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

Massachusetts Berry Notes Underwriters:

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IN THIS ISSUE:

CROP CONDITIONS:

Strawberries: Mulch removal was completed for most growers by mid April - later than usual due to the persistent cold temperatures. Subsequent growth has been slow to stalled with the season running late at this point by 7-10 days, more or less depending on location. Plants under row covers are coming along slowly with bloom expected in a week or so. Winter injury has not been common in most fields most likely because of the good snow cover for most of the winter. It may be soon to know for sure, so keep an eye on plants as they begin more vigorous growth. Also, be sure to look for damage from Cyclamen Mite, especially in fields where this has been a problem before. See the NE Small Fruit Management Guide for recommended management options. **Brambles:** Summer fruiting varieties are pushing growth with leaves visible and beginning to expand. No flower tissue easily visible yet for most varieties but will come quickly with the onset of warm temperatures. A significant amount of dieback is likely following this winter's cold temperatures. It may not be possible to fully assess the extent of winter damage until growth is farther along. Shoots that grow from lower regions of the canes will set a crop, but yields are expected to be down. Some shoots may begin growing and then wilt from sublethal damage. Primocane varieties are showing some new growth but only a few inches so far. Brambles in tunnels should be monitored for two-spotted spider mite. **Blueberries**: Flower buds are in tight cluster (see chart in this issue) and will progress quickly when weather warms up. Now is the time to look for apothecia (fruiting cups) of the overwintered fungus in mummified fruit beneath the bushes. If high infections were seen last year, be prepared to protect against this disease this year. Options outlined in the Blueberry section below. **Grapes**: Pruning is complete and vines are beginning to show slow growth with most varieties in budswell in most locations. Be prepared to scout for flea beetle soon.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for an approximately 1 week period, April 17 through April 23. Soil temperature and phenological indicators were observed on or about April 23. Total accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments for the 2014 calendar year. This information is intended for use as a guide for monitoring the developmental stages of pests in your location and planning management strategies accordingly.

Region/Location	GDD (1-Week Gain)	GDD (Total 2014 Accumulation)	Soil Temp (°F at 4" depth)	Precipitation (1-Week Gain in inches)
Cape Cod	6	56	50	1.25
Southeast (Wareham)	n/a	n/a	n/a	n/a
Southeast (Hanson)	16	74	53	0.66
East	10.5	59.5	38	0.06
Metro West	10	33	56	0.06
Central (Boylston)	15	48	46	1.03
Pioneer Valley	9	46	50	0.13
Berkshires	3	39	50	0.04
AVERAGE	8	51	49	0.46
n/a = information not available				

(***Source***: *UMass Landscape Message #6, April 25, 2014*)

STRAWBERRY

Spring Strawberry Chores

Sonia Schloemann, UMass Extension

Established plantings:

1.**Straw mulch removal** – Remove straw mulch from strawberry rows in late-March to early April. Keep straw between the rows to help suppress weeds and reduce splashing from rain or irrigation. For fields where delaying bloom to avoid frost is desired, delaying mulch removal can be a useful technique. Check plants frequently and be sure to remove mulch before any plant growth begins. Delayed mulch removal can delay bloom by up to a week.

2. **Floating row covers** – Set out floating row covers as soon as straw mulch is removed on fields where early bloom is desired. Remember to remove row covers as soon as plants beneath them are blooming to insure good pollination of the flowers. Failure to remove row covers can result in poor pollination and misshapen unmarketable fruit. Covers can be pulled back over for frost protection if needed, although irrigation will protect to a lower temperature. See more below.

3.**Spring weed control** – Calibrate weed sprayer before season starts. Apply pre-emergent herbicides to dormant strawberries. See the 2013-14 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor) for detailed recommendations.

4. **Frost Protection** – be sure that overhead irrigation for frost protection is in place and running properly before it is needed. Pump failures and blown irrigation lines are no fun at 2:00 in the morning. The next issue of Berry Notes will carry detailed information about frost protection.

5.**Insect and disease management** – Calibrate sprayer before season starts. Order scouting supplies (traps, pheromones, etc.) and anticipated spray materials and store properly.

New plantings:

1. **Site preparation** – Prepare field properly well in advance of planting. This means doing site work (e.g., drainage, running irrigation mains, picking stones, etc.), and making soil adjustments (e.g., soil pH, organic matter, etc.).

