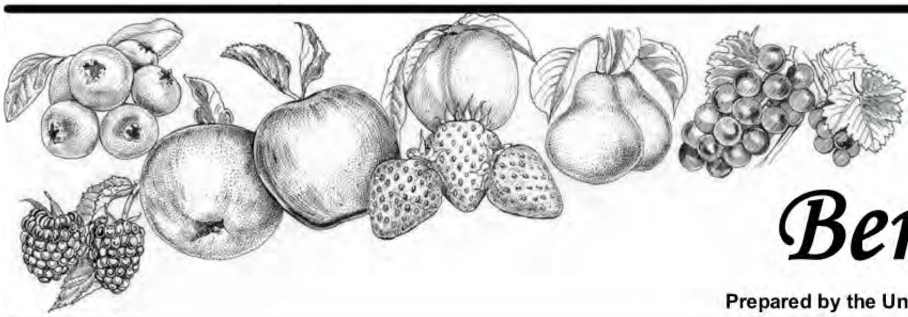

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Berry Notes

Prepared by the University of Massachusetts Fruit Team

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IN THIS ISSUE:

SHORTS:

USDA NRCS Announces EQIP Signup Dates – Energy Efficiency Included - The United States Department of Agriculture's Natural Resources Conservation Service (NRCS) has announced three rounds of funding for four conservation programs in Massachusetts. These federal programs, authorized under the 2008 Farm Bill, provide financial and technical help to farmers and forest land owners to protect soil, water and other natural resources. The assistance is available through the **Environmental Quality Incentives Program (EQIP)**, the **Wildlife Habitat Incentive Program (WHIP)**, **Agricultural Management Assistance (AMA)**, and the **Grassland Reserve Program (GRP)**, all administered by NRCS. For more info click here...

High Tunnel Raspberries and Blackberries publication updated and expanded. Northeast growers can capture more of the lucrative local market for fresh berries by growing brambles (raspberries and blackberries) in high tunnels. And the place for them to start is with the updated and expanded edition of *High Tunnel Raspberries and Blackberries*. read more

Season-long Strawberry Production with Everbearers - For those of you who are interested in producing day-neutral strawberries, there's a guide out there for you – "Season-Long Strawberry Production with Everbearers for Northeastern Producers". This 70-page guide covers information on production techniques, economics, and pests in day-neutral production. For more info click here...

New USDA Plant Hardiness Zone Map - The 2012 USDA Plant Hardiness Zone Map is the standard by which gardeners and growers can determine which plants are most likely to thrive at a location. The map is based on the average annual minimum winter temperature, divided into 10-degree F zones. See map at ....

Cyclamen Mite in Strawberry

Bob Tritten, Michigan State University Extension

Last spring [2011] a question came up during a phone call with berry extension specialists around the state—How prevalent are cyclamen mites in our strawberry fields? Summer 2010 presented a perfect chance to find this out in the southern tier. Since we were out taking soil and leaf tests for another project, I simply took another set of leaf samples on strawberry farms to examine for cyclamen mites.

Cyclamen mites are microscopic arthropods (technically not insects, just as spiders are not insects) that hide out in plants and make their living by sucking on plant cells. Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) has a good fact sheet with pictures, http://www.omafra.gov.on.ca/english/crops/facts/cyclam.htm.

In the past cyclamen mites have been considered a minor pest of old strawberry fields that ought to have been removed anyway. But in 2010, we found them with surprising frequency in young strawberry fields.

Cyclamen mites live in the crown of the strawberry plant, so you can usually only find them on the newest not-yet-unfolded leaves. Pick a leaf, gently spread it out, and look for almost-microscopic white graininess down by the leaf base. On heavily infested leaves I could see these white grains without a hand lens, but none of the farmers could. To reliably diagnose them you need a good hand lens, and I found a dissecting microscope came in very handy when finding small populations. My typical practice was to pick 25 baby leaves from each strawberry variety and examine them under the scope back at the office.

Strawberry plants heavily infested with cyclamen mites will be stunted with deformed leaves. Interestingly, we found those symptoms on only a handful of plants on 2 farms, while nearly every farm had cyclamen mites on symptomless plants. In fact, of the 8 strawberry farms we sampled, only one was free of the cyclamen mites.

What was even more surprising was that plants just planted in spring 2010 had cyclamen mites, sometimes as high as 40% of the leaves had mites, but typically they were at a somewhat lower level (10-20%). This suggests that the mites were coming with the plants from the nursery—and most of the growers were using quite reputable nurseries!

So what? You can't see them, customers can't see them, and I just said that it's hard to tell if you even have them by visual symptoms! The threshold for when their sucking activity takes a toll on the plant isn't completely agreed upon. In California, 1 mite in 10 new leaves is considered a potential problem while Manitoba uses 1 infested leaf in 15 as their threshold for treatment, with the added clarification that when you get to 45-65 mites per leaf it can cause a 1/3 yield reduction. These mites reproduce quickly, from egg hatch to adult in 2 weeks when conditions are right, and females don't need males to lay viable eggs. With this type of exponential growth, going from a couple mites to the levels that cause 33% yield reduction can happen really fast! Besides yield reduction, the mites can cause general reduced vigor and winter hardiness, compounding problems for the poor plant. Cabot is a variety that some growers love and others can't quite get to perform well after the first year, and coincidentally Cabot had some of the highest mite levels. Could the challenge with Cabot really be a cyclamen mite challenge at it's root?

What can you do if you have cyclamen mites? That's the problem, once you have them it's really hard to get rid of them since they reside way down in the protected crown of the plant. Endosulfan, a strong insecticide, is the only in-field treatment labeled in NY, and the label will end in 2016. It's supposed to be applied after renovation when the leaves have been mowed off, with high pressure and at least 200 gallons of spray/A. Anecdotally, growers haven't found even this treatment to be very effective. Usually the best thing to do for a serious infestation is to start over with clean plants.

But clean plants from where? This year we found disturbingly high levels of cyclamen mites on 2010 plants, which suggests that they might have come infested from the nurseries, and reputable nurseries at that. Hot water dips for dormant crowns used to be recommended (110 F for 30 minutes, with tight control on the exact temperature achieved), but varieties are different in their heat sensitivity and many new ones haven't been tested.

This is one of those areas where we don't have enough information. Ideally nurseries would have techniques in place to assure that they're shipping clean plants, but that's easier said than done. More research is needed to establish where the infestations are coming from and to find environmentally sound controls. Juliet Carol from the NYS IPM program has written a grant to do this research, we'll find out if it's funded in March 2011.

