M I C H I G A N

GRAPE&WINE NEWSLETTER

May 5, 2011

VOL 2, ISSUE 2

Niagara development in Southwest Michigan

News you can use

Upcoming Meetings. ***Northwest***: May 6, 3:00-5:00PM at NWMHRS, Leelanau County. ***Southwest***: May 11, 12:00-3:00PM at the Berrien County MSUE Office. See calendar for details.

Experimental Variety Tasting at Spartan Cellars. Pour, taste, and talk about new wines and potential varieties for Michigan; June 1, 1:00-4:30PM at Spartan Cellars, MSU Campus. Registration is now open, see announcement in this edition.

Short Course on Aromatic Whites. Spend the day with Anna Katharine Mansfield and Katie Cook as they deliver a program on aromatic white wine production; June 2, 8:30AM-4:30PM, Kellogg Center, MSU Campus, East Lansing.

Economic survey for Michigan wineries. If you are a winery owner, please complete the survey you received in the mail. Thanks!

MICHIGAN STATE UNIVERSITY | Extension

GROWING DEGREE DAYS

Base 50 from April 1

		2011	2010	2009	2007	5-yr Avg*
Lawton	*4/27*	80	195	116	108	137
	5/4	99	276	157	182	193
forecast	*5/11*	148	299	214	268	249
Benton Harbor	*4/27*	80	178	100	87	124
	5/4	96	260	139	156	178
forecast	*5/11*	145	279	196	250	230
Leelanau	*4/27*	43	122	57	58	79
	5/4	54	193	82	97	116
forecast	*5/11*	96	203	124	168	152
Old Mission	*4/27*	35	113	50	46	69
	5/4	47	184	72	78	104
forecast	*5/11*	88	195	109	137	133

**5-yr Avg = 2006 to 2010*

See enviroweather.msu.edu for more information.

REGIONAL SCOUTING REPORTS

NORTHWEST

Duke Elsner
Grand Traverse County MSU Extension

Northwest Michigan vineyards are still very cold and quiet. Even our earliest cultivars are just at scale crack- some buds very near bare soil may have progressed to early bud swell.

Pruning continues in the area. At the Northwest Michigan Horticultural Research Station a couple of very cold and stiff cutworms have been found in the hilled-up soils around the bases of young vines, but there has been no feeding activity.

Cane samples from Riesling and Chardonnay vines at the station showed typical levels of winter injury to primary buds, which can run as high as 10-15% in normal years. Most of the injured buds are found relatively far out along canes, allowing for adequate numbers of live nodes for typical cane or spur pruning.

Regular scouting visits to area vineyards will begin soon.

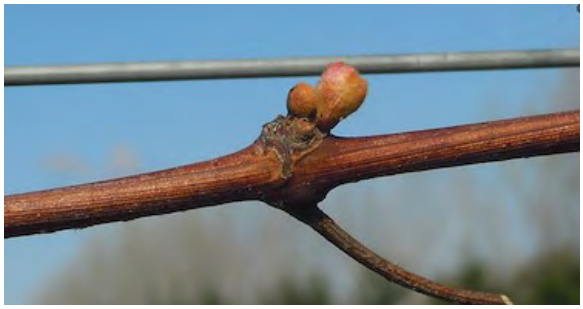
Southwest

Diane Brown
Berrien County MSU Extension

Steve Van Timmeren
MSU Trevor Nichols Research Complex

The weather in southwest Michigan continues to be on the cool and rainy side as we move slowly into spring. Highs were in the 50s and 60s and lows in the 30s and 40s. Hail was reported on April 27th, in the Lawton and Mattawan areas that caused injury to some buds. There was a chance of frost overnight in low-lying areas both Tuesday and Wednesday of this week, but grape bud development is progressing slowly, so little injury is likely to have occured. Grape buds are at full swell and color is beginning to show in the buds. Budbreak for juice grapes is expected to occur this week in many vineyards. The historical average date for budbreak in juice grapes is April 27th. The latest date recorded by National Grape for budbreak in Southwest Michigan is May 13th. Some wine grapes are developing more slowly and are still at early swell, while others are more advanced. Winter injury is apparent in some varieties.

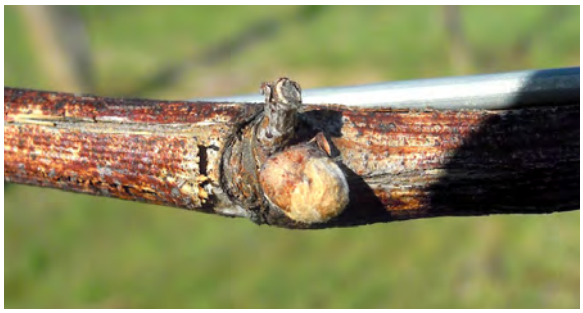
We are again scouting four vineyards in southwest Michigan; a Concord vineyard in Van Buren, a Niagara and Vignoles vineyard in Berrien, and a Chardonnay vineyard in Allegan. So far this season everything remains fairly quiet in the vineyards. Buds are pushing in the Concord and Niagara vineyards and are just starting to show signs of movement in the Vignoles and Chardonnay vineyards. We caught our first male grape berry moth in a trap today. There were no signs of either grape flea beetles or cutworms at any of the sites yet. However,