2. **Preplant weed management** – Some pre-plant herbicides must be applied 30 days prior to planting. Keep this in mind. Some herbicides can be applied shortly before or after planting See the 2013-14 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor) for detailed recommendations.

Planting–

a. Check condition of plants on arrival and contact nursery if you have concerns.

b. b. Keep dormant plants moist (but not wet) and cold (32°F) until planting.

c. c. Lay out planting scheme before taking plants out of cold storage or have field ready before delivery if no cold storage is available.

d. d. Make sure transplanter is in good running order before planting day.

e. e. Soak roots in water for up to an hour before planting. Do not allow plants to sit in water much longer before planting but make sure they are moist until planted.

f. f. Set plants so the middle of the crown is at the soil surface (not to deep or too shallow). This may take some fine-tuning of the planter.

g. g. Irrigate immediately after planting to settle soil around the plants.

h. h. Recheck planting depth after irrigation and make adjustments as needed.

Spring Weed Management in Strawberries: *there have been several label changes for strawberries*

Bruce Bordelon, Purdue University

There is a new formulation of Gramoxone, a revised supplemental label for Sinbar, and labels for Prowl H20, Aim, Blazer, Chateau, Solix 3, and Goal. Growers should read the 2014 Midwest Commercial Small Fruit and Grape Spray Guide to familiarize themselves with these 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. With the old formulation (Gramoxone Max) the rate range was 1.7 to 2.7 pints per acre. 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, Vol 14, Issue 1, April 7, 2014*)

RASPBERRIES/BLACKBERRIES

Spring Bramble Chores

Sonia Schloemann, UMass Extension

Established Plantings:

1. **Pruning and trellising** - Finish pruning before budbreak by removing spent floricanes and thinning remaining canes to 6-8" apart. Keep row with to no more than 18" at the base. These practices allow for good air circulation and light penetration within the canopy and benefit fruit quality.

2. **Spring weed control** – Calibrate herbicide sprayer before season starts. Apply pre-emergent herbicides according recommendations in the 2013-14 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor). Hand-weed trouble spots with perennial weeds if needed.

3. **Insect and disease management** – Calibrate sprayer before season starts. Order scouting supplies (traps, pheromones, etc.) and anticipated spray materials and store properly. A dormant lime-sulfur application can help control cane and spur blights but must be applied before green tissue appears.

New Plantings

1. **Site preparation** – Prepare field properly well in advance of planting. This means doing site work (e.g., drainage, running irrigation mains, picking stones, etc.), and making soil adjustments (e.g., soil pH, organic matter, etc.).

2. **Preplant weed management** – Some pre-plant herbicides must be applied 30 days prior to planting. Keep this in mind. Some herbicides can be applied shortly before or after planting See the 2013-14 New England Small Fruit Pest Management Guide for detailed information.

Planting –

a. Check condition of plants on arrival and contact nursery if you have concerns.

b. Keep dormant plants moist (but not wet) and cold (32 ℉) until planting. Plant as soon as is feasible after delivery.

c. Lay out planting scheme before taking plants out of cold storage or have field ready before delivery if no cold storage is available.

d. If using a transplanter, be sure it is in good running order before planting day.

e. Soak roots in water for up to an hour before planting. Do not allow plants to sit in water much longer before planting but make sure they are moist until planted.

f. Set dormant plants at the same depth as they were in the nursery. This may take some fine-tuning of the planter. Trim 'handles' to 6" at planting.

g. Irrigate immediately after planting to settle soil around the plants.

h. Apply a layer of organic mulch to help suppress weeds until plants are well established. Mulching is only recommended in raspberries during the establishment year. In subsequent years, mulch can lead to rot at the base of canes from excess moisture.

i. Seed row middles to slow growing sod such as hard fescue to reduce soil erosion.

BLUEBERRY

Spring Blueberry Chores

Sonia Schloemann, UMass Extension

Established Plantings:

1. **Spring weed control** – Calibrate herbicide sprayer before season starts. Apply pre-emergent herbicides according recommendations in the 2013-14 New England Small Fruit Pest Management Guide (www.umass.edu/fruitadvisor). Hand-weed trouble spots with perennial weeds if needed.

2. **Frost/Freeze Damage** – Be prepared for heavy frost/freeze events during bloom with frost protection. More detail on this in the next issue of Berry Notes. Note that frost damage to blossom tissue can result in more infection by mummyberry so fungicide applications soon after a frost event is recommended.

