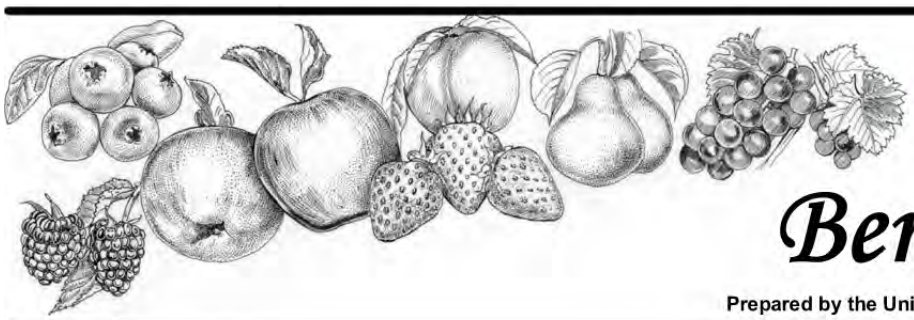

UMass Amherst EXTENSION

Berry Notes

Prepared by the University of Massachusetts Fruit Team

April 2010 Vol. 22, No. 4

www.umass.edu/fruitadvisor/berrynotes/index.html

Berry Notes is edited by Sonia Schloemann with articles written by other contributors with attribution; sources are cited. Publication is funded in part by the UMass Extension Agriculture & Landscape Program, subscription fees and generous underwriting. Questions can be directed to Sonia Schloemann at 413-545-4347, sgs@umext.umass.edu. Please cite this source if reprinting information that originates here.

IN THIS ISSUE:

Editors Note:

The 2010-2011 New England Small Fruit Pest Management Guides are available for purchase through the UMass Extension Fruit Advisor website (http://www.umass.edu/fruitadvisor/), through the New England Vegetable & Berry Grower's Association and State Extension offices by early April. It contains updated label information and pest management recommendations for Strawberries, Blueberries, Raspberries, Currants & Gooseberries, and Grapes. Cost is $12 per copy plus $4 S&H.

TRAC Record Keeping Software available online - This valuable software is available online at the following website http://www.nysipm.cornell.edu/trac/downloads/. We strongly encourage all berry growers to try this software for their operations. **For more information contact**: Juliet E. Carroll, Ph. D., Fruit IPM Coordinator, Cornell University at 315-787-2430

Plant growth is well ahead of seasonal average throughout the region: Unseasonably warm weather during March has advanced the phenology of fruit crops significantly over where we normally are at this time of year. This issue of Berry Notes contains important information on how to protect fruit crops from frost/freeze damage that may occur during bloom. Below is a table that shows how far ahead we are in Massachusetts in terms of growing degree days in various locations.

Location	2010 GDD accumulation as of April 14, 2010	2009 GDD accumulation as of April 14, 2009
Cape Cod	102	23
Southeast	107	27
East	n/a	9
Metro West	73	12
Central	n/a	5
Pioneer Valley	103	32
Berkshires	92	29
Average	95	18

Spring Strawberry Chores

Sonia Schloemann, UMass

Established plantings:

1. **Straw mulch removal** – Remove straw mulch from strawberry rows in late-March to early April. Keep straw between the rows to help suppress weeds and reduce splashing from rain or irrigation. For fields where delaying bloom to avoid frost is desired, delaying mulch removal can be a useful technique. Check plants frequently and be sure to remove mulch before any plant growth begins. Delayed mulch removal can delay bloom by up to a week.
2. **Floating row covers** – Set out floating row covers as soon as straw mulch is removed on fields where early bloom is desired. Remember to remove row covers as soon as plants beneath them are blooming to insure good pollination of the flowers. Failure to remove row covers can result in poor pollination and misshapen unmarketable fruit.
3. **Spring weed control** – Calibrate weed sprayer before season starts. Apply pre-emergent herbicides to dormant strawberries. See the 2010-11 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor) for detailed recommendations.
4. **Frost Protection** – be sure that overhead irrigation for frost protection is in place and running properly before it is needed. Pump failures and blown irrigation lines are no fun at 2:00 in the morning. The next issue of Berry Notes will carry detailed information about frost protection.
5. **Insect and disease management** – Calibrate sprayer before season starts. See article in this issue for more information. Order scouting supplies (traps, pheromones, etc.) and anticipated spray materials and store properly.

New plantings:

1. **Site preparation** – Prepare field properly well in advance of planting. This means doing site work (e.g., drainage, running irrigation mains, picking stones, etc.), and making soil adjustments (e.g., soil pH, organic matter, etc.).
2. **Preplant weed management** – Some pre-plant herbicides must be applied 30 days prior to planting. Keep this in mind. Some herbicides can be applied shortly before or after planting See the 2010-11 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor) for detailed recommendations.

1. **Planting** –
   a. Check condition of plants on arrival and contact nursery if you have concerns.
   b. Keep dormant plants moist (but not wet) and cold (32˚F) until planting.
   c. Lay out planting scheme before taking plants out of cold storage or have field ready before delivery if no cold storage is available.
   d. Make sure transplanter is in good running order before planting day.
   e. Soak roots in water for up to an hour before planting. Do not allow plants to sit in water much longer before planting but make sure they are moist until planted.
   f. Set plants so the middle of the crown is at the soil surface (not to deep or too shallow). This may take some fine-tuning of the planter.
   g. Irrigate immediately after planting to settle soil around the plants.
   h. Recheck planting depth after irrigation and make adjustments as needed.

Want to Spend Less Time Weeding Strawberries?

Use the Power of Buckwheat to get Ahead of the Weeds

Thomas Björkman, Cornell University

You can get more out of a strawberry bed by using a cover crop well in the year before planting. A properly managed buckwheat cover crop can reduce how much weeding is required and improve tilth to keep the roots more productive. Buckwheat is well known for its ability to mellow the soil, buckwheat is also good at reducing the annual weed seed bank and weakening perennial weeds The effective plan starts with a field that is open in the spring, uses a double crop of buckwheat followed by a winter-killed grain. That may seem like a lot of work, it can pay back many times over during the life of the strawberry bed.

The following planting schedule requires the full season to be completed.

1. Till the ground in mid-spring when soil conditions allow the ground to work up easily.
2. Plant in late May or early June. Prepare a good seedbed so the soil is loosened several inches deep and not lumpy. Drill 50 lb/ac, 1 inch deep or less.

