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CROP CONDITIONS:

Strawberry renovation is underway. See related article in this issue. Fertilization is important for good canopy regrowth. Watch for root weevil infestations and renovate or plow down promptly if feeding is observed. This will reduce populations significantly. Sprays may still be needed. Also watch for cyclamen mite and potato leafhopper infestations, especially in new fields. Pull blossoms and set runners on new plantings. **Raspberries/blackberries** are in full harvest now. Irrigation during this hot dry weather will be important for maintaining berry size and cane health. Watch for two-spotted spider mites and potato leafhopper, especially in fall fruiting varieties. Be on the lookout for Orange Rust on black raspberries and blackberries. Also keep an eye out for symptoms of fire blight in raspberries. Leaf samples should be taken now for tissue analysis. **Blueberries** are also in harvest now. Blueberry Scorch has been found in Massachusetts. Be sure to check for aphids and promptly control aphids in blueberries as they can vector the blueberry scorch virus from infected to healthy plants. Leaf samples can be taken for tissue analysis from now to mid August to determine nutrient status of the bushes. This is especially important for blueberries since soil tests are not a reliable check on adequate nutrition. Late varieties may still benefit from fungicide applications to control anthracnose and alternaria fruit rots. **Grapes** are in green fruit. Powdery Mildew is a concern on susceptible varieties. Maintain an open canopy with good sunlight penetration and air circulation to help control this and other diseases. Grape Berry Moth is also active now. Pheromone traps are good monitoring tools for this pest. Scouting for disease and insect levels and taking corrective action are important activities before bunch closure. Mite infestations can build up quickly at this time of year. Be sure to check the underside of your leaves. Insects that will also need attention now are Potato Leafhopper, rose chafer/Japanese beetle and Grape Berry Moth. **Currants and Gooseberries** harvest is almost complete with growers reporting a heavy crop. Some foliar diseases are evident now and should be controlled. Two-spotted spider mites may also be building up.

Spotted Wing Drosophila - Update

SWD has been found at this date (mid-July) at several locations in Massachusetts as well as in Connecticut, Rhode Island and New Hampshire. Online information and resources are being developed continuously. UNH has a very good site at http://extension.unh.edu/Agric/AGPMP/Spottedwingdrosphila.htm. Penn State University has also just released a new series of excellent fact sheets on SWD for the Northeast. They can be found at:
Spotted Wing Drosophila, Part 1: Overview and Identification: http://pubs.cas.psu.edu/FreePubs/PDFs/xj0045.pdf
Spotted Wing Drosophila, Part 2: Natural History: http://pubs.cas.psu.edu/FreePubs/PDFs/xj0046.pdf
Spotted Wing Drosophila, Part 3: Monitoring: http://pubs.cas.psu.edu/FreePubs/PDFs/xj0047.pdf
Spotted Wing Drosophila, Part 4: Management: http://pubs.cas.psu.edu/FreePubs/PDFs/xj0048.pdf

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for the two-week period, June 28 through July 11. Soil temperature and phenological indicators were observed on or about July 11. Total accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments for the 2012 calendar year. This information is intended for use as a guide for monitoring the developmental stages of pests in your location and planning management strategies accordingly.

Region/Location	2012 Growing Degree Days		Soil Temp (˚F at 4" depth)	Precipitation (1-week gain)
	2-week gain	Total accumulation for 2012		
Cape Cod	347	1,272	80˚	0.20"
Southeast	325	1,226	77˚	Trace
East	367	1,328	81˚	0.31"
Metro West	320	1,209	71˚	0.50"
Central	321	1,276	68˚	0.67"
Pioneer Valley	352	1,327	68˚	0.42"
Berkshires	225	1,016	69˚	0.22"
Average	322	1,236	73˚	0.33"

(***Source***: *UMass Landscape Message #16, July 13, 2012*)

STRAWBERRY

Strawberry Renovation

Sonia Schloemann and A. Richard Bonanno, UMass Extension

Matted row strawberry plantings benefit from a process called 'renovation' after harvest to stimulate new growth to support next year's crop and to interrupt the build-up of certain pests and diseases mid-way through the growing season. For best results, renovation should be started immediately after the harvest is completed to knock down two-spotted mites, sap beetles and/or root weevils and to promote early runner formation. Early runner-set translates to higher yield potential the following year. Build-up of leaf spots and other foliar pathogens can be

cleaned up with this process, too. Renovation should be completed by late-July in normal years. The following steps describe renovation of commercial strawberry fields. Specific rates and timing of applications can be found in the New England Small Fruit Pest Management Guide at http://www.umass.edu/fruitadvisor/pdf/2010NESmallFruitGuide.pdf.

1. **Weed control**: Annual broadleaf weeds can be controlled with the 2,4-D amine formulation (Amine® 4 or Formula 40) applied immediately after final harvest. Be extremely careful to avoid drift when applying 2,4-D. Some strawberry damage is also possible if misapplied. Read and understand the label completely. If grasses are a problem, sethoxydim (Poast) will control annual and some perennial grasses. However, do not tank mix Poast and 2,4-D.

2. **Mow the old leaves off** just above the crowns 5-7 days after herbicide application. Be careful not to damage crown by mowing too low.

