in the next year in order to comply with the new EPA regulations for fumigants. Watch your labels for changes, and be sure to follow all label requirements. Your chemical dealers will assist you with the changes, and keep an eye out for training opportunities where you can learn about how to comply. We will be offering workshops at the Strawberry Expo this November to help all growers prepare for these new label changes, so we hope to see you there.

Cherry Leaf Spot and the Need for Postharvest Fungicide Applications in this Early Harvest Season

Nikki Rothwell, Northwest Michigan Horticultural Research Station
George Sundin, Plant Pathology
Michigan State University Extension

With the cherry season behind us for 2010, growers have inquired about post-harvest management strategy for cherry leaf spot (CLS). In a typical year, we harvest tart cherries in mid-July to mid-August, and a post-harvest fungicide spray is applied within a week of harvest. The intent for this spray is to prevent early defoliation that can lead to reduction in tree winter hardiness, diminished fruit set the following year, and result in poor fruit quality in future seasons. These post-harvest applications are commonly sprayed mid- to late-August, which in most years is effective enough to prevent premature leaf loss in September. In the case of 2010, much of the tart cherry harvest was finished by early July, which leaves almost an extra month to manage for cherry leaf spot. The following guidelines should help growers when making their post-harvest cherry leaf spot management decisions.

First, all growers should have made the “typical” chlorothalonil application just after harvest. If the orchard was clean or fairly clean up until this point, this spray will keep the leaves protected until the first of August. Further fungicide applications will be warranted if conditions remain wet and warm. Long periods of warm, dry weather will keep the cherry leaf spot fungus in check.

Under cherry leaf spot-conducive conditions, a second post-harvest fungicide application in early August will further protect the leaves until mid-August, the traditional timing for the post-harvest spray. Again, if the orchards do not already show signs of cherry leaf spot, this second post-harvest application should protect foliage through to September, and because the cherry leaf spot fungus grows slowly, the pathogen will not have adequate time to move through its life cycle and result in premature defoliation. On the other hand, if an orchard is already showing signs of leaf drop at this time, a third fungicide application may be warranted at the end of August. Additionally, if conditions in August are wet and warm, even clean orchards may need another fungicide application. Because there are many formulations of chlorothalonil available, growers should check the label for the maximum allowable limit for the season.

Potential Non-Target Effects of Glyphosate on Apples

Dave Rosenberger-Plant Pathology; Mario Miranda Sazo-Cultural Fruit Practices;
Craig Kahlke-Horticulture; Hannah Mathers-Horticulture and Crop Science; Chris Watkins-Horticulture
Cornell University

Fig 1.

Glyphosate (Round-Up and generics) is an important tool for managing ground cover beneath apple trees. According to the last available data from the USDA's National Agricultural Statistics Service, 54% of New York apple acreage was treated with glyphosate at least once in 2007, and 10 percent of that acreage received two applications (Anonymous 2008). However, there are increasing concerns that glyphosate may sometimes damage fruit trees in subtle ways that may be largely unrecognized. In this article, we will review the latest information and hypotheses about non-target effects of glyphosate on apples.

Trunk cankers: In a 2004 article in Scaffolds, Rosenberger and Fargione hypothesized than an interaction between glyphosate and Botryosphaeria dothidea was causing basal trunk cankers and tree decline in some apple orchards in eastern NY and Connecticut (see Scaffolds 13(13), 14 June 2004). Injury was especially common on Macoun trees. Since then, Macoun trees throughout eastern New York and New England have continued to develop basal trunk cankers, decline, and die. However, the link between glyphosate and basal cankers on Macoun is still hypothetical. No one has pursued the long-term studies required to prove that glyphosate is at fault.

Varying levels of trunk injury (presumably glyphosate-related) have been noted in other cultivars on farms where Macoun trees have been killed, but tree losses from trunk cankers have been mostly limited to Macoun plantings. Cortland is probably the second most commonly affected variety. More recently, however, some of the older Honeycrisp plantings in the Hudson Valley have begun to show trunk cankers somewhat like those previously reported on Macoun (Fig. 1). It is not yet clear whether these cankers on Honeycrisp will eventually result in tree death or whether the Honeycrisp trees will tolerate the trunk damage. We also don't know if trunk injury like that shown in Fig. 1 has adverse effects on yield or fruit quality.

