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Berry Notes

Prepared by the University of Massachusetts Fruit Team

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IN THIS ISSUE:

Crop Conditions

Environmental Data

STRAWBERRY

- ❖ Strawberry Renovation
- ❖ Strawberry Root Weevil and Black Vine Weevil

RASPBERRIES/BLACKBERRIES

- ❖ Pruning Caneberries (Brambles) to Minimize SWD Habitat within the Planting
- ❖ Summer Caneberry Chores

BLUEBERRIES

- ❖ Blueberry Maggot Emergence Sharply up After Rains

GRAPES

- ❖ Protect Grape Clusters from all Major Grape Diseases During Early Fruit Development
- ❖ Japanese Beetles

GENERAL INFO

- ❖ Small Fruit Leaf Tissue Analysis
- ❖ Bird Management Options For Fruit Growers
- ❖ Honeyberries, Haskaps, Blue Honeysuckle: Is There Commercial Potential For Wisconsin?

UPCOMING MEETINGS

Crop Conditions:

Strawberries: Harvest is complete in most June-bearing varieties across the state with many reporting good yields and quality. Day Neutral varieties have begun ripening fruit. Newly planted fields are sending runners which should be swept into rows prior to rooting. Potato leafhopper can be found in many new plantings (see IPM Berry Blast from June 27 for more on PLH). Strawberry bed renovation for fields being kept over for next year is the main activity now. Prompt renovation will be important for keeping SWD populations down this year. See more on this in the Strawberry section. **Brambles:** Summer fruiting varieties are being harvested now. Many are reporting very good fruit set and yield. Wet weather has led to some cases of Phytophthora root rot in low lying areas or in fields with heavy soil. Two-spotted spider mite, Japanese Beetle and potato leafhopper are active now and may need to be controlled. SWD are active now and growers should be following a comprehensive management plan (see June 27 Berry Blast or our [SWD Info page](#) for specifics). An open canopy with conditions for good air circulation and spray penetration is a good practice for managing SWD. Primocane varieties are reaching full height. This is a good time for tipping blackberries and black raspberries to encourage lateral growth rather than excessively long primocanes. **Blueberries:** Fruit on early varieties is ripening and harvest may have begun in some areas. There have been reports of Cranberry Fruitworm infestations again this year. It is too late now to control this pest except by hand removing damaged clusters. Farms with noticeable damage this year should be ready for control during the green fruit stage next season. Japanese Beetle is showing up now and may require control prior to harvest starting in some varieties. Consult labels for pre-harvest intervals before spraying. Blueberry Maggot damage may show up soon and may be hard to distinguish from SWD damage; both cause the fruit to soften and rot. **Grapes:** All varieties are in green fruit stage now. Wet weather has kept disease pressure high this year. See below and recent New England Grape Notes for post bloom disease management recommendations. Leaf pulling can be done now to open the fruit zone for light penetration and also to improve spray coverage. Waiting until veraison to leaf pull can result in sunscald on fruit. Watch for Grape Berry Moth in high risk vineyards.

ENVIRONMENTAL DATA

The following data was collected on or about June 28. Total accumulated growing degree days (GDD) represent the heating units above a 50° F baseline temperature collected via our instruments for the 2017 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		Soil Temp (°F at 4" depth)		Precipitation (in inches)
	<i>1-Week Gain</i>	<i>2017 Total</i>	<i>Sun</i>	<i>Shade</i>	<i>1-Week Gain</i>
Cape Cod	144	699	74	66	0.32"
Southeast	120	664	77	64	0.75"
North Shore	145	772	63	60	0.55"
East	157	876.5	72	69	0.41"
Metro West	140.5	812.5	60	58	1.17"
Central	130	821	62	60	1.09"
Pioneer Valley	127	824	71	64	0.70"
Berkshires	110	684	63	59	0.61"
AVERAGE	134	769	68	63	0.70"

n/a = information not available

(Source: UMass Landscape Message #15, June 30, 2017)

STRAWBERRY

Strawberry Renovation

Bruce Bordelon, UMass Extension

This was a relatively early year for strawberries and by now, most harvest is over. As soon as harvest is done, it's time to begin the renovation process. Matted row strawberry plantings must be renovated each year to establish new crowns for the following year's crop. For best results, renovation should be started immediately after the harvest is completed to promote early runner formation. The earlier a runner gets set, the higher its yield potential. Growers should begin renovation as soon as the last marketable berries are harvested. Delaying renovation is one of the most common mistakes growers make. Renovation should be completed by the end of July in normal years. The following steps describe renovation of commercial strawberry fields.

