



Berry Notes

Prepared by the University of Massachusetts Fruit Team

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IN THIS ISSUE:

CURRENT CONDITIONS

ENVIRONMENTAL DATA

STRAWBERRY

- ❖ Winter Mulch for Strawberries
- ❖ Winter Annual Weeds in Strawberries
- ❖ Anthracnose Crown Rot in Strawberries

BRAMBLES

- ❖ Raspberry and Blackberry Variety Review
- ❖ High Tunnels for Late Fall Raspberries and Blackberries

BLUEBERRIES

- ❖ 'Superior' (MN 5451) Blueberry Released from Minnesota
- ❖ Spring Planting Plans

GRAPES

- ❖ Post-Harvest Checklist for Vineyards

GENERAL INFORMATION

- ❖ What is the Best Way to Put Micronutrients into Plants?

UPCOMING MEETINGS

Editors Note:

NEVF
New England Vegetable & Fruit
CONFERENCE '09
December 15, 16 & 17
Radisson Hotel, Manchester, N.H.

Includes 27 educational sessions
over 3 days, covering major vegetable,
berry and tree fruit crops

Extensive Trade Show with
Over 100 exhibitors

Additional information, including downloadable
registration material, may be found at
www.newenglandvfc.org

Sponsored by the New England Vegetable & Berry Growers Association and the Massachusetts Fruit Grower's Association in conjunction with the Universities of Connecticut, Massachusetts, New Hampshire, Rhode Island, Vermont and Maine, as well as Cornell University and the Connecticut Agricultural Experiment Station – in cooperation with the U.S. Department of Agriculture

November 18, 2009 - 12:45 PM EST Blueberry/Cranberry Disease Management

- **Blueberry Viruses**
[Dr. Annemiek Schilder](#), Michigan State University
- **Important Cranberry Diseases in the Northeast**
[Dr. Frank Caruso](#), University of Massachusetts

Register by contacting Laura McDermott at lgm4@cornell.edu.
Or go to www.fruit.cornell.edu/Berries/webinarindex.htm

Winter Mulch for Strawberries

Sonia Schloemann, UMass Extension

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

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



When should the strawberry grower plan to apply mulch? Research suggests that a good timing guide is to apply mulch after three consecutive days with a soil



temperature of 40°F or below. This soil temperature usually occurs after multiple frosts, and when the plants have slowed growth in response to cooler temperatures. It is best to apply mulch before the soil freezes solid. In New England mulches are applied in late November.

What is a good mulch material?

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



give good control.

How much mulch should be applied? A traditional, level matted row planting will require 2.5 to 3 tons of straw per acre for a 2 to 3 inch deep mulch, or about 300 small bales of average weight. Raised bed plantings and sites with strong wind may require twice this amount for adequate coverage.

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

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

rakes and tedders to equipment specifically designed for the purpose.

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



last 3-4 seasons. Floating row covers are widely used to protect annual plasticulture plantings.

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

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

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

Winter Annual Weeds in Strawberries

Kathy Demchak, Penn State Horticulture

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

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

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

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

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



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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

Anthracnose Crown Rot in Strawberries

Kathy Demchak , Penn State University

Anthracnose crown rot, caused by *Colletotrichum gloeosporioides* or *C. fragaria*, can be a big problem for strawberry producers in warmer areas of the country such as the southeastern U.S. We're finding that anthracnose crown rot can be a problem for growers in Pennsylvania as well. While it's possible that anthracnose crown rot could occur in either matted row or plasticulture plantings, the material in this article is directed towards plasticulture production where the disease is more common. Here's some information on symptoms and management.

Symptoms: At first, plants may just generally appear to lack vigor and fail to grow, especially under cool conditions, as it takes some time for the fungus to invade the crown. As the name indicates, the crown of the plant ceases to grow and dies. Branch crowns may or may not be present, and their presence can make it difficult to see what's going on in the center of the plant. Eventually the entire plant may die, though this may not happen until warm conditions occur during fruiting. Digging out some plants and cutting through the crown is the best way to see what's going on. Look for a reddish-brown discoloration of the crown. Note that because of the cool wet conditions we had this entire summer and much of this fall, slow growth has been common and alone isn't a cause for panic.

Source of plant infection: Most commonly these diseases come in on plants from the nursery, but it's possible that if tips were bought in, the disease didn't originate where the plug plants were rooted. *C. gloeosporioides* in particular can be present on a wide range of plants including apples, peaches, and some weeds, so it's difficult to eliminate all possible sources.

