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Fruit Crop Advisory Team Alert

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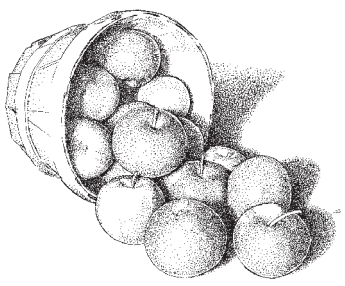

Last issue for 2009

This is the final issue for the 2009 season of the *Fruit CAT Alert* newsletter. Included in this issue is an index of articles to help guide readers through the topics covered this year. Educators and specialists have worked hard to inform readers about current issues and crop production throughout the last few months.

We will continue to publish timely articles at the *Fruit CAT Alert* web site: http://ipmnews.msu.edu/fruit. Interested in staying informed via email notification? Send an email to catalert@msu.edu with your full name and note that you wish to subscribe to the fruit edition. At the *Fruit CAT Alert* web site, you can also sign up to received RSS feeds when new articles are posted. (See image.)

Look for a bright orange RSS feed logo on the right side of the web page.

We love to hear feedback from our readers. Do you have a comment or suggestion? Please send it to catalert@msu.edu or mail it to the address on the back of this newsletter. Indicate whether you are referring to our fruit, vegetable, field crop or landscape edition.

Thank you. - Joy Landis, editor and Andrea Buchholz, asst. editor

Inoculum reduction in orchards with apple scab

George Sundin, Plant Pathology, and Amy Irish-Brown, MSU Extension Educator

Orchards with existing apple scab infections on leaves will carry over significant inoculum into next season. In addition, much of this inoculum will likely be resistant to strobilurin fungicides. Thus, any methods that would be useful in reducing this inoculum load are important to consider.

The apple scab fungus overwinters in fallen leaves. During the following spring, the fungus undergoes a sexual cycle and produces a fruiting body called the pseudothecium that contains the ascospores. These ascospores are the spores that represent the primary inoculum. Development of these spores is timed with the development of the tree, and the spores can begin to be released around green tip.

Inoculum-reduction methods serve to reduce the primary ascospore load by eliminating some of the apple scab-infected leaves. Any reduction of scab-infected leaves directly correlates with a reduction in primary inoculum. Now, it is impossible to completely eliminate this inoculum, but spore-reduction strategies have been effective in reducing spore loads by 50-80 percent.

The two main methods for spore reduction are:

1. Application of urea to fallen leaves in fall or spring.
2. Shredding of leaf litter with a flail mower.

A 5 percent solution of urea (spray urea or greenhouse grade) (40 lb urea in 100 gallons of water) is used to increase the breakdown of leaves. Urea will stimulate indigenous microbial breakdown of leaves; urea can also soften leaves which are then more easily ingested by earthworms. These native organisms will work better as the temperatures rise; thus, urea applied in November may not be as effective if followed relatively quickly by freezing temperatures and snow cover. An application in spring can be highly effective in spore

reduction and the urea may also directly inhibit ascospore formation. Another possibility is the direct application of urea to leaves on trees; this method usually is less effective because if the leaves do not drop within seven days after application, the nitrogen present will be taken up into the tree and not be available for leaf degradation. Finally, urea sprayed on the ground beneath the tree canopy will also add to the nitrogen fertilization of trees and subsequent N fertilization rates should be adjusted accordingly.

Shredding leaf litter in the spring increases microbial breakdown of leaves by providing more pieces that can be invaded and consumed. In addition, mowing tends to re-orient most of the leaf pieces on the orchard floor. When the scab fungus is developing pseudothecia, the structures are all oriented in a vertical direction with the opening facing up. The spores are forcibly ejected out of the top of the pseudothecium. If a leaf piece containing a pseudothecium is inverted, the spores are ejected into the soil and not into the air. Thus, re-orientation also decreases inoculum load by preventing the fungus from effectively discharging spores.

A few other points: 1) the mower must be set low enough to reach leaves low to the floor; 2) the mower must be offset to reach leaves beneath the trees; 3) if the mowing is done later in the spring, the re-orientation of leaves is also effective. Prior to spring, the pseudothecia structures have not developed yet. **IPM**

The 2009 season tree fruit diseases

George Sundin, Plant Pathology

In this article, I will review what we've observed and learned in 2009 and try to explain mechanistically the cause of disease issues we've faced this year. Before that, I want to acknowledge the excellent MSU Extension folks in the state (Mira Danilovic, Amy Irish-Brown, Erin Lizotte, Mark Longstroth, Nikki Rothwell, Phil Schwallier, Bill Shane and Bob Tritten) that work long and hard to stay on top of things in the tree fruit world. I am indebted to these dedicated professionals, rely on them for information, and enjoy the many "fruitful" discussions we have.

Apple scab

2009 was a difficult year for managing apple scab and the next few years will likely be just as difficult. First, we faced the difficulty of losing the strobilurin fungicides on the Ridge, as we recovered significant levels of strobilurin-resistant apple scab fungal isolates in 2008. Combining this loss of an important fungicide with a significant apple scab infection period in late April led to scab symptoms showing up and causing problems throughout the season. One note on the **strobilurin resistance testing** that is ongoing in my laboratory. We have sampled approximately 70 orchards throughout the state and a few more in Wisconsin and Ontario. Currently, we have approximately 2,000 isolates of the apple scab fungus ready for testing. These isolates all have to be propagated and replicates put into long-term storage prior to testing. We have just initiated the testing of the first isolates for **strobilurin resistance**. We are also testing each isolate for **resistance to sterol-inhibitor (SI) fungicides**. We hope to complete the testing and have all results by the Great Lakes Fruit and Vegetable Expo in December. All growers with orchards that we've tested will be informed individually concerning the results. I will also be communicating results on a regional basis throughout the winter so everyone is up to date about the resistance status of the apple scab fungus in their regions.

Table 1. Heavy (severe) infection periods for apple scab infection in various locations in Michigan in 2009.

Location	Date(s)	Wetting period	Average temperature	Rainfall
Bainbridge	19-22 April	59 hr	41.0	1.04"
Bainbridge	27-29 April	29 hr	54.2	1.25"
Bainbridge	30 Apr – 2 May	38 hr	52.0	0.37"
Sparta	25-27 April	36 hr	53.6 F	3.57"
Sparta	30 Apr – 1 May	20 hr	55.4	1.33"
Hart	19-22 Apr	68 hr	38.0	1.07"
Hart	25-27 Apr	41 hr	48.5	1.58"
Traverse City	25-27 Apr	52 hr	44.5	0.97"

Weather conditions provide the most difficulty when assessing the prospects for disease occurrence in any season. Conducive weather is always difficult because even the best managed programs can still be defeated by rapidly growing pathogens. The situation with apple scab in Michigan illustrates this concept. In late April, extended periods of wet weather combined with average temperatures in the high 40's to low 50's were enough to constitute severe infection events for scab in most apple-growing regions of Michigan (Table 1). The wetting hours were typically far above the necessary timing for scab infection according to the Mills model modified by Jones (Figure 1 on page 3). The Mills model, with wetness durations modified by Jones, is published in tabular format in the Michigan Fruit Management Guide (pg. 59 in the 2009 edition). For example, at an average temperature of 53°F, 25 hrs of continuous wetting are required for a severe infection event, while 36 hr

were observed in Sparta between April 25-27. Heavy rainfall compounded the situation, leaving newly-developing foliage unprotected during several hours of infection.

The multiple, closely-occurring wetting events in Michigan this year interfered with fungicide applications resulting in orchard blocks that were unprotected. These blocks were subsequently infected by the scab fungus. Once scab infection occurs during primary scab season, growers must actively manage scab throughout the rest of the season as these primary lesions produce conidia (asexual spores). These conidia greatly increase the amount of scab inoculum in the orchard, meaning there is much more to control, and for a longer period of time.

Fungicides available for apple scab management

With the probable loss of strobilurins in all apple-growing areas of Michigan, the available alternatives are dwindling and include: EBDC's, Captan, Anilinopyrimidines (AP's), Syllit (dodine), sterol inhibitors (SI's), and copper (Table 2).

We will revisit the issues with fungicide resistance, and available fungicides during the winter and prior to the 2010 season when we have all of the results from the fungicide resistance testing. Also, see the accompanying article on strategies for reducing overwintering inoculum of the scab fungus on leaves on the orchard floor.

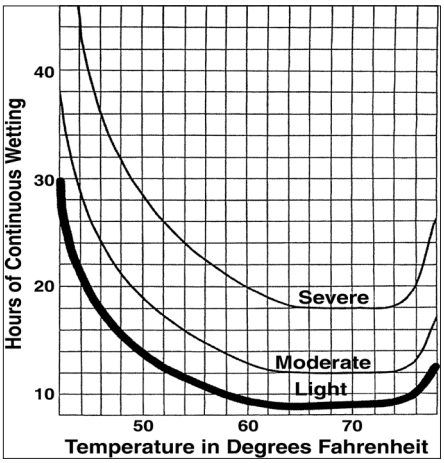

Figure 1. Mills table showing the relationship between wetness duration, temperature, and degree of apple scab infection. Originally published in Mills (1944) Cornell University Extension Bulletin **630**:1-4.