3. **Insect and disease management** – Calibrate sprayer before season starts. Order scouting supplies (traps, pheromones, etc.) and anticipated spray materials and store properly. A dormant lime-sulfur application can help control cane and spur blights but must be applied before green tissue appears.

New Plantings

1. **Site preparation** – Prepare field properly well in advance of planting. This means doing site work (e.g., drainage, running irrigation mains, picking stones, etc.), and making soil adjustments (e.g., soil pH, organic matter, etc.).

2. **Preplant weed management** – Some pre-plant herbicides must be applied 30 days prior to planting. Keep this in mind. Some herbicides can be applied shortly before or after planting See the 2013-14 New England Small Fruit Pest Management Guide for detailed information.

Planting –

a. Check condition of plants on arrival and contact nursery if you have concerns.

b. Keep dormant plants moist (but not wet) and cold (32 ℉) until planting. Plant as soon as is feasible after delivery.

c. Lay out planting scheme before taking plants out of cold storage or have field ready before delivery if no cold storage is available.

e. Soak roots in water for up to an hour before planting. Do not allow plants to sit in water much longer before planting but make sure they are moist until planted.

f. Set dormant plants at the same depth as they were in the nursery. This may take some fine-tuning of the planter. Trim 'handles' to 6" at planting.

g. Irrigate immediately after planting to settle soil around the plants.

h. Apply a layer of organic mulch to help suppress weeds until plants are well established.

i. Seed row middles to slow growing sod such as hard fescue to reduce soil erosion.

Blueberry Disease Fast Fact Sheet; Mummyberry

Dena Fiacchino, Cathy Heidenreich, and Wolfram Koeller, Cornell University

What: Mummy berry is caused by the fungus, *Monilinia vaccinii-corymbosi*, and is one of the most important blueberry diseases in New York State. If left untreated, mummy berry can reduce yields by 30-40%. Early control and detection is necessary to reduce the impact of this disease.

When: The fungus overwinters in infected berries, or "mummies" on the soil under bushes. Mushroom-like structures (apothecia) grow out of the mummies (Figure 1). In early spring, ascospores are released from the apothecia to infect the newly emerging leaf tissue. These spores are disseminated by wind and rain. This step is the primary or shoot blight phase of the disease. Shoot blight symptoms typically develop 2 weeks after infection. Infected shoots and leaves wilt, turn brown, and die (Figure 2). Masses of secondary spores (conidia) are produced on infected shoot surfaces (Figure 3), which then infect flower blossoms, starting the second phase of the disease.

Where: Mummy berry occurs in most regions where blueberries are commercially grown. This fungus only infects cultivated blueberries and a few wild blueberry species. Generally, the disease is introduced from neighboring infected plantings or from wild blueberries in nearby woods.

How: Under moist conditions in early spring, apothecia begin to form from mummified fruit remaining on the soil surface. The apothecia slowly develop as moisture levels and temperatures rise. At low temperatures such as 35° F, spores mature slowly taking 10+ hours to release, however at an increased temperature of 61° F, apothecia take about 4hrs to fully mature.

Conidia form on infected shoots, then are carried to flower blossoms by wind and pollinating bees (who are tricked by color changes and sugar secretion into thinking that the infected leaves might be flowers). Once the fungus has been introduced to the flower, it will germinate with the pollen and slowly infect the developing fruit. Evidence of blossom infection does not appear until the fruit begins to ripen. As normal berries ripen, the infected berries begin to shrivel and turn a pinkish color. (Figure 4) These "mummy berries" become filled with fungus, and have a hard grayish white center.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

They fall to the ground, shrivel up becoming pumpkin- shaped, and turn dark brown or black. These serve as an inoculum source the following spring when apothecia form and disease cycle begins again.

Control Strategies: Mummy berry can be a difficult disease to control. An integrated pest management program including both cultural and chemical control strategies is needed for best results. The best time to achieve control of this disease is during the primary infection phase.

- Rake or disk soil beneath the blueberry bushes or cover the fallen mummy berries with a 3-4 inch mulch layer before apothecia appear in the spring.
- Apply 200lbs/A of 50% urea to burn out apothecia.
- Fungicides may be used to control this disease during both disease phases. For control of the primary infection phase applications should begin at green tip and continue on 7-10 day intervals when conditions favor infection.

For secondary infection control, make applications beginning at bloom on the same type of schedule. Different fungicides are required to control primary vs. secondary infections.

