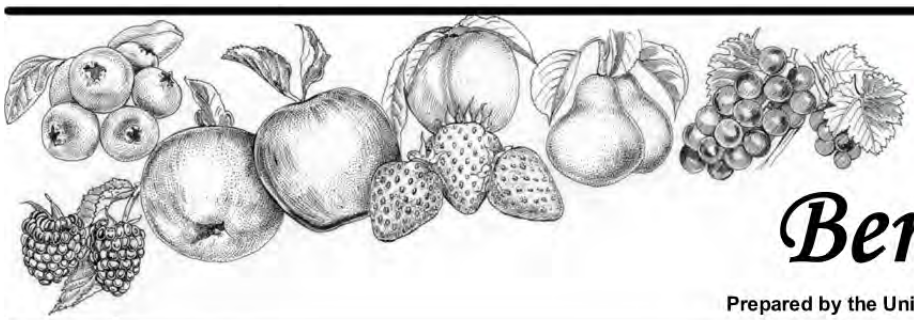

# Berry Notes

Prepared by the University of Massachusetts Fruit Team

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



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IN THIS ISSUE:



**Editors Note:**

**The 2010-2011 New England Small Fruit Pest Management Guides** will be available for purchase through the New England Vegetable & Berry Grower's Association and State Extension offices by early April. It contains updated label information and pest management recommendations for Strawberries, Blueberries, Raspberries, Currants & Gooseberries, and Grapes. Cost will be $12 per copy plus $4 S&H and will be available from your local State Extension offices or via the UMass Extension Fruitadvisor website at www.umass.edu/fruitadvisor.

**Check out the UMass Extension Mass Aggie Seminar Series** at: http://www.umass.edu/fruitadvisor/massaggie/index.html

**Pesticide Applicator Licenses and Recertification:** We encourage anyone who applies pesticides on commercial crops to obtain a pesticide applicators license. While it is required only for certain circumstances or for use of certain types of pesticides, being able to document training in safe mixing, loading, and application procedures can be useful when dealing with the public. In order to find out how to obtain a pesticide applicators license or to find opportunities to earn recertification credits if you have a current lisence, check out the UMass Extension Pesticide Education website at http://www.umass.edu/pested/index.htm. There you will find information on:

- Licensing Information
- Training Workshops to Prepare for Exams
- 2010 Pesticide Exam Schedule
- Directions to Exam Sites
- Examination Study Materials
- Recertification Training Workshops

## Straw Removal in Strawberries

*Bruce Bordelon, Purdue University*

The proper time to remove straw from matted row strawberries is when the bare-soil temperature at 4 inches averages about 40-43˚F. This usually coincides with mid to late March in central Indiana. Plants will begin pushing new leaves as the soil temperatures rise steadily through the month, so the straw should be raked off the tops of the beds and into the row middles. Leaving some straw on top of the beds for plants to grow up through provides a clean surface for fruit. Straw should be removed before the plants grow enough to cause yellowing of foliage. Allowing the leaves to become etiolated (yellowed with long petioles) due to late straw removal can reduce yields by as much as 25%. However, uncovering the plants early may promote early growth and increase chances of frost or freeze injury. The difference between early removal and late removal may increased first harvest by about three days, so there is no real advantage. After the straw is removed the frost protection irrigation equipment should Spring freeze damage can also be a significant economic problem for Midwest grape growers. Widespread damage occurred in 2007 from the warm March followed by the Easter freeze. Over the past few years frost damage in Indiana has been sporadic. A technique called long pruning or double pruning helps avoid spring frost and freeze damage, especially on varieties that tend to bud out early. This type of pruning is only applicable to spur or no-tie training systems. The procedure utilizes the apical dominance of buds on a cane. The first buds to begin growing are those on the tip of a cane, while buds closer to the base begin growth later. To perform long pruning, select canes to be used for fruiting spurs during the normal pruning practice, but leave those canes long, with 10-15 more buds than desired. Spurs are normally pruned to 3 to 4 nodes for fruiting, but if they are not cut back, then the extra buds will help delay the development of the desired basal 3 to 4 buds, which helps avoid frost injury. After the date of the last probable spring freeze has passed, the canes are shortened to the desired length to properly adjust the bud number for the vine. Growth of the basal buds can be delayed as much as two weeks if weather conditions are favorable. While this procedure requires an extra trip through the vineyard, it can mean the difference between a full crop and little or no crop. (***Source**: Facts for Fancy Fruit, Volume 10 • Issue 1, Feb 2010*)

## Spring Weed Management in Strawberries

*Bruce Bordelon, Purdue University*

There have been several herbicide label changes for strawberries. Growers should read the 2010 Midwest Small Fruit and Grape Spray Guide to familiarize themselves with these new changes. Changes that may influence weed management decisions for early spring are listed below.