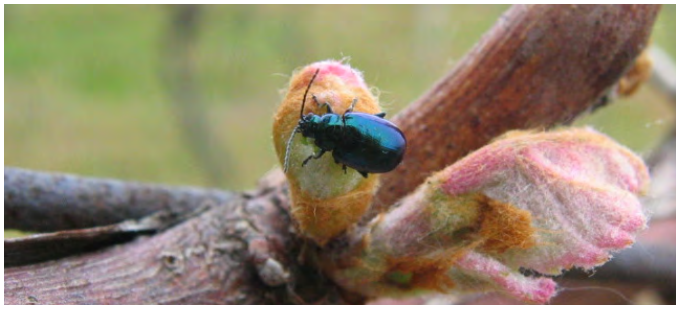
Concord on May 4; *Photo: D. Brown.*

Niagara on May 4; *Photo: S. Van Timmeren.*

SW Vignoles on May 4; *Photo: S. Van Timmeren.*



SW Pinot Noir on May 4; *Photo: D. Brown.*



Grape flea beetle (aka steely beetle) adult feeding on a Concord bud in 2006; *Photo: S. Van Timmeren.*

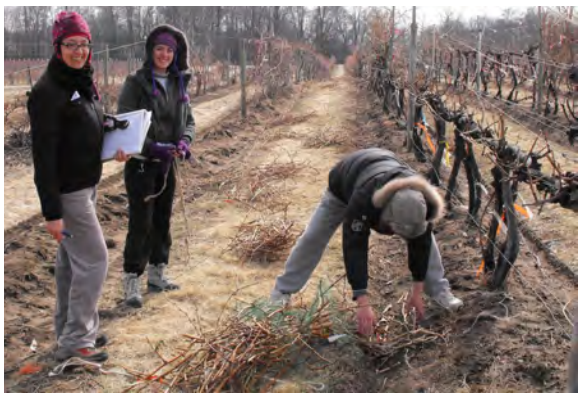
with the relatively cool weather the buds aren't moving very fast and remain vulnerable to both flea beetles and cutworms. Growers should be scouting for cutworms and grape flea beetle. Make sure you're keeping an eye on your buds, especially near woods borders. Phomopis disease pressure is building, with temperatures above 50 F and continued wet weather. It is important to get fungicide applications on early in the season to help control phomopsis.

There is still time to register for the first in-season grape meeting, to be held on May 11th, at the Berrien County Extension Office, 1737 Hillandale Rd., Benton Harbor, Michigan. Every season has it's own challenges and this year is no exception. The cool rainy weather we have had so far is markedly different than last season, with resulting weather-related differences in development of grapes, and grape pests. Annemiek Schilder will give her outlook on what's in store for diseases this season. Rufus Isaacs will present a brief update on insects to watch for and how to manage them. If you are looking for tools to manage weeds that have been troublesome, Bernie Zandstra will be on hand to answer your questions about which herbicides are available to use in grapes, and their efficacy for specific weeds. If you have been thinking about mechanical options for managing weeds, Matt Grieshop will have some useful information about some newer machines that could help you accomplish this goal. The meeting begins at noon with a catered lunch, followed by programs until 3 pm. Registration is 15.00 in advance, 20.00 at the door. Please RSVP for this meeting so we can have an accurate lunch count. Register by calling Linda or Jamie at 269-944-4126.

Paolo Sabbatini and Attila Filo, Department of Horticulture, Michigan State University

Crown gall: A devastating grapevine disease in Michigan

Last week, staff and students of the Viticulture and Enology Research and Extension Program at MSU (with the help of volunteers from Traverse City: thanks!) completed the pruning of several horticulture research plots across the state - from the NW to the SW research station and from Fennville to Lansing (Picture 1). Every year, it is sad to see how many trunks and cordons need to be removed because of crown gall infection, especially in our cold tender *vinifera* cultivars and in young, newly planted vines. So much permanent wood, so much energy that the vine fixed and stored, thrown away just with a single cut! These vines, still infected after the cut, are looking to regain their balance during the growing season! Is it possible to solve this problem?