In the mean time, take a look at your plants this spring, bring leaf samples to your local extension office where you can use a microscope to examine them, and check out the fact sheet mentioned above for excellent pictures of what you're looking for. The first part of the solution is identifying the problem. (***Source****: New York Berry News, Vol. 10 No. 2, February 2011*)

Frost/Freeze Protection in Strawberries

Jeremy Pattison, Virginia Tech

Even though the coldest part of the season has past, beware of temperature fluctuations during bloom that can plunge below freezing and damage emerging flowers. Strawberry crowns are fairly tolerant of low temperatures when fully dormant. However, as the plant awakens, re-hydrates tissues and begins to grow there is a concurrent loss of cold tolerance. Additionally, flower structures begin to emerge from the crown, which are sensitive to low temperatures, and will require some form of protection to avoid damage.

Not all frost/freeze events will be similar and strategies to protect your crop can be modified appropriately based on the weather conditions and stage of crop development. There are generally two types of freeze conditions strawberry plants will experience in the field, radiation and advective freezes. Radiation freezing results when heat from the atmosphere and ground is lost continuously to a cloudless sky on a cold, windless night. Advective freeze events occur when temperatures drop below freezing and are accompanied by high winds. The latter presents growers with a challenge in protecting the crop and alternative strategies are required if freeze damage is to be avoided.

Under radiational type freezes, overhead irrigation is the typical strategy employed for frost protection. Protection is provided to the emerging blossoms via the continual freezing of water on the plant. As water cools and freezes, two sources of heat are released, sensible heat and latent heat of fusion. Freezing of liquid water is an energy releasing processes and can generate up to 144 btu's for every pound of water frozen (latent heat of fusion).

A significantly less amount of heat is given to the environment by water cooling (sensible heat). Therefore, under conditions of radiational freezing, irrigating the fields and allowing the physical process of water freezing to occur on the plants can afford a great deal of protection and moderation of the temperature experienced by the blooms. For this method to be effective, uniform irrigation patterns and subsequent continuous freezing of water is required on the surface of the plant. Sprinkler heads spaced either 40' x 40' or 30' x 30' is optimum and uniformity of coverage is a function of sprinkler type and available water pressure. Traditional impacts require higher water pressure and can operate well at larger spacing. Wobblers can operate at lower pressures, have faster rotation compared to impacts but have a limited range and require closer spacing (30' x 30'). The key to successful frost protection is to optimize the irrigation layout to match the specifications of your system (i.e. proper spacing based on irrigation heads and water pressure provided by the pump).

A more challenging situation occurs when weather forecasts predict a large cold front with sub-freezing temperatures and high winds (advective freeze). Under these conditions it becomes increasingly difficult to provide your crop with the necessary conditions of uniform irrigation patterns and continual heat release. Protecting the strawberries using overhead irrigation can do more harm than good as uneven watering patterns and frequent freezing of the irrigation nozzles can lead to the crop experiencing colder temperatures than the ambient due to evaporative cooling. As water freezing is a heat releasing process, the opposite is true when liquid water becomes a gas (evaporative cooling). This can be the case even under freezing temperatures when frozen water can change phases directly from a solid to a gas (sublimation) during cold temperatures and high wind velocities.

Some rules of thumb for frost protection during radiation freeze conditions have been presented through various extension outlets and will be re-emphasized. Things to keep in mind for effective crop protection is when to start irrigating, the proper volume of water to use and when to stop. Different plant tissues and stages of crop development have varying critical temperatures associated with them when damage is experienced (Table 1).

Table 1. Critical temperatures of strawberries at various stages of flower development

Stage of Development	Critical Temp. (°F)
Tight bud	22.0
"Popcorn"	26.5
Open blossom	30.0
Fruit	28.0

Source: Perry, K.B. and E.B. Poling. 1986.
Field observation of frost injury in strawberry buds and blossoms,
Advances in Strawberry Production 5:31-38.

The first step in beginning to prepare for a protection event is to know what stage of development the plants are and what the forecasted low is to determine what strategy is needed. When flower buds are still tucked into the crown and weather forecasts predict a low of 29°F then no protection will be needed. However, if a significant amount of flowers are open and forecasts are predicting lows in the mid 20's, the crop will certainly need protection and addressing when to turn the system on becomes the next consideration. As was mentioned, two opposing energy processes are influencing the temperature of the crop. The latent heat of fusion (water freezing) will release heat (approximately 144 btu's/lb of water), meanwhile evaporative cooling (absorbing approximately 1,044 btu's/lb of water) will absorb heat (energy) from the plant and lower plant tissues below the ambient. Therefore a problem arises important to the initial start-up of irrigation. That is, the first water to come into contact with our crop will actually cool tissues greatly due to evaporative cooling and plunge plant tissues several degrees below the ambient air temperature. As a result, overhead irrigation should be initiated when temperatures are a few degrees above the critical temperature for the structure you are trying to protect (i.e. open blooms, start at 340F under light wind) in order to compensate for the energy (heat) lost during evaporation. Table 2 shows some suggested precipitation rates under varying environmental conditions to ensure uniform ice formation.

Table 2. Irrigation rates, in/hr, for critical temp of 28°F and relative humidity of about 70%

	Wind Speed (mph)			
Min. Temp.(F)	0-1 mph	2-4 mph	5-8 mph	9-14 mph
27	0.10	0.11	0.14	0.16
26	0.10	0.13	0.16	0.17
25	0.10	0.14	0.18	0.21
22	0.10	0.18	0.24	0.29
20	0.11	0.21	0.28	0.34
18	0.12	0.23	0.31	0.38
15	0.13	0.26	0.35	0.43

Source: Perry, K. 1998. The strawberry grower. Vol. 5 No. 2.

An emerging area of research in frost/freeze protection deals with the use of floating row covers. Dr. Allen Straw, of the University of Tennessee, recently presented some preliminary data at the National Berry Growers meeting in Nashville looking at row covers used in conjunction with overhead irrigation for frost protection. Allen has shown that combining overhead irrigation with row covers can significantly moderate the plant canopy and keep temperatures substantially above the ambient. This method appears to be most useful during advective freeze conditions when protection from overhead irrigation is unpredictable and the use of row covers alone may not provide the needed protection.

