



# Berry Notes

Prepared by the University of Massachusetts Fruit Team

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### UPCOMING MEETINGS

## Current Conditions:

**Strawberry** fields remain quiet at this time of year. Dayneutral varieties are still fruiting. Annual production or plasticulture fields are being planted now. Late summer and early fall is a good time to fertilize both new and established strawberry fields. Leaf tissue analysis can help guide fertilizer amounts but typically strawberries will need 20 – 50 pounds of nitrogen at this time of year. Amounts depend on how much was applied at renovation and the organic matter content of the soil. Check new fields for evidence of potato leafhopper burn and evaluate older fields for the level of foliar diseases. Irrigation is needed in most areas due to the dry weather in August. **Highbush Blueberry** is winding down. Dry weather in late summer has caused some fruit drop unless irrigation was employed. Survey fields for weak bushes and determine whether or not Blueberry Stunt may be the cause (see more on this below). Only non-nitrogen fertilizer applications should be made this late in the season. Also, be sure to keep you blueberries well watered during the coming weeks. **Summer raspberry** harvest is done. Be on the lookout for Orange Rust on black raspberries and blackberries. **Fall raspberries** is in full swing. Botrytis fruit rot is still a threat, especially during wet weather. Be sure to provide irrigation (drip preferred) so the canes can size up the fruit. Also check for mites and leafhopper damage. **Grapes** are well into veraison and nearing harvest for early varieties. Early table grape varieties (e.g., 'Lakemont', 'Himrod', 'Vanessa', 'Reliance', 'Canadice') are being harvested. Midseason varieties will be ready soon. Scouting for disease and insect levels and taking corrective action are still important activities now. Downy Mildew seems to be prevalent in susceptible varieties this year. Prepare for wine grape harvest by checking fruit ripening parameters regularly. Mite infestations can build up quickly at this time of year. Be sure to check the underside of your leaves.

## ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for a two week period, August 9, 2007 through August 22, 2007. Soil temperature and phenological indicators were observed on or about August 22, 2007. Accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments from the beginning of the current calendar year. This information is intended for use as a guide for monitoring the developmental stages of pests in your location and planning management strategies accordingly.

Region/Location	2007 GROWING DEGREE DAYS		Soil Temp (°F at 4" depth)	Precipitation (2-Week Gain)
	2-Week Gain	Total accumulation for 2007		
<b>Cape Cod</b>	243	2,023	74°F	0.15"
<b>Southeast</b>	236	1,929	62°F	0.11"
<b>East</b>	263	2,087	70°F	0.30"
<b>Metro West</b>	255	2,088	63°F	0.12"
<b>Central</b>	237	1,873	62°F	0.73"
<b>Pioneer Valley</b>	216	1,964	66°F	0.86"
<b>Berkshires</b>	253	1,953	67°F	1.12"
<b>AVERAGE</b>	243	1,988	66°F	0.49"

*n/a = information not available*

*(Source: UMass Extension 2007 Landscape Message #22, Aug 24, 2007)*

## STRAWBERRY

### Strawberry Fall Check-List

*Sonia Schloemann, UMass Extension*

√ **General:** Flower bud initiation deep in the crown of the plants is happening now, determining next years' yield. So, maintaining good plant health into the fall is important. In addition to keeping up with the fertilizer program, suppressing leaf diseases improves the ability of the plant to carry on photosynthesis and store starch in the crowns. Don't let leaf spot or powdery mildew get ahead of you. Narrow the rows to about 12" and cultivate the alleys in fruiting fields and new plantings for the last time before mulching. Plant winter rye in plowed down fields as soon as possible in order to get good establishment and growth before winter.

√ **Nutrition:** Nitrogen fertilizer should be applied to bearing beds in early September to bring your seasonal total up to 100-120 lbs/acre. Most growers apply about 70-80 lbs of nitrogen on at renovation. The fall application should provide another 30-50 lbs (more on soils with low organic matter content). This stimulates good root growth in the fall and supplies nitrogen needed for flower bud initiation. New fields need to have a total of 80 - 100 lbs/acre of nitrogen with about 40 lbs applied in the fall. Ammonium nitrate (35% N) is a good fertilizer for the fall application. If your leaf tissue analysis shows deficiencies in magnesium or boron, early fall is a good time for foliar applications of Epsom salts (15lbs/100gal/acre for magnesium) and Solubor (3lbs/100gal/acre) for boron. Don't make these

applications on hot humid days, however, or phytotoxicity could result. Read the labels.