Fire blight

Fire blight seemed to mostly be a problem on older Jonathan trees that did not receive a complete management program. Jonathan is one of the most, if not the most, susceptible variety to fire blight grown in Michigan. We also faced issues with an extended bloom period and infection that occurred on late bloom. When this occurs on Jonathan, even a relatively small amount of blossom infection can lead to significant shoot blight later. We observed trees on the Ridge and in southwest Michigan harboring a tremendous number of shoot blight infections. Shoot blight can be effectively kept in check with Apogee; Apogee treatments sharply reduce apple shoot growth and thicken cell walls inside the shoot making it difficult and in most cases impossible for the fire blight pathogen to infect the shoot. Older trees are typically able to recover from extensive fire blight infection in the following season if an effective disease-control program is utilized.

Streptomycin resistance continues to be a major problem for fire blight control. In areas with resistance, alternatives for blossom blight control include the alternate antibiotic Kasumin. A Section 18 specific exemption for the use of Kasumin in 2009 was granted late by the EPA resulting in delayed availability of Kasumin to growers this year. We are anticipating that Kasumin will be available earlier in 2010. Other streptomycin alternatives include oxytetracycline (Mycoshield or the generic compound FlameOut) and the biological controls Serenade MAX, and bacterial antagonists BlightBan and Bloomtime. However, only Kasumin is as effective as streptomycin; while the other materials may control blossom blight, they do not kill the pathogen like streptomycin does. Thus, inoculum remains in the tree which can lead to shoot blight infections.

In orchards with existing streptomycin resistance problems, the use of Apogee is critical. Apogee is a growth inhibitor that reduces shoot growth. This reduced growth is accompanied by increased shoot blight control as the fire blight pathogen tends to infect only actively-growing shoots. Apogee use is critical because this shoot blight control is effective against both streptomycin-susceptible and streptomycin-resistant strains of the fire blight pathogen. Do not use Apogee on 'Empire' and 'Winesap' as fruit cracking may occur. While the Apogee effect on Jonathan trees is reduced compared to other varieties, it can still help control shoot blight under high pressure situations like those experienced in 2009.

Summary

When environmental conditions favor disease, disease will occur. Even when conditions are unfavorable, we must remember that inoculum may still be around. For example, in years with cold temperatures during apple bloom where we might escape blossom blight

Table 2. Available fungicides for apple scab control in Michigan for 2010.

Comments: Protectants, maximum 7 days protection	
EBDC's	e.g., Dithane, Manzate, Penncozeb
Captan	Captan
Comments: Work better in colder conditions, not as effective for fruit scab	
Anilinopyrimidines	Vangard or Scala
Comments: Resistance to SI's present in many orchards	
Sterol Inhibitors	Indar, Rally (formerly Nova)
SI tank mix	Inspire Super (Difenoconazole + Vangard)
Comments: Resistance to dodine present in many orchards; can be used as a rescue spray if dodine has not been applied during previous 5 yrs	
Dodine	Syllit
Comments: Potential russet problem if used after about 1/2" green tip	
Copper	Kocide, Cuprofix, C-O-C-S, etc.

infection, the fire blight pathogen will eventually ooze out of cankers providing inoculum for subsequent shoot blight. Each infection event enables the pathogen to increase population size meaning that further control attempts must then deal with increased inoculum. Proper protection of susceptible tissue is the key.

The last thing to remember is we grow many acres of highly disease-susceptible varieties in Michigan. For example, Jonathan and Gala for fire blight and McIntosh for apple scab. When disease susceptibility is high, the pathogen is heavily favored. For example, if a much smaller population size is required to cause blight on a highly-susceptible variety, it makes it much more difficult if not impossible to adequately control. This also reinforces the need for active and efficient disease management and resistance management of existing bactericides and fungicides for long-term protection. **IPM**

A big year for multicolored Asian ladybeetle?

Rufus Isaacs, Entomology

Harvest of grapes and fall raspberries is underway, and it's time to be thinking about multicolored Asian lady beetles (MALB). The multicolored Asian lady beetles has become a pest of fall-harvested fruit crops because it seeks the sugary juice and tight spaces found in ripe berries, causing contamination of ripe fruit. If crushed, the beetles can release defensive secretions, tainting juice and wine. Since the worst year of 2001 when this insect tainted a lot of juice and wine across the Midwest and became stuck inside raspberries at harvest-time, it has generally not reached these levels again. But this year is shaping up to be a year where multicolored Asian lady beetles affect harvest of fall crops including grapes and raspberries.

Each fall since 2001, we have been on the lookout for the biological and environmental conditions that can combine to create these problems. For an outbreak year of Asian ladybeetle, it seems you need three key components: 1) high aphid populations for the beetles to feed on, 2) a long warm fall switching to a period with cold night temperatures and warm days, and 3) ripe fruit present when beetles start searching for sugars and overwintering sites. Unfortunately, the fall of 2009 has the potential to cause lady beetle problems for fruit growers in southern Michigan.

Recent reports from southeast and southwest Michigan indicate that soybean fields in southern Michigan are experiencing a late-season surge of soybean aphid with hundreds to thousands per plant in some fields. These aphids provide food for ladybeetles, and there have been high numbers of multicolored Asian lady beetle populations found in some soybean fields. As the soy fields dry up, these insects will need a place to go and prepare for overwintering, which may mean grape clusters and raspberries. In previous Septembers, cold night temperatures followed by warm days have triggered the switch in behavior from aphid-hunting to moving to vineyards, and we have had these conditions in the past few weeks.

At this point, I recommend scouting soybean fields near vineyards or raspberry fields to see what insects are in there. Do you see lots of aphids, or lots of multicolored Asian lady beetles? If so, this is a warning sign that the multicolored Asian lady beetles are likely to move out of the soy fields as soon as they dry down. Regular scouting of fruit crops from now to harvest will allow early detection of beetles getting into clusters or berries. This lady beetle species has distinctive markings on the head (an M or W pattern), and it varies widely in the color and spot markings. For more information on the biology and coloration of this beetle, see the MSU multicolored Asian lady beetles page online at www.ipm.msu.edu/asianladybeetle.htm.

Scouting of fruit crop fields will provide the information needed to make informed decisions about the need to control multicolored Asian lady beetles to prevent the flavor taint, and remove the beetles before harvest. A sampling scheme has been developed at the University of Minnesota to guide winegrape growers' decisions just before harvest. Their research showed that when 26 clusters are sampled randomly from across a vineyard, the taint taste in the juice was detectable by only 10 percent of the population when five multicolored Asian lady beetles were found in this vineyard sample. So, five beetles in 26 clusters is their action threshold to guide control decisions.

B. Ree, Texas A&M University, Bugwood.org

The various colors and spot patterns of the multicolored Asian ladybeetle.

For juice grape growers, National Grape Cooperative has established a threshold of six beetles per 10 pound sample of fruit. Attempts to develop a practical method for removing the taint without removing the flavor of the juice or wine have not yet been successful. Individual growers will have to decide what level of comfort they have in allowing beetles in their fruit and the risk of having this taint, but the thresholds described above indicate how sensitive people are to these chemicals.

Some non-chemical methods for reducing multicolored Asian lady beetle infestation include submerging clusters in water after harvest or manually shaking the fruit to release them while picking. These approaches can help reduce infestation, but they may not be practical for management of large acreage fields. Before considering any chemical control method, it is essential to talk with your buyer, processor, or winemaker to make sure that they understand the need for preventing infestation and to make sure they approve of your late-season use of insecticide. This is particularly important for winemakers, given their sensitivity to anything that might affect the aroma and taste of wine. If deciding on a pre-harvest insecticide for multicolored Asian lady beetle control, also be aware of seasonal limits for insecticides that you may have used earlier in the season,

Insecticide	Rate per acre	Chemical class	Grape PHI	Raspberry PHI	Comments
Aza-Direct	16-32 oz	Botanical	0 d	0 d	Organic option. Repellent to beetles; can help get them out of clusters.
Pyganic	16-64 oz	Pyrethrum	12 h	12 h	Organic option. Repellent and short-lived.
Evergreen	8-16 oz	Pyrethrum + PBO	12 h	12 h	8 oz rate controls MALB and has some repellency activity. Not for organic use.
Clutch	2-3 oz	Neonicotinoid	0 d	NR	MALB not on the label but this has high activity. Note 0 day PHI.
Venom	2-3 oz	Neonicotinoid	1 d	NR	MALB on the label. This has excellent activity on MALB, both repelling and killing beetles.
Baythroid	3.2 oz	Pyrethroid	3 d	NR	MALB not on the label but this has high activity. Note longer PHI.
Mustang Max	2-4 oz	Pyrethroid	1 d	1 d	MALB on the label. Quick knock-down and excellent control of beetles.