Picture 1. Viticulture students pruning Chardonnay vines at the SWMREC and weighting canes. *From left to right*: Letizia Tozzini (Ph.D. candidate), Dana Acimovic (MS candidate) and Shijian Zhuang (MS candidate). Letizia is working on carbon and nitrogen dynamics in vines, Dana on early leaf pulling to reduce cluster compactness and Shijian on canopy management to reduce vegetal flavors (IBMP, 2-methoxy-3-isobutylpyrazine) on red wines. Projects are partially funded by the Michigan Grape & Wine Industry Council

Crown gall is caused by the bacterium *Agrobacterium vitis (*rarely by *Agrobacterium tumefaciens*) and it is one of the most economically destructive grape diseases worldwide in cool-cold viticulture regions. Severe crown gall incidences are unfortunately common in Michigan. *Agrobacterium vitis* survives in grapevine cuttings, debris, and in soil. It is particularly concentrated in the rhizosphere of grapevines and infects through natural openings (Picture 2) most commonly generated on roots or by freeze or physical injuries. The bacteria systemically colonizes grapevines, disseminates to shoots via xylem sap flow. Grapevines grown in areas subject to freezing winter temperatures are especially vulnerable to crown gall because freezing injuries provide a wound where the disease can initiate. Post callus formation and vascular connection of graft unions can also result in crown gall development (Picture 3). Moreover, tissues surrounded by incomplete calluses are more prone to freeze injury. Consequently, crown gall is often a major problem not only in nurseries, but also during vineyard establishment. In fact, crown gall most frequently occurs during in-nursery rooting or after the first winter in the vineyard. The infection most often occurs on the lower trunk, around the graft union, at the base of the cutting, and at disbudded points. Prevention of freeze injury (i.e., selecting vineyard sites that avoid low temperatures) and graft union protection (i.e., soil burial/mulching techniques: Picture 5) still represent some of the major strategies to suppress crown gall. Why this bacteria is so dangerous, can we just spray some antibiotics on the vine and kill it like we do when we get pneumonia or bronchitis?

Crown gall infection is unique because it involves the inter-kingdom transfer of transfer DNA (T-DNA) from the bacterial pathogen into the plant genome. The bacterial T-DNA is inserted into the plant chromosome. Because the plant cell cannot regulate the expression of the T-DNA genes, they "transform" producing an abnormal proliferation of plant cells, resulting in crown gall tumor that we see on the vines (Picture 5). After, crown gall development disrupts the grapevine trunks' vascular systems, preventing nutrient flow, and, ultimately, causing plant decline and mortality. Antibiotics were tried; unfortunately several formulations have proven ineffective in field trials for management of A. vitis-infected grape vines. This is due to the enormous genetic variability and adaptability of the virulent strains to the chemicals.

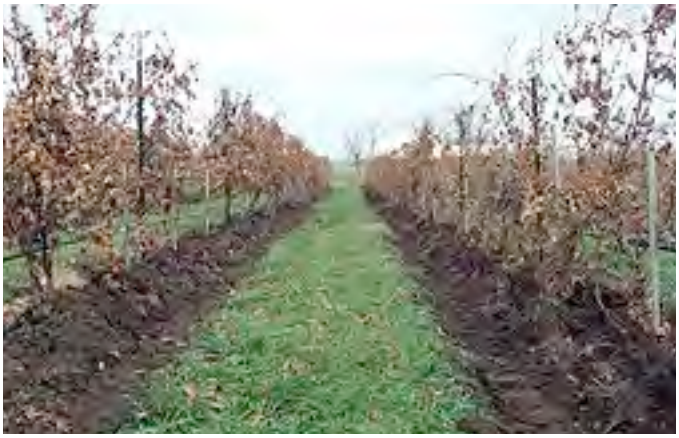
Currently, there are no completely effective methods of controlling crown gall disease in

Picture 2. Crown gall infection at graft union of *V. vinifera* grapevines shortly after vineyard establishment; vines will inevitably die.

Picture 3. Grapevine showing crown gall already at the nursery. The infection developed during the callus formation.

vineyards. However, there are practical options for partial disease control which aim at producing pathogen-free planting material by in vitro apical meristem or shoot tip tissue culture or at inhibiting bacterial infection (i.e., soil fumigation, solarization). We really hope that grape nurseries will have soon crown gall free material to plant. If you want to be up to speed on this topic check the clean Plant Network web page (http://www.groups.ucanr.org/ncpn/). Several scientists across US are growing vines in specific vineyards (also referred to as foundation blocks) containing virus- and disease-free (e.g., *A. vitis*-free) scion and rootstock grapevine varieties. Vineyards were established in California, Washington, Missouri, and New York and ongoing evaluations of *A. vitis*-free grapevines are being done in Michigan (by Tom Zabadal), Indiana, New York, Ohio, and Pennsylvania. Other strategies to reduce crown gall incidence in both vineyard and nursery are heat treatment of dormant grapevine cuttings and chemical treatment of dormant grapevine cuttings prior to grafting.

Traditional breeding for grapevine crown gall resistance represents another approach, although resistant varieties that produce high quality fruit have not yet been developed. Site selection, multiple trunk grapevine training (Picture 4), hilling of grapevine graft unions (Picture 5), and irrigation management to avoid freeze injury are still the most important tools. None of the currently available cultural practices yield acceptable levels of control in vineyards. However, genetic engineering and biological control are promising research approaches with significant potential for suppressing grapevine crown gall. Research in the area of biological control is very promising. Several antagonistic strains of *A. vitis* have been identified that



Picture 5. Growing cold tender varieties in cool climates requires hilling up of the soil around the base of the vine trunk, especially in newly plant vineyards. The goal is to cover the base of the vine up above the graft union. If there is a hard freeze, the trunk will, but the soil insulation will preserve some canes or buds alive for the next growing season.