√ **Weeds:** Weed management in the early fall is limited to cultivation and hand weeding/hoeing. The only herbicide you should consider using is Poast® for controlling grasses. Poast® will only work on relatively small grasses. Big clumps of crabgrass will have to be pulled by hand. However, quackgrass can be knocked down by cultivation or mowing and then treated with Poast® when new growth is less than 6" high. One note of caution; Poast®, which is used with a crop oil surfactant, can injure strawberry foliage in cold weather. I would recommend its use as a spot treatment at this time of year rather than a broadcast treatment of the whole field. Weed management later in the fall can include applications of preemergent materials such as Devrinol® and Sinbar®.

√ **Diseases:** Clean up severe infections of leaf spot and powdery mildew. Nova® and Pristine® may be a good materials for this use. Healthy leaves are important at this time of year to supply the plant with the energy to produce flower buds for next year's crop and to store energy in the roots for the first flush of growth next spring. Apply Ridomil Gold®, Alliette® or Phostrol® in September or early October in areas where Red Stele has been identified. It is best to apply these materials when the soil is beginning to cool but before heavy fall rains begin. This should not be

considered an alternative to good site selection for strawberries.

√ **Insects:** Check fields for infestations of leafhopper or aphids. Generally, plants can take a fair amount of

feeding by these insects, but heavy infestations can be a problem. And, aphids in particular, can vector virus diseases and should not be allowed to build up especially when they are in the winged form and can disperse to other fields.

### Late Summer Weed Control In Strawberries

*Andrew Senesac, Cornell University*

Winter annual broadleaf and grassy weeds begin to germinate and get established in the late summer and early fall. Weeds such as horseweed (maretail), chickweed, groundsel, sowthistle and downy brome will overwinter as small inconspicuous plants and then begin rapid growth and seed production in the spring. There are a few options to manage these weeds for LI growers at this time of year.

Sinbar (terbacil): Strawberries (planting year 2007) that are well established can be treated with 2-4 oz. of Sinbar in the late summer for winter annual weed control, the application must be washed off actively growing strawberry foliage immediately with irrigation or rainfall or severe injury will occur. This timing is not labeled or recommended for bearing plantings, however Sinbar can be used on all plantings later in the fall after the plants have gone dormant but before covering with straw.

Devrinol (napropamide): Devrinol can be applied in the early fall and again later after strawberries have gone dormant. A total of 8 lbs can be applied in a single growing season. Split applications in the late summer and late fall will help manage both winter annual weeds and volunteer rye from the straw cover.

Select (clethodim) max. 16 oz/yr for LI or Poast (sethoxydim): These two herbicides will control annual and perennial grasses with no residual soil effect. Select has generally been more effective on perennial grasses like quackgrass, but both control annual grasses like foxtail and crabgrass well. Poast should not be applied within 6 weeks of a Sinbar application. Both require the addition of a crop oil concentrate for optimal results. (*Source: Long Island Fruit & Vegetable Update, August 31, 2007*)

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## RASPBERRY

### Raspberry Fall Check-List

*Sonia Schloemann, UMass Extension*

√ **General:** Encourage hardening off of canes in summer bearing varieties of red and black raspberries and blackberries by avoiding nitrogen fertilizers and supplemental watering at this time. Do not remove spent floricanes until later in the winter unless they are significantly infected with disease. Fall bearing raspberries can still benefit from irrigation in dry weather to help maintain fruit size.

√ **Nutrition:** Based on soil and tissue test results, apply non-nitrogen containing fertilizers and lime as needed. For example, Sul-Po-Mag or Epsom Salts can be applied now so that fall rains can help wash it into the root zone for the plants.

√ **Weeds:** Now is a good time to do a weed survey and map of problem areas, so that you can use this information to develop an effective management strategy. A late fall application of Casoron® (dichlobenil) for preemergent control of broadleaf weeds next spring should be made only when temperatures are below 40°F, preferably just before rain or snow.