Mowing strawberries at renovation. Photo by Eric Hanson, Mark Longstroth and Bob Tritten

3. **Fertilize the planting**. The main goal is to deliver nitrogen at this time to help regrow the canopy. Nitrogen should be applied at 25-60 lbs/acre, depending on vigor and basic soil fertility. Split applications (one now and the rest in 4-6 weeks) are better than a single fertilizer application. This gives plants more time to take up the nutrients in the fertilizer. A leaf tissue analysis (recommended once the canopy has regrown) is the best way to fine-tune your fertilizer program. This will tell you what the plants are actually able to take out of the soil and what nutrients are in sufficient supply or not. See Leaf Tissue Test Sampling Instructions at the UMass Soil and Tissue Testing Lab website at http://www.umass.edu/soiltest/list_of_services.htm for more on this.

4. **Subsoil**: Where tractor and picker traffic has been heavy on wet soils, compaction may be severe. Subsoiling between rows will help break up compacted layers and provide better infiltration of water. Subsoiling may be done as a later step if field conditions are unsuitable.

5. **Narrow rows and cultivate between rows**: Reduce the width of rows to 12-18 inches at the base. More berries are produced along row edges than in row middles. Wider rows lead to lower fruit production (yield and quality) and increased disease pressure. Narrow rows also give better sunlight penetration, air circulation, spray coverage, and over-all fruit quality. Use a roto-tiller, multivator or cultivator to achieve the row-narrowing. Work in the straw between the rows at this time, too. If possible, try to throw 1-inch of soil on top of the rows at this time to stimulate new root formation on established crowns and new runners.

6. **Weed control**: Pre-emergence weed control should begin immediately after the plants are mowed and the soil is tilled to narrow the crop row. The most common practice at this time is to apply half the annual rate of terbacil (Sinbar at 4 oz/acre). It is essential that the strawberry plants are mowed, even if 2,4-D was not applied, to avoid injury from Sinbar. If regrowth of the strawberry plants has started, significant damage may result. Some varieties are more sensitive to Sinbar than others. If unsure, make a test application to a small area before treating the entire planting. Sinbar should not be used on soils with less than 0.5% organic matter or on reportedly sensitive varieties. Injury is usually the result of too high a rate or overlapping of the spray pattern.

If Sinbar is not used, napropamide (Devrinol at 4 lb/acre) or DCPA (Dacthal at 8- 12 lb/acre) should be applied at this time. Dacthal is preferred over Devrinol if the planting is weak. If Sinbar is used, napropamide (Devrinol at 4 lb/acre) should be applied 4 to 6 weeks later. This later application of Devrinol will control most winter annual weeds that begin to germinate in late August or early September. Devrinol should be applied prior to rainfall or it must be irrigated into the soil. During the summer, Poast can be used to control emerged grasses. Cultivation is also common during the summer months. Cultivations should be shallow and timely (weeds should be small) to avoid root damage to the strawberry planting. The growth of strawberry daughter plants will also limit the amount of cultivation possible especially near the crop row. Other materials that can be used at this time include Chateau and Prowl H20. See the New England Small Fruit Pest Management Guide for specific rates and other information.

7. **Irrigate**: Water is needed for both activation of herbicides and for plant growth. Don,t let the plants go into stress. The planting should receive 1 to 1-1/2 inches of water per week from either rain or irrigation.

8. **Cultivate to sweep runners into the row** until plant stand is sufficient. Thereafter, or in any case after September, any runner plant not yet rooted is not likely to produce fruit next year and is essentially a weed and should be removed.

Coulter wheels and/or cultivators will help remove these excess plants in the aisles.

9. **Adequate moisture and fertility during August and September** will increase fruit bud formation and improve fruit yield for the coming year. Continue irrigation through this time period and fertilize if necessary. An additional 20-30 pounds of N per acre is suggested, depending on the vigor.

Rooting Strawberry "Tips" to Create Plugs

Steve Bogash and Kathy Demchak, Penn State University

1) Use tips only from a reputable source. Tissue cultured mother plants are the preferred source. Using tips from your own or other local fields can create future problems, as there is the potential to move diseases and mites from field to field. Also, many varieties are patented and require licensing in order to take cuttings. USDA varieties are not patented, and can be propagated at no charge.

2) Ideally, tips should be planted as soon as they arrive. However, if this is not possible, the tips may be stored at 34˚F and 75-80 percent humidity for up to two weeks from the date they were harvested from the mother plants. If you're in a pinch for time and cooler space, pack the plants in ice. Allow 35 days from planting to grow a field-ready plug. Trim any runner cord to a 3/8- to 1/2-inch stub before planting.

Strawberry Plugs (photo courtesy Steve Bogash)

3) Carefully cull the tips you are going to plant. Anything that looks at all questionable should be discarded.

4) Sort tips by size. Do not plant small and large tips in the same trays, as the smaller plants are likely to get shaded. The smaller plants in this now lower canopy in the flat are ripe for botrytis and powdery mildew as air circulation will be poorer in the lower canopy.

5) Plant the tips in plug trays with 50 cells per tray. Use a sterile media designed for rooting herbaceous "bare-rooted" plants. This includes most professional grower mixes. If you are recycling trays, be sure to remove all organic matter from them, then chlorine dip (one part liquid bleach to nine parts clean water) the trays prior to use. Be careful to avoid contamination of the propagation area.

6) The hook on the tip should be just in the potting media. Do not bury the crown.

