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Berry Notes

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Message from the Editor

YOUR INPUT IS NEEDED!!!

Rich Bonanno and David Nyachuba, UMass

Recent contamination outbreaks for tomatoes and spinach have raised concerns about the safety of fresh produce. As a grower, you, too, may be receiving pressure from buyers about the safety of your produce. To address this issue, UMass Extension and the UMass Department of Nutrition, with funding from the Massachusetts Department of Agricultural Resources (MDAR), have teamed up to implement a Good Agricultural Practices (GAP) certification program for fruit and vegetable growers in Massachusetts. To achieve this goal, your help is needed. During the first week of November, you will be receiving a survey to assess your thinking about fresh produce safety. We hope you will take the 15 minutes or so to complete it. The results from this survey will direct the designing of a GAP food safety program that meets the needs of Massachusetts fruit and vegetable growers like you, i.e. the educational resources developed for the growers during the program will reflect the results of the research efforts of the project.

If you do not receive a copy by the 24th of November, 2008 and are interested, please contact David Nyachuba at 413-545-0552 or email him at dgn@nutrition.umass.edu.

STRAWBERRY

Winter Mulch for Strawberries

Sonia Schloemann, UMass Extension

An important fall job in commercial strawberry production is mulching. Strawberries are commonly grown in cold climates, such as the northern US and Canada, but the strawberry plant itself is actually quite vulnerable to cold injury. Research has shown that, without mulch, strawberry crowns can suffer damage at temperatures below 12°F and unprotected strawberry plants can suffer desiccation damage from drying winter winds. A protective mulch can protect strawberries from cold by providing insulation, and from desiccation by providing a barrier against drying winds. Mulches will also protect plants from injury caused by soil heaving, which results from freezing/ thawing cycles during the winter. So, a key to consistent quality strawberry production in cold climates is in protecting the plants from severe temperatures or temperature swings through the practice of mulching.

Production systems can also affect the need for mulching. Plants on raised beds, for example, are more vulnerable to cold and desiccation injury than plants in level plantings, especially in locations that are exposed to strong winter winds. Annual production systems, such as fall planted plasticulture, may utilize less hardy or disease susceptible cultivars. As we will see, mulching practices must adapt to these new systems.

When should the strawberry grower plan to apply mulch?

Research suggests that a good timing guide is to apply mulch after three consecutive days with a soil temperature of 40°F or below. This soil temperature usually occurs after multiple frosts, and when

the plants have slowed growth in response to cooler temperatures. It is best to apply mulch before the soil freezes solid. In New England mulches are applied in late November.



Raised bed plantings and sites with strong wind may require twice this amount for adequate coverage.

How is the mulch applied? Smaller plantings may be mulched by hand by shaking out the bales of straw over the row. Larger plantings often use bale choppers to break up the straw bales and distribute the straw over the bed. Choppers are available for both small bales and large round bales.



What is a good mulch material?

The traditional mulching material for strawberries in New England is straw. Straws from wheat, rice, oats, or Sudan grass work well. Straws coarser than Sudan grass are not recommended. Straw should be clean, free from weed seed, and contains a minimum of grain seed. Strawberry growers can produce their own straw, often cutting the straw before the grain seed is viable. Store straw for mulching in a dry area. Occasionally, grain seedlings can become a weed problem the following spring; an application of sethoxydim will give good control.

How much mulch should be applied? A traditional, level matted row planting will require 2.5 to 3 tons of straw per acre for a 2 to 3 inch deep mulch, or about 300 small bales of average weight.

How and when is the mulch removed?

In the spring, when plants begin to show growth under the winter mulch (new green tissue), the mulch should be raked off the rows to allow sunlight to penetrate and reach the foliage. Delaying removal will delay plant growth and flowering and may reduce yield. Mulch can be raked off by hand with ordinary yard rakes in smaller plantings. In larger plantings, various mechanical tools

are available ranging from modified hay rakes and tedders to equipment specifically designed for the purpose.

Floating row covers as mulch. These covers are composed of a plastic such as polypropylene, spun-bonded into a fabric that is permeable to light, air, and water. Research and growers' experiences demonstrate that these covers are useful for winter protection of strawberry plantings. While floating row covers are available in several weights, only the heavier weights are recommended for winter protection. At present a widely available weight recommended for winter strawberry protection is 1.25 oz/yd² (42 g/m²). A variety of fabric widths are available, with common widths ranging from 15 feet to 60 feet. This material currently costs about 4 cents per square foot. With proper care, this heavier fabric should last 3-4 seasons.



Floating row covers are widely used to protect annual plasticulture plantings.