Broadcasting is possible, but to avoid gaps it must be done with great care to spread evenly using 70 lb/ac. Use shallow incorporation, such as with a drag or chain, to give the buckwheat a faster start than the weeds. Good ground cover is a must for weed suppression.

3. Mow after 45 - 50 days, after immature seed have begun to form.
4. Replant as before, or if the soil is moist and there is time, allow second crop to grow from volunteers. If the soil is dry, irrigate about 1" a few days before planting
5. Mow the second crop within a week of flowering. Plant a winter cover crop (annual ryegrass, oats) in late August or early September.
6. Till in spring and plant a new strawberry crop.

The keys to success with a buckwheat cover crop is to have it start growing quickly, have no gaps in the stand, and to kill it on time. The procedure described here favors all those things.

Preparing the ground for rapid cover crop growth is important. If the field is too hard or dry at planting, the stand will be poor. A stand like the one on the left will not be effective for reducing weeds. It should look like the one on the right.

The winter cover crop is important for maintaining the tilth that buckwheat contributes and for smothering late summer and fall weeds. Grasses do a good job, and there are two that will grow well in the fall and have mostly killed residue in the spring for easy strawberry establishment. These are oats and annual ryegrass. If you need nitrogen, there is another choice.. Medium red clover can be broadcast with the second buckwheat planting. It will grow after the buckwheat is mowed in the fall and provide both winter cover and nitrogen. If it was too dry for the clover to take, plant a conventional grain winter cover.

Perennial weeds are weakened by this buckwheat regime that combines timely cultivation with smother cropping. There is quite a bit of variation in control among the perennial weed based on the limited information we have. Quackgrass is substantially set back for a lot of users. Canada thistle is weakened but not killed. *Oxalis* (yellow woodsorrel) and field bindweed don't grow a lot in the buckwheat but come back the next year from deep roots.

Volunteer buckwheat is likely to appear in the spring. The recommended schedule keeps the volunteer seed to a minimum, but some additional control will be needed. For most strawberry growers, the buckwheat volunteers are killed at planting and with the first cultivation or herbicide application. It's not difficult to control them at this stage. In fact growers have said that they saw the seedlings but did nothing extra to control them and never had them come back. However, if the early cultivation is missed and buckwheat plants set seed in the new strawberry planting, they may keep appearing over the next year or two. Thus timely control works and does not require anything beyond normal weed control in the first season. However, if volunteer buckwheat isn't controlled then, it can become an annoyance.

More information about buckwheat as a summer cover crop is available at:

www.nysaes.cornell.edu/hort/faculty/bjorkman/covercrops/ (***Source**: New York Berry News, Vol. 7, No. 3 March 2008)*

RASPBERRY

Spring Bramble Chores

Sonia Schloemann, UMass

Established Plantings:

1. **Pruning and trellising -** Finish pruning before budbreak by removing spent floricanes and thinning remaining canes to 6-8" apart. Keep row with to no more than 18" at the base. These practices allow for good air circulation and light penetration within the canopy and benefit fruit quality.

2. **Spring weed control –** Calibrate herbicide sprayer before season starts. Apply pre-emergent herbicides according recommendations in the 2010-11 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor). Hand-weed trouble spots with perennial weeds if needed.
3. **Insect and disease management** – Calibrate sprayer before season starts. See article in this issue for more information. Order scouting supplies (traps, pheromones, etc.) and anticipated spray materials and store properly. A dormant lime-sulfur application can help control cane and spur blights but must be applied before green tissue appears.

New Plantings

1. **Site preparation** – Prepare field properly well in advance of planting. This means doing site work (e.g., drainage, running irrigation mains, picking stones, etc.), and making soil adjustments (e.g., soil pH, organic matter, etc.).
2. **Preplant weed management** – Some pre-plant herbicides must be applied 30 days prior to planting. Keep this in mind. Some herbicides can be applied shortly before or after planting See the 2010-11 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor) for detailed recommendations.
3. **Planting** –
   a. Check condition of plants on arrival and contact nursery if you have concerns.
   b. Keep dormant plants moist (but not wet) and cold (32˚F) until planting. Plant as soon as is feasible after delivery.
   c. Lay out planting scheme before taking plants out of cold storage or have field ready before delivery if no cold storage is available.
   d. If using a transplanter, be sure it is in good running order before planting day.
   e. Soak roots in water for up to an hour before planting. Do not allow plants to sit in water much longer before planting but make sure they are moist until planted.
   f. Set dormant plants at the same depth as they were in the nursery. This may take some fine-tuning of the planter. Trim 'handles' to 6" at planting.
   g. Irrigate immediately after planting to settle soil around the plants.
   h. Apply a layer of organic mulch to help suppress weeds until plants are well established. Mulching is only recommended in raspberries during the establishment year. In subsequent years, mulch can lead to rot at the base of canes from excess moisture.
   i. Seed row middles to slow growing sod such as hard fescue to reduce soil erosion.

BLUEBERRY

Using Sprinklers to Protect Blueberries from Spring Freezes

Mark Longstroth, MSU Extension

Many Michigan growers use sprinkler systems to protect blueberry flowers from spring freezes. Sprinklers are very effective under certain circumstances but can actually increase injury if used at the wrong time. Sprinklers used for irrigation do not protect below 23-24°F. If the system fails due to cold or wind the blueberries will get much colder than in areas where you are not sprinkling. When you use sprinklers to prevent freezing injury, you are using the energy that water releases when it freezes, and changes from a liquid to a solid, to keep the temperature in the ice right at the freezing point 32°F. As long as you keep the ice WET, the ice temperature will stay at 32°F. If the ice dries out and water starts to evaporate from the ice the ice will get colder than the air temperature as it evaporates. The temperature will fall to the dewpoint (wet bulb temperature).

Protection with sprinklers

If you understand that you need to keep the ice wet, and when your system will fail to keep the ice wet, you will understand how to use your sprinklers to prevent freeze injury.

Table 1. Irrigation rate (inches/hour) needed to protect fruit buds under different wind and temperature conditions. (U of Florida Ext. Circ. 287)

Temp (°F)	Wind speed (mph)		
	0-1	2-4	5-8
27	.10	.10	.10
26	.10	.10	.14
24	.10	.16	.30
22	.12	.24	.50
20	.16	.30	.60
18	.20	.40	.70
15	.26	.50	.90

The freeze protection from sprinkler systems is limited by the irrigation rate. Most sprinkler systems in Michigan blueberries are designed to provide about 0.12 to 0.15 inches of water per hour. This volume protects plants to about 22° F with no wind or 24° to 25° F with a light wind. More water is needed to protect at lower temperatures and higher wind speeds, see Table 1. Since you do not know what the wind speed will be several hours from now I suggest only trying to protect to 25° F.