NR = not registered

e.g. 12.8 oz limit on Baythroid.

If multicolored Asian lady beetles are detected in grape clusters at or above threshold levels as harvest is approaching, there are some effective organic and conventional insecticides with short pre-harvest intervals that can provide beetle control and allow harvest of fruit with much lower levels of contamination. These include the products listed in Table 1 which have demonstrated good activity on multicolored Asian lady beetles in laboratory bioassays and vineyard trials. There is much less data available on efficacy in raspberry, but similar performance would be expected. For any attempt to reduce multicolored Asian lady beetles infestation using insecticides, it is essential that the insecticide reach the target. This means using high water volume and focusing sprays on the clusters. These beetles like to hide in the crevices between berries, so that's where the spray needs to reach.

Take-home messages on MALB management this fall

There are warning signs of a big year for multicolored Asian lady beetles in Michigan fruit that have yet to be harvested.

This beetle is abundant only in some areas, so scouting will help you detect if and when multicolored Asian lady beetles move from other plants to fruit crops.

There are some thresholds developed for wine and juice grapes to help with decision-making.

Check with your winery, processor, or buyer regarding their policy on pre-harvest insecticides.

If using insecticides, choose a short PHI product and remember that the label is the law. **IPM**

Overview of blueberry diseases during the 2009 season

Annemiek Schilder and Timothy Miles, Plant Pathology

Conditions for mummyberry were favorable during the spring of 2009 with generally more disease pressure than in 2008. This was due to frequent rains and cool weather in spring and higher numbers of overwintering mummies from the previous season. In addition, overly wet fields and frequent rains prevented many growers from applying protective fungicides at critical times. Shoot strikes in four scouted fields were first noticed in mid-May and increased rapidly towards the end of May and into early June, followed by a decrease as old shoot strikes dried up and fell off the bushes. Conditions during bloom were moderate for dissemination of spores to the flowers as cool conditions reduced honey bee activity. Fruit infection incidence was low to moderately high, particularly in sites with a history of mummy berry. In unsprayed plots in a fungicide efficacy trial in Ottawa County, as many as 83 shoot strikes and 55 mummified berries per bush were observed. In the four scouted fields, the highest average observed was about 70 shoot strikes and 100 mummified berries per bush.

Anthracnose fruit rot incidence was moderately high this year, and in some fields more than previous years. Frequent rains during the growing season, particularly during fruit development and ripening, promoted infection. Infection levels increased rapidly towards harvest. Relatively more post-harvest Botrytis gray mold of berries was noted, which is not surprising as cool, wet weather promotes the fungus *Botrytis cinerea*. Leaf spots were common in some fields. At some sites, these appeared to be due to pesticide spray injury as no pathogen could be isolated. In other sites, they were caused by bacteria (reddish-brown spots with brown blisters on the lower leaf surface). Later in the season, leaf rust was noted here and there (reddish-brown spots with yellow pustules on the lower leaf surface). In some fields, leaf spots and distortion were caused by tobacco and tomato ringspot virus. Powdery mildew was the cause

of wrinkling, reddish or yellowish blotching, and white floury spots on leaves of Jersey bushes in many fields later in the season.

Twig blight was more apparent this year than in previous years, as the rainy spring and summer provided suitable conditions for infection. On the four farms that were scouted, the majority of twig blight was caused by *Phomopsis vaccinii*. In early to mid-summer, cane collapse and flagging was noted in many fields, which appeared mostly due to *Phomops*is. These would be the result of infections in 2008 or perhaps even 2007. Some 'Duke' fields showed rather severe blighting of canes and plant death. While there was concern that this might be caused by the fungus *Botryosphaeria*, analysis of a few samples so far have only yielded Phomopsis. The cultivar Duke appears particularly susceptible to cane blight, and brown discoloration of the wood into the crown was noted. This would result in repeated blighting of canes growing from the infected crown. For the first time this year, we detected Phytophthora root rot, caused by the oomycete *Phytophthora cinnamomi* in a blueberry field in Ottawa County that had an area with poor drainage and standing water for days. The bushes showed leaf yellowing and reddening and rapid plant death. The crown and upper roots showed a reddish-brown discoloration when cut open. Phytophthora root rot is generally more common on heavier soils with poor drainage and plants grown in bark beds with continuous drip irrigation in the Southeastern United States.

Another rare blueberry disease in Michigan was seen again 2009, namely red leaf, which is caused by the fungus *Exobasidium vaccinii*. This fungus systemically invades plants and causes the shoots to be stunted and the leaves to turn fully or partially red in very striking patterns. The leaves are somewhat curled and exhibit a velvety white layer on the underside under humid conditions. Later in the season, this layer turns brown. Infected plants continue to produce infected canes every year.

Virus and virus-like symptoms were common, which is typical for cool years. Blueberry scorch and blueberry shock virus were found in 2009 in several Michigan locations and even made the national news. The three plantings with blueberry scorch virus have been removed whereas the one with blueberry shock virus will be removed later this season. As far as is apparent from testing of nearby fields, these diseases have not spread. A blueberry survey showed no blueberry scorch or blueberry shock virus in about 50 fields surveyed; however, other virus diseases such as tobacco ringspot virus, tomato ringspot virus, blueberry leaf mottle virus, blueberry shoestring virus were observed. Tobacco and tomato ringspot are common causes of blueberry dieback, stunting, and curled and malformed leaves with necrotic spots. We are still investigating the cause of a new disorder characterized by leaf bronzing and cupping and bush decline, the pattern of which suggests a viruslike cause. The symptoms have been seen in a many older fields of Jersey, Rubel, and Bluecrop. Various ELISA tests were done on plant samples but were negative except for blueberry shoestring virus. The plants were also tested for *Xylella fastidiosa*, a bacterium that invades the vascular system and causes bacterial leaf scorch in the southern United States, but none were positive. However, virus-like RNA has been detected and points to a viral cause. Investigations are ongoing as to the cause of this baffling symptom in collaboration with virologists in Oregon and Minnesota. **IPM**

Lost in translation: Blueberry viruses are not a food safety risk for consumers

Carlos García-Salazar, MSU Extension Central Region – Ottawa County

Since the discovery of the blueberry shock and scorch viruses around West Michigan, there has been a large volume of articles and information coming out of both MSU and the Michigan Department of Agriculture (MDA). This information has attracted national and international attention and has been disseminated all over the world. Communication between growers, scientists and regulatory agencies has been very effective in informing the Michigan blueberry industry and stakeholders about the danger that implies the spread of these viruses across the production area. Despite this efficiency in communicating between and within the blueberry industry, our communication seems to be less effective when dealing with the public.

Some consumers that have read or listened about the "new viruses" in blueberries are concerned about the health risk to humans if they consume blueberries from fields infected with these viruses. Plant pathogens are not a threat to humans, they only affect plants, but not everybody out of the agricultural community understands this concept. The reason is simple. Every community develops its own culture, and this culture is communicated to members through a language. People outside this community will have a hard time trying to figure out the meaning of that particular language.

In agriculture, we have different "cultures" that are represented by growers of the diverse commodities we produce. For those of us immersed in the blueberry industry, communication within the blueberry growing community is not a problem because we all speak the same language. In other words, we share the same "culture." However, communication across commodities or "cultures" out of our own is another matter.

When we try to communicate a subject to another culture, we need to access this culture through its own language. Otherwise, the meaning will be lost in translation.

For lay people, when we talk about viruses the first thing that comes to mind are **human** pathogens. People are not obligated to know the difference between a human pathogen and a plant pathogen.

When consumers read a newspaper with a heading like **"Pair of blueberry viruses hit area farms: Blueberry shock, blueberry scorch found in Michigan for first time"** (Kalamazoo News, July 28, 2009) or **"Two viruses threaten Michigan blueberry**

industry; scientists forced to destroy research plants" (The Washington Examiner, August 31, 2009), it is unavoidable that some blueberry consumers wonder if eating blueberries they will get exposed to the "new viruses" found in our fields.

When dealing with the blueberry shock and scorch virus issue, it seemed that our first target audience was the blueberry growing community. But the media took the issue and made it a public matter. Therefore, it will be very important that in our next meeting (September 24, 2009) we emphasize and clarify to the public that ***consuming blueberries does not represent a human health risk***. IPM

Specialty (minor-use) crop pesticide prioritization in the 2009 IR-4 Food Use Workshop

Satoru Miyazaki, John Wise, and Bernard Zandstra

Due to the current review of crop protection chemicals under the Food Quality Protection Act and the high cost to industry of product registration, specialty crops (formerly known as minor crops) and sometimes, minor uses on major crops are at risk of having few available pest management products or being lost for pest management. To mitigate this problem IR-4 (Interregional Research Project No.4), primarily funded by USDA-CSREES, facilitates pesticide registration for specialty crops by conducting field residue trials, and occasionally, efficacy trials. Specialty crop research needs are prioritized each year during a national workshop since resources are limited. The primary objective of this workshop was to have the participants identify the most important research projects for the 2010 IR-4 research program.