Figure 2a.

Decreased winter hardiness: During the summer of 2009, Mario Miranda Sazo arranged for a group of us to meet with Dr. Hannah Mathers to discuss her research at Ohio State University where she and her graduate students have shown that one springtime, low-dose application of glyphosate to trunks of field grown ornamentals can reduce winter hardiness and cause bark cracking in several ornamental species, including crab apples (Daniels et al. 2009; also see http://www.ag.ohio-state.edu/~news/story.php?id=4685). The research from Mathers' group helped to explain why we have occasionally seen blocks of apples where scaffold limbs were killed during winter following improper application of glyphosate the previous season (Fig. 2a). Trees that suffer winter damage following glyphosate exposure often show an unusual pattern of water-soaked discoloration in the xylem when cross-sections of limbs are examined (Fig. 2b-c).

Figure 2b.

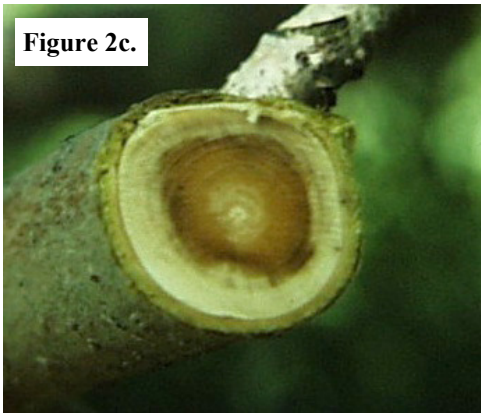

Figure 2c.

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Potential Non-Target Effects of Glyphosate on Apples - Continued from Page 8

Over the past several years, we have seen local instances and heard reports from other states where young apple trees developed nondescript trunk cankers (Fig. 3) and/or dieback in patterns that seemed inconsistent with any known disease or weather-related phenomenon. Weak fungal pathogens such as Cytospora species can often be isolated from canker margins on affected trees, but various experts have hypothesized that winter injury may be the underlying cause for some of the observed damage. Given the recent results from Mathers' lab, it seems possible that glyphosate-induced cold injury might be involved in causing the unusual damage to young trees in locations where glyphosate has been applied anytime over the past two years, either in the orchard or in the nursery.

Figure 3.

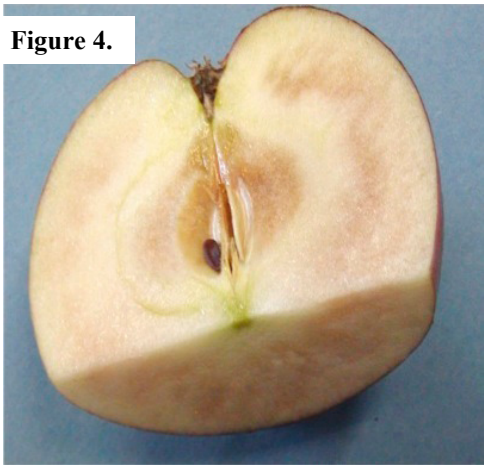

Figure 4.

Internal browning during CA storage: Internal browning is a disorder that can appear during controlled atmosphere (CA) storage (Fig. 4 - on following page). Even mild cases of internal browning are unacceptable for fruit used in fresh-cut slices. Incidence and severity of internal browning vary from block to block, but the underlying factors that contribute to differences among blocks have not yet been determined.

We recently investigated effects of glyphosate exposure on internal browning in Empire apples held in long-term CA storage. To simulate the level of glyphosate exposure that might occur via drift of small droplets onto lower limbs when glyphosate is applied beneath trees, we sprayed a low rate of glyphosate (Roundup Powermax, 1 ml/gal) over several lower limbs on four Empire trees in each of three different orchards in western New York. Applications were made between 22 July and 12 August of 2009. The rate of glyphosate applied was roughly 1/30th of the concentration that would be used if glyphosate was applied at 1 qt of product per acre in a sprayer calibrated to deliver 30 gal of water per sprayed acre. The glyphosate concentration we used was so low that the sprayed limbs did not show any visible damage from glyphosate, either in fall of 2009 or during the 2010 growing season.