Cultural management: The disease organism(s) are most problematic under warm (above 80 degrees F)

humid conditions. Thus in plasticulture, avoiding situations that make conditions warmer - such as leaving the row covers on during warm spells - should be avoided. If the disease is present, manage row covers to keep plant temperatures as cool as possible, even though this may mean not having the first ripe berries. Using straw mulch between the rows and around the plants helps by keeping temperatures cool and minimizing rain splash, which spreads inoculum from infected to uninfected plants. Removing plants from the field that show symptoms of crown rot - plus a few of their neighbors - can help greatly with reducing inoculum and spread of the disease.

Chemical management:

Captan, Topsin-M, Switch, and the strobilurin-containing (QoI) fungicides Pristine, Abound, and Cabrio are all fairly effective on anthracnose in general. However, wording on individual product labels varies as to which species or type of anthracnose (fruit or crown rot) is covered. In

general, a spray or two of Captan and Topsin in the fall before row covers are pulled on helps to minimize diseases such as leaf spot and Botrytis whether anthracnose is present or not. In the spring, concentrate on protecting plants especially during warm spells, with fungicides applied every 7 to 10 days if necessary. Keep in mind that if applying bloom sprays for gray mold, Pristine and Switch are also very good gray mold materials. Alternate with or include Captan to minimize buildup of resistant fungicide strains. Be sure to follow label recommendations for alternating fungicides to minimize development of resistant disease strains.

Thanks for Dr. Frank Louws at North Carolina State University for providing background information for this article, and reviewing its accuracy. (**Source:** *The Vegetable & Small Fruit Gazette, Volume 13, No. 11, November 2009*)



RASPBERRY

Raspberry and Blackberry Variety Review

Courtney Weber, Cornell University

Raspberry varieties are classified as floricanes (summer) or primocane (fall) bearing. (A few primocane bearing types are described as everbearing, which produce a small to intermediate fall crop and can be managed in a double cropping system.) Raspberries are naturally biennial with a perennial crown. Primocanes grow the first year, go dormant in fall, get chilled in winter, and fruit the following summer (the primocanes are now called floricanes, which die after fruiting). New primocanes are growing as the floricanes fruit. Floricane varieties must be pruned in the spring to thin the fruiting canes and remove dead canes for better disease management and fruit size. There are red (*Rubus idaeus*), black (*Rubus occidentalis*), and purple (red x black hybrid) raspberry varieties suitable for production in temperate states.

Primocane varieties fruit on the first year's growth in the fall of the year. Currently, red varieties and some yellow varieties are available of this type although developments in black and purple raspberries include primocane fruiting. The strength of fruiting in primocane types varies widely from tips only on some floricanes varieties to nearly the whole cane in varieties such as 'Autumn Britten' and 'Himbo Top'. Later primocane varieties such as 'Ruby' and 'Heritage' can have yield reductions from early frosts in more northern growing regions. Pruning in primocane varieties is done by mowing spent canes to the ground before primocanes emerge in early spring.

Currently available black and purple raspberry varieties are floricanes bearing with most developed in New York or derived from germplasm from the region.

New raspberry varieties are actively being developed in about 11 public breeding programs around the world with the majority suitable for production in the temperate regions of the U.S. coming from Cornell University ('Heritage', 'Encore', 'Prelude', 'Titan', 'Ruby', 'Taylor'), University of Maryland ('Caroline', 'Anne', 'Jaclyn') and Ag Canada in Nova Scotia ('Nova', K81-6). Increasingly, new varieties from European programs are being introduced in to the U.S. ('Autumn Bliss', 'Autumn Britten', 'Polana', 'Polka', 'Himbo Top' and others). No variety will work well in all locations, soil types, and

productions systems, but many have proven useful in many different situations. By planting a series of varieties, it is now possible to have fruit from mid to late June until fall frost (or longer with protection) in much of the temperate U.S. with only a short late-summer lag in production.

PRIMOCANE RED RASPBERRIES

Autumn Bliss (Great Britain, Plant Patent #6597) is an early ripening raspberry with large, highly flavored fruit. It ripens 10 to 14 days before Heritage. Much of the crop is produced within the first two weeks of harvest, which is an advantage in northern climates. It produces short canes with few spines. The fruit is dark red and darkens with storage and is fairly soft. It is susceptible to raspberry bushy dwarf virus.