√ **Diseases:** Fall bearing raspberries can suffer fruit rot problems due to increased moisture present in the

planting (more frequent precipitation, longer dew retention, longer nights) late in the growing season. The majority of this fruit-rot is *Botrytis cinerea*, gray mold. Captan 80 WDG is labeled for use on brambles. In addition Elevate®, Switch®, Pristine® are additional materials available for this use. Frequent harvesting and cull-harvesting are the best practices, but are expensive and impractical in many cases. Thinning canes in dense plantings can also help. Scout summer bearing brambles to look for powdery mildew and treat if necessary. See the *New England Small Fruit Pest Management Guide* for recommended materials and rates. If Phytophthora root rot has been identified in a field, treat the affected area with Ridomil Gold®, Alliette®, or Phostrol® in September or early October. This timing is important to get the material in place in the root zone before the onset of cool wet weather (and soil) in the fall.

√ **Insects:** Now is the time to check plantings for crown borers. Adults of this pest look like very large yellowjacket, but is actually a moth. They are active in the field in August and September laying eggs. Scout the fields for crown borer damage by looking for wilting canes. This symptom can also indicate Phytophthora root rot, so when you find a plant with a wilting cane (or two), dig up the plant and check the roots for brick red discoloration in the core of the roots

(phytophthora) or the presence of a crown borer larvae in the crown. Rogue out infested crowns and eliminate

wild bramble near the planting, since they will harbor more of this pest.

## Botrytis Gray Mold Control in Fall Raspberries

*Annemiek Schilder, Michigan State University*

Gray mold, caused by the fungus *Botrytis cinerea*, is one of the most important diseases affecting fall raspberries. Fall raspberries are usually at greater risk of infection than summer raspberries because of the prevailing weather conditions, such as lower temperatures, heavy dews and frequent precipitation. Cool, wet weather, and heavy rains in the late summer and fall that keep the plants wet for extended periods are conducive to development of the fungus and infection of the fruit.

Typical symptoms include a brown discoloration of the fruit and the presence of a gray fuzzy mold, which can rapidly develop and spread to neighboring healthy berries. Symptoms tend to be more severe inside the canopy and on clusters that are closer to the ground. Even if berries look perfectly healthy at harvest, they can change to a moldy mass within 24-48 hours.

*Botrytis cinerea* is a ubiquitous fungus, which is able to grow and sporulate profusely on dead organic matter. It overwinters in old infected canes and plant debris. The spores are airborne and can travel long distances on the wind. When the spores land on plant surfaces, they germinate and can invade the plant tissues directly or through wounds. Overripe berries and bruised berries are particularly susceptible to infection. Latent flower infections are not as important in raspberries as they are in strawberries.

Cultural methods are very important for control of Botrytis gray mold. Choosing a site with good air flow can reduce humidity in the canopy considerably. Low-density plantings, narrow rows and trellising can also

reduce a buildup of humidity. Good weed control and moderate fertilizer use to avoid lush growth are also important. Selecting a resistant cultivar or, at the minimum, avoiding highly susceptible cultivars will help to reduce the need for control measures. During picking, avoid handling infected berries, since spores can be transferred on hands to healthy berries. Timely harvesting and rapid post-harvest cooling can also help to reduce losses to Botrytis gray mold.

Several fungicides are labeled for control of Botrytis in raspberries. Fungicide sprays during bloom are important to prevent pre-harvest infections, while post-harvest infections can be reduced by sprays close to harvest. Switch (cyprodinil + fludioxonil) is a reduced-risk fungicide with excellent systemic and protectant activity against gray mold. It has a zero-day pre-harvest interval (PHI). Another good option is Elevate (fenhexamid), which is a reduced-risk, locally systemic fungicide with a zero-day PHI. Since these fungicides are in different chemical classes, they can be alternated for fungicide resistance management. My recommendation is to save Switch and Elevate for critical sprays, e.g., during wet periods and for sprays closer to harvest. Other fungicides that may be used in the spray program are Captevate (captan + fenhexamid) (3-day PHI), Pristine (pyraclostrobin + boscalid) (zero-day PHI), Captan (captan) (three-day PHI), Rovral (iprodione) (zero-day PHI) and Nova (myclobutanil) (zero-day PHI). To improve the efficacy of Rovral, an adjuvant may need to be added. Pristine and Nova also provide excellent control of late leaf rust, which sometimes infects the leaves and fruit of fall raspberries. (**Source:** *Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 16, August 21, 2007*)

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## BLUEBERRY

### Highbush Blueberry Fall Check-List

*Sonia Schloemann, UMass Extension*

√ **General:** Blueberry plants should be encouraged to harden off for the winter. This means no nitrogen fertilizer at this time. Flag bushes that show premature reddening of leaves compared to others of the same variety. This can be an indicator of infection with virus or other pathogens. If you haven't done it already, make some notes on observations from this year that might be helpful in coming years (e.g., variety performance, sections of the field that did well or poorly, how well some practices worked, or didn't, etc.). Relying on

memory isn't always accurate enough. Nothing can replace a detailed field history when trying to diagnose problems.

