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STRAWBERRY

Strawberry – Powdery Mildew

Jay W. Pscheidt, Oregon State University Extension

Cause: *Sphaerotheca macularis f.* sp. fragariae, a fungus that overwinters on infected plant tissue including living leaves. This fungus is favored by conditions that produce high humidity but dry leaves. Conidia are able to begin germination after 6 hours and complete it within 24 hours, irrespective of temperature. Lesion expansion is related to temperature but does not seem to be related to relative humidity. It is a highly specialized pathogen that forms a close association with the host. Conditions that favor the host also favor the pathogen. Much of the fungus remains on the outside of infected plant parts but sends in rootlike structures, haustoria, to obtain nutrients. The white growth seen is composed of both mycelium and fungal spores. 'Hood', 'Totem', and 'Benton' are moderately resistant or tolerant to mildew; 'Shuksan', 'Sumas', and 'Linn' are moderately susceptible; 'Olympus', 'Redcrest', 'Independence', 'Puget Summer', 'Firecracker', 'Whonnock' and 'Northwest' are very susceptible.

Symptoms: Edges of infected leaflets curl up, exposing undersides that often are reddened and coated with a grayish white powdery mildew fungus. Diseased leaves later turn purplish or red. In irrigated fields, the fungus also may attack fruit. Some day-neutral cultivars are susceptible to fruit infection in fall even though leaves may appear healthy.

Note the curled leaves and gray patches on underside of leaves.

Powdery mildew symptoms has a grayish-white appearance on underside of leaves.

Cultural control:

1 Destroying old leaves by renovating plants after harvest may help reduce inoculum.

2 Plant resistant cultivars.

Chemical control: The disease needs to be controlled on highly susceptible cultivars after summer renovation so plants remain vigorous until they cease growth and go dormant in late fall. Many of these products, such as soaps, oils and sulfurs, may influence mite problems in the field.

1 Abound at 6.2 to 15.4 fl oz/A. Do not apply more than 2 sequential applications or more than 4 applications per year. May be applied on the day of harvest. 4-hr reentry.

2 Bicarbonate-based products. Might supplement a normal program when powdery mildew is first observed. Do not mix with acidifying agents. Thorough coverage is essential. Easily washed off by rain, so reapplication is necessary.
   a Armicarb 100 (85% potassium bicarbonate) at 2.5 to 5 lb/100 gal water. 4-hr reentry.
   b Kaligreen (82% potassium bicarbonate) at 2.5 to 3 lb/A. 4-hr reentry.
   c MilStop (85% potassium bicarbonate) at 2.5 to 5 lb/A. 1-hr reentry.
   d Remedy (by Bonide) is registered for home use.

3 Cabrio EG at 12 to 14 oz/A. Do not use more than twice sequentially or more than five times per year. May be used at harvest. 12-hr reentry.

4 E-Rase RTU (Jojoba seed oil) is registered for home use. May solidify below 50oF. H O

5 JMS Stylet Oil at 3 quarts/100 gal water. Do not use during freezing temperatures, above 90°F, or when plants are under heat or moisture stress. Do not use when foliage is wet because good coverage is essential. 4-hr reentry.

6 Kumulus DF (80% sulfur) at 5 to 10 lb/A. 24-hr reentry.

7 M-Pede at 1 gal/50 gal water is registered on strawberry for soft-bodied insects and has shown good activity against powdery mildew on several other crops. 12-hr reentry.

8 Microthiol Disperss (80% sulfur) at 5 to 10 lb/A. Activity depends on temperature: it may not be as effective below 65°F and may burn plants if applied above 85°F. Do not use a spreader sticker. 24-hr reentry.

9 Pristine at 18.5 to 23 oz/A. Do not use more than 2 consecutive applications or more than 5 times/year. Can be used day of harvest. 12-hr reentry.

10 Procure at 4 to 8 oz/A. Do not apply within 1 day of harvest or more than 32 oz/A/year. See label for crop rotation restrictions. 12-hr reentry.

11 Rally 40 W at 1.25 to 5 oz/A. Applications may be made up to the day of harvest. Do not apply more than 30 oz/A/season. 24-hr reentry.

12 Safer Garden Fungicide (Ready To Use 0.4% sulfur) throughly sprayed over the entire plant. Do not use when the temperature is over 85°F or within a few weeks of an oil spray. Do not use on fruit that will be used for canning or within 1 day of harvest.

Biological control:
Sonata (Bacillus pumilis strain QST 2808) at 2 to 4 quarts/A is registered for suppression only. As such it is not recommended for use in the PNW. May be applied up to and including the day of harvest. 4-hr reentry.