7) Do not fertilize just planted tips. The fertilizer charge in most potting media will be sufficient until the plants are well-rooted. Fertilize for the first time at two weeks after planting using 100 parts per million (ppm) of nitrogen with calcium nitrate as the source, and repeat at weekly intervals. If you are holding the plants for longer than four to five weeks (thus creating super plants), switch to 20-20-20 at 100 ppm of nitrogen for later applications.

8) Your goal is to keep the leaves moist until the tips start to create their own roots. Hot, sunny days will require extra mist, while cooler, cloudy days less mist. The assumption with the following misting regimen is that you will be placing the new tips in a greenhouse or high tunnel. Enclosed structures will require less misting as wind will not dry the leaves as with plants growing outdoors. Do not allow the surface of the leaves to dry for the first seven days. Mist using fogger nozzles of an intermediate discharge rate. Start with the following misting regimen, but adjust it as needed to prevent over-watering or desiccation of the leaves:

a) Time for the system to reach operating pressure needs to be factored in as this regimen assumes actual misting time.

b) Day 1-7: Use five seconds of mist every 15 minutes.

c) Day 7-12: Gradually reduce misting. Keep the media moist. Misting should be terminated by the end of this period.

d) After week three, the plants should be well-rooted and ready to begin conditioning for field planting. Keep the media moist, but expose the plants to full sun by setting them on a field wagon or on groundcover fabric. Keeping them in a greenhouse or high tunnel is okay, but do not mist and maintain good airflow.

e) Do not mist after sundown, even at first. Some growers believe misting after sundown can create bigger plugs, but

the greater chance of disease offsets any possible benefits.

Additional recommendations:

• Plants can be rooted in either an enclosed structure (greenhouse/high tunnel) or outdoors. If outdoors, choose a protected location to keep the unrooted tips from being dislodged by wind or heavy rain. Be sure to put down a layer of groundcover fabric before rooting plants outdoors. Make sure your misting set-up is working ahead of time.

• Shade cloth can be used to limit plant desiccation, but is not recommended. This will slow the time from sticking the tips to having field-ready plugs by about a week.

• Soil inoculants such as Plant Shield and Mycostop may be advantageous in preventing soil-borne diseases. However, no definitive research has been done using these products on strawberry tips at this time. In other crops, these products have prevented a wide range of soil-borne diseases.

• Due to the constant misting, control of diseases should be managed primarily with good ventilation. Any fungicides that are applied during the time the tips are being misted will be washed off too quickly to accomplish anything. However, a fungicide application to the plants prior to planting is probably a good idea. • Scout the plants for spider mites. Their eggs are tiny so use a hand lens. If any eggs or mites are found, treat before planting in the field. Materials for two-spotted spider mite control include: Vendex, Acramite, Oberon, Kanemite, Portal and Zeal. Zeal is only for eggs and immatures. As always, growers should closely follow label restrictions and requirements. Thanks to Dr. Frank Louws at North Carolina State for disease control pointers and to David Lankford, formerly of Davon Crest Farms, for many helpful suggestions.

RASPBERRIES/BLACKBERRIES

Raspberry & Blackberry Harvest & Postharvest Handling

Craig Kahlke, Lake Ontario Fruit Team

Bramble (raspberries and blackberries) are the most delicate of the small fruit we harvest in the Northeast, so special care must be taken in their handling. Since nearly all of the bramble operations in our region are harvested by hand for the fresh market, training pickers becomes extremely important. Prior to harvest, workers should undergo a Good Agricultural Practices (GAPs) training, in which they are instructed on proper hand-washing, personal hygiene, and subsequent harvest of produce with clean hands. They should only take breaks and eat lunch in designated area(s) outside the harvest area, and should not eat or smoke while in the field. Hand-washing is mandatory when returning to the fields to continue harvest. Only potable drinking water should be brought into the picking area. An operation that is strictly pick-your-own (PYO) should provide hand-washing facilities prior to entrance to the field. Signage should also be provided similar to the worker dos and don'ts above.

Workers should be instructed to only pick undamaged berries with good appearance, and harvested fruit should not be exposed to direct sunlight. Finger pressure will damage berries, so observe pickers and train them to pluck brambles delicately. Do not pick the berries when they are wet. One-half pint containers are the traditional size for brambles, and wide, shallow containers are better than deep ones. Over- ripe berries will crush lower berries in the container if it is too deep.

As most raspberries and blackberries produced in the Northeast are consumed quickly, these operations should harvest fruit as close to peak ripeness as possible. The theory here is that whether PYO or a small roadside stand or farm market, consumers will pick or buy the fruit, promptly refrigerate them, and consume them within 2-3 days. Thus storage life is not a serious consideration, so fruit should be harvested at or near peak ripeness and flavor. If the operation plans on retailing the fruit to local or regional supermarkets, more care must be taken in harvest, postharvest handling, and stage of fruit at harvest. In this case, fruit may sit a while or suffer a break in the cold chain, reducing storage and shelf-life. Therefore, it is best to harvest fruit slightly under-ripe. These brambles will be firmer and consequently hold up better in the long-term, with some sacrifice of flavor. 31-34 F is ideal. Pallets of fruit should be transported in refrigerated trucks leaving space for cold air movement along the walls, floor, and ceiling. If berries are covered with plastic, berries should be allowed to warm only when they are ready to display to customers, allowing condensation buildup on the outside of the plastic wrap.