Gramoxone Inteon is the new formulation for strawberries. This formulation is designed to be safer to the user. However it is still restricted use and the signal word is still “Danger”. Gramoxone Inteon contains an “alginate” which is made from seaweed and slows absorption into the bloodstream. There is also an alerting agent that smells like decaying grass, and emetic and purgative, and a green dye. The new formulation also comes with some rate changes. Rates for the new formulation are 2.5 to 4 pints/acre.

Chateau (flumioxazin) is registered for pre and post emergence weed control in dormant strawberries. In dormant strawberries, the rate is 3 oz/acre. Also apply a crop oil concentrate at 1% or a non-ionic surfactant at 1⁄4% by volume. Chateau will control emerged chickweed, field pansy, and oxalis if sufficient contact is made with the weeds. Chateau will not control all emerged weeds. Scout the field and check the labels. 2,4-D amine may still be required to control other emerged weeds.

Select 2EC (clethodim) is a grass specific herbicide registered in strawberry. It is applied at 6 to 8 ounces per acre. It is effective on small, actively growing grasses. It has improved activity over Poast on cool-season and perennial grasses. Add 1 qt/100 gal spray of crop oil concentrate. Repeat application at 14 days for perennial grasses. Ammonium sulfate can be added at 2.5 lb/acre to improve activity on perennial grasses. Do not apply within 4 days of harvest. Select will not kill old established grasses. Avoid spraying on hot humid days or some crop burning will result.

Ultra Blazer 2E (acifluorfen) is registered for use in annual and perennial strawberries. In matted row plantings, applications can be made after renovation and when plants are dormant during fall or early spring. The PHI for matted row strawberries is 120 days, so growers need to carefully consider spring application dates. (***Source**: Facts for Fancy Fruit, Volume 10 • Issue 1, Feb 2010*)

**RASPBERRY**

## While You're Pruning Your Raspberries and Blackberries…..

*Kathy Demchak, Penn State University*

Pruning is therapeutic – not only for a lot of us who enjoy pruning, but also for your plants. Pruning keeps plants healthy by encouraging new growth and opening up the plant canopy, and provides an opportunity to remove disease-infected or insect-infested canes. Here are some signs and symptoms of various diseases and insects to watch for while you prune your raspberries and blackberries. If you're done pruning by the time you read this, you may want to take another look before the plants leaf out to see if you missed any of these items.

**Diseases**

*Crown gall*: This systemic bacterial disease causes galls to form usually near the crown, though galls can also appear on the canes. Galls will be brown and cracked-looking at this time of the year. The largest galls can be the size of a golf ball, and several may be clustered together into a mass of galls in severe cases. If you find plants with galls, dig them out, and check the soil for galls that have broken off. You probably won't be able to completely eradicate the problem, but this will help. Thoroughly clean your pruners with alcohol before moving on to uninfected plants.

*Anthracnose*: This fungal disease causes circular or oval pits on the canes. These lesions are more noticeable on canes that retain a reddish or greenish color, such as blackberries and black raspberries. Spores produced from these lesions will infect the young canes that will emerge soon. Prune out canes that are severely pitted, remove them from the planting, and be sure to apply a good coating of lime sulfur at green tip.

*Botrytis or gray mold*: This fungus overwinters as sclerotia on the canes, which are tiny black, oval-shaped structures. Use cultural controls, i.e., anything that encourages drying of the foliage – and bloom sprays later on.

*Cane blight*: The epidermis of infected canes develops a silvery color by spring. Later on, buds may fail to break or lateral shoots may wilt (these can also be symptoms of winter injury). Remove infected canes.

**Insects**

*Raspberry crown borers:* You may be able to notice holes at the base of canes where larvae have bored in to enter the crown area. Especially with thornless blackberries and black raspberries (plants that send up new canes from the crown area), number of canes may decrease, and growth from infested crowns will be weak. Canes may break off making galleries in the crown visible. Because these borers take two years to mature, you may be able to find larvae in the crowns. A soil drench of Capture can be applied in fall or spring, as larvae overwinter in the soil.

*Red-necked cane borer:* Watch for a swelling on the cane. If you find one, carefully peel or scrape off the bark and look for tunnels that circle the stem. Remove any canes that have swellings. Adults are present anytime during the summer and are ¼-inch long beetles with a reddish section behind the head. Spray a labeled insecticide (Admire or Pyrellin) if necessary when adults are present. (***Source****: The Vegetable & Small Fruit Gazette, March 2008)*

**BLUEBERRY**

## Getting the Jump on Mummy Berry in 2010

*Kerik Cox, Cornell University*

The 2009 blueberry season was characterized by a surprising number of mummy berry disease outbreaks in NY. During the late spring and summer months, there was considerable rainfall and some fairly long wetting periods. Moreover, the cool weather during spring and summer likely extended the bloom to petal fall period, exacerbating an already devastating situation for mummy berry disease.