√ **Nutrition:** Hold off on any nitrogen fertilizers. Based on leaf tissue tests and soil tests, sulfur, lime, and some fertilizers can be added now. Apply these before fall rains begin and also before adding any supplemental mulch to the plants.

√ **Weeds:** As with other small fruit crops, now is a good time to do a weed survey and map the weed problems in

your planting. This information will be very useful in tailoring your weed management plan so that is effective and not wasteful. A late fall application of Casoron® (dichlobenil) for preemergent control of broadleaf weeds next spring should be made only when temperatures are below 40°F, preferably just before rain or snow.

√ **Diseases:** Weak plants can easily be detected at this time of year because they tend to turn red earlier than healthy bushes. Upon finding weakened bushes, try to determine the reason for weakness. Is the root system damaged? If so, is it likely from a disease infection or root damage by voles or grubs? If the roots are healthy, could a crown borer (Dogwood borer) be the culprit? Or is stunt disease the cause? Or Scorch? Accurate diagnosis is the first step in resolving the problem and avoiding spread. Enlist the help of specialists if you have trouble determining the cause of problems. See factsheet on Blueberry Scorch at

[www.umass.edu/fruitadvisor](http://www.umass.edu/fruitadvisor) for help diagnosing this disease.

√ **Insects:** The main worry now is for sharp-nosed leafhopper which is the vector for stunt disease. If you have determined that you have bushes infected with stunt disease in your planting, an application of malathion to the infected bushes and any immediately surrounding bushes should be made to control leafhoppers BEFORE removing the infected bushes. Failing to do this will likely cause the spread of the disease to clean bushes even after infected bushes have been removed. More on this below. In eastern areas of the state, growers are concerned about infestations of Winter Moth. Go to [www.umassgreeninfo.org/fact\\_sheets/defoliators/wm\\_id\\_man.html](http://www.umassgreeninfo.org/fact_sheets/defoliators/wm_id_man.html) for more information on this alarming new pest. For now, growers should know that any moths seen flying in their plantings are likely NOT Winter Moth or Canker Worm moths. These moths do emerge and begin flight until November.

## Leafhoppers and Stunt

Gary Pavlis, Rutgers University

Stunt disease of blueberry plants is caused by a mycoplasma-like (MLO) organism as previous stated. MLO's are microscopic organisms that have no definite shape, unlike uniformly shaped types of bacteria or viruses. The MLO of stunt disease live mostly in the transport tissues of the plant, primarily in the phloem.

Leafhoppers of many species feed on plants by piercing the surface of leaves or stems and sucking juices from the phloem tissues. Any leafhopper feeding in the phloem of a stunt-infected blueberry plant has the potential to pick up some stunt MLO in its meal. Fortunately, only one species of leafhopper is known to be able to harbor these MLO's in its body and transmit them to other plants. This is the blueberry sharp-nosed leafhopper, *Scaphytopius magdalenis*. This leafhopper feeds and reproduces on a relatively wide range of blueberry cultivars and on the wild blueberry which grows nearly everywhere in the pinelands of New Jersey. Sharp-nosed leafhoppers are not pest unless the following steps are completed:

- 1) They must feed on stunt-infected plants.
- 2) They must move to healthy plants.
- 3) They must feed long enough to transmit the MLO to the plants.

Stunt disease will spread quickly if these three steps are favored by the particular situation in a blueberry field. Disrupting any of these steps to a sufficient degree can reduce the spread of stunt disease.

Of course, getting rid of all leafhoppers in an area would halt the spread of stunt disease. This is a very impractical solution, since the wild blueberry plants in

our area provide for a large population of leafhoppers in the areas around our cultivated fields. We can't control the development of these populations, so we must defend our cultivated plantings from them. We do this with insecticide treatments, made during the periods when adult leafhoppers are active. Only adult leafhoppers have wings and the ability to move great distances, so these are the real pests in the stunt disease problem.