1. Weed control: Post emergent application: Annual broadleaf weeds can be controlled with 2,4-D amine formulations. Check the label as only a few products are labeled for use on strawberries. e.g. Amine 4 [Dimethylamine salt of 2,4-D (3.74 lb./gal.)] at 2 to 3 pts/acre in 25-50 gallons of water applied immediately after final harvest. Be extremely careful to avoid drift when applying 2,4-D. Even though the amine formulation is not highly volatile, it can vaporize under hot, humid conditions and cause damage to sensitive plants a considerable distance from the site of application. Some damage to strawberries is also possible. Read and understand the label completely before applying 2,4-D amine. If grasses are a problem, sethoxydim (Poast 1.5 EC) or clethodim (Select 2 EC) will control annual and some perennial grasses. However, do not tank mix these materials and 2,4-D. See the Midwest Fruit Pest Management Guide [or the New England Small Fruit Management Guide] and the product label for rates and especially for precautions.
2. Mow the old leaves off just above the crowns 3-5 days after herbicide application. Do not mow so low as to damage the crowns.
3. Fertilize the planting. Generally, nitrogen should be applied at 25-60 lbs/acre, depending on vigor. It is more efficient to split nitrogen applications into two or three applications at regular intervals, rather than apply it all at once. A good plan is to apply about half at renovation and half again in late August when flower bud development is occurring. A soil test will help determine phosphorus and potassium needs, but foliar analysis is a more reliable measure of plant nutrition. For foliar analysis, sample the first fully expanded leaves following renovation.
4. Subsoil: Where picker traffic has been heavy on wet soils, compaction may be severe. Subsoiling between rows will help break up compacted layers and provide better infiltration of water. Subsoiling may be done later in the sequence if crop residue is a problem or if soils are too wet at this time.
5. Narrow rows: Reduce the width of rows to a manageable width based on your row spacing, the aisle width desired, and the earliness of renovation. A

desirable final row width to attain at the end of the season is 12-18 inches. Wider rows lead to low productivity and increased disease pressure. This means that rows can be narrowed to as little as 6 inches during renovation. Use a tiller or cultivator to achieve the reduction. Since more berries are produced at row edges than in the middle, narrow rows are superior to wide rows. Narrow rows will give better sunlight penetration, better disease control, and better fruit quality.

6. **Cultivate:** Incorporate the straw and other plant material between rows and throw a small amount of soil over the row by cultivation. Strawberry crowns continue development at the top, and new roots are initiated above old roots on the crown, so 1/2 – 1 inch of soil on the crowns will facilitate rooting. This also helps cover straw and old strawberry leaves in the row and provides a good rooting medium for the new runner plants.
7. **Weed control:** Pre-emergence weed control should begin immediately. There are more options today than in past years. Chateau, Dacthal, Devrinol, Prowl H₂O, Sinbar and Spartan are labeled materials. See the Midwest Fruit Pest Management Guide and check the product labels carefully. Devrinol must be incorporated

by irrigation, rainfall, or cultivation to be effective. Rate and timing of Sinbar or Prowl H₂O application is critical. If regrowth has started at all, significant damage may result. Some varieties are more sensitive to Sinbar than others.

8. **Irrigate:** Water is needed for both activation of herbicides and for plant growth. Don't let the plants go into stress. Ideally the planting should receive 1 to 1-1/2 inches of water per week from either rain or irrigation.
9. **Cultivate** to sweep runners into the row until plant stand is sufficient. Thereafter, or in any case after early September, any runner plant not yet rooted is not likely to produce fruit next year and can be removed. Coulter wheels and/or cultivators will help remove these excess plants in the aisles.
10. **Adequate moisture and fertility** during August and September will increase fruit bud formation and improve fruit yield for the coming year. Continue irrigation through this time period and fertilize if necessary. An additional 20-30 pounds of N per acre is suggested, depending on the vigor.

(*Source: Facts for Fancy Fruit, Issue 17-07, June 22, 2017*)

Strawberry Root Weevil and Black Vine Weevil

Christelle Guédot, University of Wisconsin Extension

Common Names: Strawberry root weevil & black vine weevil

Order: Coleoptera

Family: Curculionidae

Scientific Name: *Otiorhynchus ovatus* & *O. sulcatus*

Strawberry root weevil (SRW; Fig 1) and black vine weevil (BVW; Fig 2) can be found in strawberry in Wisconsin. SRW adults are 1/5" long, shiny black to light brown with rows of small pits along their back, and a prominent blunt snout (Fig 1). BVW adults are larger than SRW, a little less than 1/2" long, dull black with yellow small flecks on the back (Fig 2).