Whichever the type of operation, berries will likely need to be harvested at least every other day. Regardless of the final market destination, brambles will have longer storage and shelf-life if they are harvested early in the morning and promptly cooled. Early in the day there is less heat buildup in the fruit and they will cool quicker

than fruit harvested at mid-day. Retail growers may want to consider setting up an inexpensive forced-air cooling system to more rapidly remove field heat from your fruit and therefore cool them much faster than traditional passive cooling. For more information on forced-air cooling, see the article "Forced-air Cooling to Improve Berry Quality & Shelf-life" in the May 21, 2010 (Volume 10, Issue 13) article of Fruit Notes. This article is also in the New York Berry News, June 10, 2010 (Volume 9, Number 6) that can be found online at http://www.fruit.cornell.edu/nybn/archives/html.

Brambles picked early in the day, rapidly cooled, and kept in a cold chain can expect to have a maximum storage life of 5 days in our region.

Resources: Raspberry & Blackberry Production Guide for the Northeast, Midwest, and Eastern Canada, NRAES-35. 2008.

(***Source**: New York Berry News, Vol. 11, No. 6. June 2012*)

BLUEBERRY

Controlling Japanese Beetles in Blueberries

Rufus Isaacs, Michigan State University

Japanese beetles can feed on the foliage and fruit of blueberries, causing damage to the plant and increasing the risk of fungal diseases. Their emergence during mid-summer can also create a risk of contamination of harvested berries. Japanese beetles are highly mobile insects and can fly into fields from surrounding areas. This article provides information on management options based on research conducted over the past few years at the Trevor Nichols Research Complex and at grower's farms.

Scouting. Weekly scouting for beetles should be done through July and August to identify field with, and without, beetle pressure. This can help ensure that management is targeted to the most important areas, and it will help with planning pest management activities around harvest activities. Regular field scouting can also detect the distribution of beetles in a field. If scouting indicates that the field only has beetles on the perimeter, as is often the case, a border application can be sufficient to gain control and allow harvest of beetle-free fruit. Grassy adjacent areas are often a source of beetles, so be on the lookout for this pest in fields near pastures, golf courses, urban areas, etc. Since the beetles are good flyers, this also applies to areas that might be across a road or hedgerow.

Fig 5. Adult Japanese beetle; *Photo: P. Jenkins.*

Field management. Clean cultivation is a highly effective method to reduce the suitability of fields for Japanese beetles, because the female beetles search out moist grassy areas to lay their eggs. Grassy perimeters may still be attractive and harbor beetle grubs, but there are approaches to making these areas less suitable for larval survival (see last section below). For many farms, clean cultivation may not be a suitable system due to potential problems with dust or mud, so growers have implemented a mixed system that has bare ground when beetles are flying in July and August, followed by a fall seeding of winter rye to provide soil structure during winter and spring. This is then mowed and tilled in the spring before beetle activity. Such a system is an effective approach to minimizing the suitability of fields for this pest.

Weeds can be a big draw for this beetle, so make sure fields do not have sassafrass, Virginia creeper, raspberry or blackberry, or any other attractive weeds growing in them. These plants are much more attractive than blueberry plants, and once beetles find them and start feeding, this will attract more beetles to the field.

In small plantings, beetles can be removed by hand and put into soapy water to help reduce the population. Use of monitoring traps in crop fields is not recommended since these traps will draw beetles from the surrounding landscape into the field, creating hot- spots around the trap where the beetles feed, mate, and lay eggs.

Broad-spectrum insecticide options. The organophosphate Imidan (buffer to pH 6.0) provides excellent activity on adult beetles, providing 7-10 days of activity, with a 3 day PHI.

The pyrethroid Asana has been labeled for a few years in blueberry and this provides high mortality and some repellency of Japanese beetles. However, this insecticide

also has a 14 day PHI making it of less use as harvest approaches. Blueberries also have label for Mustang Max (4 oz per acre) and Danitol (10-16 oz per acre) which are also pyrethroids. These have shorter pre-harvest intervals (Mustang = 1 day, Danitol = 3 days) and can be applied aerially and by ground. These products are also highly effective against Japanese beetles.

The carbamates Sevin and Lannate provide immediate kill of beetles present during the spray. They are also stomach poisons, so if beetles eat treated foliage they will also receive a higher dose. This can be a good property for control of Japanese beetles since they eat so much that a strong dose of insecticide is taken up. Lannate has a short residual activity of a few days, whereas Sevin provides a week or more of protection. Sevin has a 7 day PHI in blueberries which has reduced its usefulness near harvest.

Selective insecticides. The labeling of Provado, Actara, and Assail for use in blueberries after bloom provides selective options for Japanese beetle management. These provide 2-3 days of lethal activity from the surface residues before the residue is absorbed into the foliage. Thereafter, beetles must eat treated foliage to get a dose of the insecticide. Once inside the foliage, these neonicotinoid insecticides are rainfast and provide significant sub- lethal effects of repellency and knockdown activity, but with much less direct mortality from the residues. All three of these insecticides will also provide excellent control of aphids and leafhoppers, especially if the spray is applied to the whole bush. Assail has a 1 day PHI, while Provado and Actara have a 3 day PHI in blueberries.