Autumn Britten (Great Britain, Patent Pending) is early ripening with large, firm, good flavored fruit. The fruit tends to be dark and darkens in storage. It is taller than 'Autumn Bliss' with better fruit quality but lower yields. It produces sparse cane numbers.

Caroline (University of Maryland, Plant patent # 10,412) is a large, good flavored, conical fruit. The fruit will darken with storage. It produces tall upright canes. The short fruiting laterals can be challenging to pick, but

yields are very good for the fall. It has moderate to good resistance to Phytophthora root rot.

Heritage (Cornell University-NYSAES) is considered the standard for fall bearing varieties. These tall, rugged canes have prominent thorns and can be very high yielding if the complete crop can be harvested. The primocane crop ripens relatively late. Fruit is medium-sized and has good color and flavor, firmness, and good freezing quality. It is resistant to most diseases. Due to its late ripening, this variety is not recommended for regions with cool summers or a short growing season with frost before September 30 unless high tunnels or other cold protection is used.

Himbo TopTM (variety 'Rafzaqu') (Switzerland) produces good quality, large fruit. The fruit is bright red with good flavor. Plants are vigorous and upright and medium in height with very long fruiting laterals that require



trellising. Sucker production is somewhat sparse leading to moderate yields.

Jaclyn (University of Maryland, Plant Patent #15647) is an early season variety with large firm berries ripening 2 weeks before Heritage. The fruit is dark red with superior flavor and will darken with storage. The fruit is very long conical and adheres tightly until fully ripe. Plants are vigorous and erect but susceptible to yellow leaf rust. Potato leaf hoppers show a strong preference for this variety and can cause significant damage.

Joan J (Great Britain) is an early season variety with very firm fruit with a thick texture. The fruit is conic and dark red and will darken with storage. The canes are vigorous, upright and spineless making picking easy. Yield and fruit size is very good. The fruit skin is thin and can be damaged easily, especially in high temperatures.

Josephine (University of Maryland, Plant Patent #12,173) fruit is large with very good flavor ripening in the late season. Berries are firm and cohesive. Plants are upright and vigorous needing little containment trellising. It is resistant to leaf hopper and Phytophthora root rot. This variety will extend the season in a high tunnel system. (This variety is not currently available due to propagation problems.)

Polka (Poland) has medium large primocane fruit that ripen in the mid-fall season. The fruit is somewhat soft with good quality and a shiny red appearance. It is a vigorous variety with good sucker production. Potato leaf hoppers so a strong preference for this variety and can cause significant damage.

PRIMOCANE YELLOW RASPBERRIES

Anne (University of Maryland, Plant patent # 10,411) produces large, conic, pale yellow fruit that ripen mid- to late season. It has very good flavor and texture. Tall upright canes sucker sparsely requiring higher planting density. It is resistant to Phytophthora root rot but susceptible to leaf hoppers and rust.

Kiwigold (New Zealand, Plant patent # 11,313) and **Goldie** (cv. Graton Gold) (California, Plant Patent #7,625) are amber sports of Heritage, similar in all characteristics except fruit color. Fruit blushes pink when overripe with Goldie slightly darker. The fruit is medium-sized and has good flavor and firmness and ripens relatively late. They are resistant to most diseases.

FLORICANE RED RASPBERRIES

Early Season

Boyne and **Killarney** (sibling varieties from Manitoba) perform very similarly. Both have are early season with small to medium sized fruit with good eating and freezing quality but can be somewhat dark and soft. The plants are spiny and produce many suckers. They have excellent winter hardiness but are susceptible to anthracnose. Boyne is moderately resistant to late yellow rust and

tolerant to Phytophthora root rot and crown gall, but is susceptible to raspberry fireblight.

Killarney is moderately resistant to Phytophthora root rot and is susceptible to mildew.

Prelude (Cornell University-NYSAES, Plant Patent #11,747) is the earliest summer fruiting variety available. The fruit is medium sized, round, and firm with good flavor. It is very resistant to Phytophthora root rot and has good cold hardiness. A moderate fall crop is large enough to warrant double cropping. It is the best early season variety available for the northeast.

Mid Season

Canby (Oregon) canes are tall, nearly spineless, and moderately productive. The fruit ripens mid season, is medium to large in size, firm, and bright red with excellent flavor. It has moderate to poor cold hardiness, and buds may winter kill in cold climates. It is susceptible to Phytophthora root rot.