References:
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Miller, T. C., Gubler, W.D., Geng, S. and Rizzo, D.M. 2003. Effects of temperature and water vapor pressor on conidial germination and lesion expansion of Sphaerotheca macularis f. sp. fragariae. Plant Disease 87:484-492.

(**Source**: The Oregon State University Extension Plant isease Control Guide on-line at HTTP://plantdisease.ippc.orst.edu/)

RASPBERRY

Announcement of a New Bramble Resource

Doug Pfeiffer, Virginia Tech

A new electronic resource is now available for bramble growers and others interested in the bramble industry. Under the sponsorship of NABGA, web site has been created by Doug Pfeiffer, Tony Bratsch, and Jerry Williams of Virginia Tech, entitled "Bramble Production and IPM News" (http://www.nabgaipm.shorturl.com). While there is a focus on pest management issues, the site also provides access to information on other bramble production topics. The main features of the site are:

- Bramble resources: links to publications, and listings of bramble faculty by state
- Current issues - upcoming meetings, regulatory alerts with deadlines for public comment
- Bramble pest biology
- Insect and disease control recommendations
- Pesticide regulatory changes, based on daily checks of the Federal Register Pesticide section
- Labels and MSDS for pesticides recommended in bramble production.

A streamlined version of this site has also been developed for downloading onto PDAs.

In addition to the web site, a listserv has been created at Virginia Tech to allow discussion of bramble related topics. Regulatory alerts, where public comment is requested will be posted here (to reduce the need to actively check the web site for announcements), in addition to other timely announcements. Members may post question to the group as well. Contact Doug Pfeiffer, Entomology Dept., Virginia Tech (dgpfeiff@vt.edu), to be added to the listserv. (***Source**: Virginia Vegetable, Small Fruit and Specialty Crop Newsletter, November-December 2005; Volume 4, Issue 6*)

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 is 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 0-day pre-harvest interval (PHI). Another good option is Elevate (fenhexamid), which is a reduced-risk, locally systemic fungicide with a 0-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) (0-day PHI), Captan (captan) (3-day PHI), Rovral (iprodione) (0-day PHI), and Nova (myclobutanil) (0-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. 21, No. 17, September, 2006*)

Late Leaf Rust on Raspberries

Annemiek Schilder, Michigan State University

Late leaf rust has been noticed on raspberry fruit in Michigan. Typical symptoms are bright orange-yellow, powdery pustules on individual drupelets (see photo). These are the spores of the rust fungus, *Pucciniastrum americanum*. This disease is usually considered minor, but occasionally causes serious damage to susceptible red and purple raspberry cultivars. It usually appears late in the season. Losses are primarily due to fruit infection which may make the fruit unmarketable. The fruit is susceptible during all stages of development.

The symptoms of late leaf rust on leaves are often rather inconspicuous. On the upper leaf surface, small chlorotic or yellow spots appear that eventually turn brown. On the undersides of infected leaves, small light-yellow pustules appear with powdery spores. Middle-aged leaves on actively growing plants are most susceptible to infection. Spore masses may also occur on leaf petioles, canes, and calyces. If the infection is severe, the canes may be defoliated prematurely, which can reduce plant vigor and increase susceptibility to winter injury.

The fungus produces uredospores, which are capable or causing new infections throughout the growing season. These spores are wind-disseminated and may also be spread mechanically from infected to healthy fruit during harvest.

The alternative host for this disease is white spruce (*Picea canadensis*). However, it appears that spruce are not absolutely necessary for the rust to survive on raspberries, because the disease has been found in raspberries year after year in areas remote from any spruce trees. Raspberry cultivars known to be susceptible are Comet, Heritage, Caroline, and Festival. In Canada, the summer-bearing cultivar Nova was highly resistant to late leaf rust.

Unlike the orange rust fungus, the late leaf rust fungus is not systemic. Disease incidence can be reduced by any management practice that increases airflow and reduce leaf wetness duration within the canopy. Removal of old floricanes and infected primocanes during the winter should reduce the amount of overwintering inoculum.

In areas with white spruce, removal of leaves and other debris from infected raspberry plantings should help break the disease cycle by reducing white spruce infection in the spring. Avoid establishing new raspberry plantings near white spruce stands. Fungicides effective against late leaf rust are Nova, Pristine, and Cabrio. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 19, No. 3, September 7, 2004*)