Short PHI and organic insecticide options. For growers looking for beetle control immediately before harvest or in organically grown fruit crops, some selective insecticides with 0 day PHI's can provide a tool to repel beetles and help achieve beetle-free fruit during harvest. Compounds containing neem (Azadirect, Neemix etc.) have a 0 day PHI and pyrethrum (Pyganic) has a 12 h PHI. These compounds are labeled for organic use, and have a short but effective impact on adult Japanese beetles, with some mortality, some knockdown off the crop, and some repellent activity. Typically there is only 1-2 days of activity against beetles because the residues do not remain active for long. The non-organic form of Pyganic, called Evergreen, also has a 12 h PHI, and is much more effective against Japanese beetle than Pyganic due to the addition of a chemical that inhibits the beetle's ability to break down the insecticide.

Soil-applied insecticides. Japanese beetles typically lay their eggs in moist grassy areas and many fruit farms have a large amount of this suitable habitat. An additional approach to managing Japanese beetle populations is to target the grub stage of this pest in these areas to reduce the abundance of beetles in the following year. If the location of high grub densities near fruit fields is known, these areas could be treated with a soil insecticide to get maximum return on this treatment. Our experience in Michigan blueberry fields has been that application of Admire (16 oz/acre) to grassy field perimeters, applied in late June, reduced the abundance of beetles on nearby bushes in the following year. This effect only lasted for the first few weeks of their flight period, however. After that, beetles flying into the area from outside swamped out this effect, so there is only a short-lived benefit from targeting the grubs in fields that are surrounded by infested grassy areas. This approach is expected to work best in isolated farms with minimal immigration of beetles from surrounding areas. (***Source**: Michigan Blueberry Newsletter, Volume 4, Issue 12, June 22, 2010*)

GRAPE

Mid-Season Grape Berry Moth Management For 2012

Rufus Isaacs, Michigan State Univ.

So far this spring we are seeing generally lower GBM pressure than recent years. This is perhaps due to the early frost and extreme heat of the past few weeks. In vineyards where growers expect to harvest this season, monitoring for GBM should still be part of the IPM program. Growers who are managing their vineyards for harvest in 2012 should now consider protecting berries from grape berry moth in vineyards, as the second generation of this pest can infest berries and lead to later cracking and splitting of fruit as the berries start to swell.

The MSU model for grape berry moth predicted the start of the second generation egglaying around June 25th in Berrien county. This is based on 8 1 0 growing degree days accumulated since the date of wild grape bloom which was in mid to late May across the region. Growers in more delayed sites would expect this egglaying to have started in late June/early July. In general across the state we are getting into the second generation of this pest.

The date of wild grape bloom can be used to predict the start of second generation egglaying at your location using the MSU grape berry moth degree day model (on line at www.enviroweather.msu.edu, look for grape berry moth model in the fruit section).

The predicted start of egglaying is the optimal timing for application of insecticides that are active on eggs and young larvae, such as Intrepid, Altacor, and Belt. For these products, excellent cluster coverage is essential but once it is on the clusters, long residual control of grape berry moth (2-3 weeks) and rain-fastness are achieved. For products that are broadspectrum that are best timed for egg hatch, applications should be delayed to be timed

100 degree days later, at 910 degree days from wild grape bloom. For the locations in far SW Michigan, this was closer to Independence Day but sites in NW Michigan that are close to cluster closure are also likely close to this point now.

The MSU GBM model is a tool to assist with timing of control measures. It is not designed to replace regular vineyard scouting, which can show the exact date of wild grape bloom at your farm. In vineyards being harvested growers should also be checking clusters for the level of infestation by grape berry moth through the season, to provide indications of whether it is worth the expense of a pesticide application.

In our recent research trials, spray programs that timed applications for berry moth control based on the degree day model outperformed those that used a calendar approach. This was the case for broad spectrum insecticides, and even better control was achieved when we tested degree-day timed sprays using some of the new insecticides that are highly active and long-lasting for berry moth control. For example, a program using Intrepid at 8 oz/acre applied at 810 degree days followed by Altacor at 3 oz/acre applied at 1620 degree days provided similar or slightly better control than a Sevin and Imidan program in the mid and late season timings. Altacor also has activity against Japanese beetles, making it a useful tool for mid-season control when both pests are present. Belt has a similar mode of action to Altacor and is less expensive, but it is more selective and does not provide the Japanese beetle control. Other pest insects may be important in your vineyards, but if you are focusing on berry moth control, degree daytimed applications of long-lasting and active insecticides applied with excellent coverage provides an effective program to reduce pressure from this pest.

Finally, a word of early warning for growers with vineyards that will be harvested this year. The exceptionally early and warm weather this summer is setting up conditions that will favor a fourth generation of grape berry moth in the late part of the summer. If 1620 degree days falls before early August (and it looks like it will), this means that the eggs laid around that time will be primed to develop through all the way to moths, rather than stopping at the pupa stage for overwintering. After the recent experience during hot summers (think 2010), we are better able to predict this and will provide some updated warnings as that time of the season approaches.

Drought Stress, Vine Performance, and Grape Quality

Joseph A. Fiola, University of Maryland

Although it is generally accepted that grape and ultimate wine fruit quality is better in relatively "dry" seasons, it is clear that water STRESS or excessive drought is NOT desirable for balances of yields and wine quality. Excessive water is not desirable but adequate water to keep the plant systems active and productive is mandatory!