Row covers are best applied on still days. Be sure to line up sufficient labor to place the row cover. If possible, use wider widths for more efficient application. The row cover edges must be anchored, as must areas where two covers overlap. A variety of methods are used to anchor the edges. Edges may be anchored with posts, rocks, or tube sand. The edges may also be covered with soil.

Once the mulch is in place, the job is not done for the winter. Monitor the planting frequently. If straw has blown off areas, replace at once. Watch the edges of row covers, and adjust anchors if needed. Repair any rips or holes as soon as possible.

Any reference to equipment or product brand names does not constitute endorsement over like products or equipment.

Winter Annual Weeds in Strawberries

Kathy Demchak, Penn State Horticulture

Winter annuals can be a problem in strawberries. Typically strawberry fields are left undisturbed during the fall, so it's easy for winter annuals to become established, overwinter, and then surprise you with the amount of competition they can provide during harvest season when they flower and produce seeds.

Which ones are our biggest problems? Chickweed by far is the one on which I get the most complaints, and we covered the biology of that weed in two earlier articles (see April 2006 and Dec 2003 issues of the Vegetable and Small Fruit Gazette, available on-line). Other common problem winter annual weeds are shepherd's-purse, field pansy, yellow rocket, and annual bluegrass. We'll cover those here.

First, a word on these weeds' life cycles. Sometime you'll see the same weed classified as a winter annual, a summer annual, a biennial, or even a perennial, which can be confusing. Winter annuals are those that germinate primarily in the fall and then flower and produce seed in the spring, typically dying out during hot weather. However, weed seeds of most winter annuals can germinate at times of the year other than the fall, so their timing sometimes seems to be off. Also, in different sections of the country and climates, weeds may behave somewhat differently depending on local conditions. For example, winter annuals that may die here during a hot dry summer might continue to live in a cooler wetter climate.

Here are some specifics on biology of our problem winter annuals. When you look at how many seeds one plant can produce under optimal conditions, it's easy to see why these weeds can take you by surprise.

Shepherd's-purse: In this region of the country, seeds germinate in late summer, early autumn, or early spring. Plants flower and produce seeds in late spring and early summer. Seeds are produced in heart-shaped pods, shaped like purses shepherd's used long ago. Each plant can produce up to 38,500 seeds. Seeds can live in the soil for 35 years. (Image *Purdue Extension, extension.entm.purdue.edu/.../issue25/index.html)*



Yellow rocket: This weed is in the same family as shepherd's-purse. I've seen it germinate in large numbers in fields in the fall and flower like crazy the next spring. I've also seen it classified as a biennial or perennial, though from

what I can tell in strawberry fields, it seems that the problem is more easily controlled after the first season. This one is also a prolific seed producer, at up to 24,000 seeds per plant. Not a problem everywhere, but when it is, you know it. (Image: MSU Extension, www.ipm.msu.edu/weeds-nursery/YellowRocket.htm).

Field pansy: This one looks a lot like Johnny jump-ups, though the flowers are less showy. Seeds germinate in late summer and early fall, and the plant flowers in spring. A really healthy one can produce 46,000 seeds per plant. Yikes. (Image University of Vermont, www.ppws.vt.edu/scott/weed_id/vioar.htm).

Annual bluegrass: Seeds germinate in late summer, early fall, and spring. I've seen figures stating that it can produce 20,000 seeds per plant, though I've also seen numbers much lower. This plant doesn't always die out during the summer. (Image University of Missouri, extension.missouri.edu/.../ipm1007bluegrass.htm).



So, what's the best thing to do if you have these weeds on your farm? If you have only a few, be sure to pull them out before they have a chance to produce seed (re-read the seed numbers above if you need extra impetus).

Certain pre-emergent herbicides work well (see the table below), and can be applied around Labor Day where the label allows this timing (Sinbar in the establishment year, and Devrinol and Dacthal in any year) to keep weeds from establishing. If you missed applying an herbicide before the weeds emerged, Sinbar and Chateau (Chateau can't be used until the plants are dormant) both have some kickback activity, so they can

Table 1. Herbicide efficacy on certain winter annual weeds for pre-emergent (Chateau, Dacthal, Devrinol, and Sinbar) or post-emergent activity (Stinger, Poast and Select)

	Chateau	Dacthal	Devrinol	Sinbar	Stinger	Poast	Select
Chickweed	Good	Good	Good	Good	None	None	None
Field pansy	No data	Good	None	Good	None	None	None
Shepherd'spurse	Good	Poor	Fair	Good	None	None	None
Yellow rocket	No data	None	None	None	Poor	None	None
Annualbluegrass	Poor	Fair	Good	Fair	None	Poor	Fair*

*label indicates improved control at up to the 4-leaf stage

(Source: The Penn State Vegetable & Small Fruit Gazette, Volume 12, No. 10, October 2008.)

burn down weeds while still in the cotyledon stage. Tillage when the weeds are young can disturb them enough to keep them from establishing between the rows, which then gives you a second chance to apply herbicides at a later time than Labor Day. Finally, pre-emergent herbicides can be applied in late fall, just before straw is applied over matted rows, which will prevent additional weeds from germinating during late fall, mild spells in winter, and early spring.