BLUEBERRY

Lime Sulfur for Phomopsis Control

Gary Pavlis, Rutgers Universisty

I have recommended the use of lime sulfur for Phomopsis control. The fall application should go on when 2/3 of the leaves drop. Some growers have balked at using this material because of its corrosive nature. A grower from Massachusetts wrote to me and says he has a solution to this problem. He says that, "before applying the lime sulfur, I first spray the tractor and sprayer with a light oil and then the lime sulfur comes off when I wash the equipment after application. What works best, believe it or not, is "PAM", which is a combination of vegetable oil and lecithin which are biodegradable and therefore not the environmental hazard that motor oil would

be. Generic brands of this cooking oil are cheaper and are equally effective. I can cover my equipment with 3-4 cans for a total of about 6-7 dollars." Sounds like a good idea to me. I wouldn't want to do this for a weekly spray but lime sulfur is applied just once in the fall and once in the spring. (***Source**: The Blueberry Bulletin, Vol. 22, No. 22, Sept 6, 2006*)

Stunt Disease

Gary Pavlis, Rutgers University

Roguing of diseased bushes should be progressing. This is important in all varieties but should be done with extra care where blocks of Bluetta or Weymouth are located close to Blueray or Bluecrop. In the Pemberton area where there is still an appreciable acreage of Rancocas, varieties adjoining this old variety should be carefully inspected. In such situations there seems to be a more rapid spread of stunt disease. The Rancocas is very resistant to this virus disease but it is susceptible and may be a source of the disease without showing symptoms vividly. After many years of harboring the disease some Rancocas bushes are now clearly exhibiting stunt symptoms. All old plantings of Rancocas should be carefully rogued. Remember to spray diseased bushes before removing them. It is necessary to kill the leafhoppers and it is more efficient, more economical, and wise from the standpoint of conservation of beneficial insects to spray individual bushes rather than entire fields. (***Source**: The Blueberry Bulletin, Vol. 22, No. 22, Sept 6, 2006*)

Disease Identification

Gary Pavlis, Rutgers University

Growers ask me to provide them with information so that they are more able to identify the typical blueberry diseases such as Alternaria, Anthracnose, Phomopsis, Botrytis and Mummy berry. I should just explain that the ability to positively identify a disease comes largely from experience. I once spent a few days looking at thousands of plants and tagging those with stunt while I was working on my masters degree in Arkansas. This experience was very early in my career and I accompanied Dr. Jim Moore from Arkansas and Dr. Al Stretch, USDA Pathologist. As a result of this experience, I have never forgotten what stunt looks like. This experience was invaluable and a grower who is not sure about disease ID should invite someone to his field who can spend some time and help him with identifications. This ability is critical in the choice of cultural and pesticide decisions.

Another aid to Disease ID are extension publications. The Highbush Blueberry Production Guide has photos and descriptions that will be of great value in disease ID Also, Michigan State produces one called 'Blueberry Diseases in Michigan', Extension Bulletin E-1731. Write Michigan Cooperative Extension, Michigan State University, East Lansing, MI 48824. There is also the new Compendium of Blueberry and Cranberry Diseases. This is an excellent resource for growers and researchers alike. This manual is produced by the American Phytopathological Society, 3340 Pilot Knob Road, St. Paul, MN 55121-2097. It should be realized that there are many times where disease ID is impossible without the help of their cooperative extension office in these cases.

Dr. Marvin Pritts, Cornell University has developed a Web-based diagnostic tool to help the grower/educator determine what might be wrong with their berry plants - from pest injury to herbicide injury to nutritional deficiencies. By answering a series of questions about symptomology, one is led to a possible cause. The site uses lots of photographs and can be very useful. To access the site, go to http://www.hort.cornell.edu or http://www.fvs.cornell.edu and select "Resources." Then select "Berry Diagnostic Tool.". (***Source**: The Blueberry Bulletin, Vol. 22, No. 22, Sept 6, 2006*)

GRAPE

Grape Diseases at Harvest

Jim Travis, Penn State University

Weather conditions across the state are very variable this season. Some areas are very dry while others have received normal rainfall amounts. However, bunch rots caused by several different grape rotting fungi and sour rot organisms are not uncommon across PA vineyards. If growers observe the clusters carefully, they may be able to discern the cause of the rotting fruit. Growers may find Botrytis (gray mold), sour rot (sour smell and fruit flies) and grapes that are shriveling into mummies. Black rot will cause berries to become mummies early in the season but the number of black rot mummies don't continue to increase the closer it is to harvest. Also, if black rot has caused berries to mummify there should be typical black rot lesions on leaves and shoots near the affected clusters. If the number of mummies is increasing as the Brix levels

increase, the rot may be caused by Phomopsis or Ripe Rot. The best way for a grower to identify if mummies are caused by Phomopsis is to look for leaf or shoot lesions. There should be an association of Phomopsis leaf and shoot lesions in the area of the mummified fruit. Ripe rot is a newly recognized bunch rotting problem to us in PA. It probably has been here for years but we are just beginning to identify this problem in ripe grape bunches. The problem appears as soft fruit on red varieties that progresses to mummies as the fruit ripens above 18 Brix. On white varieties the berries appear first to be brown and then turn into black mummies. Identification can become confused since it appears that in some cases, sour rot may follow the initial ripe rot infection.