Row covers have traditionally been used in strawberry plasticulture to 1) extend the fall season promoting additional branch crown development, 2) provide winter protection from cold temperatures and wind and 3) spring use for advancing flowering and early harvest. When temperatures are forecasted to be in the mid to low 20's during bloom, row covers alone have been thought to not provide adequate protection. The amount of cold protection provided by floating row covers is a function of its weight with the highest weight fabrics providing the most protection. Or is it? Allen's preliminary data indicated that using a double layer of 1 oz/sq yd cover provided adequate crop protection (30°F) when ambient temperatures went as low as 25°F and was more effective than using a single layer of 2 oz/sq yd cover. Charlie O'Dell also has some experience indicating that this double layer effect is not simply additive and may involve other 'insulating' effects. More research is needed into this area; however, these results are promising and could possibly result in conserving water during the spring season, decreasing early season flower loss and increasing the average hours of sleep for the farm manager. Research trials looking at the repeatability of this layer effect will help to provide a working set of protocols for the use of row covers as a possible alternative to traditional frost protection.

In order for any strategy to be effective, we need to be prepared and informed about the conditions affecting our location. Setup a weather station in the lowest section of the field wired to an alarm system to notify you when temperatures are approaching levels that will require action to be taken. Timely setup of irrigation pipes and preventive maintenance on critical equipment will help to ensure success when action is taken. And most of all, we have to deal with what Mother Nature throws at us. GOOD LUCK! (***Source****: Virginia Cooperative Extension Fruit News, April, 2009*)

Strawberry Anthracnose Fruit Rot Control Alert

Mike Ellis, Ohio State University

This could be a bad year for development of Anthracnose fruit rot in perennial matted row strawberries in the Eastern United States. **Anthracnose fruit rot is a warm weather disease.**

Anthracnose is a constant threat in "annual" or "plastic culture" strawberry production, but is very sporadic in perennial matted row production. However, when it does develop in matted row production it is general devastating. This abnormally warm spring could be favorable for anthracnose development if temperatures remain high especially with abundant rainfall like we had last year. We had an epidemic of anthracnose fruit rot in perennial matted row plantings throughout the eastern U.S. in 1991. It "popped up" in plantings and on farms that had never seen the disease before. It can move around undetected on nursery stock and never develop in "normal" years; however, when high temperatures combined with rainfall occur during bloom through harvest, it can explode on you. This could be one of those years.

Normally eastern growers make sprays through bloom for Botrytis fruit rot control and may not make sprays during harvest. If anthracnose is a threat, fungicide sprays to control it are required throughout harvest. Hopefully the weather will return to "normal", but these high temperatures have me thinking about anthracnose and I wanted to share these thoughts with growers. If it stays abnormally warm, some pre bloom applications of Captan fungicide may be a good idea to keep the anthracnose fungus from building up populations on symptomless leaves then attacking the fruit as it develops.

[See: http://ohioline.osu.edu/hyg-fact/3000/pdf/HYG_3209_08.pdf for more details about Anthracnose and next issue of Berry Notes will carry more on management recommendations.]

RASPBERRIES/BLACKBERRIES

The Ideal Red Raspberry Cane Density

Becky Hughes and Adam Dale, University of Guelph

Red raspberries can be divided into two groups, those that bear fruit on the first-year canes, called primocanes, and those that fruit on the second-year overwintered canes, called floricanes.

Most raspberries we currently grow in Ontario are floricane-fruiting, or summer-bearing cultivars. These are usually grown under one of two management systems. In the annual system, the vegetative primocanes and the floricanes grow together. After harvest the floricanes are removed and the primocanes continue to grow and produce a crop the following year. Each year, there is competition between developing primocanes and the bearing floricanes. In a biennial system, the row is mowed to the ground every second year. Primocanes develop, in the absence of floricanes, the first year and produce fruit in the second year. Raspberries in this system are picked every two years. During the fruiting year, primocane growth is usually suppressed until the first harvest to reduce competition with the floricanes, and give higher yields.

Fall-fruiting, or primocane-bearing raspberries such as Autumn Britten and Heritage are usually mowed to the ground every year and the primocanes bear fruit late each summer and into the fall.

Yield in summer-bearing raspberries is influenced by cane density, cane size and primocane competition. Most studies on the ideal cane density for red raspberries were completed over 20 years ago. These studies took place in Europe and North America where cultural practices, row spacing and cultivars varied. Dale (1989) reviewed these studies and concluded that if the cane density was calculated on the total land area, the cane density for maximum yield was remarkably consistent. He concluded that the ideal fruiting cane density in the traditional annual production system is between 5 and 8 fruiting canes per m2 of total land area. Bushway et al. (2008) recommend lower cane densities of 3-5 canes per linear foot with 9 feet between rows, or 4-6 canes per m2 of total land area.

In a biennial floricane-fruiting system with primocane suppression, cane density can be doubled as there is little or no competition from non-fruiting canes.

Most growers prune based on the number of canes per linear meter of row. The following table gives the ideal number of canes per linear meter for various row spacings. In each scenario, the row width should be maintained at 30 cm or less. As cane density in summer-bearing raspberries is increased, the yield per cane decreases, there are fewer fruiting laterals, fewer fruits per lateral and smaller fruit (Dale, 1989). In these cultivars, growers have to balance increased yield per unit area with decreasing fruit size and increasing disease pressure as cane density is increased. There may also be a relationship between cane density and winter injury in floricane-fruiting varieties with less dieback at lower cane densities (Buszard, 1986).

In primocane-fruiting raspberries, research suggests that the number of fruiting canes over the whole season should be similar to that used in biennial cropping. Yield is influenced by both cane density and the length of the growing season. However, fruit size in primocane-fruting raspberries is not decreased as cane density increases (Bushway et al., 2008). Many growers maintain a maximum row width of 30 cm and don't thin canes in primocane-fruiting cultivars. The recommended cane density is currently between 10 and 16 canes/m2. Research currently ongoing on cane management in high tunnel primocane-fruiting raspberries in Quebec appears to confirm the recommended densities.

These numbers are a guideline only, because cultivars, management practices, disease control, growing conditions such as high tunnels, and other factors will affect yield. However the lesson to be learned is that the ideal number of canes per meter of row changes with row spacing.

Ideal number of red raspberry canes for the various production systems and row spacings (center to center). Adapted from Dale (1989).