Effects of "excessive" drought stress:

- Vine growth is inhibited – may seem desirable, but if old leaves are diseased or damaged there will be no replenishment of new leaf surface for photosynthesis.
  - The desired leaf-to-fruit ratio is about 12-15 leaves per cluster.
  - Growth processes like shoot growth and early berry growth are very sensitive to water stress.
  - Early drought stress will not allow the development of the proper ratio and the vine will not have the capacity to properly ripen fruit.
- Reduced photosynthesis - optimum wine quality does not come from stunted vines with non-functional leaves.
  - Leaf photosynthetic function is less sensitive than growth, however, postveraison stress (now) may slow down the photosynthetic function and suppress ripening.
- Fruit ripening may be delayed or suppressed, potentially decreasing quality and increasing risk of disease and bird predation.
  - Brix may appear to increase, but may be the result of dehydration, not actual increase in sugar.
  - Post veraison berry growth is quite resistant to water stress.
  - Small berries typically are associated with high quality, but if the small size is due to excessive stress, the grapes may not produce high quality wines.
  - Varietal character (secondary products) develops in the last few weeks before ripening, so late stress also affects flavor development.
  - Wines made with grapes from drought stressed vines have typically been characterized by having dull or little fruit, less complexity, and relatively short life.
  - Untypical or Atypical aging (UTA or ATA) has been associated with grapes that have been produced in seasons of drought stress, either directly or through drought induced nitrogen deficiency.

The desirable scenario of drought stress for optimal grape wine quality:

- Adequate water early in the season to have good, but not overly-vigorous, canopy and cluster development through bloom.
- Mild stress should gradually develop after bloom so that good fruit set can occur, but the growth of the berries and shoots are slowed somewhat.
- After fruit set, the canopy should be filling the trellis, and at this time the stress should increase so that the shoots slow growth markedly, the berries stop growth at a somewhat reduced size, and yet the leaves are still fully functional.
- Mid-season to harvest, the vines should be maintained at the intermediate stress to reduce vegetative growth, but keep the leaves healthy through harvest.
- There should be minimal basal leaf yellowing before harvest if the canopy is kept properly open.
- Stress does not get too severe at any point. Look for signs of leaf wilting and tendril drying.
- Irrigate if vines become too stressed during ripening, especially just after veraison.
- Canopy management should be meticulous.
- Careful cluster thinning to balance the crop is critical – do not try to maintain a large crop on drought stressed vines.

For newly planted and young newly bearing vines:

- A very conservative approach should be taken with young vines just beginning their bearing cycle (2-5 years old).
  - Crop should be thinned or even dropped completely under severe drought conditions as it may affect the winter sensitivity (cold damage) and long term survivability of the vines.
  - Irrigate if necessary to avoid severe stress.
- For newly planted vines, drought stress needs to be avoided – irrigation and weed management are necessary – to maintain good establishment.
  - Poor winter survival is a much greater risk in newly planted vines that have been exposed to severe drought stress.
- Pay special attention to new "replants" in existing vineyards as these are sometimes forgotten at this point.

High wine quality appears to require adequate, but not excessive, water supply early in the season to support the crop. Moderate stress later will help limit further vegetative growth, but allows healthy leaves to fully ripen the fruit. Severe stress should be avoided.

References:

Gladstone. Viticulture and Environment.

Lakso and Pool. Drought Stress Effects on Vine Growth, Function, and Implications for Wine Quality Ripening. Winkler. General Viticulture.

(***Source**: Maryland Timely Viticulture, Mid-Season Series*)

GENERAL INFORMATION

Small Fruit Leaf Tissue Analysis

Sonia Schloemann, UMass Extension

Leaf tissue testing is an excellent way to monitor plant nutrient levels. With perennial fruit crops, leaf analysis is better than soil tests for determining an optimal fertilization program. While soil tests reveal the quantity of certain nutrients in the soil, leaf analysis shows exactly what the plant has taken up. However, soil tests are necessary for determining soil pH (and lime or sulfur recommendations) and soil organic matter content (SOM). If nutritional problems are suspected in a given planting, it's a good idea to take both leaf and soil tests.

Leaf analysis is helpful for detecting nutrient deficiencies (especially of minor nutrients) before they effect plant health or yield. The best tissue analysis for berry crops comes from green, healthy, whole leaves (except for grapes). Do not submit plant tissue that has disease, leaf burn, insect or hail damage. Keep the material in a cool place (insulated chest) or refrigerate before mailing. Record all foliar sprays in case the results are influenced by nutrient or pesticide applications.

A minimum of 50 leaves from raspberries or strawberries, and 80 to 100 leaves from blueberries should be selected for each analysis. Do not mix leaves from fields with different soil types or management histories. Do not combine leaves from healthy plants with plants that are not growing well.

Strawberry:

Strawberry samples should be taken from the first fully-expanded leaves after renovation, about July 15 to August 15.

Raspberry:
Raspberry samples should be leaves from non-fruiting canes taken between August 1 and 20.

Blueberry:
Blueberry samples should be leaves taken during the first week of harvest, from July 15 to August 15.

Grape:
Grape samples should be taken either at bloom or veraison (berry coloring). Bloom samples should be taken from leaves opposite first fruit cluster on a shoot. Verasion samples should be taken from the furthest fully expanded leaf on a current season's shoot. Unlike other berry crops, grape tissue testing is done on just the leaf petioles, so the leaf blades can be discarded.