Larvae of both weevils are quite similar: they are C-shaped cream-colored legless grubs with a brown head, about 12 mm long. BVW is native to Europe and was first introduced to the US in the early 1900s. In both species, the adults cannot fly; they walk or get carried on plant material or equipment from one location to another. Adults feed at night and remain in the soil or leaf litter at the base of the plant during the day and climb up to feed on leaves at night. BVW adults are polyphagous and feed on over 150 plants.

Another insect feeding on roots is the strawberry rootworm, which was discussed last summer in [Wisconsin Fruit News Issue 10](#). Please, refer to that article for

identification, damage symptoms, and management recommendations.



Fig. 1. Strawberry root weevil. (*BugGuide. Photo Credit: Harvey Schmidt*)

Fig. 2. Black Vine Weevil. (*BugGuide. Photo Credit: metrioptera*)

Life Cycle

Adult females lay eggs in the soil where larvae develop, feeding on plant roots. BVW adults feed for 21-28 days on foliage prior to producing eggs. Interestingly, all adults are females that are capable of laying eggs through parthenogenesis (asexual reproduction). Females lay eggs in clusters of ~30 eggs in or on the soil from June to September. As soon as the eggs hatch after 10-14 days, larvae (Fig 3) wiggle down into the soil and start feeding on roots. Larvae will then overwinter in the soil. From April 1 to June, larvae pupate, and adult begin to emerge.

Adults move slowly and should not be confused with swifter predacious ground beetles. There is only one generation per year of each species.



Fig. 3. Strawberry root weevil larva. (Oregon State Univ. Ken Gray, Insect Image Collection)



Fig. 4. Strawberry root weevil damage to roots. (Oregon State Univ. Ken Gray, Insect Image Collection)



Fig. 5. Strawberry root weevil damage to leaves. (Oregon State Univ. Ken Gray Insect Image Collection)

Damage

The main damage is caused primarily by the larvae feeding on the root system (Fig 4) in early spring. Damaged plants are weakened, stunted, more susceptible

to winter injury and diseases, and may see a decrease in yield. Severe infestation may cause the plants to die. While adult weevils chew characteristic notches from the edges of leaves (Fig 5), their feeding is usually minor and does not result in economic loss.

Monitoring

Look at plantings in the spring for smaller, less vigorous plants and examine the roots for grub presence. In early summer, when adults begin to emerge, inspect leaves for leaf notching from adult feeding, especially on sucker growth near the ground. The presence of adults on top of foliage can be confirmed after dark on warm calm nights using a flashlight. You can also look for adults in plant debris at the base of the plant during the day. Laying a small piece of cardboard next to strawberry plants provides a refuge that can be checked easily in the early morning for the presence of adults. In the fall, you can look for areas with weak growth that redden prematurely. Although an old threshold, for BVW, between 2-8 larvae per strawberry plant (20x20cm soil sample including damaged plants) was determined to cause economic damage. If grubs are found in the spring, insecticides should be applied after harvest, when adult weevils emerge and start feeding but before egg laying occurs.

Biological control

Nematodes, such as *Heterorhabditis* spp. and *Steinernema* spp., may provide some control of weevil larvae when applied as a drench (following label directions) in the root zone where grubs are present.

Cultural control

Cultivation of the soil in early spring before planting can eliminate overwintering larvae. Cereal cover crops can be planted in rotation, as small grains are not hosts for root weevils.

Chemical control

If the use of an insecticide is warranted, for optimal control it is best to spray at night, between dusk and midnight, on warm, calm evenings when adult weevils are the most active feeding on foliage. For BVW, because adults require foliage feeding for 3-4 weeks before laying eggs, the first foliar application targeting adults should be made three weeks after detection of the first adult. Adults do not all emerge at the same time, thus a second foliar spray should be applied three weeks after the first one.

A list of available insecticides to control weevils in strawberry is provided in the following table. This is not an exhaustive list of insecticides. For other fruit crops, be sure to read the label to make sure they are registered for that specific crop in Wisconsin. There are many other trade names available, and we do not recommend these that are listed above other options. All product recommendations can be found in the [2017 Midwest Fruit Pest Management Guide](#). Additionally, you should always

fully read and follow the label before spraying any pesticide.

Class (IRAC code)	Trade Name	Active ingredient	PHI* (days)	Effectiveness
Neonicotinoids (4A)	Platinum	Thiamethoxam	50	Good on grubs and adults
	Admire Pro	Imidacloprid	14	Excellent on grubs
Organophosphate	Lorsban	Chlorpyrifos	21**	Good on grubs and adults

* Pre-Harvest Interval (PHI)

** Restrictions vary, check the label for details.

(Source: Wisconsin Fruit News, Vol. 2, Issue 4 – May 26, 2017)

RASPBERRIES/BLACKBERRIES

Pruning Caneberries (Brambles) to Minimize SWD Habitat within the Planting

Juliette Carroll, Cornell University

Examine your caneberry plantings for conditions that promote SWD infestation and take steps to eliminate them. Although we cannot change the weather, we can alter conditions in the planting to reduce the cool, dark, humid areas preferred by SWD. Pruning and training systems can help maintain an open canopy to increase sunlight and reduce humidity. This will make plantings less attractive to SWD, will reduce SWD activity, and will improve spray penetration and coverage.