Nova (Nova Scotia) is vigorous and upright with long, fruiting laterals. The canes have very few spines. The fruit ripens in mid-season and is medium sized, bright red, firm, and somewhat acidic in taste. It is considered to have better than average shelf life. The plants are very hardy and appear to resist most common cane diseases, including rust. It will set a late fall crop.

Titan (Cornell University-NYSAES, Plant patent # 5404) produces large canes with very few spines with suckers that emerge mostly from the crown, so it is slow to spread. It is susceptible to crown gall and Phytophthora root rot but is extremely productive. Fruits ripen mid to late season and are extremely large and dull red, with mild flavor. Berries are difficult to pick unless fully ripe. With only fair hardiness, Titan is for moderate climates. It is resistant to the raspberry aphid vector of mosaic virus complex.

Late Season

Encore (Cornell University-NYSAES, Plant patent # 11,746) is one of the latest summer fruiting raspberry varieties available. It produces large, firm, slightly conical berries with very good, sweet flavor. The fruit quality is considered very good. It is moderately susceptible to Phytophthora root rot and has good cold hardiness.

K81-6 (Nova Scotia) produces canes that are medium tall with spines only at the base. The fruit is very large with good flavor that ripens very late summer with average firmness. It is resistant to late yellow rust but is susceptible to leaf curl virus and raspberry fire blight. Hardiness is judged adequate for most areas.

BLACK RASPBERRIES

Black Hawk (Iowa State University) fruit is small and glossy with good firmness. Plants are vigorous, similar to wild types. The canes are relatively hardy, and resistant to

anthracnose. Yields are moderate. This variety is generally falling out of favor due to its small fruit and wild growth habit.

Bristol (Cornell University-NYSAES) fruit is medium to large and firm, with excellent flavor. Plants are vigorous, high yielding for black raspberry and hardy. It is susceptible to anthracnose and tolerant to powdery mildew.

Haut (USDA-ARS, Maryland) fruit is large sized but soft. The dark shiny black color makes them very attractive. It ripens over a long period producing good yields. The plants are vigorous and upright with good productivity.

Jewel (Cornell University-NYSAES) fruit is large, firm, glossy, and flavorful. Plants are vigorous, erect, hardy, and productive. This variety appears to be more disease resistant than others including resistance to anthracnose.

Mac Black (Michigan) ripens medium large berries 7-10 days later than most varieties. The fruit is large, moderately firm and flavorful. The canes are vigorous, erect, and hardy.

PURPLE RASPBERRIES

Brandywine (Cornell University-NYSAES) ripens later than most red varieties and are large, reddish-purple, and quite tart. Berries are best used for processing. This is a high yielding variety. Canes are very tall with prominent thorns, and suckers grow only from the crown so the plant will not spread. It is susceptible to crown gall but partially resistant to many other diseases.

Royalty (Cornell University-NYSAES, Plant patent # 5405) is the most widely planted purple variety. Fruit ripen late and are large and reddish-purple to dull purple when fully ripe. Berries tend to be soft but sweet and flavorful when eaten fresh. It is excellent for processing and can be harvested when fruit is red for fresh eating. Canes are tall and vigorous, with thorns, and are extremely productive. Royalty is immune to the large raspberry aphid, which decreases the probability of mosaic virus infection, but is susceptible to crown gall. (*Source: New York Berry News, Vol. 8, No. 10, October 2009*)

High Tunnels for Late Fall Raspberries and Blackberries

Marvin Pritts, Cornell University,

Producing fruits, vegetables and flowers out-of-season is one way to increase value and income because crops usually can be sold at a higher price then. The use of high tunnels is a technology that can be implemented just about anywhere for a modest cost, and can be used to bring crops on earlier or extend them later in the season. A high tunnel is simply a large hoop house covered in plastic, with sides that can be rolled up or opened for ventilation. High tunnels are not powered by electricity so they do not typically have fans, heaters or lights. Because the plastic covering is generally applied and removed seasonally, and because they are not powered with electricity, high tunnels are usually classified as temporary structures and may fall outside of certain taxing, building and zoning requirements.

Plants are set directly into the soil under the tunnel. Tunnels are high and wide enough to allow tractors through to spray and cultivate. A typical size is 15 to 30 feet wide and 96 feet long. Europeans have been using this technology for years, and often connect several tunnels together. The Chinese also have

been using a type of tunnel technology to produce fruits and vegetables. Because the United States is such a large country, we have found it economical to grow crops in the south and ship them north to extend the season. However, even in warm climates, tunnels are helping to improve fruit quality.