Extension educators and extension faculty alike received numerous reports of unstoppable mummy berry disease throughout the state in 2009. The disease even overwhelmed a demo trial we'd set up in the Catskills. The weather conditions were so conducive for infection and inoculum pressures so high as to

**Figure 1.** Apothecia produced on mature mummy berries hidden and protected by ground cover.

completely overwhelm chemical management practices in most production operations with a history of mummy berry disease. Many blueberry farms devastated by mummy berry in 2009 now face levels of mummy berry inoculum that may still overwhelm the best chemical management practices in 2010.

Mummy berry disease is caused by a fungus belonging to a genus responsible for many fruit diseases. Unlike the species causing other fruit diseases, the species of *Monilinia* causing mummy berry disease in blueberries

**Figure 2.** Blight leaf tissue "strikes" with powdery grey infective spores that are attractive to bumblebees.

is unique in that it has evolved the ability to mimic flowering, a process that is important to both the plant and the blueberry producer. Fortunately, it is possible to stop the mummy berry fungus from 'mimicking' flowers and tricking bumble bees into perpetuating its devastating life cycle.

The first step in breaking the cycle of infection is to develop an understanding of how it occurs. The process begins with mummy berries present on the orchard floor or in a nearby planting. As early as April in NY, these germinate to form little trumpet shaped mushrooms called apothecia (Fig. 1). The apothecia emerge at time when the predominately-affected cultivar at the operation is at green tip. These apothecia release ascospores, which are capable of traveling great distances to infect young leaf buds.

The blighted leaf buds, referred to as strikes, become transformed by the fungus to appear like a flower to pollinating bumblebees (Fig. 2). The fungus causes the tissue to reflect in the UV spectrum in a pattern similar to that of flowers. Moreover, the sporulating tissues on these strikes (Fig. 2) produce sweet odorous chemicals that "smell" and "taste" like the floral nectar that bumblebees are seeking during pollination. Bumblebees visit both mummy berry strikes and flowers as they forage, and during this process spores from strikes are transferred like pollen grains to the stigmatic surface of open flowers. These spores germinate like pollen grains and infect the ovaries through the stylar canal. Unlike flowers fertilized by pollen grains, flowers infected by spores from strikes develop into a mummy berry (Figs. 3A, 3B) instead of a blueberry.

The mummy berry disease cycle can be stopped at two places: the mummy, and the leaf strikes. Because elimination of flowers is not an option for blueberry producers, fungicides are the most logical means of killing mummy berry spores and leaving pollen grains unaffected. Unfortunately, the spring rains can wash off fungicide residues and cause strikes to sporulate with increasing abundance. In order to give fungicides a chance, one must try to reduce the numbers of spores available to infect flowers by targeting the mummies and protecting young leaf tissue. In operations that were greatly impacted by mummy berry in 2009 there will simply be too many mummies for fungicides to prevent leaf and subsequent flower infections.

In order reduce the number of mummy berries with apothecia at leaf bud break there are a few options. One option is the use of urea fertilization. This typically involves the application of a high rate of urea (200 lbs/A) to the planting floor to burn apothecia after emergence. This option is high risk because apothecia emerge over a fairly long period and the application would have to be timed just right to affect the majority of apothecia. An alternative is to try a lower rate (40 lbs/A) application of feed grade urea to the row middles and area under the bushes. This should be done before leaf bud break and as soon as you can get the spray equipment into the field. This practice is meant to enhance microbial degradation of the mummies instead of burning the apothecia, which is why the application needs to be made as soon as possible in the spring. This practice is quite successful for reducing apple scab inoculum in apple orchards and could promote reduction of mummy berry inoculum as the mummies are quite susceptible to microbial degradation, which is enhanced by available nitrogen.

Another option is the use of fresh mulch to cover mummy berries and smother emerging apothecia. Applying 2-3 inches of mulch as soon as the snow melts should be sufficient to cover mummies and prevent apothecia from emerging. The mulch helps to increase the distance that emerging apothecia would need to extend to eject spores and limits light exposure, which is needed to stimulate

**Figure 3A.** Developing mummy berries (A) cut at 50 to 75% coloring to reveal infection of ovaries.

germination of apothecia on mummy berries. If your operation had a serious mummy berry problem in 2009 and you have mulched beds, you will need to remove the existing mulch (despite labor intensity), and re-mulch beds. Once mummy berry becomes established in existing mulch, it is actually a favorable organic matter rich environment for the pathogen. Similar to established mummy berry in mulch beds, moss can be an extremely favorable ecosystem for mummy berries, providing moisture and organic matter. Moreover, moss protects mummy berries from exposure to detrimental environmental conditions and management practices. Although moss can be a nice feature in pick your own blueberry operations it can be a serious problem if mummy berry becomes established. In these instances, the moss should be removed manually by removing the sod on which it is established. There are chemical means of the killing moss, but these means must be repeated on a yearly basis, and often provide limited success.