A word on rates on these materials – split applications work well with Devrinol and Sinbar. The maximum yearly rate for Devrinol 50DF is 8 lb/a and for Sinbar 80WP is 8 oz/a. With Devrinol, you can split the total, applying 4 lb/a around Labor Day and the balance before you put the straw down. With Sinbar, assuming that you may have applied 2 oz/a earlier in the establishment year (the labeled rates and timing are more restricted in later years), you can apply an additional 2 oz/a around Labor Day, and 4 oz/a or whatever amount you haven't used for the year before putting the mulch on. Also, with Sinbar, see the label for different rates allowed depending on the amount of organic matter you have in your soil.

Stinger, Poast, and Select are post-emergent materials. Stinger has little or no activity on these weeds, while Poast and Select are post-emergent grass herbicides that don't work all that well against annual bluegrass once established – so you may want to concentrate on preventing that one from establishing in the first place through pre-emergent materials and shallow tillage.

As always, follow the label. It's the final word on allowable use.

Editor's note: Be sure to check with your supplier and/or state specialist to be sure a product is registered for use in your state (SGS).

RASPBERRY

The Biology and Management of Raspberry Crown Borer

Jackie McKern, D. T. Johnson and B. Lewis, University of Arkansas

The raspberry crown borer, *Pennisetia marginata* (Harris) (Family: Sesiidae; clearwing moths), is a pest of blackberries and other cane fruits.

Distribution

This pest is native to North America. The distribution has been recorded as: New England west to Nebraska and south to Georgia and an additional distribution in Washington, Oregon, California, New Mexico, and British Columbia, Canada.

Damage

If preventative control is not maintained, within a few years the accumulated damage by larval feeding within the crowns can result in a significant reduction in yield and plant death. During the mid- to late summer, some larvae will feed in the lower couple inches of a cane, weakening the cane, reducing nutrient flow. Trellised plants may exhibit reduced cane vigor whereas wind may break the weakened base of free-standing canes. They can become girdled; causing the whole cane to dry up and the terminal form a dead shepherd's crook. Larval tunneling also provides entry for pathogens and moisture that cause the crown to decay and die.

Life Stages and Life Cycle

Eggs are reddish brown, oval in shape, 1/16" long and appear slightly rough under magnification. In October



and early November in Arkansas, single eggs can be found on the underside of the new lighter green terminal leaves that developed in September.

Larvae, after hatching in October, are 1/10" long with a brown head and a white body covered with a few colorless hairs. A full-grown larva found in August may be 1.1" long with a smooth reddish brown head and a dull white body.

Along the ventral surface, the body is constricted and has three pairs of short prolegs. A distinguishing characteristic is the crochets on the prolegs that resemble small setose



spines rather than hooks. Before May, the larvae are very difficult to find under the bark on the lower canes. Larvae can be found inside crowns and in the lower four inches of canes from early May until pupation in August or early September.

Pupae are reddish brown, varying in length from 3/4" to 1". Legs are held closely to the body and are unable to move. They have a circlet of spines located dorsally on each abdominal segment facing downward used to aid pupa to exit tunnel in cane or crown when molting to a moth. The male pupa is smaller than the female and has two rows of spines on the sixth abdominal segment, whereas the female has one row. The head of the pupa terminates in a four-angled, sharply pointed process.

Moths mimic yellow jacket wasps. They vary in both size and color between sexes. Males have wingspans of from 3/4" to 1", the females from 1" to 1.5". The head is black with yellow rings around each eye and black antennae; the thorax is brownish black with three yellow spots on each side between the eye and the forewing; each segment of the abdomen, except the last, is encircled by two contrasting bands, the anterior black and the posterior yellow. The forewings are transparent with a brown discal cell and bordered by brown. The bands of yellow on the female are usually more pronounced and wider when compared to the male. The female has smooth antennae, an enlarged abdomen and the last abdominal segment is solid yellow with a very slight anal tuft. The male has comb-like (pectinate) antennae and the last abdominal segment is black mixed with yellow with a large anal tuft.

Biology

Knowing the biology of a pest is important for the implementation of efficient control tactics. Recent evidence indicates the raspberry crown borer in Arkansas completes its life cycle in one year, instead of the two years required in cooler, more northern latitudes. In the more northern states

(OH, IN, IL, and further north) the adults emerge earlier (August to early September) than in Arkansas (mid-Sept and October) and require 2 summers to complete the RCB life cycle. In AR and further south the life cycle of the RCB is completed in 1 year.