Production System	# canes/m2	Distance (m) between rows	# canes/linear m of row fruiting	# canes/linear m of row vegetative
Primocane fruiting	10-16	1.5	15-24	-
Primocane fruiting	10-16	2.0	20-32	-
Primocane fruiting	10-16	2.5	25-40	-
Primocane fruiting	10-16	3.0	30-48	-
Floricane-fruiting				
Annual System	5-8	2.0	10-16	10-16
Annual System	5-8	2.5	12-20	12-20
Annual System	5-8	3.0	15-24	15-24
Floricane Fruiting – Biennial System				
Non-bearing year	10-16	2.0		20-32
Bearing year	10-16	2.0	20-32	
Non-bearing year	10-16	2.5		25-40
Bearing year	10-16	2.5	25-40	
Non-bearing year	10-16	3.0		30-48
Bearing year	10-16	3.0	30-48	

References

Bushway, L., M. Pritts and D. Handley. 2008. Raspberry and Blackberry Production Guide for the Northeast, Midwest, and Eastern Canada. NRAES-35. 157 pp.

Buszard, D. 1986. The effect of management system on winter survival and yield of raspberries in Quebec. Acta Hort. 183: 175-181.

Dale, A. 1989. Productivity in red raspberries. Hort. Rev. 11:185-228.

BLUEBERRY

Control of Winter Moth Damage in New England Blueberries

Sonia Schloemann and Robert Childs, UMass Extension

Winter Moth (*Operophtera brumata*): This is a new and important pest of blueberries and other deciduous plants, especially in Southeastern New England. They can severely defoliate bushes. Moths emerge from the soil usually in late November and may be active into January. The male moths are light brown to tan in color and all four wings are fringed with small elongate scales that give the hind margins a hairy or fringed appearance. The female is gray, almost wingless (brachypterous) and, therefore, cannot fly. Females are usually found at the base of trees or scurrying up tree trunks. Winter moth caterpillars are pale green caterpillars with a white longitudinal stripe running down both sides of the body. They are “loopers” or “inchworms” and have just 2 pairs of prolegs. At maturity, the caterpillars will be approximately one inch long, whereupon they drop to the soil for pupation. Pupation occurs from late May into early June. Winter moth caterpillars are often found in association with both the fall and spring cankerworms, which look and have similar feeding patterns to the winter moth caterpillar.

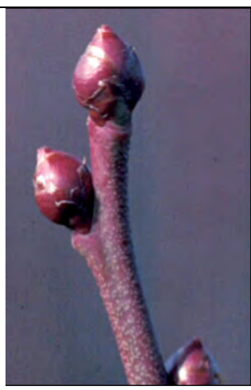
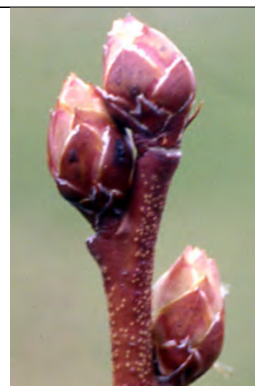
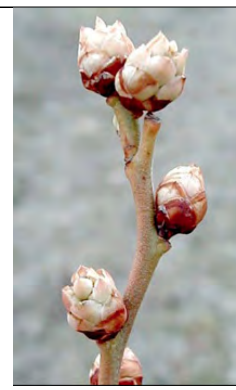
Life Cycle: After mating, the female deposits eggs loosely in bark crevices, under bark scales, under lichen, or elsewhere. The adult moths then die and the eggs over-winter. Eggs are dark-colored at first but turn orange within 3-4 weeks. In March, just prior to hatching, they turn red and eventually a deep, shiny blue just prior to hatching. Eggs hatch when temperatures average around 55℉. It is believed that egg hatch in Massachusetts occurs when 20 Growing Degree Days (base 50) have accumulated, which is historically during the second week in April but earlier if temperatures are atypically warmer, depending. This means that egg hatch occurs just at or right before bud break of most of the host plants. After hatching, the larvae wriggle between bud scales of newly swelling buds of such hosts as: maples, oaks, ash, apples, crabapples, blueberry, cherries, etc. and begin feeding.

Damage: Caterpillars feed within both flower and foliar buds. Once a bud has been devoured from within, the caterpillar will migrate to other buds and repeat the process. Destruction of the flower buds leads to greatly diminished harvest on fruit crops. Older larvae feed in expanding leaf clusters and are capable of defoliating trees and other plants, when abundant.

Management: A dormant oil spray to the trunks and branches of bushes may be helpful to kill the overwintering eggs before they hatch. However, some eggs are under bark flaps and loose lichen and may be protected from oil sprays. Caterpillars may also invade host plants by ballooning onto them after treatment has been applied. Several insecticides are labeled for use against either Winter Moth or Spanworm or both and are outlined in the table below.

Additional information can also be found at: http://extension.umass.edu/landscape/fact-sheets/winter-moth-overview

Blueberry Bud Stage
Image and Description Source: *Michigan State University Blueberry Facts website*.

		
Dormant **Description:** No visible swelling of the fruit buds. Bud scales tightly closed. No visible signs of growth.	**Bud Swell** **Description:** First sign of growth as plant growth begins in the spring. Visible swelling of the flower buds; outer bud scales begin to separate at the tip revealing paler interior bud scales. This bud stage can usually tolerate cold temperatures of 10 - 15^{0}F.	**Budbreak** **Description:** Flower buds open and the individual flowers can be seen between the bud scales. Can tolerate cold temperatures of about 20^{0}F.
Recommendation for Controlling Winter Moth or Spanworm		
Dormant oil, 2-2.5% **plus** Esteem 35WP, 5 oz/A **or** Confirm 2F, 16 oz /A **or** Asana XL, 4.8-9.6 oz/A	Dormant oil, 2-2.5% **plus** Confirm 2F, 16 oz/A **or** Delegate 3-7 oz/A **or** Assail 70WP, 1.9-2.3 oz/A **or** Asana XL, 4.8-9.6 oz/A **or** Esteem 35WP, 5 oz/A	NO OIL AFTER BUDSWELL Confirm 2F, 16 oz **or** Delegate 3-7 oz/A **or** Asana XL, 4.8-9.6 oz **or** Esteem 35WP, 5 oz

Where brand names for chemicals are used, it is for the reader's information. No endorsement is implied, nor is discrimination intended against products with similar ingredients. Please consult pesticide product labels for rates, application instructions and safety precautions. Users of these products assume all associated risks.