Bumblebee pollinating pruned and trellised raspberry. Photo: Gregory Loeb, Cornell Univ.

Pruning tactics for caneberries (raspberries and blackberries) have been developed to achieve excellent fruit yield and open the canopy. Knowing different pruning strategies will help you manage SWD. Added benefits include improved fruit color and flavor promoted by sunlight, easier picking by workers and customers, and easier weed management.

Caneberries (brambles) grown in the Northeast include red and black raspberries and blackberries, all are susceptible to SWD infestation. However, fruiting season differs among cultivars, which influences the risk of infestation.

- **Summer bearing varieties develop berries on floricanes** that grow the prior year and overwinter. Fruit ripens and is harvested in early to mid-summer, prior to SWD population buildup, lowering the risk of infestation.
- **Fall bearing varieties develop berries on primocanes** that grow, flower, and fruit in the same year. Fruit ripens and is harvested in late summer and early fall when SWD populations are high and risk of infestation is extreme.
- **Plants developing berries on floricanes and primocanes haven't had floricanes removed after fall fruiting.** Fruit ripens and is harvested from early to mid-summer on the floricanes and from late summer to early fall on the primocanes. The risk of SWD infestation will be low early in the harvest season and will increase as the summer progresses and the SWD population builds up.

Pruning suggestions for summer bearing varieties

Summer raspberries – maintain 4-5 healthy floricanes per foot of row.

Blackberries – maintain 3-4 healthy floricanes per foot of row.

Black raspberries – maintain 6-8 floricanes per hill.

Everbearing – maintain 4 primocanes and 4 floricanes per foot of row.

Floricanes should be held upright with a trellis to facilitate spray coverage and air circulation. Holding fruiting canes to the outside on a V-trellis will keep them

to the outside of the growing primocanes and facilitate spray coverage and harvest.

Prune out the smallest primocanes beginning when they are 12 to 18 inches high to select and keep the biggest and best canes. Keep a few more than the suggested cane density per foot of row or per hill. Begin removing spent floricanes in July along with any late emerging primocanes. In November, laterals on black raspberry and blackberry primocanes can be cut back to 3 or 4 buds.

Pruning suggestions for full bearing varieties

Maintain 4-6 primocanes per plant on a trellis.

Encourage early fruiting by placing row covers over the row after mowing in the spring. Remove the row covers when the primocanes are 18 inches tall. This will bring on

flowering about two weeks early and help avoid or minimize SWD damage.

References

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http://noursefarms.com/resources/newsletters/spring_2015.pdf

Pritts, M. 2013. Horticultural strategies for living with SWD. New York Berry News 12(10):1-2.

<http://www.hort.cornell.edu/fruit/nybn/newsletters/2013/nybn1210.pdf>

(Source: Cornell University SWD Blog entry, June 27, 2017)

Summer Caneberry Chores

Gina Fernandez, North Carolina State Univ. and Marvin Pritts, Cornell Univ.

Chores and timing may be somewhat different in your area or for your cropping system. For detailed recommendations for the Pacific Northwest, subscribe to The Small Fruit Update (contact smallfruitupdate@peerbolt.com).

Plant growth and development

- Fruit development.
- Rapid primocane growth.
- Floricanes senesce.
- Pruning and trellising.

Floricanes-fruiting raspberries:

- May need to adjust primocane numbers if canes are too thick (i.e. remove less vigorous primocanes at their base)
- Train primocanes to the trellis.
- Pinch black raspberry primocanes at 3 to 4 feet tall to promote lateral growth.

Primocane-fruiting raspberries:

- Train primocanes within a trellis to hold canes erect.

Erect blackberry types:

- In warm climates with a long growing season, tip the new primocanes when they are about 6 to 12 inches below the top wire of the trellis to encourage lateral branching. Continue tipping at monthly intervals to maintain desired branching and height of canopy (laterals should reach top wire).
- In colder climates, tip primocanes once when they are about 3 to 4 feet tall to encourage lateral branching.
- Prune out spent floricanes after they have produced fruit; remove weak primocanes.
- Train primocanes to trellis to minimize interference with harvest. Shift trellises or V trellises make this relatively easy.

Trailing blackberry types:

- Train new primocanes to middle of trellis, on the

ground in a weed-free area, or temporarily to trellis outside of fruiting area (depends on trellis type).