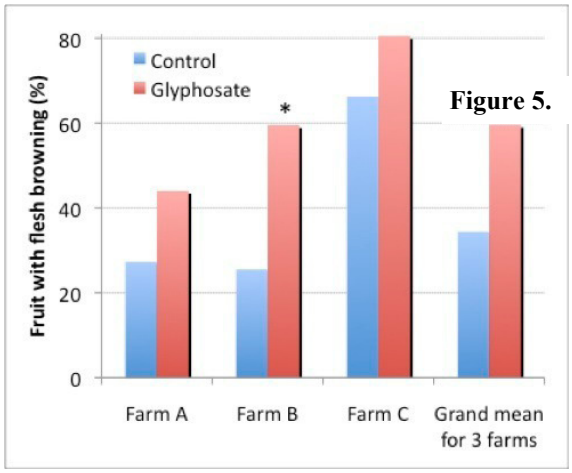

Figure 5.

In early October, about eight weeks after the glyphosate had been applied, samples of 25 fruit were harvested from the sprayed limbs and from the unsprayed tops of each of the four sprayed trees in each orchard. Similar samples were collected from adjacent control trees in each orchard, and all of the samples were then stored for eight months in CA storage chambers in Ithaca that were held at 36°F with 2% oxygen and 2% carbon dioxide. After fruit were removed from CA storage in early June, they were held at 68°F for 7 days before they were evaluated for internal browning.

Fruit from trees where one or several lower limbs had been sprayed with glyphosate showed a higher incidence of internal browning than fruit from control trees (Figs. 5 & 6). Effects of glyphosate on flesh browning were similar for fruit collected from the sprayed limbs and for fruit collected from the tops of trees, so results for the combined samples (50 fruit/tree) are shown in Fig. 5. In addition to increasing the incidence of internal browning, glyphosate treatment also increased the severity of browning. Effects of glyphosate on severity of browning followed the same trends among orchards as shown for comparisons of incidence in Fig. 5.

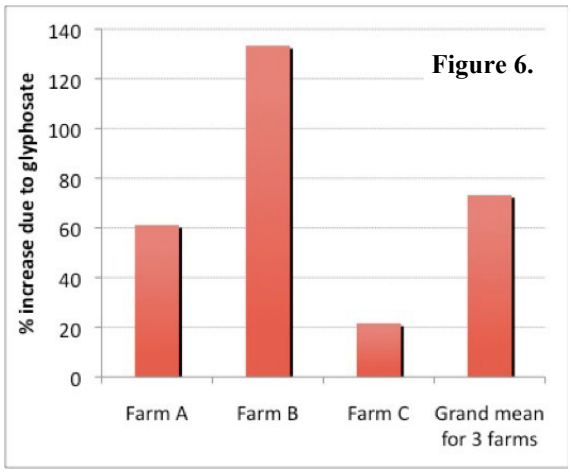

Figure 6.

The background level of internal browning evident in control fruit varied greatly among farms. Some of the browning in our controls may have been caused by glyphosate exposure incurred when the participating growers applied glyphosate to these orchards either earlier in 2009 or in previous years. That possibility is supported by the fact that, on Farm B where we found the largest and most consistent differences between control and treated fruit, the grower had not applied

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Potential Non-Target Effects of Glyphosate on Apples - Continued from Page 9

glyphosate in the test orchard in either 2008 or 2009. The other two growers routinely applied glyphosate in early summer, and trees on Farm C, which had the highest level of browning in the controls, usually received a second application in early August.

The results reported here were derived from only one year of data, one application timing, and one cultivar, so it would be premature to conclude that glyphosate exposure is the major contributing factor for internal browning problems in apples. Nevertheless, the data from our 2009–10 trial suggests that glyphosate may exacerbate this storage problem.