**Figure 3B**. Mature mummy berries (B) that have fallen to orchard floor in autumn and overwintered to spring.

Once the best efforts are made to reduce inoculum, a regular program of fungicides aimed at protecting emerging leaf and flower tissue needs to be implemented. The chemical management program should be started when the first variety is showing 1/4" of green tissue on leaf buds, and end when the latest flowering variety is at 50% petal fall. Fungicide applications should be made prior to rain events and re-applied on 10-14 day intervals unless the planting receives more than 2" prior to the end of the interval. There are several excellent mummy berry fungicides, but one of the best fungicide programs consists of applying Indar 2F (6 fl oz/A) alternating with Pristine (20 oz/A) or Switch 62.5 WG (14 oz/A). These materials will not only help control mummy berry, but also control the majority of other fungal diseases of blueberry such as anthracnose and *Botrytis*.

If you had mummy berry in 2009, you should consider practicing all of the recommended cultural and chemical management practices. If you do not implement the inoculum reduction practices, you can easily overwhelm the ability of your fungicides to control the disease. Even if you do both cultural and chemical management, do not be surprised if the problem is not immediately solved in 2010. Although mummy berry disease appears to become established "out of the blue", it actually becomes slowly established over time. Mummy berry can take several years of proactive management to eliminate. If you did not have mummy berry in 2009, it is not necessary to implement the cultural and chemical management practices. However, it will be important to begin scouting for mummy berry strikes around bloom to ensure that mummy berry doesn't "get the jump on you" in later seasons. (***Source**: New York Berry News, Vol. 9, No. 1, March 2010*)

## Control of Winter Moth Damage in New England Blueberries

*Sonia Schloemann and Robert Childs, UMass Extension*

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

**Life Cycle**: After mating, the female deposits eggs loosely in bark crevices, under bark scales, under lichen, or elsewhere. The adult moths then die and the eggs over-winter. Eggs are dark-colored at first but turn orange within 3-4 weeks. In March, just prior to hatching, they turn red and eventually a deep, shiny blue just prior to hatching. Eggs hatch when temperatures average around 55˚F. It is believed that egg hatch in Massachusetts occurs when 20 Growing Degree Days (base 50) have

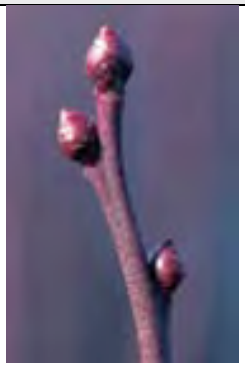
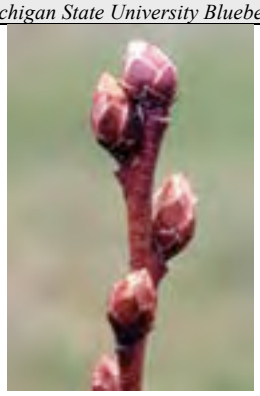
accumulated, which is historically during the second week in April but earlier if temperatures are atypically warmer, depending. This means that egg hatch occurs just at or right before bud break of most of the host plants. After hatching, the larvae wriggle between bud scales of newly swelling buds of such hosts as: maples, oaks, ash, apples, crabapples, blueberry, cherries, etc. and begin feeding.

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

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

**Blueberry Bud Stage**

***Image Source***: *Michigan State University Blueberry Facts website.*

| Dormant | Bud Swell | Bud Break |
|---|---|---|
|  |  |  |

**Recommendation for Controlling Winter Moth or Spanworm Damage**

| | | |
|---|---|---|
| Dormant oil, 2-2.5%<br>**plus**<br>Esteem 35WP, 5 oz/A<br>or<br>Confirm 2F, 16 oz /A<br>or<br>Asana XL, 4.8-9.6 oz/A | Dormant oil, 2-2.5%<br>**plus**<br>Confirm 2F, 16 oz/A<br>or<br>Delegate 3-7 oz/A<br>or<br>Assail 70WP, 1.9-2.3 oz/A<br>or<br>Asana XL, 4.8-9.6 oz/A<br>or<br>Esteem 35WP, 5 oz/A | Confirm 2F, 16 oz<br>or<br>Delegate 3-7 oz/A<br>or<br>Asana XL, 4.8-9.6 oz<br>or<br>Esteem 35WP, 5 oz |