Most irrigation systems cannot easily be changed to deliver more water and protect to lower temperatures. Increasing the operating pressure is not advisable because the volume is not increased substantially (You need to increase the pressure 4 times to double the output). Higher pressure can break lines and reduces the uniformity of application. Larger nozzles can be installed in some systems, but only if the capacity of the system, mainlines, well and pump can handle the added volume. For example, 9/64-inch nozzles that deliver 0.12 inches water per hour require 60 gallons per minute per acre of blueberries. Switching to 5/32-inch nozzles would deliver 0.15 inches per hour but requires 68 gallons per minute per acre. Irrigation systems are not designed to apply enough volume to protect from temperatures in the low.

Critical temperatures

Growers should only use sprinklers to protect blueberry from freezing, at around bloom time. The temperature range where sprinkler can protect the crop is relatively narrow from 24 to 32 F. This narrow temperature range is also the range that will hurt blueberry open flowers. When blueberries begin to grow in the Spring the buds can handle very cold temperatures. Swollen buds can tolerate 15-20° F. The lower end of the range is where almost all the flowers are killed and the upper end is where damage begins to occur. At "early pink bud" (individual flowers are visible in bud), injury occurs between 18° and 25° F. These are temperatures colder than you can protect to with an irrigation system. In “late pink bud”, when the flowers have separated in the cluster but the flower petals are still closed, 25-28° F is lethal. This is in the range where we can protect but if there is a wind or the temperature gets a little colder than predicted we could cause more damage than if we had not turned on the system. Once we turn on the system we need to keep it on until the temperatures are above freezing or you will cause a lot of damage as the temperature of the ice goes down colder than outside the irrigated area.

It is because of this narrow margin of error that I recommend that growers only try to protect at bloom when the temperature range that will cause damage is well inside the range that we can protect to with an irrigation system. Fully open flowers are killed between 28° and 31° F. Right after bloom when the petals fall, is the most sensitive, 31° F will damage green fruit.

Dr. Mike Mainland from North Carolina State University provided a useful rule of thumb during a workshop in 2003. He suggested not even attempting frost control until at least a few flowers in the field are open. He reasons that most flowers are tight enough to tolerate 22-24F until the first flowers open, so protecting before the first bloom is not useful. This rule of thumb is especially useful when there is a wide difference the emergence of buds on a shoot. If most of the flower buds on a shoot are terminal (at the end of the shoot) and are opening at the same time, then you might want to frost protect in late pink bud. But there is no reason to try and protect flower buds at temperatures below 23 or 24F. Another consideration is wind. Don't attempt to frost protect if the combination of wind and temperature will exceed to capacity of your system to protect (see accompanying table). If the temperature gets colder or if it is windy, we have a safety margin and our system can still protect the blueberries. If we were operating the system at the edge of its effectiveness it is more likely to fail. Dr. Mainland suggested studying the weather forecast closely, and hanging colored flagging in the field to indicate wind strength.

When to turn on the System

Table 2. Starting temperature for overhead sprinkler freeze protection based on the dew point of the air.

Dew point	Start irrigation at
26 ˚F	34 ˚F
25 to 24 ˚F	35 ˚F
23 to 22 ˚F	36 ˚F
21 to 20 ˚F	37 ˚F
19 to 17 ˚F	38 ˚F
16 to 15 ˚F	39 ˚F

Once you have looked at the field and see open flowers and checked the weather and see that the temperature is supposed to get down to 26° F. You need to decide if you are going to turn on the system that night. I would not turn on the system if the temperature were forecast to fall below 24 F. If windy conditions (more than 10 MPH) were forecast I would not turn on the system at all. When you turn the system on and start to irrigate the air temperature will fall in the field. This is because the water is evaporating and cooling the air. The dryer the air, the greater the temperature falls. How dry the air is will dictate when you turn the system on. This can be calculated from the dew point, which is measured with a wet bulb thermometer on a sling psychrometer.

Once you start the system it is necessary to keep it running until the ice starts to melt on its own. If your system fails and the ice dries out and begins to evaporate it will change from a blueberry heating system to an effective refrigeration system that can significantly reduce your crop. As long as water drips from the ice the system is working. If the ice is clear, this indicates the system is working properly and the water is freezing uniformly.

When can I stop irrigating?

Stop irrigating when the ice is melting and temperature is rising. Ice breaking free from branches indicates water is forming under the ice and it is likely safe to quit. Normally this is when temperatures are above freezing and rising. Beware of sudden dips in the temperature soon after sunrise.

Soil surface considerations

Some frost avoidance can be gained by keeping the soil surface clean of vegetation, moist and packed. Moist soils have a large capacity to capture and store heat energy during sunny days, and release heat to maintain air temperature during cold nights. Weeds, sod, and plant residues insulate the soil from the sun and reduce heat capture. In addition, tall grass and weeds raise the effective ground level. This is important since cold air is heavier than warm air, and settles along the ground and in the lowest areas of fields. If fields are covered with foot tall grass or weeds, flower buds a foot higher in the canopy may be injured during a frosty night. Mowing fields with tall weeds is worthwhile.

Another consideration is that moist soils have a higher heat capacity than dry soils, and packed soils absorb more heat than recently cultivated soils. It is not worthwhile to cultivate just before a frost. Some growers attempt to irrigate during the day prior to predicted frosts in order to increase the water content of the soil Wet soil will absorb more heat. This may be of some value if water is applied early in the day, and there is ample sun to warm the wet soil. Irrigating late in the day or on cloudy days will not increase soil temperatures and provide more heat at night. The bottom line is that clean, moist, and packed soil surfaces absorb the most radiant energy during the day, and protect from frost by releasing this heat during the night. (***Source**: Michigan State University Extension – VanBuren County Blueberry Pages*)

Blueberry Disease Fast Fact Sheet; Mummy berry

Dena Fiacchino, Cathy Heidenreich, and Wolfram Koeller, Cornell University

What: Mummy berry is caused by the fungus, *Monilinia vaccinii-corymbosi*, and is one of the most important blueberry diseases in New York State. If left untreated, mummy berry can reduce yields by 30-40%. Early control and detection is necessary to reduce the impact of this disease.