Why would these phenomena be associated with glyphosate? Glyphosate kills plants by blocking a critical enzyme pathway known as the shikimic acid pathway. The blocked enzyme is essential for respiration in plants, so plants that receive a full dose of glyphosate cannot survive unless they are engineered to be glyphosate-resistant or have evolved to be resistant. (The latter is happening with some weeds in fields that are used repeatedly for Round-Up Ready crops). At lower concentrations, however, glyphosate can adversely affect plants without producing any immediately visible effects.

A broadly held concept is that glyphosate breaks down quickly in soil and has no residual activity. However, the real picture is far more complex. Much of the glyphosate that is applied does, in fact, break down to innocuous compounds within several days. However, some of the glyphosate becomes trapped in soil, and additional amounts are slowly released from the roots of weeds that are killed by the glyphosate. The latter phenomenon explains why there are plant-back delays for some annual crops where glyphosate may be applied to kill a winter ground cover. Glyphosate released into the soil may be available for uptake by the meristems in root hairs. Once inside the non-target plant, it may persist for more than a year while causing subtle disruption of critical plant functions.

Glyphosate complexes very quickly with many different cations in water and soils. Thus, when glyphosate is mixed with hard water in a spray tank, it can be inactivated by the calcium and magnesium ions in the water and it will not provide effective weed control. It also complexes with iron, so steel spray tanks (other than stainless steel) cannot be used to apply glyphosate. In soils, the affinity of glyphosate for cations can reduce availability of calcium, magnesium, manganese, copper, iron, nickel, and zinc, either by direct chemical interactions or by negative effects on soil microbes involved in making these minerals available to plants. Glyphosate taken up by roots can also interfere with movement and availability of some of these minerals inside plant tissue (Cakmak et al. 2009).

Glyphosate exposure has been shown to reduce root growth and seed production, and affect seed quality in some crops. Glyphosate taken up by roots or absorbed through leaves tends to accumulate in meristematic tissue and storage organs. No one knows how much of the glyphosate taken up by apple trees ends up in apple fruit, but it seems quite likely that glyphosate may affect nutrient balances within apple fruit.

Numerous studies have shown that glyphosate exposure can increase susceptibility of many annual plants to various diseases (Johal and Huber 2009). In some cases, the increased susceptibility to diseases occurs because glyphosate interferes with natural defense systems in plants and in other cases root diseases may develop because glyphosate upsets the natural soil microflora. In apples, we know that natural defense systems are critically important for creation of barrier zones that limit the expansion of fungal pathogens in older xylem. (See the article on apple cankers in N.Y. Fruit Quarterly, Winter 2007) Thus, it is possible that the basal cankers on trunks of trees sprayed with glyphosate may develop in part because the glyphosate inactivates plant defense mechanisms that would otherwise limit the invasion of pathogens such as Botryosphaeria dothidea, Cytospora species, etc.

Can phosphite fungicides activate glyphosate in soil? There is some evidence that high rates of phosphorus can release soil-bound glyphosate and make it available to plant roots (Cornish 1992). Normally, this would be of little concern because apple growers generally do not apply high rates of phosphorus. However, the phosphite fungicides (and phosphites sold as foliar nutrients) have proven useful for controlling summer diseases on apples (Rosenberger & Cox 2009). Phosphites are highly systemic in plants but cannot be utilized by plants until they have been exuded from roots and changed from phosphites to the plant-usable form of phosphorus by soil bacteria. Most of the phosphites taken in through foliar sprays are released from root hairs, the same tissues that are most likely to absorb glyphosate from soil.

No one has studied this question, but high levels of phosphorus might develop in the rhizosphere of apple roots if trees receive repeated applications of phosphites during summer. The phosphorus in the rhizosphere could conceivably trigger a release of soil-bound glyphosate. Glyphosate taken into the roots of phosphite-treated trees could theoretically contribute to reduced winter hardiness, compromised plant defense mechanisms, and/or increased tendency toward internal browning of fruit held in CA storage. Considerable time and money will be required to test these complex hypotheses, and perhaps we will find that there is absolutely no interaction between glyphosate and phosphite fungicides. However, until more information is available, excessive use of phosphites (more than one or two applications per year?) should probably be avoided in orchards where glyphosate is used.