Place samples in sealed paper bags, clearly labeled with field names. Below is a list of labs that perform leaf tissue analysis:

MASSACHUSETTS
Soil & Plant Tissue Testing Laboratory - West Experiment Station/UMass Amherst MA 01003 Telephone: 413-545-2311 www.umass.edu/soiltest

NEW HAMPSHIRE
University of NH Analytical Services Lab - Spaulding Hall, Room G28A, 38 Academic Way Durham NH 03824 (603)862-3200 *http://extension.unh.edu/agric/agpdts/soiltest.htm*

PRIVATE
Brookside Laboratories - 308 South Main St. New Knoxville, OH 45871 Telephone: 419-753-2448 http://blinc.com

Spectrum Analytic - 1087 Jamison Rd. Washingon Court House, OH 43160 Telephone: 800-321-1562 http://www.spectrumanalytic.com/

Fertigation of Vegetable Crops

Bill Lamont, Penn State

Total fertility requirements in plasticulture are not different than those in conventional open-soil culture. With a drip irrigation system, however, application can be much more precise and timed with crop development. Soluble fertilizers can be added to the drip irrigation water to provide uniform crop fertilization. A simple "hozon brass siphon mixer" venturi injector draws soluble fertilizer from a bucket or jug into the line at a preset ratio (usually 1:16 or 1 gallon for every 16 gallons of water flowing through the line). However the hozon injection system; is suitable only for 1⁄3 to 1⁄2 acre plantings or less. Other venturi units are available in sizes up to 2 inches in diameter. More expensive injectors with greater capacity and accuracy use an electric or hydraulic "pump" to inject fertilizer solutions from a stock tank into the line. A hydraulic device, called a Dosatron, placed in the mainline can be set a various dilution rates and operates with water flowing directly through it. Use only high quality, soluble fertilizers that completely dissolve. All fertilizer injections should be made ahead of either the main filters on the line or the secondary filters if placed closer to the field, so that any contaminants are filtered out.

Fertigation is used most commonly to supply nitrogen and potassium, because they are highly soluble and move easily through soils to roots. Phosphate and micronutrients are best applied prior to planting and not injected through the irrigation system. Other chemigation applications may include pest control measures, but check label restrictions on use in chemigation applications. If any fertilizer or chemicals are applied through the system, a check valve or proper back-flow prevention devices are required to ensure that no contamination of the water source is possible.

Preplant Fertilizer
Take a soil test to know what level of fertility is in your soil. Use a starter fertilizer, a small amount of fertilizer, either liquid or dry, that is applied in the bed in drip irrigated crops. This fertilizer would contain all of the phosphorus (P) and micronutrients and up to 20-30% of the nitrogen (N) and potassium (K). On soils testing very low in P and K, the starter can be broadcast or banded in the bed. If only small amounts of P and micronutrients are required, then it would probably be better to band these materials 2 to 4 inches below the bed surface and to the side of the plant row but not between the drip tube and the row. In most cropping situations, approximately 20 to 30 lbs per acre of N and K would be sufficient in the starter fertilizer mixture. In situations where the soil test index for P is high or very high, then no P would be added to the soil.

Note on phosphorous and micronutrients. In general, simultaneous application of P and micronutrients is not recommended in drip irrigation systems. This is because of precipitation events that can happen between the fertilizers or between the P and the calcium or magnesium in the well water. If application of P is required during the season (such as during cold periods), it should be injected as phosphoric acid alone, in separate applications. Acidification of the irrigation water to pH 4.0 to 5.0 might be needed to keep the P in solution during this fertilizer application. Acidification can be achieved by using phosphoric, sulfuric, hydrochloric, or

other acids to reduce the pH of the water. Concentrated acids always must be added to water, never the reverse.

Similar problems also occur for micronutrient injection. The key is to avoid precipitation. If micronutrients must be injected, then soluble forms, less subject to precipitation, such as chelates, should be used. Like P, micronutrients should be injected alone.

Injected Fertilizer Rates

In most situations, injected fertilizers will consist only of N and K. The amount of N to use is determined basically by the N requirement of the particular crop. This amount of N is recommended for each crop for each season. The current recommendations for open- soil culture can serve as "starting points" for developing local plasticulture recommendations.

The amount of K to be injected is based on the soil- test predicted requirement of K for the crop minus the portion of this requirement that is applied in the bed as a starter. For example, if the soil tested medium in K, perhaps only 100 lb. per acre of fertilizer would be required for the season. If 20% of this K, i.e., 20 lb., were applied in the bed as starter fertilizer, then 80 lb. would be injected through the season.

Sources

Several sources of N and K can be used for drip irrigation injection, but all sources must be highly water soluble to be effective. Nitrogen sources include ammonium nitrate, calcium nitrate, various N solutions, and urea. Potassium can come from potassium nitrate, potassium chloride, or potassium sulfate.

Frequencies

It is most convenient to think of rate of injection in terms of pounds of a particular nutrient per acre per day or week. For example, the recommended schedule of N injection for a particular crop might be to start out early in the season with l lb. N/acre/day and finally inject 2.5 lb./acre/day when the crop is at its peak growth rate. The general rule is that the amount of N and K injected /day or week starts out low and peaks with the crop demand for the nutrients. It is tied to the stage of crop growth or development.