Warm Weather and Deaaclimation

Joe Fiola, University of Maryland

Many fruit growers get understandably concerned in January and February when we get a run of "warm' weather like we have been experiencing. When a deciduous vine or tree experiences weather warm enough to start the deacclimation process, there is an increased risk of winter damage to buds and wood. Here is a simplified model of dormancy.

Dormancy

- Deciduous vines go through various phases as part of their winter survival:
- **Acclimation** – As temperatures drop in the fall, the vine begins to "go dormant" and slowly become more and more tolerant to lower and lower temperatures.
  - o If you remember correctly, this past fall temperatures slowly went down and we did not have a hard frost until well into November in most locations in the state – that was premium acclimation conditions leading to good cold tolerance.
  - o Tony Wolf at VA Tech reported that the MLTE values he got from testing Traminette and Viognier were all very good, indicating very good acclimation in fall and early winter.
- **Dormant** - When vines have reached "full dormancy" they then need to experience a certain period of time of temperatures around 40 degrees Fahrenheit to satisfy their "rest."
  - o This year December was colder than average, so most vines and fruit trees received enough cold to satisfy their rest requirement by the end of the year.
- **Deacclimation** - After their rest is satisfied, they then require another period of time with conditions above a specific temperature to come out of dormancy and begin a new growth cycle.
  - o During this period, grapevines in the Mid-Atlantic typically experience a series of deacclimation and deacclimation periods caused by periods of alternating warm and cold weather. This is what many refer to as the "fluctuating temperatures" of January and February.
- **Vines are more sensitive to cold damage when they have recently experienced a period of deacclimation, especially when temperatures drop very low and quickly shortly after the warm spell.**
  - o For example is a dormant vine can normally tolerate down to 0 degrees with no bud damage, after a period of deacclimation above 50, the vine may only be able to only tolerate +5 degrees with no damage and will experience a percentage of bud death at 0 degrees.
  - o If temperatures drop down gradually slowly after the warm spell, the vines have the capacity to "re-harden," possibly even down to their previous low temperature tolerance (in this example back down to 0 degrees).

Let's all hope for a gradual change back to "reasonably cold" weather - for the vines and fruit trees at least. (***Source***: *Maryland Timely Viticulture, Dormant Season*)

The effect of training system and yield on fruit quality of Marquette and La Crescent wine grapes in a Vermont vineyard

*Claire Luby, Middlebury College, Middlebury, VT *Currently at University of Wisconsin*

Reduced fruit quality in wine grape is commonly perceived to go hand in hand with high yields. Increasing yields without good vineyard management practices can lead to reduction in sugar concentration, lower pH and higher titratable acidity as the plant partitions finite resources into a larger number of berries (Howell et al 1991). Fruit quality and other characteristics can be influenced by various technical and environmental factors such as climate, cultivar, training system, vine microclimate management, and soil. Hence it is important to find a balance between these parameters in order to optimize yield without compromising quality (Jackson and Lombard 1993).

The objective of this study was to determine the effect of training system and yield on fruit quality parameters of 'Marquette' and 'La Crescent' (*Vitis* spp.) wine grape cultivars in a Vermont vineyard. The grapevines studied were grown at Lincoln Peak Vineyard in New Haven, VT. Three training systems were sampled with 'Marquette': Geneva Double Curtain (GDC), Single Wire (SW) and Vertical Shoot Position (VSP). Fruit of 'La Crescent' was sampled from GDC and SW training systems.

All of the grapes from each vine selected were harvested and total yield, average cluster weight and average berry weight were measured. A sample of 100 berries from each vine was juiced and frozen at -35 ^{o}C for further analysis.

Fruit quality parameters measured included soluble solids concentration, pH, and titratable acidity of the juice.

For 'Marquette', yield (yield per vine, yield per meter row, and yield per hectare) was significantly higher in GDC vines than in either VSP or SW vines (Table 1). Soluble solids concentration was significantly lower in GDC and SW vines than in VSP vines but differences between GDC and SW vines were not significant (Table 1). The pH was significantly higher in SW vines than in either VSP or GDC trained vines (Table 1). Titratable acidity was highest in GDC vines and lowest in VSP vines. Titratable acidity in the GDC system was significantly higher than in the VSP system with vines on the SW system being intermediate (Table 1). While yield varied significantly amongst training systems, it did not account for differences seen in quality parameters (Figure 1). Titratable acidity and soluble solids concentration exhibited no correlation with yield (p>0.05 for Pearson's correlation coefficients). Even through some quality measures were not as high for the GDC training system where yields were highest, all values for these quality measures were acceptable. Thus, with well-maintained GDC vines, the vineyard was able to produce significantly more fruit of a comparably high quality.

Table 1: Means (+/- standard error) for yield and fruit quality parameters among training systems for Marquette grapevines. GDC is the Geneva Double Curtain training system, SW is the single wire system, and VSP is the Vertical Shoot Position system. Means with different superscript letters differ significantly (P<0.05).

	GDC	SW	VSP	Significance
Total yield per vine (kg)	**10.0 ± 0.6^{a}**	**6.1 ± 0.5^{b}**	**2.1 ± 0.2^{c}**	**<0.001**
Yield (kg)per meter row	**4.1 ± 0.3 ^{a}**	**2.5 ± 0.2 ^{b}**	**0.9 ± 0.1 ^{c}**	**<0.001**
Yield (kg) per hectare	**11200 ± 700 ^{a}**	**9040 ± 810 ^{a}**	**3100 ± 300 ^{b}**	**<0.001**
Average cluster weight (g)	**86.0 ± 3.4 ^{a}**	**72.3 ± 3.7^{b}**	**43.3 ± 2.2 ^{c}**	**<0.001**
Average berry weight (g)	**1.4 ± 0.0 ^{b}**	**1.5 ± 0.02 ^{a}**	**1.2 ± 0.0 ^{c}**	**<0.001**
Soluble Solids (^{o}Brix)	**27.1 ± 0.2^{b}**	**26.6 ± 0.2^{b}**	**28.0 ± 0.2 ^{a}**	**<0.001**
pH	**3.1 ± 0.0 ^{b}**	**3.2 ± 0.0 ^{a}**	**3.1 ± 0.0 ^{b}**	**<0.001**
Titratable acidity (g·L^{-1})	**8.3 ± 0.1 ^{a}**	**8.0 ± 0.1 $^{a\ b}$**	**7.6 ± 0.2 ^{b}**	**<0.001**

A similar trend was observed for 'La Crescent'. Yield (yield per vine, yield per meter row, yield per hectare) was significantly higher in GDC vines than with SW vines (Table 2). However, the only wine quality measure that was significantly different between training systems was pH where the pH in SW vines was significantly higher than pH of GDC vines (Table 2). Yield per vine was also significantly negatively correlated with pH across training systems: pH decreased as yield increased (Pearson's correlation coefficient N=81, r=-0.524, r^2= 0.275, P<0.001). Soluble solids concentration and titratable acidity were not significantly different between training systems and neither was significantly correlated with yield across training systems (Figure 2). Thus, even though yield was significantly higher on the GDC training system, quality was not impacted.