Adult flight and egg laying can occur from mid-September through mid-October. Flight varies from year to year, for example in Conway, AR the flight began on September 16 in 2004 and was delayed until October 5 in 2005. Mating occurs in the late morning on the upper side of a shaded blackberry leaf. A virgin female raises her abdomen and begins calling males by everting her ovipositor, beating her wings and releasing a sex pheromone.



Males in range follow the pheromone odor (plume) upwind toward the “calling” female. As the male lands near the female, she stops wing fanning and the male begins wing fanning. The couple circles each other for about 20 minutes then mate for about 90 minutes. During the day, mated females fly from plant to plant within a row depositing single eggs on the underside of newer blackberry leaves, usually one of the new fall flush of lighter green terminal leaves. A single moth may lay up to 150 eggs. Egg development requires from 40 to 60 days with hatch occurring from early October to early November. The young larva chews a small exit hole in the egg. Upon hatching, larvae follow the leaf veins to the petiole and began crawling down the cane on the shaded side toward the ground. The descent of the larva averages 15 cm within 5 min. Within 30 minutes it reaches the bottom of the cane, wedges itself in a small bark crevice, and bores into the bark leaving only a small pinpoint of frass and silk at the entry point. It forms a round cavity in the bark (hibernaculum) where it curls up and is inactive over the winter. The following spring the larva tunnels into the cambium. By early May, the larva begins to tunnel into the crown of the plant and feed. From late April to early August, larvae occur in the crown beneath the soil making it difficult for insecticide to contact larvae and control them. By the end of July or early August the larva is fully developed. The mature larva bores from the crown upwards into a cane to a few inches above soil level. The larva bores a small escape tunnel through the side of the cane leaving a thin intact covering of bark for protection against weather and predators. Pupation occurs from mid August through mid- to late September. In mid-September to early October, the chisel-like head of the pupa breaks through the thin

layer of bark covering the escape tunnel. The pupa wriggles part way out of the cane by flexing its spined abdominal segments. The pupal case splits lengthwise and the adult crawls out, leaving the pupal case protruding from the cane. At this point, males fly off in search of females. Virgin female moths walk up the cane to a leaf in the upper canopy and begin calling males for mating.

Control

Better raspberry crown borer management could result in more sustained, healthy caneberry plantings that could yield fruit for a longer period of time. Currently, blackberry plantings are removed every 6-8 years. Timing of applications could make a significant difference in the efficacy of treatments due to the different locations of the larvae within the plant

throughout the season. The insecticide bifenthrin, applied as a soil drench directed at the base of blackberry plants using 50 to 100 gal of spray solution per acre in the last week of October and early November, resulted in excellent control (99 to 100% mortality) of the overwintering larvae on the lower canes, slightly less control when applied in early April (83 to 90% mortality), and poor control when applied in May (33% mortality) (McKern et al. 2007).

In October 2005 and 2007, two formulations of bifenthrin (Capture 2EC, Brigade 2EC Brigade WSB) received EPA registration for caneberries against raspberry crown borer at a rate of 6.4 oz product/acre (0.1 lbs a.i./acre). Directions for use are: apply 6.4 oz product/acre, post-harvest (fall) or pre-bloom (spring), as a drench application directed at the crown of plants in a minimum of 200 gallons water/acre. Research in Arkansas has noted sprays diluted in 50 gallons water/acre to be effective against raspberry crown borer (McKern et al. 2007). Greater efficacy is observed in an application prior to a significant rainfall event. Do not make pre-bloom foliar and pre-bloom drench applications. Restrictions: do not apply more than 0.20 lbs. a.i. per acre per season and do not apply within 3 days of harvest.

Natural Enemies

There are a few natural enemies of the raspberry crown borer but all produce less than 67% reduction in the local borer population, while several insecticides (including Capture) cause nearly 100% mortality. The nematode *Steinernema feltiae* caused 33 to 67% raspberry crown borer larval mortality when applied to soil in Colorado in June and July (Capinera et al. 1986). Two entomopathogenic nematodes, *S. carpocapsae* and *Heterorhabditis bacteriophora*, applied as a soil drench to the base of blackberry plants in early April caused 53 and 33% raspberry crown borer larval mortality, whereas *S. feltiae* applied in October after egg hatch killed 46% of raspberry

crown borer larvae (McKern et al. 2007). On October 11 and 14, several raspberry crown borer egg parasitoids in the family Eulophidae emerged from several hundred eggs collected from a blackberry planting in Conway, Arkansas. In Ohio, two parasitoids emerged in the fall from raspberry crown borer pupae, e.g., *Pterocormus chasmodops* and *Bracon bembeciae*, but none have been collected in Arkansas.