Nutrients can be injected into the system in various frequencies. Basically, the frequency of injection, whether once a day or once every 2 days or even once a week, depends on system design constraints, on soil type, and on grower preference. Research has shown that the frequency, even up to once per week, is not as important as achieving a correct rate of application of nutrients to the crop during a specified period of time. With computer control of drip irrigation systems, some growers find it easy to inject more frequently, such as once every day. This may have a slight advantage logistically. For example, injecting fertilizer on a more frequent basis would reduce the chances that nutrients were leached from the beds during a heavy rain storm or excessive irrigation compared to injecting larger amounts on a less frequent basis. If the chances for leaching losses are extremely low for any particular field, then injection once per week would be satisfactory. In any case, it is extremely important that the nutrients applied in any irrigation event are not subject to leaching either during that same irrigation event or by subsequent irrigation events. This is why knowledge of the crop root zone is important for optimum fertilizer management. It is critical to monitor the application of water and to realize that fertilizer application is linked closely to water application. **To be a good fertigator, a grower first needs to be a good irrigator.**

When injecting fertilizer in noncontinuous (bulk) fashion, such as once per day or once per week, it is important to keep in mind a few pointers about the operational sequences for the injection events. The drip irrigation systems always should be brought up to operating pressure prior to injecting any fertilizer or chemical. After the system has been pressurized fully, the fertilizer can be injected. Following the completion of the fertilizer injection, the drip irrigation system should be operated for a period of time to ensure flushing of the nutrients out of the tubes and into the soil. This period might be the next irrigation cycle of the day, if that water will not contain fertilizer. With these operation constraints in mind, it becomes very important to design the drip irrigation system so that fertilizer injection can be achieved in a reasonable amount of time without running the risk of overwatering the crop to get the fertilizer applied. This means that injection pumps, pipe sizes, and injection rates must be adjusted properly to apply the nutrients in the desired amount of time, so that the system can still be flushed without applying excess water during the injection and subsequent cycles.

In some systems, fertilizer is injected continuously (concentration injection) so that all irrigation water applied contains nutrients. This system is acceptable as long as no irrigation cycle is excessive, causing nutrients to be leached below the root zone.

It should be apparent from the above discussions that water application and fertilizer application are linked inextricably. (***Source**: Maryland Vegetable & Fruit Headline News, Volume 3 Issue 7 July 12, 2012*)

UPCOMING MEETINGS:

July 16, 2012 – *Massachusetts Fruit Growers Association Summer Meeting*. 10AM-3PM. UMass Cold Spring Orchard, 391 Sabin St. Belchertown, MA. For information see: http://extension.umass.edu/fruitadvisor/events/massachusetts-fruit-growers-association-summer-meeting.

July 17, 2012 - *Specialty Small Fruit Production and Processing at Cherry Hill Farm*. 5-7pm. Springfield, VT. For more information see http://www.uvm.edu/vtvegandberry/meetings/meetlist.html .

July 18, 2012 – *Organic Weed Management at Hurricane Flats*. 5-7pm. S. Royalton VT. For more information see http://www.uvm.edu/vtvegandberry/meetings/meetlist.html .

July 24, 2012 - *Lake Ontario Summer Fruit Tour. 8AM-5PM.* Walworth, Williamson, Pultneyville, and Alton N.Y. for information and registration, go to: http://www.fruit.cornell.edu/lof/.

July 26, 2012 - *MNLA/MFGA Great Ideas Summer Conference and Trade Show*. 9am – 4pm. Elm Bank Horticulture Center, Wellesley MA. For more information see http://extension.umass.edu/landscape/events/mnlamfga-great-ideas-summer-conference-and-trade-show.

July 26, 2012 - *Tractor Cultivation Tools for Diversified Production*. 4-6pm. Plainfield VT. For more information see http://nofavt.org/events/tractor-cultivation-tools-diversified-production.

July 31, 2012 - *UMass IPM Fruit and Veg Twilight Meeting*. 5-7:30pm at Kosinski Farm 420 Russellville Road, Westfield, MA. We will discuss IPM innovations for apples and blueberries, greenhouse tomatoes. For more information, see http://extension.umass.edu/fruitadvisor/upcoming-events.

August 7, 2012 – *Pollinator Conservation Short Course*. Randolph Center VT. For more information see http://www.uvm.edu/vtvegandberry/meetings/meetlist.html .

August 9, 2012 - *Aronia: A New Fruit Crop for the Northeast*. 1-5pm. UConn Research Farm, 59 Agronomy Road, Storrs, CT 06268. Registration required. To register or learn more, contact Lois Stack at lois.stack@maine.edu.

August 10-12, 2012 – NOFA Summer Conference. UMass, Amherst, MA. For more information and registration see: http://www.nofasummerconference.org/

August 14-15, 2012 - *NASGA Summer Tour*, Halifax, Nova Scotia. For information or to register go to: http://www.nasga.org/.

August 16, 2012 - *Aronia: A New Fruit Crop for the Northeast*. 1-5pm. UMaine Highmore Farm, 52 US Route 202, Monmouth ME 04259-0179. Registration required. To register or learn more, contact Lois Stack at lois.stack@maine.edu.

August 16, 2012 - *Orchard Health and Apple Intensive with Michael Phillips*. 1-5pm. Flag Hill Farm. 135 Ewing Rd. Vershire, VT, For more information see http://nofavt.org/events/orchard-health-and-apple-intensive-michael-phillips

If you know of an event that would be suitable for this list, please forward to sgs@umext.umass.edu