Picture 4. Cayuga-White hybrid variety infected with crown-gall. Photo from the MSU Horticulture Teaching & Research Center in E. Lansing. The use of several multiple trunks help to reduce the impact of the disease on the entire vine.

do not produce galls. They could have potential in the biological control of the grape crown gall pathogen as antagonistic, that could "fight" against the *Agrobacterium vitis* to infect the cell after damage. Research efforts to discover or develop living organisms, or products created by those organisms, for grapevine crown gall suppression were initiated as early as 1970. Many different bacterial strains have now been studied for their ability to inhibit grapevine crown gall infection. Their efficacy and commercial viability are currently under evaluation.

Relevant reading on crown gall

Burr, T. J., C. Bazzi, S. Süle, and L. Otten. 1998. Crown Gall of Grape: Biology of *Agrobacterium vitis* and the development of disease control strategies. Plant Dis. 82: 1288-1297.

Burr, T. J., and L. Otten. 1999. Crown gall of grape: biology and disease management. Ann. Rev. Phytopathol. 37: 53-80.

Zabadal, T. J., 2008. Vineyard design and establishment. In Wine Grape Production for Eastern North America. NRAES Cooperative Extension, publication 145; pp 771-97.

Rufus Isaacs, Department of Entomology, Michigan State University

Preparing for vineyard insect management in 2011

This article provides some general comments to prepare Michigan grape growers for the coming growing season. More specific and detailed articles on insect management will be published in this newsletter through the season at the appropriate times.

Preparing based on 2010 experiences. Predicting the season ahead is notoriously difficult, so these are some general comments in light of what happened in 2010. Last year was a bumper year for grape berry moth because of the unusually high level of degree day accumulation. Compared to 2009, southwest Michigan vineyard sites were ~700 degree days ahead in September. This had two related and important effects on this key pest. First, berry moth was able to complete an additional generation last year meaning that pest pressure was very high in August and September in many vineyards. Secondly, berry moth populations were so high because the early phenology meant that many eggs of the third generation were laid before days were short enough to induce diapause (the overwintering stage when the larvae develop to the pupal stage and stop). As a result, the insect kept developing through to a fourth generation. The practical implication was that growers faced much higher pest pressure than normal, and this was in a year when many vineyard managers were very focused on saving money. Still, vineyards sprayed later in the season with insecticides to provide cluster protection from berry moth had generally lower infestation at harvest.

Berry moth in 2011. Populations of most insect pests fluctuate in response to the climate, natural enemies, availability of suitable hosts, and management programs. All of these things can affect pests, but vineyards with heavy berry moth pressure last season should be monitored very closely this season to make sure pest pressure does not get too high.

If there was significant berry moth infestation in a vineyard in 2010, early planning should be done this year for an effective control program that includes treatment against the second and third generation. The MSU degree day model can help identify the predicted start of these generations, and our experience with this model in recent years indicates that some of the new insecticides with good activity on berry moth and good residual control (such as Intrepid and Altacor) can provide excellent cluster protection when used at these timings. Intrepid is highly selective on grape berry moth and has long residual activity, so it has a good fit for protecting clusters against the third generation of berry moth if applied a month before harvest (30 day PHI). We have tested the 8oz/acre rate and have seen good performance in multiple seasons. Using a higher rate, since the label allows for up to 16 oz/acre, will provide longer residual control. This product can also be used earlier in the season, but it will not provide leafhopper and Japanese beetle control. However, a relatively new insecticide Altacor has exhibited very good berry moth activity and based on our recent studies this product also protects vines from Japanese beetle. This combination of activity indicates a good fit for Altacor in the July timing (second generation berry moth) when beetles may also be present. Both Altacor and Intrepid are a little more expensive per acre than many of the standard broad spectrum insecticides. However, a program that uses these for the second and third generation of berry moth can work very well for reducing pest infestations and helping with resistance management by using new modes of action. Additionally, if applications are made only to vineyard border regions since that is where berry moth pressure is typically highest, the cost can be lower.

A final point on berry moth: for accurate treatment timings using the degree day model, you need to know when wild grape blooms on your farm. This is the 'biofix' used to initiate the degree day timing for this pest. This season, it should be in mid-late June depending on your location in the state. Just keep a lookout for wild grape (*Vitis riparia*) in your region. Updates on this and the model development will be in future editions of the newsletter.

Late harvest Niagara. If you are a National Grape member with Niagaras, it is likely those vineyards will be harvested later than you are used to. One implication is that there will be more chances for pest infestation than when it was harvested in early September. Plan accordingly and keep the PHI and residual control of any late-season insect management in mind.