For more information see *Cornell Pest Management Guidelines for Berry Crops* [or *2008 New England Small Fruit Pest Management Guide*]. Apply all pesticides according to label rates and instructions.

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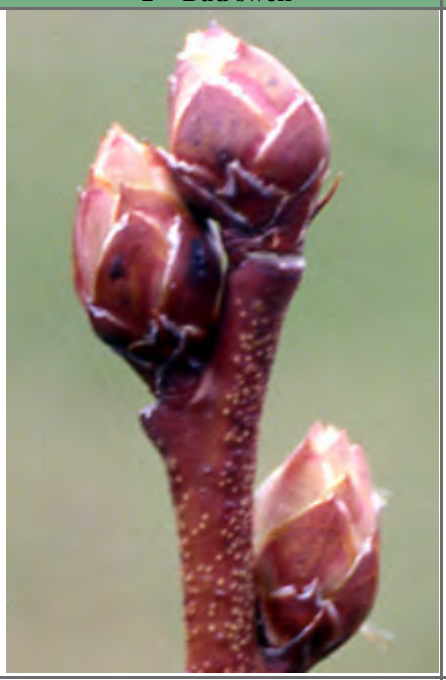
1. Caruso, F.L., and Ramsdell, D.C. (eds.) 1995. *Compendium of Blueberry and Cranberry Diseases*. APS Press, St. Paul Minn.
2. DeMarree, J.B., and Wilcox, M.S. 1947. *Fungi Pathogenic to Blueberries in the Eastern United States*. Phytopathology 37: 487-506.
3. Pritts, M.P. and Hancock, J.F. (eds.) 1992. *Highbush Blueberry Production Guide*. Northeast Regional Engineering Service, Ithaca, NY.
4. Schilder, Annemiek. 2005. *Michigan Blueberry Facts: Mummy Berry*. http://www.blueberryfacts.org/mummyberryguide. html. (***Source**: New York Berry News, Vol. 5, No. 2, March 31, 2006*)

Critical Cold Temperatures for Blueberries

Mark Longstroth, Michigan State University

1 – Dormant or tight bud	2 – Bud swell	3 – Tight cluster
		
Plant part: Flower bud. **Description:** No visible swelling of the fruit buds. Bud scales tightly closed. No visible signs of growth.	**Plant part:** Flower bud. **Description:** First sign of growth as plant growth begins in the spring. Visible swelling of the flower buds; outer bud scales begin to separate at the tip revealing paler interior bud scales. This bud stage can usually tolerate cold temperatures of 10 to 15°F (-12 to -9°C).	**Plant part:** Flower. **Description:** Individual flowers are distinguishable in the flower cluster. This bud stage can tolerate 20 to 23°F (-7 to -5°C).
4 – Early pink bud	**5 – Late pink bud**	**6 – Full bloom**

		
Plant part: Flower. **Description:** Expanding flowers are readily visible and have separated. The pink corolla tubes (petals) are short and closed. This bud stage can tolerate 23 to 25°F (-5 to -4°C).	**Plant part:** Flower. **Description:** Individual flowers fully developed. Expanded corollas are now white but still closed. This bud stage can tolerate 24 to 27°F (-4.4 to -2.8°C).	**Plant part:** Flower. **Description:** Most of the flowers on the bush have opened. The bloom stages can tolerate 28°F (-2.2°C).
7 - Petal fall		
		
Plant part: Flower. **Description:** The corolla tubes are falling off the flowers, revealing small green fruit. This is the most vulnerable stage to freeze injury. Damage can occur at 32°F (0°C).		

GRAPE

Vineyard Fertilization

Dave Scurlock and Imed Dami, Ohio Agricultural Research and Development Center

It is nearing time to start applying fertilizer if you have not done so already. In the past we would apply fertilizer in early spring before bud break because we had some time before spring work really got started. We had finished pruning, tightened the wires, tied up the vines, replanted missing vines and removed our hills on the vinifera. **Now what?** Let's throw on some fertilizer and get that done so we can go on to some other operation.