- If necessary, prune out excessive primocane growth.
- Remove spent floricanes after harvest.

Primocane-fruiting blackberries

- Tip canes at 3-4 feet to increase branching and fruiting potential.

Weed management

- Mow along side of row to maintain the width of the bed to 3 to 4 feet.
- Weed growth can be very vigorous at the same time as the crop peaks.
- Weed control is best done earlier in the season before harvest commences.
- Mow middles regularly to allow pickers to move through rows easily.

Insect and disease scouting

(these will vary by region)

- Pay particular attention to the likelihood that spotted winged drosophila (SWD) may be present in your fields this year. This pest is very attracted to blackberry and raspberry fruit, particularly later in the season. Consult your local entomologist for updates on scouting methods and occurrences.
- Scout for insects
 - Spotted winged drosophila
 - Raspberry crown and cane borer (canes girdled and wilt)
 - Psyllid
 - Two-spotted spider mite
 - June beetle
 - Japanese beetles
 - Stink bugs
 - Fire ants
- Scout for diseases
 - Botrytis

- Rusts
- Orange felt (orange cane blotch) (blackberry)
- Sooty blotch (blackberry)
- Orange rust
- Powdery mildew
- Double blossom (blackberry)
- Cane blight (blackberry)
- Powdery mildew

Water management

- Raspberry and blackberry plants need about 1-2 inches of water/week; this amount is especially critical during harvest.
- For blackberries (not raspberries) in warmer climates only, consider installing an overhead system for evaporative cooling to reduce sunscald. Turn on once or twice a day from 10 am to 3 pm for short periods of time (approx. 15 minutes).
- Give plants a deep irrigation after harvest.

Nutrient management

- Take leaf samples after harvest and send to a clinic for nutrient analysis. Do not fertilize with nitrogen at this time of the year in the northern production

regions. Blackberry growers in the south give plants additional nitrogen, check with your local recommendations.

Harvest and marketing

The busiest time of the year for a blackberry or raspberry grower is the harvest season. Each plant needs to be harvested every 2-3 days. For larger plantings, that means fruit is picked from some part of the field every day of the week.

- Pick blackberries when shiny black for shipping. Those that are dull black are fully ripe and suitable for PYO only.
- Pick directly into clamshells with absorbent pads, or for PYO use clean cardboard flats, take-home baskets, or sanitized re-usable containers.
- Keep harvested berries in shade and move into coolers as soon as possible to lengthen the shelf life of the fruit.
- Use forced-air precoolers for best removal of field heat.
- Store at 32° to 34°F and 95% relative humidity.
- Freeze

(*Source: The Bramble, Vol. 30, Issue 2, Summer 2015*)

BLUEBERRIES

Blueberry Maggot Emergence Sharply up After Rains

Rufus Isaacs and John Wise, Michigan State University Extension,

Traps for [blueberry maggot fly](#) should already be deployed in southwest Michigan [and New England] to ensure accurate detection of the early flight of this pest. The first catches were in late June in the far southwestern region of the state, and some unmanaged fields are already showing mature larvae of this pest. Detections of flies in managed fields have been very low, but after the rainstorms that have passed through recently, there has been a spike in catches of blueberry maggot flies. This pest overwinters in the soil, and needs soil moisture to emerge from the ground. With the hot, dry conditions of 2016, most of the emergence seems to have been delayed, but the rains have changed that for much of the state.

After emergence, female flies require approximately seven to 10 days to become sexually mature and mate, at which point they will begin laying eggs. Eggs are oviposited under the skin of ripening blueberries, with a single egg deposited per fruit. Eggs hatch in about five days and the maggots begin feeding, completing their development within a single berry. Upon maturity, the maggots drop to the ground, burrowing up to several inches into the soil before pupating. In Michigan's

climate, these pupae will not emerge until at least the following growing season.

Ensure blueberries are protected from blueberry maggot, a key harvest-season pest.



Blueberry maggot on ripe blueberry.

Although it is late to be starting monitoring now, it can still tell you about distribution of this pest across your farm. Initial adult emergence is best monitored using yellow sticky boards baited with ammonium acetate (or ammonium carbonate) as a food attractant, because newly

emerged females are actively feeding during this pre-oviposition period. These traps should be placed on a stake or hung on an upper branch of a blueberry bush in a perimeter row (south facing side of bushes) with enough foliage cleared from around the trap so leaves don't stick to it. Hang traps with the colored side down in a V-orientation (see photo). Traps should be deployed before first anticipated flight (late June), since most flies are expected to be immigrating from wild or non-sprayed hosts outside the commercial planting. If a resident fly population is suspected from previous infestation, a trap placed inside the field is a good idea to detect internal infestations. Traps optimally should be checked twice weekly starting just before first fruit coloring until the first fly is caught, triggering fruit protection activities.