When: The fungus overwinters in infected berries, or "mummies" on the soil under bushes. Mushroom-like structures (apothecia) grow out of the mummies (Figure 1). In early spring, ascospores are released from the apothecia to infect the newly emerging leaf tissue. These spores are disseminated by wind and rain. This step is the primary or shoot blight phase of the disease. Shoot blight symptoms typically develop 2 weeks after infection. Infected shoots and leaves wilt, turn brown, and die (Figure 2). Masses of secondary spores (conidia) are produced on infected shoot surfaces (Figure 3), which

Figure 1.

then infect flower blossoms, starting the second phase of the disease.

Where: Mummy berry occurs in most regions where blueberries are commercially grown. This fungus only infects cultivated blueberries and a few wild blueberry species. Generally, the disease is introduced from neighboring infected plantings or from wild blueberries in nearby woods.

How: Under moist conditions in early spring, apothecia begin to form from mummified fruit remaining on the soil surface. The apothecia slowly develop as moisture levels and temperatures rise. At low temperatures such as 35° F, spores mature slowly taking 10+ hours to release, however at an increased temperature of 61° F, apothecia take about 4hrs to fully mature.

Conidia form on infected shoots, then are carried to flower blossoms by wind and pollinating bees (who are tricked by color changes and sugar secretion into thinking that the infected leaves might be flowers). Once the fungus has been introduced to the flower, it will germinate with the pollen and slowly infect the developing fruit. Evidence of blossom infection does not appear until the fruit begins to ripen. As normal

Figure 3.

berries ripen, the infected berries begin to shrivel and turn a pinkish color. (Figure 4) These "mummy berries" become filled with fungus, and have a hard grayish white center.

They fall to the ground, shrivel up becoming pumpkin-shaped, and turn dark brown or black. These serve as an inoculum source the following spring when apothecia form and disease cycle begins again.

Control Strategies: Mummy berry can be a difficult disease to control. An integrated pest management program including both cultural and chemical control strategies is needed for best results. The best time to achieve control of this disease is during the primary infection phase.

• Rake or disk soil beneath the blueberry bushes or cover the fallen mummy berries with a 3-4 inch mulch layer before

Figure 2.

apothecia appear in the spring.

• Apply 200lbs/A of 50% urea to burn out apothecia.

• Fungicides may be used to control this disease during both disease phases. For control of the primary infection phase applications should begin at green tip and continue on 7-10 day intervals when conditions favor infection.

For secondary infection control, make applications beginning at bloom on the same type of schedule. Different fungicides are required to control primary vs. secondary infections.

For more information see *Cornell Pest Management Guidelines for Berry Crops* [or *2008 New England Small Fruit Pest Management Guide*]. Apply all pesticides according to label rates and instructions.

Figure 4.

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(***Source**: New York Berry News, Vol. 5, No. 2, March 31, 2006*)

Blueberry insect management overview for 2010

Rufus Isaacs, Michigan State Univ.

As blueberry growers prepare for pollination and for keeping their berries free of insect pests during the 2010 growing season, it is a good time to review the available insect management options, consider integrating some new tools into your integrated pest management (IPM) program, and make plans for the coming season.

If you missed the various MSU Extension talks this winter at the Great Lakes Expo or Southwest Michigan Horticulture Days, or even if you attended these programs, you should make plans to attend [local meetings planned this summer. See this and future newsletters for meeting announcements]. These meetings are a chance to update growers on the new developments in blueberry culture, report on our research trials, and provide timely updates on recent crop scouting.

This article is a chance to provide some food for thought about your 2010 insect management program based on our research projects, demonstration trials at farms, and discussions with growers and extension colleagues.

Scouting

This is an essential component of blueberry production, so you know what is in your field during the period from now until harvest. Investing in a knowledgeable pair of eyes who can visit your fields each week to look for various potential problem issues (insect, diseases, and weeds) makes good business sense to protect your investment. Whether you do it yourself, or have a scout from a cooperative visit your farm, hire an independent scout, or work with a consultant, this is time or money well spent. To help with scouting, MSU has developed a *Pocket Blueberry Scouting Guide* that is available in both English (E2928) and Spanish (E2928SP), and we have the same information posted online at www.blueberries.msu.edu. We will be scouting blueberry fields this summer in a few locations in southwest Michigan and will report the findings in this newsletter each week. But, there's no substitute for your own information from your own fields.

Spotted wing drosophila

If you haven't heard about spotted wing drosophila yet, you'll be hearing about it this summer because we want to be vigilant against this invasive pest. This small fly infests many fruit crops (including blueberries), and it is now in west coast fruit production regions from California to British Columbia. It has also recently been detected in Florida. The fly is different from our typical vinegar flies because it can lay eggs in intact fruit. We have not seen it in Michigan yet, but there has not been focused monitoring. That will change this month with the establishment of a multi-agency group focused on early detection. If this fly is detected, an industry-wide effort will be needed to ensure its impact is minimized.

Insecticides – many options to fit into your IPM program

The blueberry industry has a number of established and effective broad-spectrum insecticides for use against key pests including Imidan, Lannate, Sevin, etc. Grower's IPM programs should also include rotating to new chemical classes, using selective insecticides to reduce impacts on natural enemies, and minimizing impacts on pollinators. With the blueberry industry receiving many new insecticides in recent years, including Intrepid, Delegate, Assail, Asana, Danitol, Mustang Max, Provado, and Actara, growers now have a range of insecticides with different pest spectrums and properties that can provide effective insect control. Each of these has a fit for components of the pest spectrum in Michigan blueberries, and a grower's decision of which of these to use will be guided by efficacy, spectrum of activity, price, and resistance management considerations.