This study examined the influence of training system and yield on wine quality measures in 'Marquette' and 'La Crescent' grape cultivars in a Vermont vineyard. The GDC training system appeared to maximize yields for both cultivars while maintaining an acceptably high quality of fruit. While this study only includes data from 2009, past experience within this vineyard corroborates these data. GDC vines have tended to be the highest yielding training system without compromising fruit quality. VSP vines often had higher soluble solids concentration than other training systems but yields were significantly lower. GDC was, therefore, the preferred training system at this vineyard. This suggests that by maximizing photosynthetic efficiency and light availability to clusters, vines are able to ripen large crops with high quality fruit on the GDC system. Significant differences among training systems were observed in both cultivars for many of the wine quality parameters measured and most notably for yield. However, few of the wine quality parameters measured had strong relationships with yield suggesting that with appropriate vineyard management, high yields can be achieved without sacrificing quality within the yield ranges achieved in this study (Reynolds and Vanden Heuvel 2009, Jackson and Lombard 1993).

Table 2: A one-way ANOVA was performed on the means of various wine quality measures and compared across training systems for La Crescent vines. After correcting for error using Bonferroni's correction, a significance value of <0.004 is considered statistically significant. Bolded rows are statistically significant, shaded rows are not. Means and standard errors from each training system are reported in the columns on the right.

	GDC	SW	Significance
Total yield per Vine (kg)	**10.9 ± 0.7**	**6.5 ± 0.4**	**<0.001**

Yield (kg) per meter row	**4.5 ± 0.3**	**2.3 ± 0.17**	**<0.001**
Yield (kg) per hectare	**11700 ± 710**	**7910 ± 640**	**<0.001**
Average cluster weight (g)	87.8 ± 2.1	83.3 ± 2.6	0.396
Average berry weight (g)	**1.3 ± 0.0**	**1.4 ± 0.0**	**<0.001**
Soluble solids (^{o}Brix)	27.2 ± 0.2	26.5 ± 0.2	0.008
pH	**3.0 ± 0.02**	**3.2 ± 0.0**	**<0.001**
Titratable acidity (g/L)	9.4 ± 0.2	10.1 ± 0.2	0.015

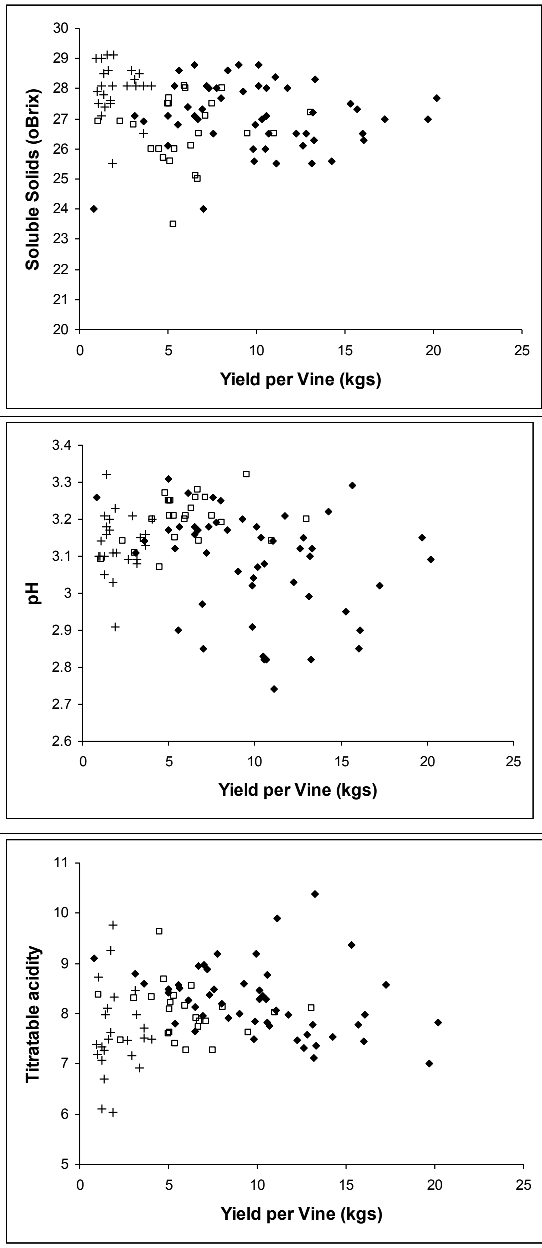


Figure 1: Relationship between yield and various juice characteristics for Marquette vines. Solid diamonds are GDC vines, outlined squares are SW vines and plus signs are VSP vines.