Raspberries are a high value crop that, in season, sell for more than \$3.00/lb. In the middle of winter, raspberries

can sell for more than \$10.00/lb. Our goal was to produce raspberries in October and November, after the field season ends from frost and rain, and when the selling price of raspberries jumps. We planted primocane-fruiting raspberry varieties, managed them in various ways to delay their production beyond the normal late August-September season, and then

fruited them under a plastic tunnel.

Primocane-fruiting raspberries were planted in April of 2004 in 4 rows spaced 7 ft apart. Plots were 16 ft. long (6 per row). All canes were mowed to the ground in the fall of 2004 after summer's growth. In spring of 2005, we



installed the framework for a tunnel over the planting. The tunnel was covered with plastic on September 13, 2005, just prior to harvest.

Typically, a grower would prefer that fall-bearing types fruit early to avoid frost so that a full harvest can be achieved. Our objective was to delay fruiting of Heritage until late in the fall when they would be protected by the high tunnel, and when the availability of fresh raspberries is low and the price is high. Five treatments were used: an unmanipulated control, applying straw over plots in late February to delay cane emergence, mowing canes to the ground in early June shortly after they emerge, pinching primocanes (removing the top 4-6 inches) when they reach a height of about 2 ft., and pinching when canes were 3 ft. tall. Each of these manipulations delayed flowering and shifted production later in the season.

Harvest started in early September at the normal time. Tunnel sides were rolled up in the morning and closed in the evening to regulate temperature. As the weather turned colder, outdoor plants slowed their production and fruit quality deteriorated. October was characterized by record rainfall, so any outdoor fruits that survived were moldy and tasteless. Inside the tunnel, however, fruit quality remained high and harvest continued into November. On particularly cold nights, we covered the plants with row cover since tunnels do not provide a large amount of frost protection. On most nights, however, we simply closed the sides and doors of the tunnel while allowing some ventilation during the day.

We were concerned that pollination would be a problem in the fall, so were anticipating requiring a bee hive. However, native bumble bees were attracted to the house in large numbers, without adding a hive. The bees stayed in the house continuously, sleeping under the leaves and foraging on raspberry flowers during the day.

Yields were high; we averaged nearly 2 lbs. per ft. of row in control plots of Heritage. Because rows were closer together than in the field, our yield per unit area was about 4 times higher than yields from outdoor plantings. Since much of the fruit was produced out-of-season, we sold our fruit at the Cornell Orchards store for \$5.00/pint (\$6.70/lb). Assuming that all of the plants in the tunnel produced as well as the Heritage controls, and assuming that we could sell everything from the tunnel, our gross sales from our 96 ft long x 30 ft wide tunnel would have been more than \$6,000. We have repeated these results in four successive years with fall-bearing raspberries, and have no evidence that yields or quality have diminished. This year we will be harvesting the primocane-fruiting blackberry Prime-Jan during September and October, extending the blackberry season from mid-July to well past frost.

Given that energy and transportation costs continue to rise, and knowing that high tunnels use free solar energy, it may be worth considering placing a few high tunnels on the farm to extend the season of the most highly-valued crops. (*Source: New York Berry News, Vol. 8, No. 10, October 2009*)

BLUEBERRY

‘Superior’ (MN 5451) Blueberry Released from Minnesota

The University of Minnesota introduced ‘Superior’ (MN 5451) blueberry in 2009 through nurseries cooperating with the Minnesota Nursery Research Corporation, as with our past introductions such as ‘Polaris’ and ‘Chippewa’.

‘Superior’ is being introduced primarily because it matures the majority of its fruit about 1 week later in the season than other blueberry varieties that can be grown in USDA Hardiness Zones 3 and 4 and also because of its exceptional productivity in cold climates. ‘Superior’ has been the most productive cultivar in trials at Grand Rapids, MN (Zone 3) and among the most productive blueberry selections in trials at Becker, MN (Zone 4) (see table below).

The plant reaches a height of 4 to 5 feet and a spread of 4-5 feet at Becker in central Minnesota. At Grand Rapids, in northern Minnesota, plants are 2.5 to 3 feet tall and 3-4 feet in diameter. The plants are similar in stature to ‘Chippewa’. They are more upright than ‘Northblue’, but

have been rated similar in hardiness and begin blooming several days later than ‘Northblue’. Plants produce a typical display of white flowers during bloom in May and maroon foliage in October.