Addressing the recently-registered insecticides in turn…

Intrepid is an insect growth regulator that has proved to be a highly-effective insecticide for fruitworm control. Growers who applied Intrepid in 2009 using the MSU degree day model for fruitworms (available through www. enviroweather.msu.edu) reported very low levels of fruitworm infestation. Intrepid is safe to bees allowing application during bloom when fruitworm egglaying starts, plus it is soft on beneficials. We have been testing programs with commercial growers who apply Intrepid during bloom then switch to **Delegate** after bloom for the next fruitworm spray (also controls maggot), or switch to **Assail** for control of fruitworms, maggot, and aphids. These programs are providing equivalent control to an Intrepid-Guthion program, or an Intrepid-Asana program. **Asana** has provided excellent control of fruitworms and Japanese beetle, and gives good control of blueberry maggot. The 14- day PHI for this product can make it challenging to fit in the postbloom timing for fruitworm control, especially in early harvested cultivars. Growers

now have two other pyrethroids available: **Danitol** and **Mustang Max**. These both provide high levels of control of key insect pests similar to Asana, but with much shorter PHIs. Pyrethroids are toxic to natural enemies and will not provide long-term control because aphid populations can rebound in the absence of biological control. Aphid control, if needed, is best achieved using members of the neonicotinoid chemical class such as **Assail**, **Provado**, and **Actara**. Each of these products is highly effective on aphids, with a broader spectrum of control that can help control other pests at the same time. **Assail** also provides fruitworm and maggot control, and **Provado** also controls maggot and Japanese beetle. The **Actara** label has aphids and Japanese beetle listed.

A new registration for 2010 is **Avaunt 30WDG** insecticide now labeled for fruitworm and plum curculio control in blueberry. This provides a new chemical class, the oxadiazines, with activity at the sodium channel that leads to insect paralysis and death. It is considered "reduced-risk" by the EPA, with a 12- hour REI and seven-day PHI. Rates are up to 6 oz/acre. Do not apply during bloom.

Blueberry gall wasp

In the past few years, grower reports of problems with blueberry gall wasp have increased. Some Jersey fields were hit hard by gall wasp in 2009, and this was even in fields where growers applied Assail immediately pre-bloom to try and stop the wasps infecting the shoots. Clearly, we need a new approach and my lab will be working this summer on some examination of the biology and control of gall wasp. We hope to have some clearer answers for you later this year.

Preparing for pollination

Make sure you are getting strong hives for your pollination rental fee by checking colonies with the beekeeper. This is an important part of the pollination puzzle because bees from weak hives do not work hard and this may reduce the level of yield you can achieve if you are stocking fields based only on the number of hives. Bumble bees are another option or can be used in combination with honey bees, but large orders for those need to be placed in January and February to guarantee bloom-time delivery. Still, you may consider calling Koppert Biologicals near Detroit to enquire about availability.

Best wishes for a productive, profitable, and pest-free season! (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 25, No. 2, April 13, 2010*)

GRAPE

Postemergence Weed Control In Vineyards

Alice Wise, Andrew Senesac, Rick Dunst Cornell University

It is important to address weed control early in the season as it is difficult to clean up a well-established stand of weeds, particularly grasses. In general, weed competition should be minimal from bloom to veraison. Young vines with shallow root systems are more sensitive to weed cover than older vines with deeper root systems. Regardless of vine age, vines stressed by nutrients, pests or water will be more sensitive to weed competition.

Postemergence herbicides are used for control of established weeds. This strategy tends to be more labor intensive and thus more expensive than preemergence programs. A rainy season and the use of irrigation will increase the frequency of postemergence applications. Consequently, this strategy is better suited to smaller vineyards with the ability to keep up with tractor work.

There are two types of postemergence herbicides: those that burn back the above-ground portion but typically do not kill the root and those that are absorbed and translocated through the plant, killing the root as well. It is feasible to eliminate use of preemergence herbicides and control weeds with several well-timed postemergence applications. The trick is to make sure weeds are no taller than 6". A well established stand of weeds may require more than one application to achieve decent control. Speaking from experience, dense stands of grasses such as crabgrass and quackgrass are particularly hard to control postemergence. Discussion of several products follows – check the Cornell PIMS website to verify registration for grapes in NY, to see if there is a Long Island restriction (ex: Rely is labeled for use in upstate NY but not Long Island) and to ensure the application rates, timing etc accurate.

When should postemergence applications start? In the majority of vineyards, May is the best time to start. One, the under trellis area is not too weedy yet. Two, with warm weather and rain, a lot of weed seed will germinate. Be patient and wait for that first flush of weed growth to get the maximum bang for your buck. When we have done a season long postemergence strategy in the research vineyard, we generally have made 3 app's.

Glyphosate (Roundup and several other trade names) is a nonselective systemic herbicide, which means that the spray must not contact green grapevine tissue. If that were to occur, the active ingredient may be translocated throughout the plant. This is particularly devastating to

young grapevines. Note that uptake is enhanced after bloom thus particular care must be taken in the bloom to late season sprays. Shielded sprayers are fairly effective at preventing contact. Typically about 30 gallons of water/acre are used in application of these products, except for CDAs (controlled droplet applicators like the Enviromist), which typically apply 5-10 GPA. Glyphosate has low human and mammalian toxicity. Also, once applied, it undergoes rapid degradation by soil microorganisms, resulting ultimately in CO2 and water. The downside to glyphosate is that, with repeated use over time, certain weed species may develop resistance to this material. Thus relying exclusively on glyphosate long term is ill advised.

Aim (carfentrazone) is a postemergence herbicide that is now registered for use in Long Island vineyards. Aim controls some annual broadleaf weed species (actively growing weeds up to 4" tall) but it does not control grasses or sedges. Aim is also an effective suckering agent. Aim is used at a maximum use rate of 2.0 fl.oz./acre, max of 7.9 fl.oz. per season in a min. of 10 GPA water. In trials conducted by Rick Dunst on Concord and DeChaunac, Aim was more effective than Gramoxone in burning off sucker growth, and a tank mix of the two was more effective than either applied alone. Aim applied alone or in a tank mix with Gramoxone or preemergence herbicides should provide effective burn down of suckers. Use non-ionic surfactant or crop oil concentrate as per label recommendation.

Paraquat is a nonselective contact herbicide. There appears to be just one formulation registered in NY: Gramoxone Inteon (2 lbs./gal a.i.), use 2.5 to 4.0 pts/a in a minimum of 10 gal./acre water. Use of an NIS or COC is recommended. Note that Gramoxone Max is no longer labeled in NY and existing supplies cannot be used. Paraquat materials must not contact green grapevine tissue (unless sucker control is intended, a practice more common in native variety vineyards). Short distance translocation through grape- vine shoots is possible, though less likely. The contacted tissue however will be killed. Gramoxone is a restricted use chemical, meaning only licensed applicators may use them. Sethoxydim (Poast, PoastPlus) is a selective postemergence herbicide that will control annual grasses very well up to 12" tall. Sethoxydim is labeled for use in nonbearing AND bearing vineyards (50 days PHI). Best success is usually ob- tained with early intervention on annual grasses not more than 6" tall. Weeds that are drought-stressed are much more difficult to control. Usually a COC (1% v/v) is added for optimal control. Broadleaf weeds and nutsedge are not con- trolled by sethoxydim.