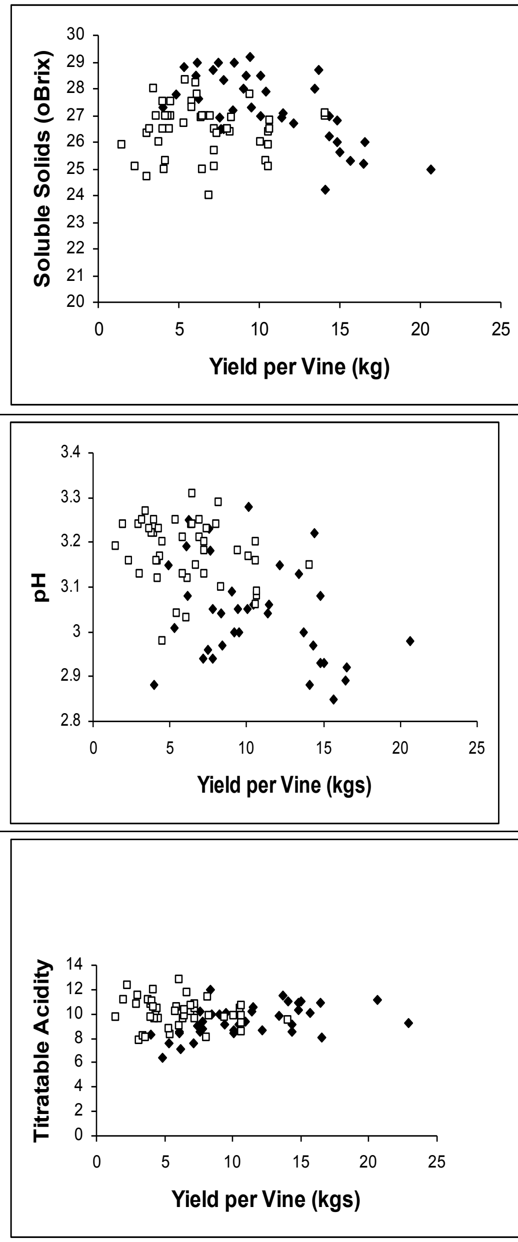


Figure 2: Relationship between yield and various juice characteristics for La Crescent vines. Solid diamonds are GDC vines and outlined squares are SW vines

Works Cited:

Howell, G.S., D.P. Miller, C.E. Edson and R.K. Striegler. 1991. Influence of training system and pruning severity on yield, vine size, and fruit composition of Vignoles grapevines. Amer. J. Enol. and Vitic. 42:191-198

Jackson, D. I., and P. B. Lombard. 1993. Environmental and management practices affecting grape composition and wine quality- A review. American Journal of Enology and Viticulture 44: 409-430.

Reynolds, A., and J. Vanden Heuvel. 2009. Influence of grapevine training systems on vine growth and fruit composition: A review. American Journal of Enology and Viticulture 60(3): 251-268.

GENERAL INFORMATION

Will You Be Ready if Spring Comes Early?

Mike Fargione and Steve Hoying, Cornell University

[***Editors Note****: While this is an article primarily for tree fruit growers, there is good information for all fruit growers contained in it*.] The winter of 2011/2012 has been unusually warm in the Hudson Valley, with no sub-zero temperatures and many occasions where it was above freezing for all or part of the day. The consequence of this unusually warm weather is that fruit trees fulfilled their chilling requirements and are on their way to a new growing season. One model predicts apple green tip could come as early as March 22 in Highland, Ulster County, NY. That would be a full 2 weeks earlier than the 32-year average green tip date. We cannot guarantee when the growing season will begin because we lack the ability to accurately forecast temperatures during the next 30 days. However, if the current weather conditions continue, we expect to have a very early spring. Will you be ready if green tip arrives on or before March 22nd? Here are some reminders of tasks to schedule and accomplish to be ready for an early start to the season:

• Will you be top working any trees in 2012? Collect bud in the next week to ensure it is still fully dormant. One excellent suggestion we heard recently was to store budwood in a labor camp refrigerator with the temperature turned all the way down. Freezing temperatures at or just below 32 ^{0}F will not harm fully dormant wood, but will prevent the development of mold. We have prepared a video where Steve Hoying demonstrates storing budwood and bark grafting techniques: http://mike.fargione.net/files/movies/index.php?file=Bark+Grafting+Flash+Video.flv .

• Will your equipment be ready to put the necessary treatments on if spring arrives early? Service tractors and implements and be sure they are in good working order and road-legal. Check, refurbish and calibrate fertilizer spreaders, weed sprayers, and particularly speed sprayers.

• Make sure spray sheds are in order and you have working scales and readable containers for measuring liquids. Prepare equipment for filling sprayers including pumps and header lines. Can pumps and fill stations be set up quickly, or can they be weather-proofed if freezing conditions follow applications?

• Inventory personal protection equipment (PPE) and order what you need for the season. Be sure your spray staff have valid DEC pesticide licenses or sign them up for CCE Special Permit Training.

• Set up your central posting area and spray record posting system. Reread the labels on crop protectants

– don't assume they have not changed since last year. Now is also a good time to review the labels of new materials you may use, make sure you have your MSDS file up to date and plan your seasonal spray programs. Make copies of labels to carry with you. Be sure sprayers are properly marked and have a label-holding system if they are will be on/cross a public highway.

• Be sure you have adequate protectants on hand for your first sprays. Mancozeb, captan or copper should go on at green tip to control apple scab. Peach leaf curl applications of copper, Bravo, Echo or other materials should go on peaches and nectarines at full dormant (last fall or this spring). Oil sprays for pear psylla control can begin at the 3% rate at dormant bud. Add copper to the oil at the dormant timing to begin pear fire blight control. A copper application on apricots for bacterial canker and a spray on susceptible peach and nectarine cultivars for bacterial spot should all go on at delayed dormant.

• Think about frost protection. Are there major repairs or new equipment that need to be ordered now to be ready if bloom arrives early this year (full bloom in 2002 was April 16th)?

• Review last year's fertilizer records. Study last year's leaf analysis and correlate to growth and vigor of each block. Use this information to plan fertilizer rates and applications and order fertilizers.

• Check on your nursery orders, including tree numbers, tree quality, and delivery dates. Remember that the earlier you plant trees the better. If you can get your trees and the weather and soil are ready you can and should plant early. March planting will result in better tree growth the year of planting.

• When do you need to start the process for H2A workers if spring comes early?

• New planting sites – look for areas where water is laying on the surface now to plan drainage needs, check soil analyses for lime and fertilizer needs, and establish berms for stone fruit planting sites. (***Source****: Hudson Valley Tree Fruit Newsletter, March 8, 2012)*

Moist, Weed-free Soil Retains More Heat

Mark Longstroth, Michigan State University

Modifying the soil to capture and retain more heat is a way growers can reduce spring freeze injury. Weed-free soil retains more heat than freshly cultivated or unmowed sites and a few degrees may make a difference this spring.

Spring frosts are a worry for all fruit growers. Radiation frosts occur when clear, calm conditions during the night allow the ground to cool by radiation to the sky. The cool soil chills the air above it, lowering the air temperature. Many growers cultivate the soil in the spring to try and reduce the weeds and expose the soil to the sun. This practice should be done as early as practicable. Cultivating just before a freeze is a bad idea. Freshly cultivated soil is cooler than mowed sod.