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(Pictures courtesy Dr. Marvin Pritts, Cornell University. Article reprinted with permission from "The Bramble" The North American Raspberry and Blackberry Growers Association newsletter, Vol. 23 No. 3, Autumn 2008)

(Source: The Bramble, the newsletter of the North American Raspberry & Blackberry Association (NARBA) Vol. 23, No. 3, Autumn 2008)

For more information about the association and about its upcoming conference Dec. 8-9 in Grand Rapids, MI, visit www.rasperryblackberry.com

BLUEBERRY

Putnam Scale on Blueberries

Kathy Demchak, Penn State University

Last summer in late June, a local county extension office was contacted by a grower who noticed some small white dots on their blueberry fruit. The dots were surrounded by a narrow reddish ring, and beyond that, a surrounding light-colored bleached area. The diagnosis (thanks to Dean Polk and Cesar Rodriguez-Saona at Rutgers) was Putnam scale.

There have been several instances of Putnam scale being diagnosed as a problem on blueberries in Pennsylvania, and though the frequency hasn't been high, I'm suspicious that this insect may be more common than you'd think. A heavy infestation of Putnam scale can result in a decline in plant vigor, smaller berries, and eventual plant death, so you may want take a look for these insects after the leaves fall off the bushes, or monitor for them next spring.

Putnam scale falls in the category of armored scales, which means that the insects themselves, which are soft-bodied, are protected by a hard coating. This affects which control measures are effective and timing of their use. Newly-hatched scale insects are called "crawlers" because they move to their feeding locations, and it is only at this point in their life cycle that they are exposed. Putnam scale is found not only blueberries, but also can be found on apple and cherry trees, and various forest and shade trees including maple, ash, beech and oak. Putnam scale may be most commonly brought into a planting on nursery plants, but crawlers can also be moved in from surrounding forest or fruit trees by wind, birds or insects. Their populations most commonly build when pruning has been minimal.

On blueberries, most of the scales are found under the rough bark on older canes - another good reason to prune the oldest canes out. By removing older canes, you remove a good percentage of the scale population, and also their most-protected living areas. A recent report suggested that the scale may only be seen on other areas of the plant, such as young stems, leaves, and berries, when their living conditions become too crowded on the older stems.

So, how do you know whether you have Putnam scale? The scales once mature are difficult to see, as they may be covered by bark, and appear as tiny (only 1/16" in diameter) gray waxy dots. If the waxy covering is lifted off, yellow insects can be seen underneath. The crawlers also are yellow. Double-sided sticky tape can be wrapped around the stems in spring and early summer, when crawlers on the tape should be apparent. Applying black electrician's tape (sticky-side out) to the double-sided tape will make the crawlers on the edge of the tape more visible, but you'll probably still need a magnifying lens or hand lens to see them, as they are about the size of mites. Research in New Jersey showed that there are two generations of this insect per year in warmer areas of New Jersey. In colder areas of the Northeast such as Connecticut, only one generation occurs. Most, if not all, of PA, probably falls in the one-generation-per-year area, but this isn't for certain. The bottom line is that crawlers will be around in spring to early summer, but if you are in a warm location where there are two generations per year, they may be found in midsummer also. Photos of all life stages can be found at <http://www.blueberries.msu.edu/scales.htm>.

Besides pruning out old canes, conserving naturally-occurring predators of Putnam scale - several species of parasitic wasps - will help with management. This means

avoiding the use of broad-spectrum insecticides (whether conventional or organic) when possible. Lime sulfur applied in the springtime for disease control also helps with scale control. Superior oil can be applied when the buds are swelling, but prior to green tissue appearing. This material is basically used to smother overwintering scales, but coverage must be complete. Use 3.0 gal of oil in 250-300 gallons of water per acre at high pressure (300-400 psi).

Esteem 35WP at 5 oz/ is labeled for Lecanium scale, which can also be a problem on blueberries, but isn't labeled for Putnam scale. Esteem's active ingredient (pyriproxyfen) is a juvenile hormone mimic. It is relatively specific, affecting certain insects such as scale crawlers and cherry and cranberry fruitworm larvae, and is safe to parasitic wasps and bees. However, on the down side for predator conservation, it is also toxic to ladybird beetles.

Life cycle and further info on control measures for Putnam and other scales are outlined in the Blueberry chapter of the Mid-Atlantic Berry Guide, available

possibly through your county Extension offices (call ahead) or on-line at <http://pubs.cas.psu.edu/freepubs/MABerryGuide.htm>.