Scale. Lecanium scale was an issue in some Michigan vineyards last season. This insect is often suppressed by a suite of natural enemies so I would expect populations to crash this season. But, if the populations remain high and might affect vine vigor, there are two windows for chemical control: delayed dormant (now) or at crawler activity (later in the summer). Delayed dormant is a good timing to ensure easier

access to the scales without a lot of foliage in the way, and options include a 1% oil application to smother the scales which can be combined with the insect growth regulator Esteem for combined modes of action. During the summer when crawlers emerge from the scales and spread out to find new places to settle, many pyrethroid insecticides and Esteem can give good control at that time. During 2010, the peak of crawler emergence was on June 30 in SW Michigan, but it is more challenging to get the coverage needed for good control at this time.

Grape phylloxera. Some hybrid cultivars are highly susceptible to leaf galling from grape phylloxera, and own rooted vineyards are at risk from declined vigor if phylloxera are feeding on the roots. Recent registration of Movento for use in vineyards provides a new tool to help growers control this insect. This insecticide is from a new chemical class and it has the unique properties of being able to move up and down in the vine (from leaves to roots and from roots to leaves). Our trials of Movento applied at 6 oz/acre at the first sign of leaf galling in 2009 (treated early July) showed very high control of phylloxera galling on leaves. Following up at this site in 2010, we also found continued control into the following season as revealed by low emergence of phylloxera from the soil. We will continue this work in 2011 to determine the long-term effects of Movento on phylloxera populations.

What about invasive insects? Two new invasive insect pests were detected in Michigan last year – spotted wing Drosophila and the Brown Marmorated Stink Bug. The Drosophila fly was found in monitoring traps at only a few vineyards and at low numbers, and only late in the season. The stink bug was not found in any vineyards, and has only been reported from four locations in Michigan. These insects will be monitored this season in vineyards, along with a few other invasive insects that we want to make sure are not present in the state.

Lannate on the way out. Lannate SP (methomyl) is a carbamate insecticide registered for use in vineyards to control a wide range of insect pests, but a cancellation order from EPA means this insecticide will soon lose grapes as a crop listed on the label. In December, a new label was approved by EPA that does not list grape, and this will be used on all new Lannate produced by DuPont. However, any Lannate with the grape label can still be sold or distributed by the registrant until June 8, 2012, and growers or suppliers with Lannate in their stocks will still be allowed to use this until those stocks are exhausted. This change has been designed to enable a gradual phase-out of this product and to ensure that growers do not get left with Lannate that cannot be used.

Annemiek Schilder, Department of Plant Pathology, Michigan State University

Spring grape disease management: What to consider

Disease history of the vineyard

Most vineyards do not have a history of all grape diseases. Growers should focus their disease control efforts on the diseases they know are a problem for them; knowledge of the amount of disease the previous year(s) will be helpful in determining the amount of risk the vineyard is facing this year. Also keep this in mind for next year and keep a record of disease occurrence in your vineyards; also to gauge the efficacy of your disease control program. Disease pressure will depend on the weather conditions, the cultivar grown, the age of the vineyard, the location, and the training/canopy management system. For instance, mechanically pruned vineyards tend to have more Phomopsis than hand-pruned vineyards. If few sprays were applied last year due to a low crop caused by spring frost damage, more inoculum may have overwintered so it would be beneficial to stay on top of the fungicide spray schedule this year, especially if you expect to have a large crop. In addition, the wet spring so far may contribute to earlier powdery mildew, downy mildew, and Phomopsis infections and potentially higher pressure than last year, but it all depends on if the wet trend continues.

Clean-up of vineyard

If you are still in pruning mode, prune out dead canes and stubs as much as possible since they are the main sources of Phomopsis spores. Remove any fruit mummies still hanging on the vine, since these may release black rot spores. Also remove large pieces of wood from the vineyard and burn them. This is especially important in Eutypa-infected vineyards, since dead wood remains a source of Eutypa inoculum for multiple years. While it is recommended to remove pruned canes from vineyards, most growers find it more practical to chop up them up. This is fine, provided that the canes are well pulverized so that they can decompose quickly. Make two passes with a brush-chopping mower if necessary.

Timing of disease control measures

Timing of disease control measures is critical to success. Protectant fungicides have to be used before an infection period and are best applied before rain. While rainfall of more than 1 to 2 inches can substantially reduce fungicide residue, there is often sufficient active ingredient left to still provide moderate to good disease control. “Stickier” formulations are better and spreader-stickers may improve adherence of the fungide to the plant surface. Applications should be made no more than 2 to 3 weeks apart depending on weather conditions and how fast the shoots grow. If there are frequent rain events and/or the shoots grow rapidly resulting in dilution of fungicide residues, then the spray interval may need to be shortened to 7 to 10 days.