Is timing of fertilization really that important? The following excerpts are from an earlier report out of the Vineyard Vantage. A report by Eric Hansen indicated that multiple applications of nitrogen may be needed to maintain sufficient nitrogen in the root zone over the extended period of peak demand, particularly on sandy soils. Efficiency of nitrogen uptake may also be affected by fertilization placement and rate. Greatest absorption may be achieved when fertilizer is applied over the soil containing the most grapevine roots, which is normally the herbicide strip immediately under the trellis. This is most important in younger vineyards where the root system is not as extensive. As a general rule, the percentage of fertilizer nitrogen absorbed decreases as the

rate of nitrogen increases. Although some growers apply high rates of nitrogen in a single application, greater efficiency of nitrogen uptake may occur from multiple applications banded beneath the vine when the vine demand is high. Studies have shown that application of nitrogen while grapes are dormant is inefficient because a high percentage of the applied nitrogen is leached from the soil before uptake by the vine. Vines absorb nitrogen relatively slowly between budburst and bloom, most rapidly between bloom and veraison and then slow down between veraison and harvest. Thus the most efficient time to apply nitrogen would be shortly after bloom when the vines are growing rapidly.

Application Rate: Generally we apply approximately 50 pounds of actual nitrogen per acre each year to juice grapes with lower rates (30 pounds) applied to wine grapes. The actual nitrogen that you apply is calculated by taking the form of nitrogen that you are applying such as ammonium nitrate, which is 33% nitrogen and multiply the weight of a 50-pound bag of ammonium nitrate which will give you 16.5 pounds of **actual N** that you are applying per bag. Approximately three 50-pound bags will give you 50 pounds of actual N per acre if applied at 0.27 pounds of ammonium nitrate per vine at an 8 foot by 10 foot spacing (545 vines/acre). Example 2: Urea (45% N) x 50 lb bag of Urea = 22.5 lbs of actual N/bag. If you are going for 50 lbs of actual N per acre then: 50 lbs/acre divided by 22.5 lbs of actual N = 2.22 bags per acre using Urea at the 50 lb per acre rate.

Training systems that permit large vines such as Geneva Double Curtain(GDC) require higher application rates of 75-100 pounds of actual N per acre. Larger amounts are best applied as split; half rate applied by bloom and the second half by veraison. Younger vineyards require less nitrogen usually in the 15 to 20 pounds of actual nitrogen per acre. Nitrogen is readily available between the pH values of 6.0 and 8.0, but becomes less available at lower or higher pH levels.

We would like to see pH values around 6.0 to 6.5. The American varieties can tolerate lower pH values of 5.5 better than vinifera type grapes. Liming should be done after you have tested your soil and determined a need and the absolute best time to lime is well in advance of planting so that you can incorporate the lime into the soil 8 to 12 inches deep. The pH is much more difficult to correct after the planting because of the slow movement of the lime through the soil. Lime can also increase the availability of other elements such as phosphorus, calcium, magnesium, and molybdenum. The dolomitic lime can be used to raise the magnesium content in the soil and pH and a calcitic lime can be used to raise the calcium content as well as the pH in the soil. If the soil pH was not corrected before planting the pH may be raised over time with multiple applications of lime of 2 to 2.5 tons per acre twice a year.

Can Potassium additions help? Next to nitrogen we have to consider Potassium as one of the next most important elements to maintain good vine health and sugar development. Application rates should be based on vine vigor, soil tests, and petiole analysis. For soil applications 100-400 pounds per acre of 0-0-60 is recommended. The number of applications may be higher in clay and sandy soil if the pH is above 6.5. Apply potassium in 2-foot bands under the trellis to assure that the major portion of the material will be available for root uptake. Potassium can be applied anytime, but the maximum uptake will be between bud break and veraison and again immediately after fruit harvest.

Organic fertilizer? Any time you can add organic material to the fields it is going to help the health of the soil and tilth. An organic material may vary greatly in composition depending on its source. When such a material is applied as a fertilizer an unknown quantity of nitrogen, phosphorus, potassium or other elements are applied unless it has been analyzed. Cost to obtain and spread and amounts are usually higher unless a readily available source is part of the operation. Observations of growth and petiole analysis can tell you if you are getting enough nutrients to the vines. Organic materials such as mulches can have a detrimental effect of tying up nitrogen that is used by microorganisms to break down the mulch into a usable form for the vine. Additional nitrogen to feed both the vine and microbes will alleviate this problem.