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(*Source: The Vegetable & Small Fruit Gazette, Vol. 12, No. 11. November 2008*)

GRAPE

Post-Harvest Checklist for Vineyards

Jodi Creasap Gee, Cornell University

It's safe to say at this point that we've reached the end of the growing season. What has not been picked by now will likely not be picked at all - unless, of course, late harvest and ice wines are in the future for some growers and wine makers. Congratulations for making it through the season! Now is the time to think about post-harvest chores. Clean up and storage and all the fun tasks that come with winterizing vineyard equipment.

Post-Harvest Checklist:

For those of you who also receive the wine grape production newsletter from Penn State University's State-wide Wine Grape Educator, Mark Chien, this is a slight repeat. However, this certainly bears repeating after such a hectic growing season and long harvest. With a few modifications for our region, including juice grapes, here's a checklist for post-harvest activities:

1. Collect all bins that may be distributed far and wide. Clean and store them properly, under cover if needed.
2. Take the nets off the vines and store bird control devices and other items that are in the vineyard during the growing season for the winter.
3. Collect your weight tickets or whatever you use to calculate your charges to your customers. Send itemized invoices out to the wineries with payment

terms. Check and double-check your contracts and numbers. If there are issues related to the contract, you can either take that up with the winery or processor now or a little later.

4. You have probably noticed vines with red leaves or white varieties with leaf curl. These may or may not be candidates for virus - be sure to check the trunk for damage or crown gall. If the trunk is clean, tag and test the vine for the presence of virus(es). They should be pulled if they test positive for virus, or you should plan to renew trunks if tumors or injuries are present.

5. If you have new vineyards that are clean tilled, it is too late to get a winter cover planted, but plan to get some grass on the soil for next year to prevent erosion. Prep the ground properly with a disc and harrow (no rototillers, please), then rent or borrow Chautauqua County's no-till drill or use an inexpensive seed spreader and roll the seed into the ground. The standard types of grasses used are rye, barley or oats. These are not permanent covers and, when taken down, they will enhance the fertility of your soils. Remember, the higher the organic matter in your soil, the less nitrogen you need to apply pre-bloom. You can plant a permanent cover of durable slow and low growers like creeping red fescue, especially if vine vigor is a chronic problem. It will likely be expensive.

6. If you had weed problems this year, you might want to try a fall application of Roundup after the leaves drop from the vines. Remember, use of several 2, 4-D formulations is illegal in the Western New York Grape growing counties, so double-check formulations and regulations prior to applications to eliminate broad-leaf weeds.

7. Be sure to record trouble spots in each block, be it a downy mildew, powdery mildew, or phomopsis problem from this year. Losing leaves to disease only skews the leaf-to-fruit ratio, thereby making ripening more difficult in these "high yield and minimum standards" times. Being on top of sprays right out of the gate next spring will keep the vines cleaner and healthier and more productive. A healthy vine can be a productive vine.

8. For grafted plants, hybrid or vinifera, and younger vines (<5 years old), you will need to hill up vineyard soil with a grape hoe or grape hoe-like device to insulate the graft unions. Recall that the graft union is essentially a weak spot - like scar tissue - that is more sensitive to cold temperatures. Sure, we had a fairly mild winter last year, but that doesn't mean Mother Nature won't surprise us this winter. Hill up 5" to 6" of dirt over the union. Other options include straw and mulch. The lighter the material, the more volume you need to protect the vine. Hilling up can be tricky, and this is where laser-planted vineyards can be very nice - the straight rows allow for relatively easy hilling up and taking down of soil. Ask someone who's experienced in hilling up, if need be, and remember that weed management needs to be spot-on, and soil conditions should be just right (not too wet or dry).

9. How much is your equipment worth to you? Vineyard equipment is expensive and essential, so take good care of it. Clean, winterize, oil, grease, and properly store vineyard equipment that is not to be used again until spring.

10. We had a few rough times during this season - what, with the hail storms and all. Tour (walking is best, but a Gator will do) around your vineyards to assess trouble spots - damaged posts, vines that need to be replaced, ruts between rows, etc.. If vines need replaced, record what and where and order plants now. Grafted vines should be planned for 2 years in advance, so plan to plant those in 2010.

11. Many growers are already pruning, are you? Is your equipment ready, and do you know who will be pruning and what their skill level is? Pruning sets the tone for quality in 2009; recall we hit the high yield trifecta this

year - more buds left, more water, and little to no crop thinning was done. While this led to high yields, many vineyards struggled to reach minimum levels of soluble sugars, which may or may not pay off.