Monitoring trap with V-orientation for monitoring blueberry maggots.



Blueberry maggot fly on trap with distinctive wing pattern.

After the pre-oviposition period is complete, female flies will begin actively searching for fruit to lay eggs in, and

there is a trap available that mimics the visual stimulus of a fruit. A green sphere trap baited with synthetic fruit volatile lure can also be used to monitor fly activity in fields. Again, these traps should be placed in perimeter rows of the field unless there is evidence of a resident population far in the interior. However, if the yellow sticky cards have been used effectively, these should be sufficient to monitor the flies.

Blueberry maggot control has been achieved for many years using broad spectrum insecticides. These kill the adult fly on contact and prevent the insect surviving to the point of being able to lay eggs into the fruit. The organophosphates Malathion and Imidan are highly active on blueberry maggot, with the latter two products having shorter pre-harvest intervals and potential for use closer to harvest. Carbamates such as Sevin and Lannate and the pyrethroids Asana, Mustang Max, Bifenture and Danitol are also active on adult fruit flies. This chemical class is sensitive to degradation from light and heat and highly toxic to natural enemy insects, so this is something to consider depending on the weather conditions in June and July.

The following reduced-risk insecticides are effective at controlling blueberry maggots and also [spotted wing Drosophila](#) (SWD). The spinosyn-containing compounds Delegate and SpinTor (non-organic) and Entrust (organic) are highly active on blueberry maggot adults when ingested, and will also control SWD. Of these options, Delegate will provide the best fruit protection from these fly pests. In field trials with high pest pressure and two week application intervals, the performance of the spinosyn insecticides has been rated as good-excellent against blueberry maggot (see table). Performance would be expected to be higher in fields with lower pressure and with less time between applications. Exirel is a new insecticide from the diamide chemical class that has demonstrated excellent control of blueberry maggot in our Michigan State University trials and is also very effective against SWD.

Rimon is registered for use in blueberries at 20 to 30 ounces per acre, and this insect growth regulator can provide an important component of a rotational program against blueberry maggots to minimize the chance of insecticide resistance. Because this insecticide is not toxic to adult flies, but acts to disrupt egg and larval development, it should be applied at the start of fly activity as determined by monitoring traps. Rimon is recommended against blueberry maggots, but provides limited control of SWD.

While the neonicotinoid insecticides such as Admire and Actara are active on blueberry maggots, Japanese beetles and aphids, they are not effective on SWD.

Properties and relative performance of insecticides labeled for controlling blueberry maggots

Compound trade name	Chemical class	Optimal spray timing for BBM	Residual activity	<u>Effectiveness rating**</u>
Imidan	Organophosphate	Within 7 days of the first fly being captured	14+ days	Excellent
Malathion	Organophosphate	Within 7 days of the first fly being captured	3-7 days	Good
Lannate, Sevin	Carbamates	Within 7 days of the first fly being captured	3-5 days	Good
Asana, Danitol, Brigade, Mustang Max, Bifenture	Pyrethroid	Within 7 days of the first fly being captured	7-10 days	Good
Delegate, SpinTor, Entrust*	Spinosyn	Immediately after the first fly has been captured	7-10 days	Excellent, Good, Fair
Exirel	Diamide	Within 7 days of the first fly being captured	14 days	Excellent
Provado, Admire, Assail	Neonicotinoid	Within 7 days of the first fly being captured	10-14 days	Good-Excellent
Rimon	Insect growth regulator	Immediately after first fly has been detected	10-14 days	Good

*OMRI-approved for organic production.

** Effectiveness rating of insecticides as noted in [MSU Extension](#) bulletin E0154, "[2016 Fruit Management Guide](#)."

(Source: Michigan State University Fruit Advisory Blog, July 26, 2016)

GRAPE

Protect Grape Clusters from all Major Grape Diseases During Early Fruit Development

Annemiek Schilder, Michigan State University

Young fruit clusters are highly susceptible to all major diseases, including [downy mildew](#), [powdery mildew](#), [black rot](#), [Phomopsis](#) and [anthracnose](#). If prolonged cool wet weather prevails during bloom, [Botrytis](#) can also gain a foothold in clusters of susceptible cultivars by promoting fungal growth on senescent flower parts. However, if conditions are dry and warm during bloom it is unlikely that bloom will be an important time for Botrytis infection. We have had a mixture of different weather patterns around the state, with warm and dry until recently in the southern part of the state and cool and wet up north. Warm and dry conditions favor powdery mildew, while all other diseases are favored by rainy weather and moderate temperatures.