The berries average 1.3 to 1.4 g in mass compared to 1.4 to 1.8 g for ‘Northblue’ and are similar in size to ‘Chippewa’. The berries are light to medium blue, similar to ‘Polaris’ and ‘Chippewa’ and lighter than ‘Northblue’. The picking scar has been similar to ‘Northblue’ and ‘Chippewa’ and larger than ‘Polaris’. The flavor is balanced and pleasant, less acidic than ‘Northblue’. ‘Superior’ berries are firmer than ‘Northblue’, similar to ‘Chippewa’, and not as firm as ‘Polaris’.

‘Superior’ is available in 2009 from DeGrandchamp’s Blueberry Nursery (see <http://www.degrandchamps.com/nursery.htm>).

Table 1. Average yield and berry weight for blueberry cultivars from 1991-2006 from plantings established in 1989 at Grand Rapids and Becker, MN

Cultivar	Yield (lbs/plant)		Berry Weight (g)	
	Grand Rapids	Becker	Grand Rapids	Becker
Superior	3.3	3.2	1.4	1.4
Northblue	2.1	3.7	1.4	1.8
St. Cloud	2.1	2.4	1.5	1.4
Bluecrop	1.0	3.9	2.0	1.7
Patriot	1.5	4.3	1.6	1.6
Friendship	1.0	2.9	0.9	1.0
LSD 5%	1.1	1.4	0.4	0.3

Table 2. Percent of total yield harvested on each of three harvest dates (average over 1994-1999) from plants established in 1989 at Becker, MN. Sequential harvest dates are separated by 14 days.

Cultivar	Harvest 1	Harvest 2	Harvest 3
Superior	26	57	17
Northblue	39	51	10
St. Cloud	51	43	6

(Source: Univ. of Minnesota Blueberry Production Fact Sheets; <http://fruit.cfans.umn.edu/blueberry/superior.htm>)

Spring Planting Plans

Gary Pavlis, Rutgers University Extension

Some growers may be considering a new blueberry planting next spring. It is imperative that some preparation occur beforehand so that disasters do not occur down the road. This year I visited a farm with 4 year old 'Duke' plants whose berries were not yet ripe. The berry load was very large but the berries were starting to dry up and there were very few leaves on the plants. As any reader of this newsletter knows, having no leaves is usually due to a root problem. When I dug a plant up I saw that the roots system went down 6-8 inches and then stopped. The plant could be literally peeled off the soil at a depth of 8 inches. Further investigation revealed that the soil changed color at 8 inches to a bright orange, contained clay and was impervious to blueberry roots. So what we have here is a planting of 'Duke' that was 4 years old, with a root system that will never grow any deeper than 8 inches because of the clay hard pan. These plants were trying to ripen a crop with a tiny root system and as a result, could not uptake enough water and nutrients to push leaves and ripen a load of fruit. The grower options are not very appealing:

1. pull up all the plants and sub-soil to a depth of at least 2 feet and replant,

2. sub-soil a new row between the old ones and move all the plants,
3. remove the trickle system and apply 6 inches of mulch to the plant row and return the trickle system to the top of the mulch hoping that the root system will grow up into the mulch.

All three require a lot of work. The alternative is a dead block of 'Duke'. This situation once again reminded me of the importance of site preparation before planting. Doing a soil boring before planting would have revealed the hard pan and the need for sub-soiling, something which is a lot easier to do before the plants are in the ground.

There are some critical things to take care of before planting. Checking pH and adjusting it to 4.5 to 4.8, doing a soil boring and checking for hard pans and the seasonal high water table, and eliminating perennial weeds are at the top of the list. In the end, a little work early can eliminate a lot of headaches later. (Source: *Blueberry Bulletin*, Vol. 25, No. 23, September 2009)

GRAPE

Post-Harvest Checklist for Vineyards

Jodi Creasap Gee, Cornell University

It's safe to say at this point that we've reached the end of the growing season. What has not been picked by now

will likely not be picked at all - unless, of course, late harvest and ice wines are in the future for some growers

and wine makers. Congratulations for making it through the season! Now is the time to think about post-harvest chores. Clean up and storage and all the fun tasks that come with winterizing vineyard equipment.