**GRAPE**

## Cold Injury Assessment and Pruning in Grapes

*Bruce Bordelon, Purdue University*

March is the most common month for pruning grapes. The threat of extremely cold weather has passed and we can evaluate any winter injury to vines that may have occurred. By April buds will begin to swell so it is important that pruning is complete prior to bud swell to avoid damage to the tender buds. Growers should assess bud damage prior to pruning so that adjustments can be made in the amount of bud retained. Bud damage is assessed by collecting canes from positions that would normally be left at pruning, bringing those canes indoors to warm up for 48 hours or more, then cutting through the buds with a razor blade to evaluate bud health. Live buds will be bright green while cold injured buds will be black or brown. A very good description of this procedure with pictures is available at the Cornell University Grape Pages website at: http://www.nysaes.cornell.edu/

hort/faculty/pool/GrapePagesIndex.html Typically, if less than 25% of the buds are damaged you can prune normally. If 25-40% of the buds are damaged then you'll want to adjust the number of buds retained accordingly. For example, if 40% of the buds are damaged then 60% are alive. If you need 40 buds per vine for the proper crop load, then you'll have to leave 68 buds to end up with 40 primary shoots. To determine how to adjust the bud number multiply the inverse of the percent live buds (1/.60) times the desired number of buds (1/.60=1.7; 1.7 x 40 = 68 buds). If more than 40% of the buds are damaged then you'll probably want to do minimal pruning now and wait until after budbreak to determine where live buds occur in order to have an adequate number for balancing the vines.

We have cut a few buds from our vines in Lafayette this week and find that all varieties have 85% or higher bud survival. Our low temperature so far this winter has been -6˚F, which is not normally damaging. mowed to the ground now for a fall-only harvest, or the fruited tips can be removed if a summer and fall harvest is desired. Remove and destroy the prunings to help prevent anthracnose and botrytis. (***Source**: Facts for Fancy Fruit, Volume 10 • Issue 1, Feb 2010*)

## Assessing Bud Injury

*Tim Weigle, Cornell University*

With temperatures hitting below zero numerous times this season there has been some concern expressed as to how badly the buds have been injured. One comment I have heard is that the best defense is a good offense and more buds will be left up to combat winter injury and to guard against another spring frost. I will leave the discussion of how you need to look at the whole picture and be prepared to thin during the growing season and the effects of over cropping on the vines carbohydrate storage to Terry Bates and Hans Walter-Peterson. I would like to direct your attention to some of the pest management problems that can be caused by leaving up more buds than you need.

**Number 1** - While not specifically a pest management issue, it is an issue of common sense. Most everyone has complained about the job an unsupervised migrant crew does, leaving up too many buds, not leaving up the best buds, etc., leaving you with a mess that requires additional input of man hours in future years to get back to a training system you recognize. Why would you do on purpose what you have tried to avoid over the years?

**Number 2** - Along the same lines as minimal pruning, or hedging (but hopefully not as drastic) will be the number of smaller shoots that come out in the spring quickly filling in the canopy. Take the problem with getting coverage in the interior of the canopy (the fruiting zone) during late season sprays for grape berry moth and move it up earlier in the season due to a quicker closing in of a denser canopy.

**Number 3** - One of my favorites, the law of limiting factors. As you push a vine toward maximum yield you will eventually run into a factor required for getting that crop ripe, while maintaining a healthy vine, that will become limiting. Powdery mildew is an excellent example of this. When the vines are hanging a moderate to high yield per acre, some powdery mildew on the foliage is not considered to be worth treating, the vine can ripen the crop while building carbohydrate reserves. However, with an excessive crop, management of late season powdery mildew becomes much more important and will require much more time and effort devoted to it than a vineyard with an appropriate sized crop.

**The Take Home Message is**: do a little detective work to see what you have in the vineyard to get the information necessary to make a good decision. Take the time to check each vineyard block, each variety within a block, and check areas separately if you know they have a tendency to be cold spots.

A guide to checking bud for cold injury can be found at: http://www.nysaes.cornell.edu/hort/faculty/pool/budcoldinjury/Assessingbudcoldinjury.html

If the pictures are a bit small for you try clicking on the picture, it should enlarge the pictures for you. As always, I welcome any questions on vineyard pest management. Just send an e-mail timweigl@netsync.net, call me at (716) 672- 6830 or drop by the office at 412 E. Main St in Fredonia NY. (***Source**: Lake Erie Regional Grape Program Update, March 5, 2003*)

## Dormant Applications of Fungicides on Grapes

*Mike Ellis, Ohio State Univ.*

For the past two years we have been conducting evaluations of dormant applications of Liquid lime sulfur and fixed copper (copper hydroxide-COCS) for control of Phomopsis cane and leaf spot on grape. We applied lime sulfur at 10 gallons per acre and copper at 3 lb per acre in 100 gallons of water per acre. We made applications in the fall (after leaf drop), in the spring at bud swell, and at both times (spring and fall).