Black rot and Phomopsis lesions have been seen for many weeks now and indicate the pathogens are active. Grape anthracnose symptoms are also visible on shoots, leaves and cluster stems of susceptible varieties. Powdery mildew has already been seen on unsprayed Chancellor clusters in East Lansing, Michigan, an indication that this year may be especially favorable to powdery mildew fruit infection. Downy mildew symptoms were first observed about 10 days ago in various parts of southern Michigan and disease pressure is likely to continue. If rains continue in northwest Michigan, this disease may be more common than in most years. Michigan State University Extension

Young fruit clusters are highly susceptible to all major diseases. Broad-spectrum fungicides and careful scouting for disease symptoms are advised.

[as does UMass Extension], advises careful scouting for disease symptoms on a weekly basis.

It is possible for fruit clusters to be infected by powdery mildew without seeing any foliar infections first, so protect the fruit of susceptible cultivars even if no powdery mildew has been seen on the leaves. In addition, downy mildew infections of flower clusters may occur before leaf infections as well, particularly in cv. Chancellor, whose clusters are highly susceptible to downy mildew. In 2009, we first observed downy mildew on Chancellor clusters in Fennville during the first week of June and in 2010 during the second week of June. Growers are strongly advised to protect flower and fruit clusters from infection by all grape pathogens using effective fungicides. The risk of infection is especially high if we have multiple rain events and moderate temperatures, resulting in prolonged wetting of foliage and developing fruit. Only the powdery mildew fungus does not need wetness but it thrives in shady areas under high relative humidity.

In general, aim to protect the clusters from the major diseases from immediate pre-bloom until four to five weeks after bloom. As the berries develop, they become naturally resistant to most diseases and the need for fungicide protection diminishes. This happens quite rapidly for downy mildew (two to three weeks after bloom), whereas for powdery mildew it is about four weeks after bloom. Concord grapes become resistant to

black rot at four to five weeks after bloom, but some wine grape varieties may remain susceptible to black rot for up to eight weeks after bloom. Be aware that the cluster stem (rachis) and berry stems can remain susceptible longer than the berries in most cases. Also, if there is variability in cluster ages due to spring frost injury, the period of susceptibility will be extended. The only disease in which berries remain susceptible throughout their development is Phomopsis, but the risk of infection diminishes after bunch closure because spore numbers drop off then. In the case of Botrytis, berries actually become more susceptible closer to harvest, especially in tight-clustered varieties. However, Botrytis may gain a foothold in clusters at the end of bloom by growing on senescing flower parts during cool, wet weather and then hangs out until becoming active again after veraison.

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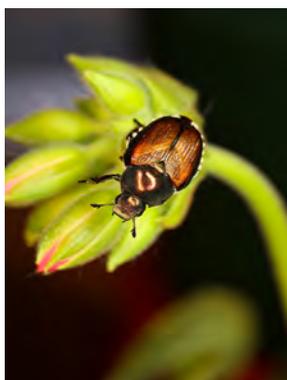
Depending on the susceptibility of the grape cultivars that you are growing, broad-spectrum fungicides or fungicide combinations are most appropriate at this time of the growing season to get the broadest control. A good option would be a tank mix of a sterol inhibitor (e.g., Rally, Tebuzol) plus a protectant (e.g., Manzate, Ziram). Remember that Manzate has a 66-day PHI and that in juice grapes produced for Welch's, Manzate cannot be used after bloom. In addition, broad-spectrum fungicides such as Pristine, Abound, and Sovran or pre-mixes such as Revus Top and Quadris Top are useful at this time. Pre-mixes Luna Experience and Inspire Super are good options for wine grapes where efficacy against Botrytis is also desired, however, they do not work against downy mildew, so a downy mildew fungicide may need to be added (e.g., Phostrol, Presidio, Revus, Forum, etc.).

For organic vineyards, a tank-mix of a protectant biocontrol agent (e.g., Double Nickel 55, Serenade) plus a plant defense booster (Regalia- giant knotweed extract) is the best option. For grapes that can tolerate these products, sulfur is a good powdery mildew fungicide and copper will protect vines against downy mildew in addition to suppressing other fungal diseases. (*Source: Michigan State University Fruit Advisory Blog, June 27, 2017*)

Japanese Beetles

Joseph A. Fiola, University of Maryland

Japanese beetles can periodically be a significant pest in Maryland vineyards. They create large holes in the younger leaves of vines and cause severe lacing and even fruit damage in heavy infestations. The population build up is typically periodic and cyclic and may require control tactics in years of large infestations. Always be extra careful with young vines as they cannot tolerate severe defoliation.