Pesticides can affect only the second and third steps of stunt disease spread listed above. Leafhoppers are either killed before they reach healthy plants or they die before feeding long enough to transmit the MLO to a new plant. Errors in detecting the presence of adult leafhoppers and problems with the timing of pesticide treatments make it difficult to achieve 100 percent stunt control by chemicals alone.

This is why the roguing of disease bushes provides an important factor in stunt disease control. Stunted bushes are easy to find especially when symptoms become bold in the fall. Attacking the stunt disease transmission cycle at steps one, by the removal of infected plants, is both simple and very effective.

Remember that it is highly recommended to spray stunt-infected plants with a short residual insecticide like Sevin or Malathion before the plant is removed. This will keep any MLO carrying leafhoppers on the infected plant from dispersing to healthy plants when the infected bush is disturbed during removal.

Many growers have told me they have trouble identifying stunt. Plants with this disease are usually the first to turn red in the fall. This may help with identification. (**Source:** *Blueberry Bulletin*, Vol. 23, No. 22, August 27, 2007)

### **Harvest and Grape Sampling**

*Mark Chien, PennState University*

**When to pick?** There is probably no more important question in making good wine. To know when to pick it is important to understand the criteria of fruit maturity. That's why you should definitely read Bruce Zoecklein's article on fruit maturity (go to <http://www.vtwines.info/> > industry pubs > vintner's corner > Vol 16 No. 1). Once you know what these are, it is up to you to assess them in an objective manner. This involves sampling. This is how I used to sample grapes in Oregon... I would take a small bucket into a field and walk up and down rows, cutting off clusters on both sides of a vsp canopy, about 50 clusters on a five acre field taken as randomly as possible. Each distinct field or variety should be a distinct sample. Clusters would be thoroughly crushed by hand and 50ml juice sample drawn and taken into the lab (aka kitchen). pH, titratable acidity and degrees brix with refractometer would be taken and recorded. A larger amount of each sample would be taken with a turkey baster and put into a good quality wine glass and each one is evaluated according to sensory attributes - flavors, aromas, color, tannin, acidity, etc. The samples would be left covered in their buckets overnight and the following morning each sample would be analyzed in the exact same fashion and numbers recorded and compared. In particular we noted pH and sugar shifts as a result of the overnight soak. Flavors, color and overall mouth feel were probably the main indices of ripeness. A total analysis of fruit characteristics such as berry turgor, stem and seed color, skin texture and ripeness of tannins, vine appearance, disease, birds, weather forecast, wine maker inputs would all be synthesized

into an assessment of maturity and readiness. We would try to make a picking decision two days before the actual harvest, sooner if weather - heat or rain, was an issue. Have the same person doing the sampling all the time so the bias and method will be consistent. Of course, don't just pick the ripe clusters. Reach into the canopy. Be careful of bees. Sample in the morning for a lower brix reading, afternoon for a higher reading. This, of course, is just one sampling methods of dozens, but it worked for us and would usually get us to with +/- 0-2 brix from the winery crush sample of the harvest fruit.

Harvest was always a particularly stressful time for me as a grower. No matter how well you planned and prepared, it always seemed that a zillion things would go wrong. It is, at best, organized chaos. Between the weather, birds, disease, labor, wine makers, etc. there was not much of chance that you can account for all the potential problems and hazards. However, I can state emphatically that there is a strong correlation between the amount of preparation you do and the efficiency, safety and effectiveness of the harvest. Now is the time to start planning. I cannot stress safety enough, it must always be the first concern of every grower. Harvest is often rushed and the conditions in the field may be wet so there is higher risk of accidents. Try to prepare for hazardous conditions. I wrote an article with my colleague Ed Hellman for Oregon Viticulture when I was a grower trying to explain how I executed the harvest. I have attached a copy for you to read if you want to know the details of how one vineyard's harvest was conducted. (*Source: PA Wine Grape Info, Aug. 23, 2005*)

### **Watch Out for Multicolored Asian Ladybeetles During Grape Harvest**

*Rufus Isaacs*

*Entomology*

The multicolored Asian ladybeetle is an effective biocontrol agent of soft-bodied insects during the summer, but grape growers and winemakers should be concerned about this insect around harvest time because of the potential to contaminate the harvest. The 2007 season has not been ideal for growth of aphids (the ladybeetle's main food), and so populations of multicolored Asian ladybeetle are relatively low in Michigan this year. It is still a good idea to scout your vineyards for this pest in the coming weeks so there are no problems with crop contamination. Very low levels of multicolored Asian ladybeetle in fruit can taint the flavor of juice and wine. The bottom line is to be alert for the potential threat as harvest approaches and have a plan.