Scythe is a postemergence herbicidal soap (pelargonic acid) that ruptures the cells within green tissue. The initial effect on weeds is seen rapidly (within minutes), but the ultimate level of control may not be known for several days. As with the other products, green grapevine tissue should not be contacted. For effective control with Scythe, grasses should be very small (<3") and broadleaves should also be small. Do not expect to apply Scythe to a dense, well-established carpet of weeds and get adequate weed control. For best results, use ³ 60 GPA water. Consequently, it will not perform well when used with low volume CDA sprayers. No additional surfactants are necessary for Scythe. OMRI approval for Scythe has been rumored for several years but no word on this.

Acetic acid and **clove oil** products have been tested in vineyards with varying success. Matran EC, a clove oil prod- uct, is OMRI approved and does not have an EPA number as the company feels it qualifies as a minimum risk product. It is best applied to weeds <6" with volumes of water sufficient to thoroughly cover plant surfaces (>30 gpa). There may be control of top growth but it is not translocated so that weeds will regrow. The need for relatively high rates/ frequent reapplication makes these types of materials a more expensive option. Their best use might be in combination with other weed control techniques such as cultivation and under trellis mowing. Also, be clear on the registration status of such products; make sure agriculture is a stated use on the label. To our knowledge, there is no acetic acid herbicide product labeled for ag use in NY. (***Source**: Long Island Fruit & Vegetable Update,No. 5, April 2010*)

GENERAL INFORMATION

Sprayer Calibration

Laura McDermott, Cornell Cooperative Extension

The importance of nozzle selection and sprayer calibration cannot be overstated. There are many studies that show that hundreds, if not thousands of dollars a season can be saved with attention to spray equipment and spray application. Additionally, according to Dr. Andrew Landers, pesticide application technology specialist at Cornell University, drift from pesticide applications can be reduced by as much as 50% by correctly selecting nozzles. Perhaps most importantly, weed, insect, and disease control will be more effective if growers follow a few simple guidelines to improving their sprayer performance.

First, pesticide sprayers should be calibrated routinely. If your farm includes fields with varying terrain, the sprayer should be calibrated for terrain type. Even backpack sprayers, which are often used by small berry growers, should be calibrated routinely. Backpack sprayers should always be calibrated by the person who is doing the spraying. When calibrating the sprayer, make sure to mimic the actual application as close as possible. Fill the spray tank half full of water and drive at the normal rate in your normal gear. Repeat the process at least 3 times and take the average. If you are moving up and down a hill, make sure that you time the tractor travel in both directions. The purpose of sprayer calibration is to reduce error, so try hard to reduce possibilities of error while calibrating.

Secondly, before you calibrate your sprayer, make sure that your nozzles and your spray equipment are appropriate for the task. There are many nozzles on the market today, all with different functions. If you haven't recently thought about what your nozzles are doing for you, it's time to re-evaluate them. Make sure that spray patterns from the nozzles are what you expect. Inspect the hoses and filters, making sure the nozzles are not clogged. Non-uniform spray patterns caused by worn or clogged nozzles, or different angles or uneven boom height are the most common cause of poor applications. Also, check the calibration of your spray tank by using a hose-end meter. Pay attention to your spray pressure. Make sure that you are operating the sprayer under the pressure recommended for your nozzle type. Keep the spray pressure consistent. Faulty spray pressure will cause your spray patterns to break down resulting in untreated areas in the field.

Thirdly, simplify your life by keeping your calibration equipment together. You will be much more likely to calibrate your sprayer if you assemble your "kit" ahead of time. Keep calibration directions, records of prior calibrations, tape measure, stop-watch, pencils, calculators, calibration jug, distance markers, and plastic gloves in a tote. Keep extra nozzles, washers, and other spare parts along with simple tools in a tool kit to carry on your tractor.

Fourth, spray when the least possible drift will result. Consider low-drift nozzles, and drift reduction strategies like keeping the boom close to the target, using drift retardant adjuvants and spraying when wind is low will help you reduce losing your spray material to an undesirable target.

Lastly, be safe. Make sure to wear the Personal Protective Equipment (PPE) listed on the pesticide label. Be sure you have the proper type of gloves, respirator and footwear that are required. For directions and more information on calibrating your sprayer, see http://www.nysaes.cornell.edu/ent/faculty/landers/pestapp/.

Acknowledgements: *We would like to thank the Cornell Cooperative Extension Associations in the host counties and also the host farms: Grisamore Farms in Locke, NY; Love Apple Farm in Hudson, NY; and Handsome Brook Farm in Franklin, NY. The workshops were supported by a grant from the New York Farm Viability Institute.*

*(**Source**: New York Berry News*, Vol. 8, No. 3, April 2009)

Critical Spring Temperatures for Tree Fruit and Small Fruit Bud Stages

Compiled by Mark Longstroth, MSU Extension

Pome Fruit

Apples	Silver Tip	Green Tip	½ inch green	Tight Cluster	First Pink	Full Pink	First Bloom	Full Bloom	Post Bloom
Old	16	16	22	27	27	28	28	29	29
temp 10%	15	18	23	27	28	28	28	28	28
kill 90% kill	2	10	15	21	24	25	25	25	25

Pears	Bud Swell	Bud Burst	Tight cluster	First White	Full White	First Bloom	Full Bloom	Post Bloom
Old	18	23	24	28	29	29	29	30
temp 10%	15	20	24	25	26	27	28	28
kill 90% kill	0	6	15	19	22	23	24	24

Stone Fruit

Apricots	Bud Swell	Bud Burst	Red Tip	First White	First Bloom	Full Bloom	In the Shuck	Green Fruit
Old	--	23	--	25	--	28	--	31
temp 10%	15	20	22	24	25	27	27	28
kill 90% kill	--	0	9	14	19	22	24	25

Peaches	Bud Swell	Calyx Green	Calyx Red		First Pink	First Bloom	Full Bloom	Post Bloom
Old	23	--	--		25	--	27	30
temp 10%	18	21	23		25	26	27	28
kill 90% kill	1	5	9		15	21	24	25