What about fertilizing vines that were winter injured? The rule here is wait and see. We are definitely going to want to reduce the normal application rates of nitrogen to vines that are showing signs of winter injury. That is delayed bud break or uneven budbreak and shoot growth. If you are unsure about your crop, it might be advisable to split the nitrogen application this year and apply a half-rate at bloom (two thirds of nitrogen goes to vegetative growth, one third to fruit). If you have very few shoots, this may be a year to not apply nitrogen. Watch for nitrogen deficiency symptoms (thin weak growth, light green foliage). If symptoms develop, apply a foliar spray of urea around veraison. Foliar sprays can be a corrective for deficiency symptoms, but are not a permanent solution to vineyard fertility problems. (***Source**: Ohio Grape-Wine Newsletter, April 2011*)

Critical Spring Temperatures for Tree Fruit and Small Fruit Bud Stages

Compiled by Mark Longstroth, MSU Extension

Pome Fruit

Apples	Silver Tip	Green Tip	½ inch green	Tight Cluster	First Pink	Full Pink	First Bloom	Full Bloom	Post Bloom
Old	16	16	22	27	27	28	28	29	29
temp 10%	15	18	23	27	28	28	28	28	28
kill 90% kill	2	10	15	21	24	25	25	25	25

Pears	Bud Swell	Bud Burst	Tight cluster	First White	Full White	First Bloom	Full Bloom	Post Bloom
Old	18	23	24	28	29	29	29	30
temp 10%	15	20	24	25	26	27	28	28
kill 90% kill	0	6	15	19	22	23	24	24

Stone Fruit

Apricots	Bud Swell	Bud Burst	Red Tip	First White	First Bloom	Full Bloom	In the Shuck	Green Fruit
Old	--	23	--	25	--	28	--	31
temp 10%	15	20	22	24	25	27	27	28
kill 90% kill	--	0	9	14	19	22	24	25

Peaches	Bud Swell	Calyx Green	Calyx Red		First Pink	First Bloom	Full Bloom	Post Bloom
Old	23	--	--		25	--	27	30
temp 10%	18	21	23		25	26	27	28
kill 90% kill	1	5	9		15	21	24	25

European Plums	Bud Swell	Side White	Tip Green	Tight Cluster	First White	First Bloom	Full Bloom	Post Bloom
Old	--	--	--	--	23	27	27	30
temp 10%	14	17	20	24	26	27	28	28
kill 90% kill	0	3	7	16	22	23	23	23

Sweet Cherries	Bud Swell	Side Green	Green Tip	Tight Cluster	Open Cluster	First White	First Bloom	Full Bloom	Post Bloom
Old	23	23	25	28	28	29	29	29	30
temp 10%	17	22	25	26	27	27	28	28	28
kill 90% kill	5	9	14	17	21	24	25	25	25

Tart Cherries	Bud Swell	Side Green	Green Tip	Tight Cluster	Open Cluster	First White	First Bloom	Full Bloom	
10% kill	15	24	26	26	28	28	28	28	
90% kill	0	10	22	24	24	24	24	24	

Small Fruits

Concord Grapes	First Swell	Full Swell	Bud Burst	First Leaf	Second Leaf	Third Leaf	Fourth Leaf
10% kill	13	21	25	27	28	28	28
90% kill	-3	10	16	21	22	26	27

Strawberries	Buds Emerged	Buds Closed	Bloom	Small Fruit
Damage	10	22-27	28	28

Blueberries	Bud Burst	Pink Bud	Open Flower	Petal Fall	Green Fruit
Damage	< 20	< 25	27	28	28

Old standard temperature is the lowest temperature that can be endured for 30 minutes without damage. This chart also shows the temperature that will kill 10 % and 90 % of normal fruit buds. These numbers were taken from Washington (WSU), Michigan (MSU) and North Carolina (NCS) Extension Bulletins. Apple - WSU EB0913, Pears - WSU EB0978, Sweet Cherries - WSU EB1128, Peaches - WSU EB0914, Apricots - WSU EB1240, Tart Cherries - MSU Research. Rpt. 220, Portions of these bulletins are posted at Gregg Lang's Fruit Bud Hardiness Page at the MSU Horticulture Department (***Source**: MSU Fruit Program Frost/Freeze page http://web1.msue.msu.edu/vanburen/frost.htm*)

Minimizing Pesticide Exposure to Bees in Fruit Crops

Julianna Wilson, Larry Gut, Rufus Isaacs and Emily May, Michigan State University

Use these practices and guidelines for minimizing exposure of bees to pesticides while still managing pests and disease in fruit crops.