Research priorities for the year 2010 field residue program for fruits, vegetables, field crops and herbs grown in the United States and Canada were assigned at the Food Use Workshop held September 15-16 in Cleveland, Ohio. The workshop was attended by Drs. Bernard Zandstra, Mary Hausbeck, Annemiek Schilder, Rufus Isaacs, Lynnae Jess, Satoru Miyazaki, Bob Hollingworth and John Wise of Michigan State University, along with other specialty crop/use researchers, extension specialists, representatives of commodity and industry groups across the country, and personnel from EPA, USDA, IR-4 plus the AAFC (Canadian counterpart of minor use program), and PMRA (Canadian counterpart of U.S. EPA) personnel.

More than 160 people attended the two-day meeting for each discipline session. Participants were provided with a complete list of all pesticides "nominated" with desired priority (i.e.; A or B rating) by regions for consideration prior to the meeting. This "nomination" process, introduced three

Priority A's for Fruits

Insecticides and Bird Repellent		
Commodity	Chemical	Reasons for Need
CHERRY	ANTHRAQUINONE*	BIRDS; GULLS, STARLINGS, WAX WINGS
CHERRY	FENPYROXIMATE	TWO-SPOTTED SPIDER MITES
CANEBERRY	ACETAMIPRID	ROOT WEEVILS, APHIDS, JAPANESE BEETLE
BLUEBERRY	ANTHRAQUINONE*	BIRDS; STARLINGS, WAX WINGS & ROBINS
BLUEBERRY	TOLFENPYRAD	CRANBERRY FRUITWORM, PLUM CURCULIO, BLUEBERRY MAGGOT
GRAPE	BIFENTHRIN	GRAPE ROOT BORER
STRAWBERRY	ABAMECTIN	IMPORTED FIRE ANT
Herbicides		
Commodity	Chemical	Reasons for Need
PEAR	CLOPYRALID	CANADA THISTLE, GOLDENROD, WILD ASTER
PEACH	SIMAZINE**	WEEDS
CANEBERRY (BLACKBERRY)	QUINCLORAC	FIELD BINDWEED, HEDGE BINDWEED, BARNYARDGRASS, CANADA THISTLE, LARGE CRABGRASS
CANEBERRY (RASPBERRY)	FLUAZIFOP-P-BUTYL	WEEDS
BLUEBERRY	QUINCLORAC	FIELD BINDWEED, HEDGE BINDWEED, BARNYARDGRASS, CANADA THISTLE, LARGE CRABGRASS
GRAPE	QUIZALOFOP	GRASSES, JOHNSONGRASS
STRAWBERRY	PROHEXADIONE CALCIUM	REDUCE RUNNER GROWTH & INCREASE YIELD
STRAWBERRY (PERENNIAL)	FOMESAFEN	WEEDS

* The Anthraquinone cherry and blueberry projects are pending EPA decisions on the researchable status of this compound.
**The Simazine/peach project was given A priority at the workshop, but now we don't have to do any residue trials, so this is off the A priority list.

years ago, greatly streamlined project selections and allowed the participants to spend more time reviewing only the worthy projects. As a group they ranked products based on need, performance, safety, availability of alternatives and compatibility with the IPM program. Only a limited number of projects could be assigned "A" (entomology [17], weed science [18], plant pathology [20]). An "A" priority guarantees IR-4 to begin the field residue program immediately the following season, with expectations that a complete data package be submitted to the EPA within 30 months. Fourteen fruit projects important for Michigan were assigned A priorities.

Priority A's for Fruits

Fungicides		
Commodity	Chemical	Reasons for Need
No A priority***		

***Although the Kasugamycin/Peach project to control bacterial spot was strongly supported by the group, the EPA representative cautioned that an additional use of Kasugamycin must be justified that there is no other alternative. It is currently B priority.

(See the accompanying table). Any "B" priority projects must be upgraded to A priority either by a Priority Upgrade Proposal (PUP) or by regional upgrade. The following new candidate priority "A" projects listed are preliminary until affirmed at the IR-4 national planning meeting on October 27 – 29, 2009. A complete listing can be found on the IR-4 web-site: www.ir4.rutgers.edu. **IPM**

1 – Southwest

Mark Longstroth, Bill Shane and Diane Brown-Rytlewski

Southwest Michigan GDD totals March 1 through September 20				Grapes, from April 1
Location	GDD 42	GDD 45	GDD 50	GDD 50
SWMREC	3648	3144	2352	2312
Fennville	3396	2903	2132	2106

Weather

The 2009 growing season will be long remembered by fruit growers for various reasons. There was some winter damage due to several radiation freezes in mid-January (-10 to -24°F). These freezes affected lower portions of orchards and vineyards and blueberries located away from Lake Michigan in good blueberry sites, located in lower topographic conditions. Initially, it was feared that wine grapes and peaches would be severely affected. These crops suffered some damage, but still harvest respectable crops. Spring began early with a warm March, but April began with a snowstorm. Significant rain events with long, warm wetting periods occurred in April on April 19 and 27. This ignited significant disease problems in apples and blueberries. A light frost that caused scattered damage occurred April 23, between these two rains.

The 2009 growing season was generally cooler than normal with the GDD accumulation slowly falling behind normal. Rainfall was plentiful in April and May into mid-June. Major storms crossed the region on June 19. These storms were followed by dry conditions in July resulting in dry soils until late August, especially in the south end of the district. Wide spread heavy rains in late August relieved most drought stress symptoms, so drought was not a major factor for most fruit crops. GDD accumulations fell behind normal as the season progressed. In late August, GDDs were as much as two weeks (300 to 500 GDD) behind normal, but harvest timings were generally only a few days behind normal. September was a little warmer with warm days and cool nights and dry, good conditions for ripening fruit. Harvest quality for most crops was good in 2009.

Tree fruit

Insect pest development was relatively normal with no unusual pest outbreaks. Japanese beetle and rose chafer numbers were low. These pests have declined over the last several years. The cool season meant that there were no third generation of codling moth after Labor Day and third generation Oriental fruit moth was not a big problem either. 2009 was more of a disease problem year. The wet spring set up the early development of diseases such as apple scab, cherry leaf spot and bacterial spot in peaches that caused significant injury or crop loss.

Apricots were blooming by April 20 and generally suffered little spring freeze injury. Apricot yields and quality were good.

Peaches were little affected by the severe cold in January. Bloom was heavy and peaches seem to have suffered little damage from spring freezes. Many growers lost some fruit buds and bloom, but this generally reduced hand thinning after bloom. Peach leaf curl was not a big problem, but symptoms were seen on leaves that appeared in mid-summer. Bacterial spot was a common problem that continued to worsen as the season progressed. Some growers tried low rates of copper pre- and post-bloom to suppress bacterial spot, with some apparent success, but with some leaf loss due to phytotoxicity. Rusty spot was common in some plantings early. Brown rot was established early in some trees and rotted nearly all fruit on those trees, in spite of apparently strong fungicide programs.

Sweet cherries were at full bloom April 27. There was some winter damage, which resulted in poor development of fruit buds in sweet cherry and some tree mortality for young orchards. The cool, wet spring was good for bacterial canker development and collapse of spurs and branches due to

bacterial canker was a problem in some plantings. Fruit brown rot and alternaria spot were common on fruit that cracked during rains before harvest. Generally, there was a good crop of sweet cherries and little brown rot during harvest.

Tart cherry bloom was in late April. There was scattered damage due to winter cold and spring frost. Many orchards had a light crop in the bottoms of the trees due to the freeze on April 23. Rains shortly before harvest helped to size fruit. A strong storm with high winds just before harvest (June 19) did blow down trees, blowing fruit off the trees and marking ripe fruit on the trees. Cherry leaf spot became a significant problem in some orchards, in part due to extended rain periods in the spring. Growers are reminded that resistance to sterol fungicide exists in cherry leaf spot and other fungicide materials need to be included in cherry leaf spot control programs.

In **plums,** bacterial canker symptoms on leaves and fruit caused fruit loss in some European plum orchards. Yields were fair to good for most plum varieties.

Apples bloomed in early May. Early development was scattered due to a generally cool spring with several warm spells. Heavy scab rains occurred on April 19 at tight cluster and April 27 during pink bud and early bloom. This was a foretaste of a wet spring marked by many long wetting events. Scab was common in area apple orchards. A Section 18 was granted for Kasumin (Kasugamyacin) for fire blight control. Bloom was generally cool. There were several rain events during bloom but they were generally cool. One warm, light rain occurred in isolation during an otherwise cool period on May 14 and resulted in a fireblight infection. This initial fireblight infection spread and many growers had significant fireblight in some orchards in 2009. Crop yields for 2009 were good.