European Plums	Bud Swell	Side White	Tip Green	Tight Cluster	First White	First Bloom	Full Bloom	Post Bloom
Old	--	--	--	--	23	27	27	30
temp 10%	14	17	20	24	26	27	28	28
kill 90% kill	0	3	7	16	22	23	23	23

Sweet Cherries	Bud Swell	Side Green	Green Tip	Tight Cluster	Open Cluster	First White	First Bloom	Full Bloom	Post Bloom
Old	23	23	25	28	28	29	29	29	30
temp 10%	17	22	25	26	27	27	28	28	28
kill 90% kill	5	9	14	17	21	24	25	25	25

Tart Cherries	Bud Swell	Side Green	Green Tip	Tight Cluster	Open Cluster	First White	First Bloom	Full Bloom	
10% kill	15	24	26	26	28	28	28	28	
90% kill	0	10	22	24	24	24	24	24	

Small Fruits

Concord Grapes	First Swell	Full Swell	Bud Burst	First Leaf	Second Leaf	Third Leaf	Fourth Leaf
10% kill	13	21	25	27	28	28	28
90% kill	-3	10	16	21	22	26	27

Strawberries	Buds Emerged	Buds Closed	Bloom	Small Fruit
Damage	10	22-27	28	28

Blueberries	Bud Burst	Pink Bud	Open Flower	Petal Fall	Green Fruit
Damage	< 20	< 25	27	28	28

Old standard temperature is the lowest temperature that can be endured for 30 minutes without damage. This chart also shows the temperature that will kill 10 % and 90 % of normal fruit buds. These numbers were taken from Washington (WSU), Michigan (MSU) and North Carolina (NCS) Extension Bulletins. Apple - WSU EB0913, Pears - WSU EB0978, Sweet Cherries - WSU EB1128, Peaches - WSU EB0914, Apricots - WSU EB1240, Tart Cherries - MSU Research. Rpt. 220, Portions of these bulletins are posted at Gregg Lang's Fruit Bud Hardiness Page at the MSU Horticulture Department (***Source***: *MSU Fruit Program Frost/Freeze page http://web1.msue.msu.edu/vanburen/frost.htm*)

Copper Products, Characteristics, and Uses

Bill Shane, Michigan State Univ.

Copper is a metal widely used in agrichemical products to control a wide range of fungal, bacterial and other pests. This article provides a general summary of copper compound categories as pertinent to fruit crops. For further information, see the reference section at the end.

Categories and products - Practically speaking there are two broad categories of copper compounds. Copper sulfate (bluestone, copper sulfate snow), a completely soluble copper form, and various "fixed" coppers that are less soluble. Copper is toxic to bacterial and fungal spores when in the dissolved form. Dissolved copper is the greatest risk of phytotoxicity to green plant tissue. Dissolved copper is very prone to rain wash off. Copper sulfate is generally used in combination of spray lime as Bordeaux, which helps to stick copper to plant surfaces and reduce the amount of dissolved copper. Copper sulfate is compatible with oil and lime. Since copper sulfate is very soluble with water, there is greater potential for phytotoxicity than the fixed coppers. Fixed coppers are much less soluble than pure copper sulfate. Fixed coppers are compatible with lime. Types of fixed coppers are copper hydroxide, copper oxychloride sulfate (COCS), basic copper sulfate is also known as tribasic copper sulfate (cupric sulfate, tricupric hydroxide, hemihydrate), and mixtures of two or more copper types.

Another type of "fixed" copper is the copper salts of fatty and rosin acid, sold as liquid compounds. These are not compatible with lime. Fixed copper and lime should not be used with Guthion, Imidan, Sevin, Thiodan, Bayleton, Captan, Carbamate, Syllit, or phosphorus acid fungicides, because of compatibility and hydrolysis concerns.

Bordeaux mixing procedure - A typical rate is 8 lb of copper sulfate, 8 lbs spray lime, and 1-gallon miscible superior oil per 100 gallons of water. Dissolve copper sulfate in one-half tank water. Once completely dissolved, add the spray lime (make sure it is fresh) with constant agitation as the tank fills. Add the oil last but before completely filling the tank. The mixture must be agitated continuously. Never combine copper sulfate alone with dormant oil. Properly made Bordeaux mixture should be near neutral pH (7.0) for safe use.

The copper compound table - The table summarizes characteristics of commonly used copper compounds, both dry and liquid products. The metallic copper content is the active ingredient and should be used to compare various compounds. In addition, it is important to note that copper sulfate and CS 2005 are both copper sulfate pentahydrate types. CS 2005 is used in the citrus industry and has been heavily promoted in Michigan.

Table 1. Copper product summary

Product	Copper form	Amount of formulation	Metallic copper equivalent	Unit type	Metallic copper/unit
Copper sulfate *Bluestone, Blue vitriol*	Copper sulfate pentahydrate*	99%	25%	1 lb	0.25 lb
Kocide 101	Copper hydroxide	77.0%	50%	1 lb	0.50 lb
Champ WP	Copper hydroxide	77.0%	50%	1 lb	0.50 lb
Nu-Cop 50DF	Copper hydroxide	77.0%	50%	1 lb	0.50 lb
Kocide 2000	Copper hydroxide	53.8%	35%	1 lb	0.35 lb
Kocide DF	Copper hydroxide	61.4%	40%	1 lb	0.40 lb
Kocide 3000	Copper hydroxide	46.1%	30%	1 lb	0.30 lb
Basic Copper 53	Basic copper sulfate	95%	53%	1 lb	0.53 lb
Cuprofix Ultra 40D	Basic copper sulfate= CuSO4 · 3Cu(OH)2 · H20	71.1%	40%	1 lb	0.40 lb
Basicop	Basic copper sulfate	95%	53%	1 lb	0.53 lb
Cuprofix Disperss	Basic copper sulfate	36.9%	20%	1 lb	0.20 lb
C-O-C-S WDG	Copper oxychloride sulfate	79%	50%	1 lb	0.50 lb
COCS 53%	Copper oxychloride + basic copper sulfate	53%	53%	1 lb	0.53 lb
Champ 2F Champ liquid Champium Formula 2	Copper hydroxide	37.5%	24.4%	1 gal	3.00 lb
Tenn-Cop 5E	Copper salts of fatty and rosin acids	58.0%	5.14%	1 gal	0.43 lb
Copper-Count-N	Copper ammonium carbonate	31.4%	8%	1 gal	0.784 lb
CS 2005	Copper sulfate pentahydrate*	19.9%	5%	1 gal	0.418 lb