It is very important to make a correct identification this season because next seasons control strategy is based entirely on which of these rots is occurring in a vineyard. The rots and their importance will vary vineyard by vineyard. The chemical controls and timings will be different for each vineyard and bunch rot organism. At this point in the season there is not much you can do to control these rots. In most cases the infections are occurring early in the season. They remain latent in the rachis or fruit until ripening. Preventing fruit damage will always reduce bunch rots. If you know the problem is Botrytis, a fungicide may provide some additional protection as berries ripen.

Follow pre-harvest label requirements carefully. Many growers and researchers believe Botrytis is best controlled prior to bunch closure. In the case of 'ripe rot', the fruit can appear sound until it reaches 20 degrees Brix and then the rot progresses rapidly from infection that occurred earlier in the season. (***Source**: Grape & Barrel Newsletter, Vol. 1, No. 5, Sept. 19, 2005*)

Late Season Spraying and its Effect on Fermentation

Alice Wise, Cornell Cooperative Extension

All pesticides have a days to harvest restriction, also called a preharvest interval (PHI). If a product is labeled 14 days PHI, this means it cannot be used within 14 days of harvest. With many growers, the application of bird netting in late August effectively ends the spray season though more and more growers are tacking down nets so that equipment can get through, particularly in late ripening blocks. From a winemaking standpoint, one of the primary concerns about late season sprays is that potential residues may inhibit fermentation. Interesting that some winemakers consider this an issue, others discount it. It is known that antifungal agents - fungicides - used in the vineyard may inhibit yeast. After all yeasts are also fungi.

Sulfur is often demonized as the reason for "stuck fermentations". Yeasts have the ability to convert elemental sulfur into H2S. If the residual elemental sulfur in the must is $\geq$ 1 ppm (although some sources claim it takes $\geq$ 5 ppm), it may lead to H2S formation and off-odors in the wine. Think "rotten egg". Consequently, a late application of sulfur, particularly if no rain occurs between the spray and harvest, may lead to H2S problems.

Copper can also be inhibitory to yeast and bacteria (malolactic fermentation is a bacterial fermentation). Non-lethal doses of copper can cause stress on the yeast which can cause incomplete fermentations and release of undesirable metabolites, all leading to wine aroma defects. Generally this occurs only with very high residual copper concentrations.

There are a number of factors that influence whether a late sulfur spray – or any other type of spray - will lead to a problematic fermentation. Many enologists call for >30 days between the last spray and harvest. The type of product is important. Micronized sulfurs, for example, are used at lower rates than the dusting sulfurs used on the west coast. Rainfall is also a factor in east vs. west coast conditions. Coverage can be a contributing factor. If fruit is free from powdery mildew, minimize the nozzles in the cluster zone and focus on keeping the canopy clean. Use a lower rate of sulfur, 4 lbs./a for example rather than a high rate for the last spray.

Other potential end of season sprays include potassium bicarbonate (Kaligreen, Armicarb, Milstop), monopotassium phosphate (Nutrol), hydrogen peroxide (Oxidate), JMS Stylet Oil and the phosphorous acid products. Winemakers may express concern about the first two. Adding excessive amounts of potassium to the must, potentially raising the pH, could be an issue. Again, this is unlikely to be an issue unless a heavy application was made shortly before harvest. No issues come to mind with hydrogen peroxide. JMS Stylet Oil is actually a very good late season spray. Past experience has shown it to do a good job keeping late season powdery mildew to a minimum. It will knock back European red mite as well. There is some evidence that late applications depress Brix (sugar) accumulation via reductions in photosynthesis. To that end, we are again conducting research comparing season long Stylet Oil with a conventional schedule to judge effects on fruit quality. Last year's results were inconclusive. Research conducted in California a few years ago indicated that Stylet Oil had no effect on fermentation. There are no obvious issues with the phosphorous acid products.

Finally, for DM and PM, there are the synthetic materials such as the strobilurins and sterol inhibitors. The

strobilurins are not the best choice due to resistance issues. Even where canopies look relatively clean, inevitably there may be low levels of powdery mildew. For this reason, if deciding to select from synthetic materials, a sterol inhibitor such as Rubigan might be a better choice than a strobie. From a fermentation standpoint, there appear to be no issues with either group of materials.