Pear bloom was heavy and there were no significant problems in pears. A good crop of Bartlett was harvested in late August.

Small fruit

Many small fruits were affected by the winter cold and the cool growing season.

In **blueberries**, winter injury was widespread in central Van Buren County. The most common symptom was fruit bud death. Leaf and shoot development was normal. There was some shoot death, but no more than normal after a cold winter in fields that were not heavily pruned in the dormant season. The major variety affected was 'Bluecrop.' Other major varieties such as Jersey and Rubel showed less injury. This injury is distinctly different from bud death due to the infection of the bud by phomopsis. Many of the cold injured buds showed early swell, but no further growth. The areas most affected by winter injury were the low areas located away from Lake Michigan where cold air collected during the radiation freezes in mid-January. Growers reported lows of -20 to -24°F. The early heavy rains caught many growers before they had applied their first mummyberry sprays. Many blueberry fields were flooded from rains, forcing growers to rely on aircraft sprays for mummyberry control. In some fields, severe mummyberry shoot strike infections were restricted to early varieties that did not received their first spray before long rains during early bud break and shoot growth. Some growers reduced the number of sprays because of the weak blueberry market in 2008 and the large holdovers that promised weak prices in 2009. Mummyberry was a significant problem in 2009 for many growers. Phomopsis twig blight was a problem for a few growers but the canker and cane collapse phase of the disease was common. Phomopsis cane canker is usually serious following a cold winter. Anthracnose fruit rot was the most common fruit rot and was also the cause of some early twig collapse. This again was due to the wet spring. The cool spring also increased virus symptom expression. Blueberry shoestring, mosaic, tobacco ringspot and tomato ringspot were easy to find and growers reported large increases in these diseases. A virus survey of blueberry fields in Michigan found all the common viruses and also found new virus diseases such as blueberry shock and blueberry scorch as well as at least one unidentified disease.

Insects were generally not a problem in blueberries where controls were applied. Cherry fruit worm appeared first after bloom followed by cranberry fruitworm. Japanese beetle was generally not a significant pest. The cool growing season was excellent for fruit growth and quality. Early in the season, growers had to wait for fruit ripening and fruit maturity was somewhat delayed allowing for good spacing of harvests. Prices were very low in the mid-season for smaller growers who sold directly to smaller shipper packers, and some growers did not harvest all their fruit in the mid-season. Yields in fields not affected by winter injury were generally high and fruit quality was good.

Grapes have been the fruit crop most affected by the cool 2009 growing season. Widespread damage was reported in wine grapes from winter cold, but the severity varied widely. Initial growth was slow. Early diseases were not severe as the lateness of grape growth allowed them to miss many disease infection periods. Downy mildew and phomopsis were the major pre-bloom disease problems. Phosphorous acid materials were used in many vineyards to eradicate the early infections of downy mildew. Phomopsis shoot and leaf lesions were common, but few other diseases were common. Generally, there were few disease infections since bloom. Black rot fruit infections were common on backyard grapes. Botrytis fruit rots have been showing up in many vineyards even in 'Concord.' We have a very heavy crop of juice grapes. The recent warm dry weather of September may not be enough to ripen a very heavy crop. Niagara harvest began this week and Concord harvest is projected for early October when sugar levels are high enough.

Early insect pests such as climbing cutworm and flea beetle were not wide spread severe pests. Cutworm is no longer the severe pest that it was several years ago, but flea beetle seems to becoming more common. Grape berry moth developed two generation in 2009. Berry moth numbers were generally lower than in previous years but some vineyards did have high populations. The third generation was also very variable and a late harvest of a large crop may result in the rejection of some loads. Japanese beetles were not a major pest and grape leafhopper numbers were generally low all season. Multicolored Asian ladybug populations are high in some soybean fields in Berrien County. Growers should scout fields adjacent to grape vineyards. These beetles will

move into fruit planting and are an unacceptable contaminate at harvest time.

Strawberries suffered some damage during bloom. Harvest was delayed in the northern areas of the region by the cool spring. Because of the cool weather, fruit size was not large and fruits were slow to ripen. Growers had a hard time supplying demand and often needed to close early or remain closed for several days to allow fruit to ripen. Harvest quality was generally good. Drought conditions after harvest and widespread potato leafhopper injury stunted some field after renovation.

Raspberries suffered some injury from the cold winter, but generally early season growth was good. Anthracnose was common in poorly sprayed summer berries. Bloom and early growth were good, but mid- and late harvests declined with the dry conditions in the mid-summer. Fall bearing raspberry harvest has been good so far with few reported fruit rots.

In **blackberries**, winter injury caused severe damage to thornless blackberries, killing many canes to the snowline. Damage was not always apparent at the beginning of growth but was soon apparent in the widely scattered weak growth. Thorny blackberries such as Illini Hardi did much better and harvested a full crop in a scarce market for good prices.

Cranberries did well as most plantings were under the snow during the extreme cold of mid-January. Some winter injury was reported where snow drifted in the beds causing problems with early spring growth. It appeared that the fruit buds in these areas were killed. No problems have been reported and there appears to be a good crop awaiting harvest in October. **IPM**

2 – Southeast

Bob Tritten

Recent weather

Our season is still running a full two weeks behind normal in terms of degree day totals. However, our harvest dates for our fruit crops have been and continue to be close to being "right on schedule" compared to normal seasons.

Soils over many parts of eastern Michigan have been dry over the last two weeks; in fact some areas have been dry for the last month to six weeks. As I look across the region, dry soils are currently impacting smaller fruit size on many varieties of apples.

Season weather review

Needless to say, the 2009 growing season has been a wild and wacky one in terms of weather. All season long our degree day totals were behind normal. As I look at our five year averages, it has been the coolest season in recent memory. For degree days base 50, we are running about 300 degree days behind last year's cool season and over 400 degree days behind the five-year average. The most notable characteristic of this season was the persistent cool morning temperatures.

This cool season impacted many of our pest populations, some with higher populations than normal while others were reduced. Codling moth and Japanese beetle were the most notable fruit pests that were reduced due to this cool growing season. Insect pests that were on the increase due to the cooler season included apple maggot, woolly apple aphid and potato leafhopper just to name a few.

Southeast Michigan GDD totals for March 1 to September 21			
Location	**GDD42**	**GDD45**	**GDD50**
Commerce (Oakland)	3491	2995	2227
Emmett (St Clair)	3355	2869	2127
Flint (Genesee)	3372	2889	2149
Lapeer (Lapeer)	3366	2884	2146
Petersburg (Monroe)*	3617	3114	2347
Romeo (Macomb)	3505	3009	2244

*Missing data has been estimated from Hudson and Toledo for July 23 – 31, 2009

We had a really wet spring, which caused major challenges for apple growers trying to control apple scab. In mid-summer or so, we went into a pattern that was mostly dry. But when I look at the seasonal rainfall averages, we are just about on par with the five-year averages across the region. Most areas had between 18 and 22 inches of rain from March 1 to date.

We had some winter injury, which continued to pose a problem for fruit growers throughout the season. The winter injury caused collapse of some of our more sensitive tree fruit crops, most notably peaches. Cold weather occurred in mid-January, and then again in early February. Many of the MAWN weather stations recorded low temperatures in the -20 to -24°F range. This caused some peaches to collapse shortly after bloom, while other trees continued to collapse all the way through harvest time. This winter damage was least pronounced in the Romeo area, which I thought had gone unscathed. However they started to see this peach tree collapse later than other growers, in mid- to late July. This tree collapse continues today.

In some respects, this past winter injury was similar to a cold weather event and the resulting winter injury in the winter of 1994. For the next few years, peach growers will be removing peach blocks earlier than expected and also do a fair amount of replanting over the next three years to maintain peach production.

Looking at apples

Apple harvest is in full swing across the region. We have an excellent crop of apples this season. Growers have finished up, for the most part, picking McIntosh and are picking Gala and a few blocks of Cortlands. The final picking of Honeycrisp also took place over the last few days. Growers are at a point now that they can see that they have a tremendous crop of apples to harvest over the next six weeks. For the most part, harvest labor has been more than adequate this year. The major challenge for apple growers down the road will be lack of bins and cooler space. As indicated earlier, fruit size is a problem in some of the unirrigated blocks across the region, most notably at this time for Gala and Empire.

Major apple pests

Codling moth pressure was the least that I have seen in my 31 seasons in working with apple growers in this region. Population pressure was down right from the start, and continued all the way through the season. In mating disruption blocks, growers were able to dramatically reduce insecticide inputs because mating disruption worked so well. In conventional blocks, it was difficult for many growers to see the rise in trap catch numbers for the first and second generations, again mainly because pest pressure was so low.