Our results indicate that both lime sulfur and copper applied in the spring resulted in a significant reduction of Phomopsis leaf and internode infection in the growing season. Lime sulfur was more effective than copper. There were no differences in disease control between the spring only and both the spring and fall applications. Although we got a significant level of disease control, we never achieved 100% control of Phomopsis with the dormant application. Therefore, the dormant application did not reduce the need for fungicide applications for Phomopsis control during the season.

We have been getting a lot of questions about the use of dormant applications of fungicides, so I will make the following comments at this time:

1. Dormant applications of lime sulfur or copper will provide some degree of Phomopsis control, but will not reduce the need for the standard recommended fungicide sprays for Phomopsis control during the growing season. We have no evidence to indicate that the dormant applications are effective against any of the other grape diseases.

In short, they could help, but if you have a good spray program during the growing season, they probably will not result in much of an increase in disease control at the end of the season. Please remember that this assumes you have a good fungicide spray program during the season. We will be presenting the results of our studies with an economic analysis after this season. The bottom line is that if you have a good spray program and your vineyards are pretty clean, you probably do not need a dormant application of fungicide in the spring.

I do not recommend a dormant application of fungicide in the fall for disease control.

2. I do recommend the use of dormant applications of lime sulfur in the following situations:

A. In organic vineyards, this should be an important spray.

B. In vineyards where Phomopsis is getting out of hand, this spray should be considered . In some Concord vineyards that are mechanically pruned, Phomopsis incidence is increasing. A dormant spray of lime sulfur would probably be beneficial here, but the economics on Concord needs to be considered.

For wine grape vineyards where the level of Phomopsis infection is severe, the dormant spray should be considered. It has been my observation over the past several years that we can detect some level of Phomopsis in almost every vineyard we inspect. It is probably not realistic to expect 100% control of Phomopsis on internodes even with a good fullseason spray program (this is my personal opinion , Mike Ellis). In our studies, the dormant application of lime sulfur plus a good full season spray program has never resulted in 100% control of Phomopsis.

C. If anthracnose is present in the vineyard, a dormant application of lime sulfur at the rate of 10 gallons per acre is very important. This spray is the major means of controlling anthracnose. We have seen serious anthracnose in several Ohio vineyards, mainly on Vidal and Reliance grapes.

In summary, a dormant application of lime sulfur ( lime sulfur appears to be more effective than copper) is beneficial and even necessary in some situations as mentioned above; however, it is not a "silver bullet" that is going to reduce the need for a full-season fungicide spray program on wine grapes. (***Source**: adapted from Ohio Grape-Wine Electronic Newsletter, Feb 2010*)

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**GENERAL INFORMATION**

## Thinking of Using Drip Irrigation this Season?

*Bill Lamont, PSU, Horticulture*

I have long believed that water would be a commodity traded in the future just like oil is now! All we have to do is look around the country and we can see the beginnings of water rights being bought and sold, water being diverted to populated areas, and the lack of water for crop production in areas hit by the recent droughts. We have to remember that in the production of vegetables all we are doing in packaging water in another form and selling it to the consuming public. We are indeed fortunate that vegetables are a major component of a healthy diet and if we look carefully we can see a shift toward preventative medicine based largely on the premise if we eat the right food, exercise, and drink good quality water we can prevent a lot of the current medical problems that we see

around us. Drip irrigation can help us supply high quality vegetables to the marketplace while conserving our precious water resources. Drip irrigation is a method of applying small amounts of water, often on a daily basis, to the plant's root zone.

No matter the size of the system, a drip irrigation system has four major components and two options.

**Major Components**
* Delivery system: emitters or line source drip tubing

* Filters: sand, disk, or screen

* Pressure regulators: spring or valve

* Valves: hand-operated, hydraulic, or electrical

**Options**
* Controller: simple electric clock or computer

* Fertigation system: electric pumps, hydraulic pumps, venturi systems, etc.

How you put these components together, and which options you choose, will depend on the size of the system, the water source, the crop, and the degree of sophistication you desire.

**Advantages and Disadvantages**
Although many advantages favor installation of a drip system, there are some limitations as well.

**Advantages**
1. Smaller water sources can be used, as drip irrigation may require less than half of the water needed for sprinkler irrigation.

2. Lower pressures mean reduced energy for pumping.

3. High levels of water management are achieved because plants can be supplied with precise amounts of water.

4. Diseases may be lessened because foliage remains dry.

5. Labor and operating costs are generally less, and extensive automation is possible.

6. Water applications are precisely targeted. No applications are made between rows or other non-productive areas.

7. Field operations can continue during irrigation because the areas between rows remain dry, resulting in better weed control and lower production costs.