Botrytis materials are perhaps more of a concern as they are targeted on the cluster zone. There are no known issues with botrycides such as Elevate, Vangard and Scala and fermentation. In general botrycides are inactive against most fungi that are not closely related to Botrytis. Fortunately, yeasts are not closely related. If near harvest and time/labor is available, snip out the worst of the infections at the minimum. Another option would be one or more sprays of Oxidate, which leaves no residue as it dissipates soon after application. While Oxidate is labeled for Botrytis, the efficacy has not been clearly determined. We are conducting trials on this topic this year. Where infections exist, some growers have tank mixed Oxidate and a botrycide. Again, there is no data to suggest this is a superior strategy; growers are experimenting in an attempt to limit the spread of infections.

Bottom line – minimize spraying late into the season - easy to say, harder to make the call if disease exists or a major rain looms. If fruit is clean at this point, don't target the cluster zone with powdery and downy sprays. Consider all options for Botrytis control and expect rainfall between the last spray and harvest to have an impact. Scout the vineyard carefully for Botrytis, a few diseased berries 2 weeks before harvest can turn into a lot of disease if rains occur. Research has shown that traditional Botrytis fungicides (Vangard, Scala, Elevate) can slow disease spread significantly when applied under this scenario.

References

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• Zoecklein, Bruce. Feb. 26, 2003 Enology Notes # 70. http://www.fst.vt.edu/extension/enology/contentextenologynotes70.html.

• Wolf, Tony. June 1, 2000 Vineyard Information Series. In his monthly newsletter, Dr. Wolf discusses work done by grad student Sarah Finger on the impact of Stylet Oil sprays on vine photosynthesis and Brix accumulation. This work is undoubtedly published formally in a scientific journal, there was insufficient time to track it down.

(***Source**: Long Island Fruit & Vegetable Update, No. 26, SEPTEMBER 8, 2006*)

General

Off-Season Management Tasks and Considerations for Selected Small Fruit Crops

Tony Bratsch, Viginia Tech.

Late fall, winter and early spring is an important period of management for small fruit crops such as strawberries, blackberries and raspberries, blueberries, and currants/gooseberries. Paying attention to management details during this time helps to ensure a successful crop the following season.

This article touches on the primary management issues related to these crops during the "off-season" months. Grapes will not be addressed because of the greater complexity of issues affecting commercial vineyard management, and readers are encouraged to visit the Virginia Viticulture Resources web site for in-depth information: http://www.vaes.vt.edu/winchester/grape/.

Strawberries:

Strawberries will continue vegetative growth and development of flower buds under short days and mild fall temperatures, until growth is halted by significant freezing temperature events, and dormancy sets in. For the matted row system, an extended fall season allows growth and increased flower number for daughter plants, and in the plasticulture system, increased crown and floral development in the fall-set plants. In matted rows and between plasticulture beds, fall to early winter is a good time to apply a pre-emerge herbicide to control winter weeds such as napropamide (Devrinol) or terbicil (Sinbar), and once the plants are sufficiently dormant, 2,4-D may be applied over the field as a post-emergence control. In warmer areas of the state, and in plasticulture, where true dormancy is questionable, 2,4-D injury may occur, and growers should be careful with its use over the tops of berries.

Matted row plantings in colder regions of the state should be mulched with straw when temperatures regularly start falling in the 20-30F degree range (usually mid to late November). Apply clean wheat straw to a depth of 2-4 inches. Straw will help to insulate the planting from temperature extremes and lessen root damage caused by frost heaving of soils, along with suppressing some weeds. Make sure herbicide applications are made before the straw is spread.

Depending on location in the state, plasticulture plantings may need protective covering with a floating row cover. Unlike matted row berries, because of varieties used and the nature of the plasticulture system (covered, warm soils), plants generally undergo a "quasi-dormancy" during the coldest part of the winter, and are quicker to resume growth than matted row berries in the early spring; in some situations they may grow slowly all winter. Recent studies

have shown that limited fall application of a row cover will help crown growth and fall flower bud set, and late winter/early spring application will help protect early growing and flowering plants. The use of row covers in plasticulture plantings has been the focus of much research, and their proper use in fall, winter and spring is very site specific.

Commercial pest management and weed control recommendations for small fruit crops are found in the Horticulture and Forest Crops PMG, VCE publication # 456-017, which can be obtained through your local county extension office.

Brambles:

Like strawberries, pre-emerge herbicides should be applied to bramble plantings in the fall and/or spring to control winter weeds and early spring weeds. There are several compounds available: simazine (Princep), norflurazon (Solicam), terbacil (Sinbar) and oryzalin (Surflan). Each has specific weed spectrums and rate/use restrictions that should be understood before application.