Apple maggot populations were very high this season. In nonsprayed and poorly sprayed blocks, I am finding a significant amount of apple maggot infected fruit. Apple maggot emerged a bit ahead of normal; at most farms they were out the first couple days of July. Apple maggot pressure seemed to follow soil moisture supplies. After each rain event, most growers had a good catch of apple maggot, primarily on yellow sticky traps, but also some red balls. At many farms, growers saw trap catch numbers that were very high, even unheard of.

Potato leafhopper populations started to build fairly early in the year, and continued to build throughout the summer. In fact, I continue to see potato leafhoppers flying in many apple blocks. In apples, it caused some severe leaf curling, particularly in new planted trees. It certainly was a good year for potato leafhopper.

Aphid populations were also very high this year, particularly green apple aphids. Aphid populations exploded in early June, and continued to plague many growers much later into the season than they typically do. While we did have good predator populations this year, in many blocks predator populations were not strong enough to completely control green apple aphid populations.

Woolly apple aphid populations were up this year, particularly late in the season. As I am harvesting apple maturity project samples in many blocks of apples, I continue to see woolly apple aphids congregating around the fruit stems and leaf axils. This is a pest problem that many growers will need to contend with next season.

Japanese beetles were another pest problem that was reduced due to the cooler than normal growing season. While the range of Japanese beetle infestation continues to expand across the region, spread seems to be slower this year than in most years. Also populations on individual farms were greatly reduced over most years' populations.

European red mites and **twospotted spider mites** flared to above threshold levels in just a few apple blocks this year. For the most part, predators kept them under control.

San Jose scale populations continue to expand around the region. As growers are harvesting fruit, they are finding the red halo damage on apples. Growers need to make note of that damage this year to help control them during the dormant season next spring as well as in the next growing season.

Predator populations were very high this year across most of the region. There was an abundant food supply for them with high aphid populations and other insects as well.

Major apple diseases

Apple scab was a major challenge for fruit growers this spring and early summer. Many fruit growers used more fungicides during primary apple scab season than they had for any previous entire growing season. Many farms had to spray to control apple scab in less than ideal conditions. With our wet soils, it caused many orchards to be torn up and they are still badly rutted. Most growers had an average of 17 wetting events during primary apple scab season, which ended late this season on June 15 with many having eight to 10 infection periods. As I am harvesting apples this fall, I am finding most growers had some apple scab in the region, and there is also a fair amount of late developed pinhead scab that growers will need to contend with next year. In sampling for apple scab which occurred during the 2008 growing season, it was discovered that there is some sterol inhibitor fungicide resistance occurring across the region. Some additional sampling occurred during the 2009 growing season. Look for results of this sampling to be discussed during winter grower meetings.

Powdery mildew was seen earlier than normal in many apple blocks.

Fireblight was not much of a concern during the blossom time, but I did continue to see some fireblight strikes later in the season at several farms. There were just a few farms that had heavy fireblight infections this year.

Nectria twig blight was also seen in many blocks of apples this year. This caused some twigs to be killed. Many growers confused this disease for fireblight.

More tree fruit summaries

Pears had a fairly good crop this year. Pear psylla populations, while present the entire growing season, were much lower than normal. Pear scab was seen in a limited number of blocks late in the season. For some growers it was the first time they had ever seen pear scab.

Peach yield was reduced this season due to tree loss from winter injury. Most growers finished picking peaches the last week of August or the first week of September. Peach size was reduced at farms that were not irrigated and where fruit was not thinned well. As indicated earlier in this report, I continue at this late date to see peach tree collapse due to wood or cambium injury that occurred this past winter. I have made many recommendations to peach growers this season where they had enough injury that entire blocks need to be removed. Peach leaf curl was seen early in the year, and at some farms where growers had never seen it before. Controls for peach leaf curl need to be made this fall and then again early next spring. Peach scab was an issue at several farms this year. Bacterial spot of peaches was particularly bad in most blocks, causing extensive fruit damage and leaf drop. X-disease was an emerging problem this summer.

Sweet cherry harvest began earlier than normal at many farms across the region with a normal crop load at most farms. Some farms experienced brown rot due to extreme moisture conditions in springtime. In many sweet cherry blocks, fruit was not clustered well, some due to a long extended rain during a key pollination period. While cherry leaf spot was not a major problem in bearing plantings of cherries, it was particularly severe in many younger plantings which were not sprayed as often. I saw several blocks of young sweet cherries that had no foliage left in mid-August or so. These trees are prone to winter injury. While cherry fruit fly trap catch numbers were very high at some farms, most growers did not see any damage this year. I also recommended that many growers apply

a post-harvest insecticide application to control late season cherry fruit fly.

Tart cherry yield was slightly below normal across the region. Some of the same pest problems and poor pollination conditions existed for tart cherries as I described for sweet cherries.

Plum harvest has wrapped up across the region early last week. Most farms had a fairly good crop of plums.

Small fruit

Strawberry yields were fairly good as I look across the region. The season started late at most farms, primarily due to cold morning temperatures. Growers reported that they needed to close many times throughout the season to allow more fruit to ripen. Potato leafhopper was a troublesome pest in strawberries this year, particularly for newly planted fields, and then for bearing fields after renovation. These unusual high populations of potato leafhopper continue to plague many growers until well into September. It is difficult at this time to tell if these high populations will be an issue in setting a crop of buds for next year. Late in the season powdery mildew infected many newly planted strawberries. Powdery mildew also causes some leaf curling, which was a bit confusing for many growers who felt like the problem was primarily caused by potato leafhopper.

Raspberry harvest continues for fall red raspberries. Most growers are having an excellent crop this fall. Again due to cool morning temperatures many fall red raspberry growers are commenting that they have had to close for a few days to allow fruit to ripen. Japanese beetle was not much of a pest problem in raspberries this year. Summer red raspberry yield was reduced this year due to some drought stress midway through the season at many farms. Potato leafhopper was a problem on fall red raspberries at many farms.

Blueberry yield was normal to above normal at most farms across the region. The season was a bit slow to get started, but once we had more heating during blueberry season it seemed as if it pushed the crop along fairly well. Due to drought conditions, many blueberry farms reported that their late season yields were disappointing, primarily due to small berry size. **IPM**

3 – Grand Rapids Area

Amy Irish Brown, Phil Schwallier, Carlos Garcia-Salazar

Grand Rapids area tree fruit summary – Amy Irish-Brown and Phil Schwallier

As far as degree days go, 2009 started out on a rollercoaster, going from normal to above normal totals, back to normal and then very much behind normal averages for the Grand Rapids area. Here toward the end of the growing season, we are about nine days behind normal averages for GDD Base 42 and over 16 days behind average for GDD Base 50.

Despite the ups and downs with degree days, the overall season has been very good for all tree fruits. Fruit set for all species has been excellent due to very favorable weather during bloom. It was rather cool during the window for chemical apple thinning, so quite a bit of hand thinning had to be done on many varieties.

Precipitation has been more than adequate for the 2009 season. Early spring rain events led to issues with diseases throughout the season. The summer months continued to bring more than average rainfall amounts with measurable rainfall recorded on 26 out of 62 days in July and August, which are normally the driest summer months. It dried out for September with no rain recorded this month until September 21. Temperatures have been very cool this summer with August 2009 being the coolest August every recorded in the general Grand Rapids area in over 100 years.

Apple harvest got a later than normal start and many growers are carefully monitoring maturity sampling to harvest this very large apple crop at optimal conditions for long-term storage. There is concern about having enough bins for the large crop. Labor availability has been more than adequate.

Pest summary

Early spring rain events led to some long and heavy apple scab infections. During primary scab there were 22 wetting events, nine of which were infections. Apple scab ascospore numbers were some of the highest ever caught in a primary scab season. While growers did all they could to try to stay covered with fungicides, heavy rains and long wetting periods early in the season led to loss of control of primary scab in many blocks. Growers have done a great job keeping scab off the fruit for the rest of the summer, but it has been costly to do so. For all tree fruits, fruit diseases have been a challenge due to the extra rain.

Fire blight was generally limited to those sites known as problems. The weather during bloom was not too favorable for blossom blight infections. The use of Apogee has helped reduce fire blight spread as well. After the many hail storms of 2008, Mother Nature decided to give us a break in 2009 – there were very few thunderstorms due to the cooler overall temperatures. On August 9, there was a straight-line wind event that moved across a stretch of the Ridge. Some trees were toppled or broken off at the graft union and apples hit the ground. The most severe damage happened to a small number of individual growers where whole blocks were taken out. There appears to be no further spread of fire blight due to this weather event.