**Note: Check labels for crops listed. Copper sulfate pentahydrate forms are more soluble than other types and thus are more prone to phytotoxicity and washoff. Fatty and rosin acid forms are not compatible with lime.*

References

Ritchie, David. Copper-containing fungicides/bactericides and their use in management of bacterial spot on peaches. Southeast Regional Newsletter. Vol 4, No. 1, March 2004.
Floyd, Robert. 1991. Bordeaux mixture and similar copper fungicides. Department of Agriculture – Western Australia. Farmnote 78.
(***Source**: Michigan Crop Advisory Team Alert, Vol. 25, No. 2, April 13, 2010*)

UPCOMING MEETINGS:

April 20, 2010 – *UMass Extension Fruit Program Twilight Meeting*. UMass Cold Spring Orchard 391 Sabin St., Belchertown, MA 413-323-6647 http://www.coldspringorchard.com 5:30. Tree fruit twilight meetings start promptly at 5:30 PM. 1 (one) pesticide recertification credit will be offered. There will be a $25 meeting admission charged at the door. A light meal or snack will be served at all meetings. For more information, call Jon Clements: 413-478-7219.

April 20, 2010 - Using Beneficial Insects in High Tunnels. Kilpatrick Family Farm, 9778 Route 22 in Middle Granville NY. 10 am. IPM Specialist Dr. Betsy Lamb will lead growers in this hands-on workshop at Kilpatrick Family Farm, 9778 Route 22 in Middle Granville NY (just a few miles west of Wells, VT). The use of beneficial insects as a means to control pest insects in high tunnels and greenhouses will be discussed. Understanding placement, handling and life cycles of the beneficial insects is just as important as understanding the pest insects. Microscopes and insects will be available. Additionally, Michael Kilpatrick will give a brief tour of the high and low tunnel production areas of his farm. Cost is $10 per person; make check payable to CCE Rensselaer County, and mail with your name and contact info to CCE Washington County, 415 Lower Main Street, Hudson Falls, NY 12839. Please register by April 15th. Call 518-746-2562 or email cdb13@cornell.edu for more information.

April 21, 2010 - *UMass/UNH Fruit Growers' Twilight Meeting***.** Macks' Apples of Moose Hill Orchards, Londonderry NH. 5:30-8:00pm. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

April 22, 2010 – *UMass/URI Extension Fruit Program Twilight Meeting*. Ledge Ends Produce at the historic Briggs Boesch Farm 830 South Rd., East Greenwich, RI 401-884-5118 http://www.ledgeendsproduce.com Hosts: Erik Eacker and Schartner Farms 5:30. Tree fruit twilight meetings start promptly at 5:30 PM. 1 (one) pesticide recertification credit will be offered. There will be a $25 meeting admission charged at the door. A light meal or snack will be served at all meetings. For more information, call Jon Clements: 413-478-7219 or Heather Faubert, 401-874-2967.

April 27, 2010 - *Tractors 101 Workshops*, 4-7 p.m. Vermont Technical College, Randolph Center, VT. (registration deadline: April 21). New farmers will have the opportunity to learn how to use and maintain tractors safely at two workshops to be held in Randolph Center and Montpelier, Vermont. Topics covered include: tractor safety, information on purchasing new and used equipment, and hands-on time driving tractors and learning about different makes and models. **Registration is required** as space is limited to 10 participants per workshop. Cost is $35. To register go to http://tinyurl.com/UVMtractors101 or call 223-2389 x 203, or email newfarmer@uvm.edu. Participants should come prepared for the weather, bring a bag dinner, and wear sturdy shoes, gloves, and work clothes.

April 30, 2010 - *Small Farm Equipment Demonstration*, 1:00-4:00pM Allison's Orchard, rt. 12, Walpole, NH. The demonstration will feature BCS walk behind tractor, tiller and/or rotary plow or the hilling attachment. rotary plough, rear tine cultivator, flail mower, rotary brush mower, sickle bar mower and PTO chipper shredder. For more information contact Carl Majewski at 352-4550 or carl.majewski@unh.edu

May 1, 2010 - *Small Farm Equipment Workshop and Demonstration*. 9:00 pm – 4:00 pm Kingman Farm, Route 155, Madbury, NH. Representatives from BCS-America small farm equipment manufacturers and OESCO-Inc will demonstrate walk behind tractors and different attachments suitable for your operations. Other speakers will discuss what to consider before deciding to lease or purchase farm equipment, and cooperative ownership and sharing of equipment. For more information or to receive a brochure please contact Geoffrey Njue at 749-4445 or Geoffrey.njue@unh.edu.

May 11, 2010 - *Harvest Equipment*, 4-7 p.m. Montpelier. (registration deadline: May 5). **Registration is required** as space is limited to 10 participants per workshop. Cost is $35. To register go to

http://tinyurl.com/UVMtractors101 or call 223-2389 x 203, or email newfarmer@uvm.edu. Participants should come prepared for the weather, bring a bag dinner, and wear sturdy shoes, gloves, and work clothes.

May 12, 2010 - *NH Fruit Growers' Twilight Meeting*. Carter Hill Orchard, Concord NH. 5:30-8:00pm. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

May 25, 2010 – Connecticut Pomological Society Twilight Meeting, Belltown Orchard, Glastonbury CT. 5:30-8:00PM. Focus on how to do a self-audit for GAP certification. For more info, contact Lorraine Los, (860)486-6449, lorraine.los@uconn.edu

May 26, 2010 - *Drip Irrigation for Vegetable & Fruit Growers***.** Brookdale Fruit Farm, Hollis NH. 5:00-8:00pm. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

June 15, 2010 - Connecticut Pomological Society Twilight Meeting, Lyman Orchard, Middlefield, CT. 5:30-8:00PM. Focus on how to do a self-audit for GAP certification. For more info, contact Lorraine Los, (860)486-6449, lorraine.los@uconn.edu

June 22-26, 2011. *10th International Rubus and Ribes Symposium, Zlatibor, Serbia***.** For more information contact: Prof. Dr. Mihailo Nikolic, Faculty of Agriculture, University of Belgr, Belgrade, Serbia. Phone: (381)63 801 99 23. Or contact Brankica Tanovic, Pesticide & Environment Research Inst., Belgrade, Serbia. Phone: (381) 11-31-61-773.