12. If you can, talk to winemakers to request samples of your wines, especially the lots that are not yet blended. We had several winemakers and vineyard managers experimenting with vineyard treatments this year, so this is a prime opportunity to demonstrate how what you do in the vineyard affects what happens in the winery. Talk to the winemaker who buys your fruit and discuss the season, the fruit quality, and assess if anything needs to be done differently next year. Wine grapes bring more money because more work is required to make high quality fruit for fine wines. Your grapes represent this region - you certainly would prefer a positive perception of good quality fruit and wine, right? It's kitschy, but true: Quality starts in the vineyard, and it is essential to forge a relationship with the winemaker to whom you are selling fruit.

13. When you have the time, sit down and review the season carefully. This season started out warm and sunny and finished wet and cool. Figure out what worked and what didn't, and remember that if you were trying something new in your blocks, it usually takes almost 3 full seasons to see a statistically significant difference in treatments. Again, record trouble spots (disease, insects, frost pockets, etc.) and plan to manage your blocks accordingly for next year. Vine balance seemed to be a problem in some vineyards this year, although it did not prevent grapes from being harvested. Plan for this for next year. Will you leave more buds on and plan to crop thin 30 days post bloom? Or will you plan to leave fewer buds on this year? One of the keys to vineyard management is managing on a yearly basis - every year is different, so you cannot always have the same practices from year to year. How was vineyard nutrition? Did you get your soil and petiole tests completed and recommendations back? Plan for nutrient amendment applications to build up soil health. Should anything be done differently for next year for vineyard floor management? Finally, you are running a business, so assess the health of the business. Did you make money? Did you sell your entire crop? Take a long, hard look at this and determine where you can improve efficiency and profitability without cutting corners at the expense of vine health.

14. Take a deep breath, send out your thanks, and relax with your families for a few days.

(Source: Lake Erie Regional Grape Program Electronic Crop Update - 11/13/2008)

GENERAL INFORMATION

What is the Best Way to Put Micronutrients into Plants?

Steve Bogash, Penn State Cooperative Extension

There are several ways to approach micronutrient plant nutrition. The first and best long-term management technique is to have sufficient micronutrients available to plants through their root system. Root micronutrient (and macronutrient as long as we are talking nutrients) uptake is largely based on pH, and having nutrients in available forms and in sufficient amounts so that and single nutrients' availability is not adversely affected by other nutrient concentrations. Secondly, plants also take in nutrients through their leaves. Foliar application can be an excellent method to make up for short term deficiencies. A regular program of timely tissue testing is the only method to spot deficiencies before they affect plant health and yield.

In general, when we are talking micronutrient deficiency in our region we are considering levels of Copper, Iron, Manganese, Boron, and Zinc. Calcium and Magnesium are primary nutrients, but since they are seldom addressed in articles relating to macronutrients and we use similar techniques to make up for deficiencies in them, their application is included here. Working towards a slightly acidic pH of 6.2-6.8 in the root zone will greatly increase the availability of most of the nutrients needed to grow a good small fruit or vegetable crop (with the notable exception of blueberries). As pH in the soil solution approaches 7.0 and higher, many nutrients become less available. Some soluble fertilizers such as Miller's Nutrichem 9-15-30 contain a blend of micronutrients formulated largely as chelates which are very stable and available to plants along with N, P and K. Dry kelp meal or kelp extracts are good natural sources to bring soil micronutrient levels up. Some, but not all of these products are OMRI listed. Soluble fertilizer blends consisting only of a blend of micronutrients such as Miller's Microplex are another option. Specific nutrient materials such as Helena's Ele-Max Super Zinc and Ele-Max Magnesium FL are very useful in supplementing zinc and magnesium levels. Trace elements fed to livestock and applied as manure to fields will often prevent micronutrient deficiencies.

While agricultural limestone and dolomitic limestone are good sources of Calcium and Magnesium, the often heavy application rates of these materials have the unpleasant side effect of increasing pH, thus decreasing the availability of many other nutrients. Applications of liquid calcium products, calcium chelate, magnesium oxides and magnesium chelate will increase the availability of these nutrients without adversely impacting soil pH.

Foliar application of nutrients is an excellent method to cure immediate deficiency problems. The single greatest concern in foliar application is in causing phytotoxic reactions, thus damaging leaves or fruit. While you might apply #1-2 / acre of Zinc chelate through drip lines, a foliar application of 3-8 oz of the same material is sufficient. Up to #3/ acre of Boron as Borax can be applied to the soil, yet only 4-8 oz/ acre is the maximum that can be applied foliarly. Growers can utilize tank mixes in applying many micronutrients. However, just as some mixes of fungicides and insecticides can be phytotoxic, multiple micronutrients in a tank mix can have a similar result. Most injury shows up within the first 48 hours. So apply a test solution to a small area, wait 48 hours and assess the situation before making the entire application. Foliar applications are best used to make up for short term deficiencies. Growers will either need to apply them often or combine foliar with fertigation application. The first step in producing a healthy crop is in creating a healthy canopy. Once you've burned the leaves from too much material or a toxic blend, it is very challenging to turn the crop around.