In general, insects appeared to take a back seat to the diseases this year. Codling moth is still a major apple pest, but most growers found their trap numbers to be very low this year. Obliquebanded leafroller numbers were down as were Japanese beetles. For some blocks, European red mites were on the high side with quite a few summer miticides being needed to keep them in check. It's a bit puzzling to see so many mites in a season that really hasn't been favorable to them – mites usually are more of a problem in hot and dry summers. We've had a cool and wet summer. Mite predators have been difficult to find in most blocks with mite issues, which are most likely leading to high populations despite less than favorable weather for European red mite. **IPM**

5 – Northwest Michigan 2009 season summary

Nikki Rothwell, Duke Elsner, Erin Lizotte and Rob Sirrine

Weather

Like all other regions in the state, northwest growers endured an unseasonably cool summer. The overall degree day totals as of September 21 are as follows: 3,143 base 42 and 1,947 base 50. Both of these accumulations are behind our 19-year averages where we accumulated 3,471 base 42 and 2,266 base 50. In essence, we are 328 GDD behind for our accumulations base 42 and 320 GDD behind for our accumulations base 50. This summer may have seemed even cooler if we compare this year's degree day averages to the warm years of 2005, 2006, or 2007 where we were between 500 and 700 GDD (base 42 and 50) warmer during those seasons.

The overall rainfall total was 17.3 inches. The spring was fairly wet, and we hit a short dry spell in the second week of June for 20 days. We had ample rainfall in July and August, but September has been dry as the first rain fell in the region on September 21.

Tree fruit

Despite the cool temperatures, all crops faired pretty well in the north, although a little on the late side. The **sweet cherry** crop was manageable this season; however, dark sweets suffered from July rains that caused cracking in many area orchards. Brine cherries also set well but unfortunately, the market for these fruits was down considerably. Many brine cherry orchards are anticipated to come out of the ground this fall. The tart cherry crop was the biggest since 2001, and the USDA underestimated the size of the crop. Northwest Michigan picked out at 184 million pounds, 34 million pounds over the USDA estimate. The large crop was similar in other tart cherry growing states, and the total production in the United States this season was 353.6 million pounds, which was 70 million pounds above the USDA average. Tart cherry prices are expected to be considerably lower than 2008. **Peaches** sized beautifully this year with all the rain, and growers that waited for the late season sun had nice color. Some growers had difficulty moving peaches this season due to a large crop. **Apple** harvest has really just begun in the last week. Gingergold harvest is underway and MacIntosh are just starting to come off the trees. Apples are large and have excellent color this season. However, growers are concerned about selling the fruit, particularly apples grown for the processing market.

Tree fruit pest summary

Fire blight was less of a challenge for **apples** this season with the dry and cool spring conditions. The weather provided a single two-day period during bloom (May 8 through May 29) when conditions pushed the epiphytic infection potential over 100. Apple scab was present in substantial levels region-wide as nine days in June provided conducive conditions for scab development; primary scab extended into late June and early July in many are orchards. Orchards with scab are currently being screened for fungicide sensitivity levels. Plum curculio damage was unusually low in apple blocks this year with little or no damage to managed blocks. Codling moth trap catches were also low this season, particularly at the beginning of codling moth emergence which made setting a biofix difficult; however, we received reports of sustained codling moth catch from around the region during the first and second weeks in June. Overall codling moth numbers at the NWMHRS were low and pressure increased only marginally later in the season. Low trap catch made it difficult to differentiate between generations, and we recorded one distinct peak in late June and continued to catch moths through last week (see trap catch summary table). Spotted tentiform leafminer emerged in late April early May, and we continued to catch them through last week with peak flight on August 11 with an average of 1,150 leafminers per trap. Obliquebanded leafroller were first caught on June 22 in the station apple blocks with variable trap catches throughout the season and a high trap catch of 32 moths on June 29. Growers reported difficulty in controlling obliquebanded leafrollers in apple and a high amount of variability in larval maturity within orchards, particularly early in the season. Apple maggot was detectable in many orchards this season but overall, this pest presented no serious threat to the crop.

Cool and damp conditions this spring

2009 Northwest Michign Horticulture Research Station insect trap count - avergages

	Date	4-May	11-May	18-May	26-May	1-Jun	8-Jun	15-Jun	22-Jun	29-Jun	7-Jul	13-Jul	21-Jul	26-Jul	4-Aug	11-Aug	17-Aug	24-Aug	1-Sep	8-Sep	16-Sep
Apple	Codling Moth	x	x	trap set	0.5	0	2	1	7	7	0	4	1	1.5	1	3	2	0	4	3	2
	Spotted Tentiform leafminer	5	69	6.5	58	8	13	13	2	13	29	26	134	165	100+	1150	109	61	94	65	34
	Apple Maggot	x	x	x	x	x	x	x	x	x	x	x	trap set	3	1	0	0	0	0	1	0
	Oblique-banded leafroller	x	x	x	x	trap set	0	0	7	32	8.0	16	9	5	8	13	5	2	4	3	14
	Oriental Fruit Moth	0.5	0	0	3	3.5	2	6	8	9	1.0	0	0.5	1.5	0	9	10	20	35	32	35
Cherry	American Plum Borer	0	0	13.6	22	6	15	6	9	1	1.0	1	14	6	16	12	6	6	4	1	x
	Oblique-banded leafroller	x	x	x	x	trap set	0	0	11	27	9.0	10	27	4	17	15	5	4	4	16	x
	Lesser Peach Tree Borer	0	0	0	0	0	2	7	18	9	6.0	5	10	27	5	10	16	3	1	2	x
	Greater Peach Tree Borer	0	0	0	0	0	1	0	5	3	1.0	4	10	22	20	11	2	29	11	6	x
	Cherry Fruit Fly Avg.	x	x	x	x	set trap	0	0	0	0	0.3	3	11	5	15	50	154	35	150	116	x
	Cherry Fruit Fly Total	x	x	x	x	set trap	0	0	0	0	2.0	9	11	14	100+	100+	462	141	450	346	x
Grape	Grape Root Borer	trap set	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	x
	Grape Berry Moth	trap set	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	x

* X represents dates before traps were set or taken down for the season.

resulted in the expression of the **cherry** yellows virus in northwest Michigan. Significant defoliation, particularly in older cherry blocks (20-plus years old) was intense and raised concerns about crop ripening. With significant leaf loss from virus early and many orchards with a heavy cropload, growers are concerned about winter hardiness. Cherry leaf spot infections were frequent this year with the NWMHRS weather station predicting cherry leaf spot infection periods for 37 days from June to August and untreated tart trees becoming completely defoliated by mid-August at the NWMHRS. Early season cherry leaf spot control was good, but infection levels increased quickly late in the season due to 160 hours of wetting during the last two weeks of August. However, most growers were successful at keeping leaves on trees into the early part of September.

Considering the increased amount of fruit cracking that occurred in dark sweet cherries this season, American brown rot was well managed in most blocks. Here at the NWMHRS, we recorded 50 percent infection in untreated Ulsters by late July. Low American brown rot incidence was a welcome change from last year when much of the region suffered from epidemic levels of this disease. Bacterial canker was present this season, although not particularly intense despite cool conditions in early spring.

American plum borer were first caught in mid-May, and continued to be caught well into September. Lesser peach tree borer has been emerging since early June with adult trap catches peaking in mid-late June and continuing through last week. Greater peach tree borer emergence began the first week of June, peaked in mid-late August and extended into September with a maximum trap catch of 29 on August 24. Plum curculio began emerging in May and fed for an extended period until conditions were right for egglaying. We observed ovipositioning scars into mid-July. Obliquebanded leafroller adult emergence began around June 22 with steady emergence all season-long, but two peak flights were recorded in late June and late July, perhaps indicative of first and second generations. We caught our first cherry fruit fly on July 7, and the population peaked during the last two weeks in August. Many area orchards recorded exceptionally high levels of cherry fruit fly, and growers are applying post-season insecticide applications to bring down the populations.

Small fruit

Grape growers are banking on this September sun and warmth to ripen the fruit. This season's cool weather has impacted grape growers more than others, and many are hoping for this warm spell to continue in order to harvest grapes with adequate brix. Verasion is apparent in many vineyards, a good sign after many weeks of green fruit.

Surprisingly, downy mildew has been more prevalent than powdery mildew this year, but neither disease has caused significant issues in well-covered vineyards. Botrytis has been a sporadic issue particularly in vineyards affected by grape berry moth. Grape berry moth numbers were significant in some of our scouted vineyards, and overall potato leafhopper numbers were lower than anticipated with the many early season rains. Potato leafhoppers were managed in many region vineyards. Lecanium scale nymphs were spotted blowing into vineyards from surrounding windbreaks – likely a result of the extremely high populations in non-crop tree species. Rose chafer arrived in late June and some vineyards experienced intense pressure and warranted control. Japanese beetles arrived in low numbers in late July and all throughout August, but we heard no reports of control measures against the beetles. *Phylloxera*, snailcase bagworms, grape plume moth and fall webworm were also observed in low numbers this season. **IPM**

Weather news

Jeff Andresen, Agricultural Meteorology and Geography

On Monday, September 21, showers and thunderstorms associated with the weather disturbance that brought extended heavy rain and flooding to much of the south and Ohio Valley during the past week ended an extended period of mostly sunny, dry weather across Michigan. Many areas had been dry since August 30. Forecast guidance is now suggesting some major upper air changes during the upcoming week leading to a cooler, more unsettled weather pattern.