What should you do now? We lack research based information needed to assess the seriousness of the non-target effects of glyphosate in apples, so we can only provide generalized rules for minimizing adverse effects:

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Potential Non-Target Effects of Glyphosate on Apples - Continued from Page 10

1. Never apply glyphosate to Macoun apples. Macoun trees seem uniquely susceptible to damage if glyphosate hits the tree trunks near the soil line.
2. Avoid using glyphosate for sucker control on apples because doing so will probably reduce winter hardiness and may increase the probability of internal browning (at least on Empire). Nor should glyphosate be applied immediately after suckers are cut because glyphosate is readily absorbed by freshly cut stems.
3. We suspect that early summer applications of glyphosate are less likely to create problems than are late summer applications. However, Mather's group in Ohio has shown that glyphosate exposure in spring can result in elevated levels of shikimic acid for at least a full year following the exposure.
4. Whenever glyphosate is applied, a drift inhibitor should be included in the spray tank to minimize the number of small droplets that are produced.
5. After the Roundup patent expired in 2000, generic brands appeared. They include Touchdown, Jury, Makaze, Cornerstone, Roundup Original Max, Roundup Pro, Roundup Weathermax, and others. Each of these products incorporates various surfactants at varying doses. Read the label and only add a surfactant if that is suggested on the label. High concentrations of surfactants may increase uptake through tree bark, so cheaper products that do not contain as much surfactant may actually be safer around trees.
6. Some growers and consultants believe that protecting trunks with white latex after planting can reduce the potential for herbicide injury, but this claim needs verification in replicated trials.
7. The pressure on herbicide sprayers should be kept as low as possible (e.g. 20–30 psi) to minimize the generation of small droplets.
8. Where possible, a hooded boom sprayer should be used to apply glyphosate to tree fruits to minimize the bounce-back from bare soil that can sometimes appear as a haze of small droplets that circle upward into trees.
9. NEVER apply glyphosate with controlled droplet applicators that disperse concentrated glyphosate from a spinning disk. The fine droplets produced by these CDAs can remain airborne for a long time and will almost certainly drift onto trees.

In summary, glyphosate can be a valuable tool for managing weed problems in orchards. It is especially useful for eliminating noxious weeds such as Canadian thistle, poison ivy, and other woody perennials. However, glyphosate can also cause extensive damage to trees, so it should be used only when necessary and then with special precautions aimed at minimizing glyphosate contact with tree foliage, root suckers, and trunk tissue.

Launch a Wine Grape Business - Learn How at Farm Science Review

Maurus Brown, Small Fruit Specialist
Ohio State University Extension

Ohio growers interested in launching a wine grape business or expanding an existing vineyard can learn more about the new Vineyard Expansion Assistance Program at Ohio State University's Farm Science Review.

Maurus Brown, an OSU Extension small fruit specialist, and Christy Eckstein with the Ohio Grape Industries Committee, will present a session on the program at 3 p.m. Sept. 21 at the Center for Small Farms, located on Beef Street in the exhibitor area. Farm Science Review runs from Sept. 21-23 at the Molly Caren Agricultural Center in London, Ohio. The show is sponsored by the College of Food, Agricultural, and Environmental Sciences, OSU Extension and the Ohio Agricultural Research and Development Center.

Brown said that the program, which was launched this year, replaces the Ohio Vine Grant Program. The new program attracted 35 applicants, 19 of which were approved $2,000 each for their vineyards. "The Vineyard Expansion Assistance Program is designed to encourage the establishment of new wine grape vineyards in Ohio, as well as expand existing vineyards, specifically for the production of vinifera and French-American hybrids," said Brown.

The incentive program was created by the Ohio Grape Industries Committee and funded through the U.S. Department of Agriculture Specialty Crop Block Grant program. It's intended to meet the goal of increasing grape acreage in Ohio by 10 percent over the next five years. Growers interested in participating in the program may apply for up to $3,000 per acre with a maximum of three acres or $9,000. The funding will cover only the cost of the winegrape vines planted.