Regular scouting of ripe blocks can help detect ladybeetles before the harvester is running through the vineyard. Research in Minnesota has shown that beetles show up on yellow sticky cards before they move to the clusters, so a few yellow traps can provide an early warning. Checking clusters is still a good idea, and if the beetles are found on the fruit just prior to harvest, there are some insecticide options with very short PHIs to consider. Research in Michigan, Ohio and New York has found that products containing azadiractin (e.g. Azadirect), imidacloprid (Provado Pro), and pyrethrum (Evergreen) have activity against multicolored Asian ladybeetle and can be used to minimize cluster infestation. In recent tests by Roger Williams at Ohio State University, Venom insecticide has given up to four days of excellent activity against multicolored Asian ladybeetle, and was one of the most

active products tested. With a one day PHI, and multicolored Asian ladybeetle on the label for this insecticide, Venom is a valuable tool for grape growers. Baythroid is a pyrethroid insecticide that has also shown high activity against multicolored Asian ladybeetle, and it has a three day PHI making it a potential option for this use. Mustang Max is another pyrethroid, with a one day PHI, and also expected to have high activity on this insect.

Any use of insecticides for multicolored Asian ladybeetle control close to harvest should be discussed with your processor or winemaker. It would be worthwhile having this discussion now to discuss how

to tackle this pest if it appears just before harvest when everyone is very busy.

For more information on this insect, and how to identify and manage this pest in fruit crops, please see the MSU IPM website: <http://www.ipm.msu.edu/beetleFruit.htm>.

## Identifying multicolored Asian ladybeetles

Multicolored Asian ladybeetles may be many colors with several or no spots. They can be distinguished from other ladybugs by the black M or W (depending on the viewing direction) between the head and abdomen ([see photos](#)). (*Source: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 17, September 4, 2007*)

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## General

### Fall Cover Crops

*Frank Mangan, UMass Extension*

Now is the time to think about cover crops for the fall especially if you need to order the seed. Here is some information about some of the more common cover crop choices for Massachusetts:

#### Non-Legumes

**Winter rye** is easily the most common cover crop used by growers in Massachusetts, and for good reason. It is inexpensive, easy to get and establish, and can be seeded fairly late into the fall and still take. It consistently overwinters here and will continue to grow in the spring producing lots of organic matter. Some growers find it difficult to incorporate in the spring if it is left to grow into May. Seeding rate: 90 – 120 lbs./acre.

**Oats** can be seeded in the fall and will come up quickly, similar to winter rye. Unlike winter rye, oats will winterkill here in Massachusetts and will not regrow in the spring. For this reason some growers prefer it over winter rye since it is easier to manage in the spring. It might have to be lightly incorporated into the soil in order to germinate. Enough growth is required in the fall to give adequate cover through the winter and early spring. Try to seed by Sept. 1. Growers along the coast can plant later. Make sure the oats have not been cooked (used as an animal feed). Seeding rate: 100 lbs./acre.

**Ryegrass** is used by some growers because of its thick root system that is thought to mop up more nitrogen than winter rye or oat. There are two types: annual and perennial. Despite their names, the annual ryegrass may overwinter and the perennial ryegrass may winterkill depending on when you seed them. If you have not seeded them before and would like to evaluate them, I would recommend that you seed a little of each in order to see their growth habits. I have only used these cover crops in the early spring. The seed is small

and light, so specialized equipment will be needed if seeding a large area. Seeding rate: 30 – 40 lbs./acre.

#### Legumes

**Clovers** are used by some growers as a nitrogen source. There are several types available. Like ryegrass, I have only used clovers as an early spring cover crop. A clover will have approximately 2.5% nitrogen whereas hairy vetch (see below) averages around 3.5% (this compares to winter rye that is usually below 1%). Clovers are a very small-seeded cover crop that need specialized equipment to establish. They can be seeded by hand in a small area, but if you want to do several acres, you will need specialized equipment. Seeding rate: 10 – 20 lbs./acre.