Further ahead, the forecast guidance has been very inconsistent with its projected solutions for the early to middle part of next week. Most recent guidance suggests a period of northwesterly flow aloft and much cooler than normal temperatures and at least the potential for a killing frost/freeze event across much of the state. Given the inconsistency of the models lately, I am not sold on this idea just yet. Medium range forecast guidance is also having problems converging on a projected upper air pattern. As it stands right now, the NOAA Climate Prediction Center **6-10 day** and **8-14 day outlooks** for September 27- October 1 and September 29- October 5, call for mean temperatures to range from below normal levels across southern sections of the state to near normal in the north. For precipitation totals, the outlooks call for a range from below normal totals across western and central Upper Michigan to near normal elsewhere across the state during the 6-10 day time frame. During the 8-14 day period, below normal precipitation totals are forecast statewide. It is important to note that forecaster confidence in these outlooks is considered below normal due to the recent inconsistencies in the model guidance. **IPM**

ACTUAL AND PREDICTED DEGREE-DAY
ACCUMULATIONS SINCE MARCH 1 2009 (*)

STATION OR DISTRICT	BASE 42 BE DEGREE-DAYS AS OF 2008	09/21 2009	BY 09/26	BY 10/01	BASE 50 BE DEGREE-DAYS AS OF 2008	09/21 2009	BY 09/26	BY 10/01
WEST UP NORMS**		2876	2928	2979		1803	1828	1852
MARQUETTE	2635	2526	2581	2633	1578	1481	1510	1533
EAST UP NORMS		2637	2690	2738		1577	1600	1621
CORNELL	2927	2755	2822	2879	1831	1651	1689	1710
SSMARIE	2746	2617	2681	2735	1636	1519	1554	1574
N.W. LP NORMS		3186	3252	3312		2053	2089	2120
BEULAH	3384	3108	3178	3251	2181	1914	1954	1988
BINGHAM	3356	3116	3186	3259	2180	1940	1980	2015
NORTHPORT	3006	2787	2850	2915	1877	1664	1699	1728
OLDMISSION	3224	2961	3028	3097	2074	1806	1844	1876
N.E. LP NORMS		3114	3177	3235		1984	2016	2046
ALPENA	3146	2895	2963	3029	1994	1771	1810	1842
ROGERCITY	3182	2887	2955	3021	2018	1744	1782	1814
W. CENT. LP NORMS		3467	3540	3608		2279	2320	2357
FREMONT	3475	3350	3432	3511	2258	2106	2157	2196
HART	3347	3193	3271	3346	2150	1976	2024	2061
LUDINGTON	3165	2987	3060	3130	1988	1798	1841	1875
CENT. LP NORMS		3553	3626	3693		2353	2394	2432
ENTRICAN	3460	3280	3359	3437	2243	2046	2096	2135
E. CENT. LP NORMS		3592	3672	3744		2387	2433	2473
BADAXE	3515	3196	3280	3364	2301	2004	2057	2100
SAGINAW	3721	3524	3617	3709	2477	2256	2316	2364
S.W. LP NORMS		3917	4008	4091		2655	2709	2758
BHARBOR	3784	3752	3839	3939	2531	2439	2493	2547
FENNVILLE	3566	3491	3572	3665	2338	2220	2270	2318
GLENDORA	3797	3734	3820	3920	2537	2430	2484	2537
GRANDJUNC	3902	3841	3930	4032	2637	2531	2587	2643
HOLLAND	4002	3922	4013	4117	2723	2606	2664	2721
KENTCITY	3599	3722	3808	3907	2369	2424	2478	2531
SPARTA	3513	3382	3460	3550	2282	2115	2162	2209
WATERVLIET	3797	3734	3820	3920	2537	2430	2484	2537
S. CENT. LP NORMS		3830	3916	3993		2590	2641	2686
BELDING	3533	3367	3447	3532	2310	2117	2167	2211
COLDWATER	3814	3806	3896	3992	2549	2502	2561	2613
ELANSING	3725	3629	3715	3807	2487	2334	2389	2437
S.E. LP NORMS		3853	3943	4022		2602	2656	2702
DETROIT	4247	4073	4171	4277	2926	2712	2776	2832
FLINT	3877	3537	3622	3714	2614	2262	2316	2362
MILFORD	3566	3422	3504	3593	2338	2159	2210	2254
ROMEO	3724	3546	3631	3723	2475	2276	2330	2376
SALINE	3858	3635	3722	3817	2598	2355	2411	2459
TOLEDO	4176	4076	4174	4280	2882	2720	2785	2840

* Since weather data for some agricultural stations are not available prior to
April 1st, GDD values for those stations during February and March are estimated
with closest available station data.
** District normals were calculated as the mean of daily GDD totals at
several stations within each district for the period 1951-1980.
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Michigan State University Cooperative Agricultural Weather Service
Cumulative Precipitation Summary For 09/21/2009

STATION	DIST	PRECIPITATION TOTALS SINCE 09/15/2009 (last week) Actual	09/08/2009 (last 2 weeks) Actual	Dev. Norm.	08/25/2009 (last 4 weeks) Actual	Dev. Norm.	04/01/09 (since Apr.1) Actual	Dev. Norm.
MARQUETTE	WU	0.31	0.31	-1.52	1.62	-2.01	13.11	-5.91
CORNELL	EU	0.53	0.53	-1.31	1.29	-2.15	12.72	-5.24
SSMARIE	EU	0.18	0.18	-1.66	1.38	-2.06	13.39	-4.57
BENZONIA	NWL	0.30	0.30	-1.44	1.38	-1.89	12.82	-4.03
BEULAH	NWL	0.36	0.36	-1.38	2.13	-1.14	18.22	1.37
BINGHAM	NWL	0.42	0.42	-1.32	2.50	-0.77	15.67	-1.18
NORTHPORT	NWL	0.22	0.22	-1.52	0.61	-2.66	5.33	-11.52
OLDMISSION	NWL	0.44	0.44	-1.30	1.68	-1.59	12.78	-4.07
ALPENA	NEL	0.80	0.80	-0.90	3.17	-0.03	19.82	2.94
ROGERCITY	NEL	0.91	0.91	-0.79	1.82	-1.38	21.66	4.78
FREMONT	WCL	0.47	0.47	-1.11	0.87	-2.18	15.41	-1.65
HART	WCL	0.11	0.11	-1.47	1.25	-1.80	16.93	-0.13
LUDINGTON	WCL	0.11	0.11	-1.47	0.86	-2.19	15.20	-1.86
LUDINGTON	WCL	0.11	0.11	-1.47	0.86	-2.19	15.20	-1.86
ENTRICAN	CL	0.57	0.57	-0.94	1.10	-1.88	16.07	-1.84
BADAXE	ECL	0.57	0.57	-0.86	1.05	-1.48	16.95	0.94
SAGINAW	ECL	0.34	0.35	-1.08	0.78	-1.75	16.26	0.25
BHARBOR	SWL	0.10	0.16	-1.45	1.93	-0.89	15.67	-2.68
FENNVILLE	SWL	0.05	0.05	-1.56	2.01	-0.81	18.97	0.62
GLENDORA	SWL	0.17	0.24	-1.37	2.06	-0.76	18.17	-0.18
GRANDJUNC	SWL	0.18	0.18	-1.43	2.64	-0.18	18.75	0.40
HOLLAND	SWL	0.00	0.76	-0.85	2.88	0.06	31.02	12.67
KENTCITY	SWL	0.17	0.24	-1.37	2.06	-0.76	18.17	-0.18
SPARTA	SWL	0.14	0.14	-1.47	0.80	-2.02	20.97	2.62
WATERVLIET	SWL	0.17	0.24	-1.37	2.06	-0.76	18.17	-0.18
BELDING	SCL	0.22	0.22	-1.18	0.79	-1.79	18.66	0.51
COLDWATER	SCL	0.15	0.23	-1.17	1.17	-1.41	17.95	-0.20
ELANSING	SCL	0.46	0.48	-0.92	1.92	-0.66	21.28	3.13
DETROIT	SEL	0.43	0.76	-0.56	1.69	-0.61	19.48	2.12
FLINT	SEL	0.32	0.34	-0.98	0.87	-1.43	22.48	5.12
MILFORD	SEL	0.20	0.27	-1.05	1.20	-1.10	19.74	2.38
ROMEO	SEL	0.87	0.88	-0.44	2.99	0.69	18.90	1.54
SALINE	SEL	0.12	0.43	-0.89	1.82	-0.48	18.37	1.01
TOLEDO	SEL	1.01	1.01	-0.31	3.63	1.33	19.44	2.08

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Crop Advisory Team Alerts
Integrated Pest Management Program
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