The Vineyard Expansion Assistance Program presentation is one of 19 sessions being offered at the Farm Science Review Center for Small Farms. Other topics include government programs for beginning farmers, local foods, using social media, food safety practices, alternative energy sources, getting started in aquaculture, agritourism, using cover crops and the fundamentals of direct marketing. For a complete schedule, log on to http://fsr.osu.edu/schedule.html. Farm Science Review pre-show tickets are now on sale for $5 at all OSU Extension county offices. Tickets will also be available at local agribusinesses. Tickets are $8 at the gate. Children 5 and younger are admitted free. Hours are 8 a.m. to 5 p.m. Sept. 21-22 and 8 a.m. to 4 p.m. Sept. 23.

For more information, log on to http://fsr.osu.edu. For the latest news and updates, follow Farm Science Review on Twitter (http://www.twitter.com/OhioStateFSR), Facebook (http://www.facebook.com/FarmScienceReview), and Ning (http://fsrosu.ning.com).

Peach Variety Showcase and Penn State FREC Open House

PENNSTATE

Thursday, August 26, 2010, 2:30—6:30 pm

Penn State Fruit Research and Extension Center, Biglerville, PA

Drop by whenever it fits your schedule that day!

- Showcase of Peach Varieties Under Trial in the Mid-Atlantic Region
- Advanced Peach Rootstock Selections
- Peach Systems Trials
- Advanced IPM/Bio-Rational Pest Management
- Engineering Solutions for Specialty Crops

Funding provided by PA Peach and Nectarine Board and USDA Specialty Crop Research Initiative. Special Guest—Jerry Frecon, Rutgers University

Featured Displays and Demonstrations

CA Building and Nearby Orchards, 2:30-6:30 pm

- Peach Varieties Under Trial in the Mid-Atlantic Region—Jerry Frecon, Rutgers Cooperative Extension
- Engineering Solutions for Specialty Crops—Matt Aasted, Carnegie Mellon University; Dr. Larry Hull, Dr. Paul Heinemann, Reuben Dise, Dr. Jim Schupp, Edwin Winzeler, Brian Lehman, Tom Kon, Dr. Katie Ellis, Dr. Tara Baugher
- Integrated Approaches to Peach Disease Management—Dr. Henry Ngugi, Dr. Noemi Halbrendt, Sarah Bardsley
- Innovative Energy Programming for Horticultural Enterprises—Dr. Katie Ellis, Dr. Dan Ciolkosz
- Native Pollinators—Dr. David Biddinger
- Student Projects on Crop Load Management, Increasing Efficiency in Peach Orchard Systems, Reducing Spray Drift and Energy Efficiency—Tom Kon, Jennifer Rouzer, Evan Moore, Celine Kuntz, Russell Rohrbaugh, Ryan Hilton, Amelia Jarvinen

Peach Rootstock, High Density Apple, and Grape Variety Plantings, 3:00-4:00 pm

- Peach Rootstock and Grape Variety Investigations—Dr. Jim Schupp, Dr. Rob Crassweller
- New Partnerships to Develop a Cost-Effective Harvest Assist System—Dr. Jim Schupp, DBR Conveyor Concepts
- Bio-Rational Pest Management—Dr. Greg Krawczyk, Dr. John Halbrendt
- Targeted Weed Sprayer Applications in High Density Commercial Pilot Orchards—Dr. Jim Schupp, Tom Kon, Dr. Tara Baugher

Peach Training Systems and Automated Thinning of Peach Blossoms, 4:15-5:15 pm

- Training Systems for Early Peach Production—Dr. Jim Schupp, Dr. Tara Baugher, Edwin Winzeler, Jim Remcheck
- Autonomous Sensing and Positioning of a String Blossom Thinner—Reuben Dise, Matt Aastad, Dr. Paul Heinemann
- Surveys to Increase Adoption of New Technologies—Dr. Katie Ellis

Special Thanks: Terry Salada, Jean Morris, Karen Weaver, Technical Support Staff, Summer Interns, Grower Cooperators!!