Most fruit crops grown in Michigan need bees, whether managed or wild, for pollination. Honey bees are by far the most important crop pollinators because they are abundant, will collect nectar and pollen at distances of more than a mile away from their hive, and are relatively easy to transport in and out of plantings in time for bloom. Honey bees are typically placed in the field when crops are at 5-10 percent bloom and then removed at "petal fall." While bees are essential for the production of most fruit crops, pest management is also critical for producing marketable and profitable yields. This can create a potential conflict between the need to protect bees and the need to prevent insect and disease pests.

Honey bee on superberry. Photo credit: Jerry A. Payne, USDA ARS, Bugwood.org

The challenge for commercial fruit growers is to manage the pests and diseases that cause crop losses while minimizing pesticide exposure to bees across the variety of crops and cultivars that may bloom at different times throughout the spring across the farm. Many insecticides are known to be acutely toxic to bees and are restricted from use during bloom to minimize exposure. Newer research suggests that other insecticides and some fungicides and inert ingredients in pesticide formulations may affect brood development when residues are brought back to beehives. As part of the response to increasing concerns and more detailed information about pesticide effects on bees, there have been recent changes to pesticide labels and the re-evaluation of practices that will minimize pesticide exposure to bees in fruit crops.

Michigan State University Extension has provided guidelines for fruit growers on minimizing the risk of pesticides to bees. It all starts with good communication between growers and their beekeepers. Discussions during the winter can set the stage for how many hives will be needed and when and where to put the bees on the farm. As the season starts, making good pre-bloom decisions and avoiding exposure of bees to toxic pesticides are essential.

Some general practices that can minimize this risk include:

- Draft a written contract with the beekeeper to clarify expectations on both sides.
- Select a location for hives on the farm that is upwind from potential drift.
- Honey bees can cover a lot of ground, so place hives in safe locations rather than along drive lanes within or close to the planting.
- Know when to expect the delivery of hives and when they will be removed.
- Examine delivered hives to know the health and strength of the hives you are renting.
- At all times, follow the label for pesticide application. New labels for neonicotinoids and for Exirel have bee-specific language.

Specific practices to minimize exposure of bees to pesticides include:

- Provide sufficient time between pre-bloom sprays and placement of hives to avoid exposing bees to lethal residues.
- Do not apply bee-toxic insecticides until crop flowering is complete and all petals have fallen.
- Do not apply insecticides permitted for use during crop bloom while bees are foraging. Spraying after sunset can greatly reduce the risk of exposure.
- Select less toxic insecticides whenever possible. Consult the Michigan Fruit Management Guide E-154 for the table of insecticide toxicity ratings for honey bees.
- If fungicides are needed during bloom, spray after sunset or when air temperature is below 55 degrees Fahrenheit whenever possible.
- Turn off the sprayer near hives and avoid pesticide drift onto open flowers.

- Use selective herbicides to eliminate forbs from drive lanes or mow before spraying to reduce flowering weeds in the crop field.
- After crop bloom, draw bees away from crop plantings by providing non-crop flowering plants elsewhere on the farm (i.e., meadows that contain bee-attractive plants or summer flowering cover crops like buckwheat).

For more detailed information on this topic, consult the recently updated Oregon State University publication "How to Reduce Bee Poisoning from Pesticides."

Drs. Gut and Isaacs' work is funded in part by MSU's AgBioResearch.

(***Source**: MSU Crop Pest Alerts, April 29, 2014*)

Oriental Beetle Control in Strawberry and Blueberry – Pesticide Resistance Concern

Richard Cowles, CT Agricultural Experiment Station, Valley Laboratory

As you may be aware, there was widespread failure in control of oriental beetle with imidacloprid in Connecticut in 2013, which may be due to the development of imidacloprid resistance. Fruit growers, golf course superintendents, and lawn care companies all had failures of control when applying various formulations of imidacloprid at the correct dosages and timing, and with proper incorporation of the active ingredient into the soil through rainfall. There are several lines of evidence that suggests insecticide resistance as the explanation for control failures, yet scientific proof of insecticide resistance may be difficult, because there are no baseline toxicological studies with this species.

Oriental beetle are of special concern in strawberry and blueberry plantings. Root feeding by the larval (white grub) stage of oriental beetle contributes to poor root function, dwarfing of plants, loss of yield, and plant mortality. Plant damage is especially severe in plasticulture systems when growing strawberries. Adult beetles readily lay eggs under the plastic, and larvae completely consume the strawberry root systems. My analysis of blueberry yield before and after adoption of imidacloprid to manage oriental beetle suggests that yields may be reduced by about 20% from feeding by this white grub.