Between 1 and 10 inches of shoot growth, Phomopsis cane and leaf spot is the primary disease of concern. Clusters and shoots are vulnerable as soon as they become exposed. Young tissues are most susceptible. Spray timing trials have indicated that this stage is important for controlling cluster stem (rachis) and shoot infections, whether by actual protection of the tissue from infection or by inactivating the fungus as it is “waking up” from dormancy in the canes. Wet weather conditions during this period of rapid shoot elongation are ideal conditions for the infection and spread of Phomopsis. Powdery mildew control should not be delayed in Vinifera and susceptible French hybrid vineyards past the 10-inch growth stage. However, in most Concord vineyards, powdery mildew control is not necessary and can wait until bloom. Black rot may be an issue in vineyards that had a problem the previous year but control is usually not needed until immediate prebloom as we generally focus on protecting the fruit only. Extended periods of wet weather are very favorable to most grape diseases. In general, if the leaves and shoots are wet for 8 hours for longer, infection is possible if not protected by a fungicide (except for powdery mildew, which needs dry leaves for infection).

What fungicides to use early in the season

The fungicides that are most effective in controlling Phomopsis are also effective in controlling early-season (foliar) black rot. The broad-spectrum fungicide mancozeb (Manzate, Penncozeb, Maneb) is generally the most effective material but Captan (captan) is also effective. Ziram is moderately effective and more effective at the 4-lb than the 3-lb rate. All of these fungicides can be tank-mixed with phosphorous acids to obtain systemic activity against Phomopsis, downy mildew and black rot as well (rates can be cut in half for both components in the tank mix, e.g., 1.5 lb Penncozeb + 2 pt ProPhyt). It is recommended to save the strobilurins (e.g., Pristine, Sovran, Abound, Flint) until somewhat later in the season when they are needed for control of multiple diseases. They may also work better under higher temperatures. Sterol inhibitors

(Elite, Rally, etc.) can be used any time during the growing season, although they may not work well at temperatures below 40ºF. Both of these groups of fungicides are prone to resistance development so are best used at critical disease control periods (immediate pre-bloom until second postbloom). Do not use these materials more than 2 to 3 times per season, and no more than twice consecutively. Rotating with fungicides with a different mode of action can help delay the development of fungicide resistance and prolong fungicide efficacy. JMS Stylet Oil or sulfur may be used to control powdery mildew early in the season. However, powdery mildew generally is not a great concern at this time, except in susceptible cultivars and vineyards that had a problem with fruit infection the previous year. Sulfur can also be added to the tank mix as inexpensive "insurance" against powdery mildew. Do not apply sulfur to sulfur-sensitive varieties or tank-mix with or spray within two weeks of an oil spray.

Revised information on spray adjuvants for fruit crops

Annemiek Schilder
MSU Department of Plant Pathology

Bill Shane
MSU Extension - Southwest

Here is a guide to the wide assortment of additives sold to growers for improving spray applications to their fruit crops. This is a revision of the adjuvant section of the 2010 Michigan Fruit Management Guide, Michigan State University Extension Bulletin E-154.

Spray adjuvants are products added to a spray tank to improve the performance of the treatment. Improper use of an adjuvant may result in poorer performance and possible phytotoxicity as well as increasing the cost of the treatment. An adjuvant may not be needed in some cases. Many agrichemical products are formulated with adjuvants and may not need an additional one. In some cases, the use of adjuvants is specifically prohibited. Check the agrichemical label to see what type of adjuvant, if any, is recommended. Check the adjuvant label to be sure that the target crop and the intended use are listed.

Avoid use of adjuvants with penetrating action with potentially phytotoxic fungicides. For example, do not use an adjuvant with strong penetrating action with copper compounds, Captan or Syllit. Be aware that soluble fertilizers may also have penetrant activity and can help move the copper or Captan into the plant tissue. Be careful when using adjuvants with penetrating action with herbicides that may come in contact with young tree trunks, vines and canes.

Emulsifiable concentrate agrichemicals contain oil and special adjuvants to allow them to mix with water. These emulsifiable concentrates will sometimes help other normally non-systemic agrichemicals to penetrate into plant tissue.

Systemic fungicides and insecticides are designed to move into plant tissue. With such agrichemicals it is best not to use an adjuvant with aggressive "sticking" action that would impede movement into plant tissue.

Avoid adjuvants with strong sticking action early in the growing season when redistribution of fungicides and insecticides by rain is desirable to extend protection to newly emerged green tissue. However, sticker action may be desirable under extended rain and cool conditions.

General terminology

Spreader: Also called surfactants, wetting agents, surface-active agents. An adjuvant with spreader activity helps to decrease water surface tension, encouraging spray droplets to land and spread over hard-to-wet surfaces such as waxy and/or hairy plants. A detergent can act as a spreader to prevent beading. Too much spreader can result in increased spray treatment dripping off of treated surfaces.

Non-ionic spreader: A surfactant with spreading action and relatively neutral charge. For general use, non-ionic spreaders are usually preferred over negatively charged (anion) and positively charged (cation) spreaders because non-ionic types are least likely to inactivate the chemicals being applied.

Penetrant: An adjuvant that enhances the movement of the agrichemical into the plant tissue. Penetrants may also help penetrate the cuticles of arthropods. Penetrants are used with many herbicides and defoliants and certain fungicides and insecticides. Many penetrants also act as spreaders and surfactants. Use penetrants with caution – they can cause phytotoxicity by helping to move non-systemic materials such as copper and Captan inside the plant cuticle. Penetrants should not be used with materials that should stay on the surface. Penetrants are not recommended on certain crops, such as grapes, where they may increase risk of damage to tender skin. Common penetrants include oils and methylated or ethylated oils, ethylenes, alcohols and aliphatic acids.