8. Fertilizers can be applied efficiently to roots through the drip system.

9. Watering can is accomplished on varied terrains and in varied soil conditions.

10. Soil erosion and nutrient leaching can be reduced.

**Disadvantages or problems**
1. Initial investment costs may be more on a per acre basis than other irrigation options.

2. Management requirements are high. A critical delay in operation decisions may cause irreversible damage to crops.

3. Frost protection that can be achieved by sprinkler systems is not possible with drip systems.

4. Rodent, insect, or human damage to drip tubes may cause leaks.

5. Filtration of water for drip irrigation is necessary to prevent clogging of the small openings in the drip line.

6. Water distribution in the soil is restricted.

**Specific Adaptations to Vegetables**
Because vegetables are usually planted in rows, drip tape/tubing with prepunched emitter holes, called a line source emitter, is used to wet a continuous strip along the row. Also since most vegetables are considered annuals, a thin-walled disposable tubing (4 or 8 mil thick) generally is used for only one season. Less emphasis is usually placed on buried mainlines and sub-mainlines to allow the system to be dismantled and moved from season to season. Costs may be high, so a goal should be to develop an inexpensive yet functional system that allows maximum production with minimal costs. You may purchase an entire system from an irrigation dealer or adapt your own components. Assistance in design from an irrigation dealer or professional can be very helpful in avoiding problems later on.

**Water Sources**
The water supply may come from wells, ponds, lakes, municipal lines, or pits. Well water sources generally are fairly clean and require only a screen filter to remove particles. However, precipitates or other contaminants in the water should be determined by a water quality test prior to considering a drip system. Municipal sources generally provide documentation of water quality tests, making it easier to spot potential problems. Surface water such as streams, ponds, pits or rivers will contain bacteria, algae or other aquatic life, and sand filters are an absolute necessity. Sand filters are generally more expensive.

**Major Components of a Drip System**
1. Delivery system
    * Mainline distribution to field
    * Sub-mainline (header line)
    * Connectors/Feeder tubes
    * Drip tape/tube
2. Filters
3. Pressure regulators
4. Valves or gauges

**Delivery System**
* Mainline distribution to field: Buried underground polyethylene plastic pipe or PVC pipe or above-ground aluminum pipe can be used to deliver water from its

source (pump, filtering system, etc.) to sub-mainline (header line).

* Sub-mainline (header): It is common to use vinyl "lay flat" hose or polyethylene pipe as the sub-mainline (header line). The vinyl "lay flat" hose is durable, long-lasting, and lays flat when not in use so equipment can be driven over it. The lay flat hose and connectors/feeder tubes are retrieved after each growing season and stored until the following year.

* Connectors/Feeder tubes: Water flows to the drip tubing through small plastic tubes attached to plastic connectors that connect the sub-mainline (header line) and each drip tube. This allows some flexibility season to season when the sub-mainline is laid out and the drip tubes are not in exactly the same place.

* Drip tube: The design of most drip tubing consists of an inner and outer chamber that allows for even water distribution over a wide range of conditions. Most tubing is polyethylene black plastic, 4 to 8 mil thick, with holes at intervals of 8 to 24 inches. In general, the sandier the soil, the closer the spacing needed. 12-inch spacing is common. The tubing is shipped flattened on a roll and is often called drip tape. Most drip tapes emit water at about 25 gallons per 100 feet per hour when operated at l0 psi pressure. Standard rolls of tape (7,200 feet) contain enough tubing tape for 1 acre of crop on 6-foot row centers.

**Filters**

Filters are essential to the operation of a drip system and may be viewed as the most important component of a drip system. For wells or municipal water a screen filter or disc filter can be used. Screen filters (150–200 mesh screen) are available in sizes from 3/4 inch (used only for 1/2 acre) to 6-inch (used with several acres). Some filters have a valve to open and flush the filter. Disc filters operate with a series of discs stacked vertically to separate out small particles. Although more expensive to purchase, they are reliable and easy to clean.

For any open or surface water sources, sand filters are an absolute necessity. They are installed as pairs of sand-filled canisters and can be back-flushed to accomplish cleaning. Canisters from 14 inches (enough for 2 acres) to 48 inches in diameter are used, depending on the size of the system. I have used a lot of stainless steel canisters over the years to clean the water from ponds.

The need to clean or flush filters can be determined by the loss of pressure through the filter. You can install pressure gauges on either side of the filter to indicate the need to flush when pressure loss exceeds 5 to 7 psi. With only one pressure gauge behind the filter, watch for reduced operating pressure in normal operation. When stream or river water is used, a sand separator is usually needed to remove suspended sand from the water before it enters the sand filter.