For floricane blackberries and raspberries, pruning can be done once plants are dormant, late fall through early spring prior to bud break, with very early spring a more preferable period. If not done during the summer, spent floricanes should be removed first. The primocanes left should be thinned to a desirable count depending on bramble type, age and vigor of the planting. In non-suckering, semi-erect blackberries, generally 6-8 canes should be left per plant. In hedgerow systems, for erect blackberries, leave 3-4 canes per linear foot, and on average 1-2 canes per foot with red raspberries. Always remove weak and insect damaged canes first.

Red raspberries are generally not headed back to maximize flowering, however if canes are too tall, they can be trimmed to 5-6 feet, or pruned past the point of any occurring winter injury. If no support is provided, canes can be cut back to 3-4 feet for greater stability as they flower and fruit in the spring. Black raspberry and blackberry canes can be headed back to bring them within bounds of the support trellis, and lateral branches should be shortened. Less in vigor, black raspberries laterals should be trimmed to 8-12 inches or 8-12 buds/lateral, while erect blackberries and purple raspberries should be trimmed to 12-18 inches or an average of 15 buds/lateral. The laterals of large, semi-erect thornless types can be left alone or trimmed to 1.5-2 feet in length, depending on vigor and size.

For primocane raspberries which were fruited on the current seasons growth, the old canes can be mowed at any point from late fall through early spring prior to shoot re-growth. Select a time when soils are relatively dry to lessen compaction, and mow canes as close as possible to the soil surface. Follow-up mowing with a pre-emerge herbicide application to the newly exposed soil surface.

There has been some research to indicate that placement of row covers in the spring may advance growth of primocane shoots in the spring. Growers may want to experiment with this technique to advance fruiting dates, and thereby improve yields in late cultivars.

Lastly, just prior to bud-break and before shoots are1/2 inch long, liquid lime sulfur (at 24-31%) or a Bordeaux formulation (copper sulfate plus hydrated lime) should be applied to reduce the potential for anthracnose infection of the canes.

Blueberries:

The key off-season tasks for blueberry plantings is application of pre-emerge herbicides where warranted, appropriate pruning, and supplemental application of mulch. Registered herbicides for blueberries are similar to brambles, and should be used to target specific weed problems. On older mulched beds, encroachment of winter weeds in the decaying mulch should be monitored. Supplemental mulching should be done when bare soil begins to show through. Apply 4-6 inches of fresh mulch in a circular area under new plants, and in older plantings in a continuous strip the length of the row, and out to, or just beyond the canopy of the plant. Where mulching is not practiced in the warmer parts of the state and in rabbit eye plantings, increased attention to weed control is needed.

Blueberries in general need minimal pruning until the third year after planting. "Clean-up" pruning, dead branches, and short branches of low vigor near the surface should be removed every year. Once plants are 5-6 years old, it is important to begin renewal pruning and removal of some of the oldest canes each winter. In general for high bush types, an ideal plant framework is 5-7 older canes, along with 1-2 newer canes at any given time. Once this level of growth is reached, 1-2 older canes can be removed annually at ground level, and those should be replaced by new canes. For increased fruit size, detail pruning can be done on the tips of fruiting branches, by thinning/cutting them back to 4-8 fruit buds/branchlet. This will reduce yield overall but create noticeably larger berries. Fruit buds can easily be distinguished from vegetative buds by their plump size.

For mummy berry and phomopsis twig blight control, make plans to apply a delayed dormant (late dormant) application of lime sulfur and an early spring application of Ziram fungicide when bud scales begin to loosen (and again 7 days later). Consult the Small Fruit Spray Recommendations for further detail and caution using lime sulfur and other fungicides in blueberries.

Currants and Gooseberries:.

Ribes species (currants and gooseberries) will require attention to weeds, pruning and disease control during the winter months. As there are limited herbicides available for use in Ribes, the use of an organic mulch will help to control weeds, and for this drought sensitive crop, also help

to retain soil moisture during the next growing season. Apply straw or composted manure, or both, in the fall to a depth of 3-4 inches. Coarse wood chips can also work well, but apply only a 1-2 inch layer. Supplemental nitrogen may be needed in the spring to off-set the seasonal breakdown of wood chips.

Currants and gooseberries need to be pruned annually. Fruits develop from buds near the base of 1 year old shoots, and will continue to fruit on "spurs" on older wood for up to three years. Pruning involves an understanding of fruiting habit, focusing on retention of fruiting wood and removing unproductive, older canes at the ground level. Ultimately, a mature bush will be pruned to leave 4-5 three-year old canes, 4-5 two-year old canes and 4-5 one-year old canes. For a new planting this is a gradual process until plants reach maturity. After the first year, leave 6-8 strong canes, after year two, leave 4-5 new canes and 4-5 two-year canes. By the third year a full complement and blend of cane ages will be achieved. Additional selective pruning includes removing any dead canes, and canes very low to the ground, and weaker, bent and broken canes in the center to keep the bush open.