To determine whether you have white grubs in berry fields, take soil and root samples with a shovel and sift through the soil to observe the white larvae. Larvae without legs are root weevils (principally black vine weevil) and larvae with legs are usually white grubs. There are two species of white grubs most commonly found in berry plantings, oriental beetle is predominant, and Asiatic garden beetle is less commonly damaging. Bring samples of grubs to the CT Agricultural Experiment Station inquiry offices for a quick ID to species. If bringing in samples, be sure to collect several larvae, and include some soil mixed with the larvae so that they do not eviscerate each other in transit.

Without an effective insecticide to target hatching larvae, growers are in a tough position. Thankfully, my colleagues at Rutgers over the years conducted the research and tested the concept that demonstrated mating disruption for oriental beetle to be an effective management strategy. It subsequently has been commercialized, but had only been registered for use in New Jersey and New York. At my urging, the registrant, AgBio, has requested state registration for "Oriental Beetle MD" in Connecticut, which should be approved in about 2 weeks. I have attached the extension and product literature, as well as ordering and price information.

I urge growers to check their fields now for presence of white grubs, and if oriental beetles are present, to consider mating disruption for preventing root losses later this year in their berry plantings.

Disclaimer: The Connecticut Agricultural Experiment Station does not endorse any product, to the exclusion of other products. Always read and follow pesticide label directions. (***Source**: CT Fruit Update, April 14, 2014*)

UPCOMING MEETINGS:

May 14, 2014 – *UMass Extension Fruit Team Twilight Meeting*, 5:30 – 7:30, Dowse Orchard. 98 North Main St., Sherborne MA 1 pesticide credit will be offered. Refreshments/snack will be served. Orchard walk, current orchard management updates. $25 meeting fee ($20 for MFGA members). Pre-registration is not necessary. For more information go to: https://extension.umass.edu/fruitadvisor/events/fruit-twilight-meeting-4.

May 21, 2014 - *UMass Extension Fruit Team Twilight Meeting*, 5:00 – 8:00, Alyson's Orchard, 57 Alyson's Lane, Walpole, NH. In cooperation with U. of New Hampshire Extension. 2 pesticide credits will be offered. Refreshments/snack will be served. Contact: George Hamilton, 603-641-6060 For more information go to: https://extension.umass.edu/fruitadvisor/events/fruit-twilight-meeting-5.

May 29, 2014 – *Weed Walkabout*, 5:00 – 7:00. Elm Bank Reservation, 900 Washington St., Wellesley MA. Correct weed identification is an important first step in the development of an effective weed management program. Join Randy Prostak, Extension Weed Specialist, for a walk through the landscape for an up-close look at weed problems of woody ornamental plantings. This workshop is held rain or shine. Preregistration required as space is limited; the cost is $50 or $45 per person for three or more registrations from the same company (10% discount). Fore more information see: http://ag.umass.edu/events/weed-walkabout.

June 7, 2014 – *Massachusetts Cultivated Blueberry Growers' Summer Meeting*. 12:00 – 3:00. Turkey Hill Farm, 380 Middle Rd., Haverhill, MA 01830. This meeting will feature Dr. Alan Eaton from the University of New Hampshire who will provide the most updated information on the identification and management of the new invasive fruit fly pest, Spotted Wing Drosophila. Cost: Free to members; others $10 payable at the meeting. For more information contact Pat Concree at theblueberryfarm@comcast.net.

June 10, 2014 – *Broadleaf Weed Identification Workshop*. University of Massachusetts French Hall, 230 Stockbridge Rd., Amherst MA. 9:00 – 3:00 Correct weed identification is an important first step in the development of an effective weed management program. Using a classroom presentation, potted weed herbarium and weed walk, UMass Extension Specialist Randy Prostak will help participants enhance their broadleaf weed identification skills. Feel free to bring a weed or two to identify. Workshop held rain or shine (lunch not provided). Grassy Weed Identification will be offered next in 2015. Registration: Cost $95 per person (pre-registration is required). 5 pesticide contact hours for categories 36, 37 and Applicators License available; valid for equivalent categories in all New England states For more information and to register, go to: https://extension.umass.edu/vegetable/events/broadleaf-weed-identification-workshop.