Post-Harvest Checklist:

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

1. Collect all bins that may be distributed far and wide. Clean and store them properly, under cover if needed.
2. Take the nets off the vines and store bird control devices and other items that are in the vineyard during the growing season for the winter.
3. Collect your weight tickets or whatever you use to calculate your charges to your customers. Send itemized invoices out to the wineries with payment terms. Check and double-check your contracts and numbers. If there are issues related to the contract, you can either take that up with the winery or processor now or a little later.
4. You have probably noticed vines with red leaves or white varieties with leaf curl. These may or may not be candidates for virus - be sure to check the trunk for damage or crown gall. If the trunk is clean, tag and test the vine for the presence of virus(es). They should be pulled if they test positive for virus, or you should plan to renew trunks if tumors or injuries are present.
5. If you have new vineyards that are clean tilled, it is too late to get a winter cover planted, but plan to get some grass on the soil for next year to prevent erosion. Prep the ground properly with a disc and harrow (no rototillers, please), then rent or borrow Chautauqua County's no-till drill or use an inexpensive seed spreader and roll the seed into the ground. The standard types of grasses used are rye, barley or oats. These are not permanent covers and, when taken down, they will enhance the fertility of your soils. Remember, the higher the organic matter in your soil, the less nitrogen you need to apply pre-bloom. You can plant a permanent cover of durable slow and low growers like creeping red fescue, especially if vine vigor is a chronic problem. It will likely be expensive.
6. If you had weed problems this year, you might want to try a fall application of Roundup after the leaves drop from the vines. Remember, use of several 2, 4-D formulations is illegal in the Western New York Grape growing counties, so double-check formulations and regulations prior to applications to eliminate broad-leaf weeds.
7. Be sure to record trouble spots in each block, be it a downy mildew, powdery mildew, or phomopsis problem from this year. Losing leaves to disease only skews the

leaf-to-fruit ratio, thereby making ripening more difficult in these "high yield and minimum standards" times. Being on top of sprays right out of the gate next spring will keep the vines cleaner and healthier and more productive. A healthy vine can be a productive vine.

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

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

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

11. Many growers are already pruning, are you? Is your equipment ready, and do you know who will be pruning and what their skill level is? Pruning sets the tone for quality in 2009; recall we hit the high yield trifecta this year - more buds left, more water, and little to no crop thinning was done. While this led to high yields, many vineyards struggled to reach minimum levels of soluble sugars, which may or may not pay off.

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

Quality starts in the vineyard, and it is essential to forge a relationship with the winemaker to whom you are selling fruit.

13. When you have the time, sit down and review the season carefully. This season started out warm and sunny and finished wet and cool. Figure out what worked and what didn't, and remember that if you were trying something new in your blocks, it usually takes almost 3 full seasons to see a statistically significant difference in treatments. Again, record trouble spots (disease, insects, frost pockets, etc.) and plan to manage your blocks accordingly for next year. Vine balance seemed to be a problem in some vineyards this year, although it did not prevent grapes from being harvested. Plan for this for next year. Will you leave more buds on and plan to crop thin 30 days post bloom? Or will you plan to leave fewer buds on this year? One of the keys to vineyard management is

managing on a yearly basis - every year is different, so you cannot always have the same practices from year to year. How was vineyard nutrition? Did you get your soil and petiole tests completed and recommendations back? Plan for nutrient amendment applications to build up soil health. Should anything be done differently for next year for vineyard floor management? Finally, you are running a business, so assess the health of the business. Did you make money? Did you sell your entire crop? Take a long, hard look at this and determine where you can improve efficiency and profitability without cutting corners at the expense of vine health.

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

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

GENERAL INFORMATION

What is the Best Way to Put Micronutrients into Plants?

Steve Bogash, Penn State Cooperative Extension

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

In general, when we are talking micronutrient deficiency in our region we are considering levels of Copper, Iron, Manganese, Boron, and Zinc. Calcium and Magnesium are primary nutrients, but since they are seldom addressed in articles relating to macronutrients and we use similar techniques to make up for deficiencies in them, their application is included here. Working towards a slightly acidic pH of 6.2-6.8 in the root zone will greatly increase the availability of most of the nutrients needed to grow a good small fruit or vegetable crop (with the notable exception of blueberries). As pH in the soil solution approaches 7.0 and higher, many nutrients become less available. Some soluble fertilizers such as Miller's Nutrichem 9-15-30 contain a blend of micronutrients formulated largely as chelates which are very stable and available to plants along with N, P and K. Dry kelp meal or kelp extracts are good natural sources to bring soil micronutrient levels up. Some, but not all of these

products are OMRI listed. Soluble fertilizer blends consisting only of a blend of micronutrients such as Miller's Microplex are another option. Specific nutrient materials such as Helena's Ele-Max Super Zinc and Ele-Max Magnesium FL are very useful in supplementing zinc and magnesium levels. Trace elements fed to livestock and applied as manure to fields will often prevent micronutrient deficiencies.