Sticker: Also called bonder. It is an adjuvant that enhances the adherence of agrichemicals to the target surface. Sticker activity is generally more useful for non-systemic agrichemicals than for systemic agrichemicals that work best inside plant tissue. Stickers are helpful for fungicide or insecticide products that are prone to wash-off, including biocontrol products. High rates of some stickers can immobilize agrichemicals. High rates of some stickers can result in excessive foaming and or result in a tenacious film on equipment. Latex-based stickers usually need to dry on plant surface before they provide protection. Terpene-based stickers (Nu-film products) need sunlight to set the film.

pH modification agents and buffers: An acidifier helps to reduce water pH. A buffer helps the spray solution to be stable at a specific pH, usually acidic. Buffers and acidifiers help guard against unwanted agrichemical breakdown, clumping and other effects that may occur because groundwater sources are often alkaline (high pH) in Michigan. Most agrichemicals are most stable at slightly less than neutral pH (below 7). Materials with a significantly shorter life at high pH include Captan and Imidan.

Drift retardant: An adjuvant that helps to inhibit the production of fine droplets by spray nozzles. It's usually used to help prevent off-target movement of herbicides or other potentially damaging agrichemicals.

Water conditioner: An adjuvant providing some benefit in the spray tank, such as protecting against negative effects of some water sources. An example is ammonium sulfate, which helps to prevent inactivation of glyphosate by tying up calcium, magnesium and iron in hard water that would otherwise bind to the herbicide. Ammonium sulfate replacements are available from several companies.

Foam retardant: This is commonly a dimethylpolysiloxane product that helps to suppress excessive foam in the spray tank that results from agitation of other materials and water. It works better if added to the spray tank before excessive foaming occurs rather than afterward.

Compatibility agent: This is useful when pesticides are combined with liquid fertilizers to help avoid breakdown of the pesticide by the salt solution from the fertilizer. Some troublesome combinations of products can be stabilized with a compatibility agent.

Silicon-based adjuvant: Reduces surface tension (aids wetting). Higher rates result in more penetration. Recommended for use with water-soluble pesticides only. This class of adjuvant contains some of the more aggressive penetrants.

Crop oil concentrate: An adjuvant that is a combination of surfactants (15 to 20 percent) and non-phytotoxic oil, either petroleum- or vegetable-based. Crop oil concentrates are used to increase effectiveness of herbicides by increasing wetting, spreading and penetration. Methylated seed oils tend to work better than petroleum-based oils as adjuvants for weed control where weeds are under environmental stress.

The following information is credited to: Paul Domoto, Dept. of Horticulture, Iowa State University; Crop Data Management System; Crop Protection Services

pH Modifiers

Product	Source	Acidifier	Buffer	Notes
Aero Dyne-Amic	Helena	X		
Buffer Xtra Strength	Helena		X	Includes conditioning agent
Buffer P.S.	Helena		X	
Choice Weather Master	Loveland	X		Hard water conditioner
Combine	Riverside		X	
Induce pH	Helena	X	X	Low foam, non-ionic surfactant
LI 700	Loveland	X		
Super Spread 7000	Wilbur-Ellis	X	X	
Sorba-Spray MG	Leffingwell	X		
Spray Aide	Miller	X		
Tri-Fol	Wilbur-Ellis	X	X	Not for use with copper fungicides
Vinegar, muriatic acid, citric acid	Various	X		No buffering action

Common adjuvants used for fruit and their properties.

Product	Source	Type[a]	Use[b]	Spreader	Sticker[c]	Penetrant	Other[d]
Activator 90	Loveland	NIS	I,F,H.G	X		(X)	O
Biotune	AgraQuest	NIS & AS	I,F	X	X		
Bond Max	Loveland	LBS	I,F	X	X		
Cohere	Helena	NIS	I,F,H	X	X		Wax soluble
Dyne-Amic	Helena	OSI	I,F,H	X		X	
Hasten	Wilbur-Ellis	NIS + veg oil	I,F,H	X		X	
Induce	Helena	NIS	I,F,H	X			O
Induce pH	Helena	NIS		X	X		O,B
Freeway (formerly Intac Plus)	Loveland	OSI	I,F,H	X			D
Kinetic	Helena	OSI	I,F	X		X	S
Franchise (formerly Latron B-1956)	Loveland	NIS	I,F,H	X	X		
LI-700	Loveland	NIS	I,F,H,G	X		X	A,D,O
Nu-Film 17	Miller	TBS	I,F,H	X	XX	(X)	
Nu-Film P	Miller	TBS	I,F,H	X	XX		
Preference	Agriliance	NIS	I,F,H	X			S
R-11 Spreader Activator	Wilbur-Ellis	NIS	I,F,H,G	X		X	
R-56 Spreader Sticker	Wilbur-Ellis	NIS	I,F,H	X	X		
Regulaid	Kalo	NIS	G	X		X	S
Silken	Agriliance	OSI	I,F	X		X	
Super Spread 90	Wilbur-Ellis	NIS	I,F,H	X			
Super Spread 7000	Willbur-Ellis	NIS	I,F	X			
Sylgard 309	Wilbur-Ellis	OSI	I,F,H,G	X		X	
Widespread Max (formerly Silwet L-77)	Loveland	OSI	I,F,H,G	X		X	
Tactic	Loveland	OSI	I,F	X	X	X	
Liberate (formerly X-77)	Loveland	NIS	I,F,H	X		X	Neutral pH, not for grapes