An important disease control measure with currants and gooseberries is to apply lime sulfur or Bordeaux formulation (at rate mentioned for brambles) to canes just prior to bud swell and break. This will help to reduce the incidence of foliar and cane diseases in the coming season. Also when pruning, be sure to remove canes that are swollen or knotted, which may harbor over-wintering, cane boring insects. (***Source**: Virginia Vegetable, Small Fruit and Specialty Crop Newsletter, September-October 2005; Volume 4, Issue 5*)

Keep Your Fresh Spinach and Other Products Safe!

Vern Grubinger, Univ. of Vermont

National attention once again is focused on food safety due to the contamination of fresh, bagged (I repeat, bagged) spinach grown in California. There is no evidence that fresh bunched spinach is involved in this episode, so you can reassure your customers about that. However, now is the time to make sure you are following the Good Agricultural Practices (GAPs) necessary to prevent microbial contamination of fresh produce.

A practical GAPs self-assessment for farms, with worksheets that can be printed out, is at: www.gaps.cornell.edu/farmassessmentws.html. A very detailed self-audit for growers is at: http://ucce.ucdavis.edu/files/filelibrary/5453/4362.pdf.The 'Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables' from the US Food and Drug Administration is at: www.foodsafety.gov/%7Edms/prodguid.html

To summarize what GAPs are, I've adapted the following from the Cornell Univ. pamphlet 'Food Safety Begins on the Farm' which can be printed from: www.gaps.cornell.edu/PUBS/PamphletEng.pdf

Steps to Minimize Pathogen Contamination During Production and Harvest of Fresh Produce

Select Produce Fields Carefully. Review land history for prior use and applications of sludge or animal manure. Choose fields upstream from animal housings. Know upstream uses of surface water and test water quality as needed. Prevent runoff or drift from animal operations from entering produce fields.

Use Manure properly. In the fall, if applying manure to planned vegetable ground, do so preferably when soils are warm (>50°F), non-saturated, and cover cropped. In spring, incorporate manure at least two weeks prior to planting. Whenever possible, incorporate manure. Do NOT harvest produce within 120 days after fresh manure application. Keep records of application rates, source, and dates. Avoid root / leafy crops if manure is applied in spring. Plant agronomic or perennials crops where manure is applied in spring.

ABSOLUTELY DO NOT SIDEDRESS FOOD CROPS with fresh or slurry manure or manure 'tea' or mulches containing fresh manure. It is OK to sidedress with mature composts or compost teas.

Exclude Animals. NO grazing of livestock near produce fields. Minimize wild and domestic animal traffic in produce fields.

Assure Irrigation Water Quality. Municipal drinking water is low risk. Potable well water is minimal risk if the well casing is maintained and livestock are excluded from the active recharge area. Surface water is higher risk. Test water quarterly or at intervals during the season (beginning, mid or high draw, and at harvest), especially if water source passes near livestock or sewage treatment. Maintain records of water tests. Filter or use settling ponds to improve water quality. Use potable water for crop protection sprays. Where feasible, use drip irrigation to reduce crop wetting and minimize risk. Apply overhead irrigation early in the day so leaves dry quickly.

Maintain Cleanliness During Harvest. Check that harvest containers are clean and in good repair. High-pressure wash and sanitize bins prior to harvest and clean bins daily during harvest. Remove excess soil from bins in field. Ensure that packing containers are not overfilled and protect produce adequately from bruising and damage. Avoid standing in the bins during harvest to reduce pathogen spread by shoes. Minimize bruising of produce during harvest. Remove excess soil from produce in the field.

Promote Worker Hygiene. Teach workers about microbial risks and the importance of hygiene. Provide and maintain clean restrooms in or near the field and in food handling areas. Supply soap, clean water and single-use towels for hand washing and enforce use.

Promote Cleanliness at U-Pick. Invite customers to wash their hands prior to entering fields. Provide clean and convenient restrooms. Supply soap, clean water, and single-use towels and encourage use.

Keep Produce Cool. Cool produce quickly to minimize growth of potential pathogens. Use ice made from potable water. Store produce at appropriate temperatures to maintain good quality. Do not overload coolers.

Post-Harvest Handling

- √ Use potable water for all produce washes.
- √ Maintain clean water in dump tanks by sanitizing and changing water regularly.
- √ Chlorinate wash water and monitor chlorine levels.
- √ Maintain 150 ppm for leafy vegetables and up to 500 ppm for other crops if conditions warrant. (note: organic growers will have to dilute this water to 4 ppm prior to draining it in order to meet national standards, check with your certifier).
  - o Maintain water pH at 6.0-7.0 to assure that the chorine is effective.
  - o Provide a final rinse if using >100 ppm chlorine.
- √ Avoid tank water temperatures more than 10°F cooler than produce temperature (so produce won't absorb wash water).
- √ Clean and sanitize loading, staging, and all food contact surfaces at end of each day.
- √ Exclude all animals, especially rodents and birds from the packing house.
- √ No smoking or eating in packing area.