**Hairy Vetch** is an excellent cover crop for Massachusetts. It can be seeded up to mid September and will survive the winter. Growers near the coast or on the cape and islands can seed vetch up till October or even later. When left to grow long enough in the spring, hairy vetch has supplied over 100 lbs./acre of nitrogen. It is very important that the appropriate rhizobia species is used for hairy vetch (the rhizobia for hairy vetch will work for all vetches and peas). Without the rhizobia the vetch will not give the desired effects. We have been recommending you mix the vetch with either winter rye or oat. There are several reasons for this:

1. Both oat and winter rye are very efficient in taking up nitrogen from the soil (remember, the vetch is getting most of its nitrogen from the atmosphere, so it does not need much from the soil). By taking up more nitrogen in the late summer and fall we are reducing the risk of contaminating surface or ground water and the nitrogen is recycled so that it can be used by next years cash crop.
2. The oat and rye can produce tremendous amounts of valuable organic matter if allowed to grow long enough.
3. Both of these cover crops will give better erosion control than vetch alone since they emerge and establish themselves

more quickly than vetch. This is especially important when vetch is seeded after September 1.

We have been recommending 40 lbs./acre of oat or rye with 30-40 lbs./acre of hairy vetch. If you are using a grain drill then you can use seeding rates as low as 30 lbs./acre of vetch. If you are spinning the cover crop on and lightly disking it in then a rate of 35 - 40 lbs./acre is suggested.

Many growers prefer the use of oat rather than rye because of the tremendous growth of rye that occurs in the spring. This can be desirable if you are looking for increased organic matter in your soils, however some growers find the amount of biomass created by these two cover crops too much to handle. In addition, we have found that we get much more growth of the vetch in the spring when seeded with oat than when seeded with rye. The rye will compete with the vetch in the spring. (*Source: Massachusetts Vegetable Notes, Volume 17, Number 17, August 24, 2006*)

## Berry Production and Quality Under High Tunnels

*Eric Hanson, Michigan State University*

We have been studying strawberry and raspberry production under Haygrove high tunnels at the Southwest Michigan Research and Extension Center (SWMREC) in Benton Harbor for three years. High tunnels are relatively inexpensive hoop houses that can be covered with plastic except during the winter. These structures exclude rain and modify temperatures, wind speed and humidity. Funding was provided by Haygrove Tunnels (cost-sharing for structures) the Michigan State Horticulture Society Trust Fund, Project GREEN and SWMREC. Vegetables and cut flowers are also being tested, under Ron Goldy's leadership, and Greg Lang is evaluating sweet cherries. Plastic was placed on the tunnels in late June 2005, early May 2006, and mid-April 2007. Here are some berry observations to date.

### Raspberries

Both fall-fruiting and summer-fruiting raspberries have shown considerable promise under tunnels. Fall-fruiting

varieties (Autumn Britten, Chinook, Caroline, Heritage) fruit on one year-old canes in the late summer and fall. Summer-bearers (Canby, Encore, Heritage, Nova) fruit on two year-old canes in July. Fall-fruiting types can be pruned to produce in the summer and fall. The summer-fruiting variety Nova produces a small additional crop in the late fall.

Summer and fall fruiting raspberries in tunnels began fruiting a few days earlier than field plants, and continue a little later as well. Nova was the highest yielding summer-bearer in the tunnels and field, whereas Caroline has been highest producing fall-bearer. Tunnel yields have been two to three times as high in tunnels compared to the field. Overall, tunnel berries also have had a fraction of the rot seen in the field (although no fungicides have been applied).

**Table 1.** Yield (1000 lb/acre) of summer-fruiting raspberries in the field and tunnel, SWMREC.

Variety	Tunnel		Field	
	2006	2007	2006	2007
Canby	3	26	1	5
Encore	2	20	1	5
Heritage	1	5	0	3
Nova	4	26	3	13
AVERAGE	3	19	1	6

**Table 2.** Summer-fruiting raspberry size and appearance and rot incidence after a short storage period, tunnel and field grown plants, SWMREC, (data are means of 2006 and 2007).

Variety	Tunnel			Field		
	Size (g)	Visual rating <sup>z</sup>	Rot (%)	Size (g)	Visual rating	Rot (%)
Canby	2.4	3.2	0.4	2.1	2.7	2.1
Encore	4.4	3.6	0.1	3.3	2.7	11.0
Heritage	2.1	4.0	0.2	1.7	2.4	3.3
Nova	3.6	4.1	0.3	2.8	3.5	5.4
AVERAGE	3.2	3.7	0.3	2.5	2.8	5.5

<sup>z</sup>rating scale from 1 (very unappealing) to 5 (excellent, no defects).