**Pressure Regulators**

Most drip tubing is designed to operate at 8 to 15 psi pressure, with 10 psi being standard operating pressure. A spring-type (used on smaller systems) or diaphragm-type pressure regulator can be purchased to hold pressure steady. These are inexpensive and reliable. Both adjustable and pre-set types are available.

**Valves or Gauges**

Watering several fields or sections of fields from one water source can be accomplished by a zone system using valves to open and close various lines. A backflow/anti-siphon valve is a necessity on a well or municipal source where fertilizers or chemicals are to be injected into the line. Hand-operated gate or ball valves or electric solenoid valves can be used to automate the system using a time clock, water need sensor (discussed later), or automatic controller box ("computer" controller).

**Optional Additions**

Fertigation or chemigation: Soluble fertilizers can be added to the drip irrigation water to provide uniform crop fertilization. A simple "hozon" venturi injector siphons soluble fertilizer from a bucket or jug into the line at a pre-set ratio (usually 1:16 or 1 gallon for every 16 gallons of water flowing through the line). The hozon injection system, however, is only suitable for 1/2 acre plantings or less. Other venturi units are available in sizes up to 2 inches in diameter. More expensive injectors with greater capacity and accuracy, use electric or hydraulic "pumps" to inject fertilizer solutions from a stock tank into the line. A hydraulic device, called a Dosatron, can be set at various dilution rates and operates with water flowing directly through the device, which is placed in the mainline. Use only high quality, soluble fertilizers that completely dissolve. All fertilizer injections should be made as close to the field as possible and ahead of a secondary screen filter in the line so that any contaminants are filtered out.

Fertigation is most commonly used to supply nitrogen since it is highly soluble and moves easily through soils to roots. Phosphate and potash are best applied prior to planting and not injected through the irrigation system. Other chemigation applications may include pest control measures, but check label restrictions on use in chemigation applications. If any fertilizer or chemicals are applied through the system a check valve to ensure no contamination of the water source is a necessity. For regulations on water use, well and valve requirements, and water permits contact the Pennsylvania Department of Agriculture.

Drip systems operate most effectively when used in conjunction with plastic mulches. Mulches reduce evaporation of water from soils and improve economy of drip water application. Vegetable operators typically use 4-foot-wide rolls of black or white-on-black polyethylene plastic mulch on 5-foot row centers with drip tape buried 1 to 3 inches deep below the plastic and either 3 to 5

inches to the side of the row or in the center, depending upon whether a single- or double-row crop is being grown. Use care in laying tubing straight so it will not be damaged when transplanting. Plastic laying machines can lay drip tape and plastic mulch in one operation.

**Maintenance**

The drip system filter should be checked daily and cleaned if necessary. A clogged screen filter can be cleaned with a stiff bristle brush or by soaking in water. Sand filters need to be back-flushed. Check lines for excessive leaking. A large wet area in the field indicates a leaking drip tube. You can install a connector to the leaking tube or bypass the leak with a short piece of feeder tube.

Excessive mineral precipitates on drip lines can be dissolved with acids, usually phosphoric acid. Tapes buried under plastic mulches are much less apt to become clogged from precipitates.

Bacteria, algae and "slime" in lines can be removed by injections of chlorine or commercial bacterial control agents applied through the fertigation system. Use a 2 ppm chlorine daily "rinse" at the end of the irrigation cycle or a 30 ppm "shock treatment" if slime becomes a problem in the system. Consult with a drip system representative for dilution rates for commercial cleaning products.

Periodic flushing of the mainline, sub-mainline and drip tape is an excellent maintenance practice. Adapters are available for the ends of each drip tape to automatically flush lines at the end of each

irrigation cycle, or they can be manually opened to allow a few gallons of water to flush from the end. This will prevent any build-up of particles or slime at the end of the drip line. (***Source**: The Vegetable & Small Fruit Gazette, March 2008*)

## UPCOMING MEETINGS:

**March 30, 2010.** *2010 Ontario Strawberry School,* Newtonville, Ontario, Canada. More information: email info@ontarioberries.com. By phone: 613-258-4587.

**April 6, 2010.** *Blueberry Pruning Workshop*, Baldwinsville, NY. See news brief below for more information.

**April 7, 2010 9:30 am – 4:00 pm,** *Making Your Compost Product Work for You!* 275 New England Small Farm Institute, Jackson Street, Belchertown, MA, Sponsored by the Northeast Recycling Council, Inc., Massachusetts Department of Environmental Protection, and New England Small Farm Institute. For more info, contact Athena Lee Bradley at athena@nerc.org or at 802-254-3636. Lunch provided.

**April 21, 2010** - *Tree Fruit Growers' Meeting: Sprayer Pattenator for Airblast Sprayer Calibration.* Macks' Apples of Moose Hill Orchards, Londonderry NH. 1:00-4:00pm. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

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

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

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

**June 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.