[a] NIS = non-ionic surfactant, AS = anionic surfactant, OSI = organo-silicone surfactant, TBS = terpene-based nonionic surfactant, LBS = latex-based sticker.
[b] I = insecticide, F = fungicide, H = herbicide (contact type), G = growth regulator.
[c] XX = tenacious sticker, (X) = modest sticker activity.
[d] O = foam retardant, A = acidifier, B = buffer, D = drift retardant, S = slows drying, U = UV protection.

Compatibility Agents

Product	Source	Note
Blender VHC	Setre	
Complex	Kalo	
E-Z Mix	Loveland	Increases mixability of pesticide and liquid fertilizer
Spray-Aide	Miller	
Combine	Riverside	
Setre FA-1	Setre	

Drift Retardants

Product	Source	Note
Brace	Riverside	
Reign (formerly Chem-Trol)	Loveland	
Deposit	Loveland	
Drop Zone DC	Helena	
Drop Zone LC	Helena	
In-Place	Wilbur-Ellis	Includes cationic wetting agent
Intac	Loveland	
LI 700	Loveland	
Placement	Agriliance	Includes cationic wetting agent
Strike Zone DC	Setre	
Weather Gard Complete	Loveland	Includes water conditioner, anti-foaming, and penetrant agents
Windbrake	Riverside	
Windcheck	Riverside	

Foam Retardants

Product	Source	Note
No Foam	Wilbur-Ellis	
Foam Fighter	Miller	
Anti Foam Agent	Kalo	
Defoamer	Kalo, Riverside	Also listed for Van Diest Supply
Fighter F-10	Loveland	
Unfoamer	Loveland	
Foam Buster	Helena	
Weather Guard Complete	Loveland	Includes water conditioner, drift-retardant, and penetrant agents

CALENDAR

2011 NW Wine Grape 'First Friday' Meetings

Sponsored by Parallel 45 Vines & Wines
Info: Jay Briggs, 231-499-0763; Duke Elsner, 231-357-8353
Please note that all meetings to not fall on a Friday this year due to holidays.

May 6
3-5PM
NWMHRS - Leelanau
Topics: Vine training, pruning, tying

June 3
3-5PM
Crane Hill Vineyards - Leelanau
Topics: Shoot thinning, leaf pulling

June 30 ***(Thursday)***
3-5PM
Leorie Vineyard - Old Mission
Topics: Crop estimation

August 5
3-5PM
2 Lads - Old Mission
Topics: MSU cover crop trials

Experimental Winegrape Variety Tasting

Sponsored by MSU Extension
Info: Paolo Sabbatini, 517-355-5191 X1302; Paul Jenkins, 517-648-5099

June 1
1-4:30PM
Spartan Cellars - MSU Campus, E. Lansing
$20 per person

Short Course on Aromatic White Wine Production

Sponsored by MSUE, MGWIC, and MWF
Paul Jenkins, 517-648-5099

June 2
8:30AM-4:30PM
Kellogg Hotel & Conference Center - MSU Campus, E. Lansing
$75 early registration; $95 regular registration for 1st person; $20/$30 additional.
Register online here.

2011 SW Grape Grower Meetings

Sponsored by MSU Extension
Info: Diane Brown, 269-605-6305

Registration includes lunch, and is 15.00 per person/meeting, paid in advance, 20.00 paid the day of the meeting. If you prefer to write one check to pay for the three meeting series in advance, the total cost for all three will be 40.00. Please register in advance with Linda Gustafson at the Berrien County MSUE office (269-944-4126). Checks should be made out to Berrien County MSUE and mailed to 1737 Hillandale Rd, Benton Harbor, MI 49022.

May 11
12-3PM
Berrien County MSUE Office
Registration: $15/$20 per person, lunch provided
Topics: Insect management, disease management, chemical and mechanical weed control

June 8
12-3PM
Cronenwett Farms - Lawton
Registration: $15/$20 per person, lunch provided
Topics: Shoot thinning, leaf pulling

July 27
Viticulture Field Day - SWMREC
Topics: To be announced
Info: Tom Zabadal, 269-944-1477

August 10
6-9PM
Dongvillo Vineyards - Berrien
Registration: $15/$20 per person, dinner provided
Topics: Insect management, spray coverage comparisons using UV dye.