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

Foliar application of nutrients is an excellent method to cure immediate deficiency problems. The single greatest concern in foliar application is in causing phytotoxic reactions, thus damaging leaves or fruit. While you might apply #1-2 / acre of Zinc chelate through drip lines, a foliar application of 3-8 oz of the same material is sufficient. Up to #3/ acre of Boron as Borax can be applied to the soil, yet only 4-8 oz/ acre is the maximum that can be applied foliarly. Growers can utilize tank mixes in applying many micronutrients. However, just as some mixes of fungicides and insecticides can be phytotoxic, multiple micronutrients in a tank mix can have a similar result. Most injury shows up within the first 48 hours. So apply a test solution to a small area, wait 48 hours and assess the situation before making the

entire application. Foliar applications are best used to make up for short term deficiencies. Growers will either need to apply them often or combine foliar with fertigation application. The first step in producing a healthy crop is in creating a healthy canopy. Once you've burned the leaves from too much material or a toxic blend, it is very challenging to turn the crop around.

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

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

Of all of the errors that I've made and seen growers make over the years, simple mathematical errors that occur in determining foliarly applied micronutrient rates seem to be the worst. It is very easy to make a simple mistake of one decimal point in calculating rates and burn a crop past the point of no return. A one decimal point mistake can produce a 10x error that will readily create a micronutrient solution that is very toxic to a crop. Foliar application also complicates tissue testing since the laboratory has no way of knowing whether the boron / zinc / copper.... that is showing up in their sample is sitting on the tissue surface or has been taken up by the plant. For field samples, wait to harvest tissue until after a soaking rain. When pulling greenhouse or high tunnel samples, wait at least one week after nutrient application, carefully wash the leaves or petioles, then, blot dry on paper towels. This simple extra care in sample handling will greatly increase test accuracy.

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

UPCOMING MEETINGS:

Nov 7 & 8, 2009. *15th Annual Franklin County Cider Days*, at various locations. For complete program of activities go to www.ciderday.org.

November 18, 2009 *Blueberry/Cranberry Disease Management Webinar*. 12:45 – 2:00.

Blueberry Viruses [Dr. Annemiek Schilder](#), Michigan State University

Important Cranberry Diseases in the Northeast [Dr. Frank Caruso](#), University of Massachusetts

For more information or to sign up go to: <http://www.fruit.cornell.edu/Berries/webinarschedule.htm>.

December 2, 2009 - 12:45 PM EST Blueberry/Cranberry Production

Blueberry Site Preparation and Fertility Considerations [Dr. Gary Pavlis](#), Rutgers University

Overcoming Blueberry Pollination Challenges [Sonia Schloemann](#), University of Massachusetts

For more information or to sign up go to: <http://www.fruit.cornell.edu/Berries/webinarschedule.htm>.

December 7-10, 2009. *North American Strawberry Grower's Association Annual Meeting and Conference*, Grand Rapids Michigan. For detailed information go to: <http://www.nasga.org/>.

December 14, 2009. *GAP Training*. Center of New Hampshire Radisson, Manchester NH. 1:00 pm-5:30 pm. This meeting will introduce the basics of USDA/FDA's GAP (Good Agricultural Practices) Certification Program for wholesale fruit and vegetable growers. For info, contact Shirley Mietlicki-Floyd at 413-545-4420 or mietlicki@umext.umass.edu or Becky Grube at 603-862-3203 or becky.grube@unh.edu.

December 15-17, 2009; *New England Vegetable & Fruit Conference*, Radisson Hotel, Manchester, NH. For more information visit www.newenglandvfc.org.

December 9, 2009 *Blueberry/Cranberry Insect Management Webinar*- 12:45 – 2:00
Winter Moth: A New Blueberry Pest [Robert Childs](#), University of Massachusetts
Japanese Beetle Management [Dr. Roger Williams](#), Ohio State University

For more information or to sign up go to: <http://www.fruit.cornell.edu/Berries/webinarschedule.htm>.

January 25-27, 2010. *Empire State Fruit and Vegetable EXPO/NYS Farmer's Direct Marketing Association Annual Conference*. OnCenter, Syracuse, NY. Mark your calendars – berry session Wednesday January 27th.

February 2-4, 2010. *Mid-Atlantic Fruit and Vegetable Convention*, Hershey Lodge, Hershey, PA. For more information visit <http://www.mafvc.org/html/>.

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.

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