Copper and zinc deficiencies are often not seen when fungicides / bactericides such as Kocide, Phyton 27, Champ, mancozeb, Manzate, Dithane are used as these materials contain either copper or zinc (zinc-based materials are primarily fungicides while copper materials do double duty). In fact, tissue testing often indicates very high to toxic amounts of these materials if the samples are pulled shortly after their application.

Liquid kelp extracts are often applied foliarly to make up for general micronutrient deficiencies in crops grown under organic production rules. Many organic growers that I've spoken with in the Lancaster area are convinced that fermented vermiculture solutions not only supply vital nutrients, but also confer serious disease prevention characteristics. Fertrell Products worked in a side-by-side tomato nutrient study this past season at Penn State's Southeast Research and Extension Center (SREC, also known as the Landisville Research Farm). We are just starting to analyze the results of that study which will be published over the next few months. An increasing number of new nutrient products are being introduced to serve the organic production market. Be sure to check the most recent OMRI listing and check with your certifier before application as this list is evolving over time.

Of all of the errors that I've made and seen growers make over the years, simple mathematical errors that occur in determining foliarly applied micronutrient rates seem to be the worst. It is very easy to make a simple mistake of one decimal point in calculating rates and burn a crop past the point of no return. A one decimal point mistake can produce

a 10x error that will readily create a micronutrient solution that is very toxic to a crop. Foliar application also complicates tissue testing since the laboratory has no way of knowing whether the boron / zinc / copper.... that is showing up in their sample is sitting on the tissue surface or has been taken up by the plant. For field samples, wait to harvest tissue until after a soaking rain. When pulling greenhouse or high tunnel samples, wait at least one week after nutrient application, carefully wash the leaves or petioles, then, blot dry on paper towels. This simple extra care in sample handling will greatly increase test accuracy.

Both foliar and root applied micronutrients are useful in maintaining plant health, neither method is better than the other. A program of soil or media testing prior to planting followed up with regular, timely tissue testing and subsequent nutrient application is the “solution” to applying micronutrients. While several examples of specific fertilizer blends and manufacturers were mentioned in this article, Penn State does not recommend one product over another. Speak to your current supplier, shop around for products that meet your needs and always get competitive pricing. Be sure you are comparing like materials. (**Source:** *The Vegetable & Small Fruit Gazette, Vol. 12, No. 11, November 2008*)

Upcoming Meetings:

- Nov. 18, 2008.** *Diagnosis, Visual Assessment and Management of Plant-Parasitic Nematodes of Vegetables and Small Fruit in the Northeast*, Lehigh County Cooperative Extension Office, Allentown, PA. For more information contact Beth Gugino at bkugino@psu.edu.
- Nov. 22, 2008.** *Berry Production for Beginners* 9:00 – 11:30, Washington County Annex II next to CCE Building Hudson Falls, NY For more information contact Cornell Cooperative Extension at 1-800-548-0881 or Laura McDermott at lgm4@cornell.edu
- Dec. 8-10, 2008,** *North American Raspberry & Blackberry Conference* in Grand Rapids, MI, as part of the Great Lakes Expo. For more information, email info@raspberryblackberry.com.
- Dec. 9-11, 2008.** *Great Lakes Fruit, Vegetable and Farm Market Expo*, DeVos Place Convention Center, Grand Rapids, <http://www.glexpo.com/>.
- Jan. 9, 2009,** NEV&BGA and Extension All Day Winter Meeting, Chicopee, MA. For program and registration information contact John Howell at howell@umext.umass.edu.
- Jan. 17 2009 9:00 - 11:30,** *Introduction to Berry Growing*, Cornell Cooperative Extension Cayuga County, 248 Grant Avenue, Auburn, NY 13021 To register or for additional information, contact Cornell Cooperative Extension at 315.255.1183.
- Jan. 19-21 2009,** *North American Strawberry Growers Annual Meeting*, New Orleans, LA For complete program and registration information go to <http://www.nasga.org/>.
- Feb. 3-5, 2009.** *2009 Mid-Atlantic Fruit and Vegetable Convention*, Hershey Lodge and Convention Center, Hershey, PA. For more information contact William Troxell at 717-694- 3596 or visit www.mafvc.org.
- Feb. 7, 2009.** NEV&BGA and Extension All Day Winter Meeting, Waltham, MA. For program and registration information contact John Howell at howell@umext.umass.edu.
- Feb. 11-13 2009,** *New York State Fruit and Vegetable Expo and Becker Forum* Syracuse, NY. For complete program and registration information, go to <http://www.nysaes.cornell.edu/hort/expo/>

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