Cover crops serve many valuable functions in fruit plantings such as reducing or preventing soil erosion, reducing soil compaction, and allowing vehicle traffic over wet soils. Cover crops also shade the soil resulting in cooler soils during radiation frosts. Keeping the soil surface clean of vegetation allows it to absorb more heat during the day. Soils have a large heat capacity, so they can capture and store considerable heat during sunny days. This heat can maintain warmer air temperatures during cold nights. Weeds and sod insulate the soil surface from the sun. In addition, tall, unmowed cover crops raise the effective ground level, so even higher flower buds may be injured where there is a tall stand of grass or weeds.

Also important is the fact that wet or moist soils have a higher heat capacity than dry soils, and packed soils are able to absorb more heat than recently cultivated soils. This means that clean, moist, and packed soil surfaces will absorb more radiant energy during the day, and protect from frost by releasing this heat during the night. In general, unmowed cover crops are cooler than mowed covers, which are cooler than loose cultivated soils. Packed bare soils are warmer than loose soils, and wet soils are the warmest of all.

Moist, packed soils can be as much as 5°F warmer than unmowed cover crops during radiation frosts. Such high increases in temperature are not common, but I have seen noticeable differences in fruit set between orchards that were cultivated as opposed to those nearby where nothing was done to the cover crop. Cultivation is not for everyone, especially where the fruit planting is on uneven ground where soil erosion is a concern. Cultivation is more suited to flatter plantings where drainage of cold air out of the planting is not a major factor in the orchard. (***Source****: Michigan State Univ. Extension Fruit News, March 13, 2012*)

Spotted Wing Drosophila Advice

Vern Grubinger, UVM Extension

I attended a meeting about this pest with researchers and extension at the CT Agricultural Experiment Station last week, where Dr. Richard Cowles has a variety of lab studies underway to better understand SWD behavior. There is much we do not yet know about this pest and how to manage it. With that in mind, here is some advice:

1. Familiarize yourself with this pest sooner rather than later. It arrived in New England last year, it attacks many types of firm ripe fruit, is winter hardy, and it can build up very, very fast as it lays a lot of eggs and has a short lifecycle. Visit the web sites listed below. SWD is not hard to identify but you must be able to tell it apart from other fruit flies.
2. Set up some traps to monitor for arrival of SWD. Traps with various baits including apple cider vinegar are easy to make (see sites below) but they will be much more effective when not competing with ripe fruit, so set them up before fruit crops start to turn color. Other regions of the country found SWD populations did not build up until early summer, and then it was abundant into fall.

Fall raspberries, day-neutral strawberries, grapes and blueberries may be our most vulnerable crops. I think it is worth monitoring in June bearing strawberries, too.

3. Know what and when to spray. If SWD arrives and you need to spray for it, materials with best efficacy appear to be: spinosad (Entrust), spinetoram (Delegate), malathion, advanced generation pyrethroids (Warrior II) and Lannate. There will be considerable selection for resistance if materials like Entrust (OMRI approved) are used too often, so organic growers take note. Surround WP is both insecticidal (it acts as a desiccant) and a deterrent to SWD. It may be suitable for use on blueberries and wine grapes. It will be important to time the first application of any insecticide to when SWD are known to be present and fruits are just starting to ripen. Work is underway to reduce insecticide rates or improve their efficacy by adding sugar and/or salt to the spray mix to stimulate SWD feeding. Stay tuned for experimental results.

4. Consider netting. On small scale, high value, high risk plantings (e.g. fall raspberries) it may be possible to exclude SWD with netting that has a mesh opening less than 1 mm. The only one I can find is ProtekNet Standard Plus which has a 1.0 x .85 mm mesh, weighs 80 g/m² has 80% porosity, 83% light transmission and lifespan of 7 years. Cost is $287 for 6.5' x 328' or $575 for 13' x 328' from Dubois Agrinovation. http://www.duboisag.com or 800-463-9999.

5. Use post-harvest practices to reduce overwintering populations. Clean up and remove as much unharvested fruit from the field as possible. It may also be possible to 'trap out' a lot of SWD once all fruit has been harvested, since the flies are active into very late fall. Use a lot of monitoring traps or try buckets with an inch of cider vinegar in the bottom, changed frequently.

For more information:

Penn State
http://extension.psu.edu/ipm/agriculture/fruits/spotted-wing-drisophila

Michigan State
http://www.ipm.msu.edu/swd.htm

Oregon State
http://groups.hort.oregonstate.edu/group/spotted-wing-drosophila

NC Small Fruit & Specialty Crop IPM – how to make SWD traps
http://ncsmallfruitsipm.blogspot.com/2011/06/do-it-yourself-spotted-wing-drosophila.html

(***Source***: *Vermont Vegetable and Berry News – March 13, 2012*)

UPCOMING MEETINGS:

March 19, 2012 - *NOFA-NH Winter Conference*. Exeter High School, Exeter NH. For detailed program and registration information go to http://www.nofanh.org/winterConference.

March 27, 2012 – Blueberry and Raspberry Pruning, Millstone Point Farm, Hurlburt Rd., Mirror Lake, NH. 3:30-5:30. To register contact Betty Lou Canty at (603) 447-3834 or email your name, address and daytime telephone number to: bettylou.canty@unh.edu

March 28, 2012 - *Northeast Harvest Agricultural Conference*, Coolidge Hall, Tposfield Fairgrounds, Topsfield, MA. 9:00 – 3:00. Pre-Registration - $20/per person Registration Day of - $25. For more info go to: http://mfbf.net/NortheastHarvestAgriculturalConference/tabid/475/Default.aspx

March 29, 2012 – *Employee Training for Garden Retailers*, Publick House, Sturbridge MA. 9:00am – 3:00pm. One pesticide recertification credit offered. Details and Registration (by mail or on-line): http://extension.umass.edu/floriculture/ or contact Tina Smith, tsmith@umext.umass.edu

March 31, 2012 – *Blueberry and Raspberry Pruning Workshop*, Pustizzi Fruit Farm, 148 Corn Hill Road Boscawen, NH 03303. 10:00am – 12:00pm. Call Mary at UNH Coop. Extension to register at (603)796-2151.

April 12, 2012 – USDA GAP Training Program, Mass. Farm Bureau Federation Office, 249 Lakeside Drive , Marlboro, MA 01752. 12:30 – 5:00. UMass Extension, the UMass Department of Nutrition and the MA Department of Agricultural Resources (MDAR) are pleased to present a **USDA Good Agricultural Practices (GAP) Training Program** for growers and other fresh produce handlers.
For more information go to: http://extension.umass.edu/fruitadvisor/events/usda-gap-training-program

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