**Table 3.** Fall raspberry yield, berry size and rot incidence after storage, tunnel and field grown plants, SWMREC, 2006.

Variety	Tunnel			Field		
	Yield (1000 lb/a)	Size (g)	Rot (%)	Yield (1000 lb/a)	Size (g)	Rot (%)
Autumn Britten	14.6	2.8	0.6	5.0	2.3	8.1
Caroline	20.8	2.6	0.0	8.0	2.0	2.9
Chinook	12.6	2.3	1.1	4.0	1.9	12.6
Heritage – mowed	15.6	2.3	0.3	4.0	1.5	6.2
Heritage-pruned for summer	16.6	2.3	--	4.4	1.6	--
Nova	3.9	3.3	0.0	1.4	2.3	16.8
AVERAGE	14.0	2.6	0.6	4.4	1.9	10.0

## Strawberries

We compared tunnel and field production of day-neutral varieties (Tribute, Seascape) on plastic-covered raised beds, and June-bearing varieties (Chandler, Darselect, Honeoye, Jewel, L'Amour, Ovation) in traditional matted rows. Planting was in 2005. Harvest was in the fall, 2005 and June, 2006 (day-neutrals) and June 2006 and 2007 (June bearers).

The tunnels generally have not provided large improvements in strawberry yields or quality. The day-neutral varieties Seascape and Tribute produced similar yields that were about the same in the field and tunnel. Jewel was most productive and largest fruited June-bearing strawberry in the tunnel and field. June-bearing varieties produced similar yields and berry size in the tunnel and field.

**Table 4.** Day-neutral strawberry yields and size, SWMREC.

Location/variety	Fall 2005		June 2006	
	Yield (lb/acre)	Berry weight (g)	Yield (lb/acre)	Berry weight (g)
Field Seascape	14,400	8.2	10,300	7.8
Tribute	18,900	5.8	10,300	7.6
Tunnel Seascape	11,300	7.7	11,900	8.1
Tribute	12,900	5.7	10,300	7.5

**Table 5.** June-bearing strawberry yields and berry weight, SWMREC, two-year means (2006, 2007).

Variety	Field planting		Tunnel planting	
	Yield (lb/acre)	Berry weight (g)	Yield (lb/acre)	Berry weight (g)
Chandler	10,000	11.1	8,900	12.0
Darselect	12,000	11.4	15,600	12.5
Honeoye	10,400	8.8	16,800	9.9
Jewel	14,400	13.4	17,300	12.6
L'Amour	11,700	11.9	15,700	12.2
Ovation	6,000	12.0	6,400	11.9
AVERAGE	10,800	11.4	13,500	11.9

(Source: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 17, September 4, 2007)

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## Upcoming Meetings:

**September 15, 2007.** *New York State Agricultural Experiment Station 125th Open House for the public*, Geneva, New York. For more information see news brief below or contact Gemma Osborne -[gro2@cornell.edu](mailto:gro2@cornell.edu).

**September 18, 2007 3-6 pm IPM Field School**, Howden Farm, 303 Rannapo Rd., Sheffield, MA. Cost \$20, two pesticide applicator recertification credits offered. For more information or to register, contact Ruth Hazzard at 413-577-3976 or [umassvegetable@umext.umass.edu](mailto:umassvegetable@umext.umass.edu)

**Sept. 20, 2007, 5:00 pm, Cover Crop Twilight Meeting.** UVM Extension office, Brattleboro VT. For more information contact (802) 257-7967 or [vernon.grubinger@uvm.edu](mailto:vernon.grubinger@uvm.edu) or go to [www.uvm.edu/vtvegandberry/meetings/covercropbrat9-20-07.html](http://www.uvm.edu/vtvegandberry/meetings/covercropbrat9-20-07.html)

**Sept. 24, 2007, 8:00 am. Small Scale Equipment: Tractors and Implements.** Jubilee Farm, Huntington Center, VT. For more information call or email Phone: 434-4122 [info@nofavt.org](mailto:info@nofavt.org) or visit [http://www.nofavt.org/event.php?e\\_id=963](http://www.nofavt.org/event.php?e_id=963)

**Dec. 11-13, 2007, New England Vegetable and Fruit Conference.** Manchester NH. For more information go to <http://www.nevbc.org/>

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