Transportation and Refrigeration.

- √ Check and clean trucks prior to loading.
- √ Sanitize if animals were previously hauled. Pre-cool vehicles prior to loading.
- √ Ensure that refrigeration equipment is working properly.

(***Source**: Vermont Vegetable and Berry News, Sept. 20, 2006*)

Upcoming Meetings

Renewable Energy for Farms and Greenhouses - A Series of Twilight Meetings

Sponsored by The University of Massachusetts Extension Agriculture and Landscape Program, Community Involved in Sustaining Agriculture (CISA) and Donald Campbell Associates

We will be exploring renewable energy systems for farms and greenhouses this summer and fall through a series of twilight meetings. Plan to join us for one or all meetings to learn how alternative energy sources might fit into your business. These meetings will provide information on funding opportunities and feature vendors and experts with a wealth of knowledge and experience. For more information, including opportunities for sponsorship, or to pre-register, contact Tina Smith, Extension Floriculture Program, 413-545-5306, tsmith@umext.umass.edu or Ruth Hazzard, Extension Vegetable Program, 413-545-3696, rhazzard@umext.umass.edu.

Field Corn Biomass for Heating Greenhouses
Wednesday, October 4, 2006
3:00 PM – 6:00 PM
Kosinski Farm, Westfield, MA
Host: Mike Kosinski, Kosinski Farm

Kosinski Farm grows 140 acres of blueberries, apples, grain corn, vegetables and tobacco. Five greenhouses provide flower and vegetable plants for retail sales at their farm stand and use in the field. Blueberries, apples and butternut squash are major wholesale crops.

Mike began heating one greenhouse with his own corn three years ago and has been expanding his use of corn for heat each year. This year he is installing two larger stoves with automated auger stoking systems. Field corn fits well into his

vegetable rotation. The corn is dried off-site and trucked back to the farm. His production costs are about $60-$65 per ton of corn, which is about one-third of the cost of heating oil ($2.45 per gal.) based on energy costs per BTU.

Additional Speakers:

Rob Rizzo, Mt. Wachusett Community College - Rob uses a variety of renewable energy sources including wood chips, wind and solar power and has reduced the energy costs at the college by 5%.

Bill Llewelyn, Five Point Farm, Northfield - Bill grows and sells corn for energy use. This season he harvested 1,000 tons of corn.

Christine Serrentino, From Field to Table - Christine will talk about the science and economics of burning corn.

Don Campbell, Consultant, Donald Campbell Associates - Don will talk about the process of fitting a farm's needs to the types of renewable energy systems currently available.

Raspberry High Tunnel Open House

Friday, October 20, 2006,
1:00 to 4:00 PM

Cornell University invites you to attend the second annual Raspberry High Tunnel Open House to observe raspberries growing and fruiting in late October – well past the time when they are normally in season. Come by Cornell's East Ithaca farm on Friday October 20 between 1:00 and 4:00 to meet with researchers, taste fruit, study this new technology and market opportunity, and hear results from year 1 of this research and demonstration trial.

The East Ithaca Farm is located on Maple Ave., adjacent to the Cornell Campus. Coming from Rt. 79 east, turn right onto Pine Tree Rd., go through the stop light by East Hill Plaza, and take the next left on to Maple Ave. The research farm is on the right, past the cemetery.

Coming from Rt. 13 north, take Rt. 366 towards Ithaca. Turn left onto Pine Tree Road at the flashing red light, just past Cornell Orchards. Take the next right onto Maple Ave. The farm is on the right, past the cemetery.

Coming west on 79, or south on 96 or 89, take Rt. 79 east through Ithaca and up the hill. Midway up the hill, bear left onto Rt. 366. At the first stoplight, take a soft right onto Maple Ave. (not a hard right). The farm is at the top of the hill on the left. For more information contact Molly Shaw, meh39@cornell.edu, 607-687-4020, or Cathy Heidenreich, mcm4@cornell.edu, 315-787-2367.

The New England Greenhouse Conference

November 1-3, 2006 at the DCU Center in Worcester, Massachusetts

To receive the 2006 New England Greenhouse Conference Program or for more information, **contact: Cindy Delaney, Phone: 802-655-7769 Email: delaney@sover.net . The complete program and registration information is also available on our web site: www.negreenhouse.org.**

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