Identification and Biology

- Japanese beetles (scarab beetle family) are approx. ½ inch with metallic green bodies and copper-colored wings.
- They are voracious feeders and attack the foliage of numerous woody and ornamental species (roses are a preferred food) as well as grapevines.
- They have a very broad list of alternate species they feed on and have been known to fly for up to 5 miles.
- Adults emerge from the soil and begin moving into vineyards in late June.

- They remain present for about 2 months during which they feed, mate, and the female lays eggs in the soil.

- Japanese beetles become established in an area (in the turf) and populations rapidly build up over a couple of years.

- Once established, the chances of eradicating them from an area are slim.

Damage

- They tend to feed on younger leaves.
- In an extreme infestation without control vines can be completely defoliated.
- They tend to be more damaging during droughty seasons.
- The tolerance of younger vines is much less because total leaf area can easily be defoliated which can lead to increased winter damage and vine death.

Scout and Manage

- Scout for damage and the presence of beetles from early-late June through mid-late August.
 - Because they are constantly emerging and moving into the vineyard, constant scouting and vigilance is required and control measures may be needed quickly and even frequently.
 - Since they typically arrive from outside the vineyard, you can sometimes find arrival hot spots where you can target and concentrate control if needed.
 - The usual threshold for making a spray application is about 15% of the leaves damaged.
 - Remember that well-established vines can tolerate significant foliar feeding by Japanese beetles, when it is the upper younger leaves that are above the top catch wire and about to be hedged off anyway.
- Control***
- If you have a few in the vineyard, just “squish” them on the leaf. There is evidence that the dead beetles may repel others.
 - The materials labeled for controlling Japanese beetles are Assail®, Actara®, Avaunt®, Belay®, Danitol®, Imidan® (14 day REI!), Neemix 4.5 plus Trilogy, and Sevin®.
- Remember that frequent, repeated sprays of Sevin® will also kill many beneficial insects (including mite predators) which can then lead to a mite outbreak. Again this is exacerbated in hot dry weather.
 - Repeated applications may be needed to control new beetles flying in from surrounding areas.
 - Surround® can be used to protect the foliage from feeding and has been very effective in some locations.
 - Where Japanese beetle populations are low or beetles are just beginning to be seen and fewer sprays are needed, using a “softer” insecticide can reduce the risk of mite outbreaks.
 - Biological control agent *Bacillus popilliae* (milky disease) can protect grassy areas from large larval populations, but it is ineffective against adults entering the vineyard.
 - Japanese beetles also have natural predators, including wasps and flies that can parasitize larvae and adult beetles, again emphasizing the important of avoiding insecticides that will harm beneficials.
- *Always read the pesticide label for complete information and product safety.**

GENERAL INFO

Small Fruit Leaf Tissue Analysis

Sonia Schloemann, UMass Extension

Leaf tissue testing is an excellent way to monitor plant nutrient levels. With perennial fruit crops, leaf analysis is better than soil tests for determining an optimal fertilization program. While soil tests reveal the quantity of certain nutrients in the soil, leaf analysis shows exactly what the plant has taken up. However, soil tests are necessary for determining soil pH (and lime or sulfur recommendations) and soil organic matter content (SOM). If nutritional problems are suspected in a given planting, it's a good idea to take both leaf and soil tests.

Leaf analysis is helpful for detecting nutrient deficiencies (especially of minor nutrients) before they effect plant health or yield. The best tissue analysis for berry crops comes from green, healthy, whole leaves (except for grapes). Do not submit plant tissue that has disease, leaf burn, insect or hail damage. Keep the material in a cool place (insulated chest) or refrigerate before mailing. Record all foliar sprays in case the results are influenced by nutrient or pesticide applications.

A minimum of 50 leaves from raspberries or strawberries, and 80 to 100 leaves from blueberries should be selected for each analysis. Do not mix leaves from fields with

different soil types or management histories. Do not combine leaves from healthy plants with plants that are not growing well.

Strawberry: Strawberry samples should be taken from the first fully- expanded leaves after renovation, about July 15 to August 15.

Raspberry: Raspberry samples should be leaves from non-fruiting canes taken between August 1 and 20.

Blueberry: Blueberry samples should be leaves taken during the first week of harvest, from July 15 to August 15.

Grape: Grape samples should be taken either at bloom or veraison (berry coloring). Bloom samples should be taken from leaves opposite first fruit cluster on a shoot. Verasion samples should be taken from the furthest fully expanded leaf on a current season's shoot. Unlike other berry crops, grape tissue testing is done on just the leaf petioles, so the leaf blades can be discarded.

Place samples in sealed paper bags, clearly labeled with field names. Below is a list of labs that perform leaf tissue analysis:

MASSACHUSETTS

Soil & Plant Tissue Testing Laboratory - West Experiment Station/UMass Amherst MA 01003
Telephone: 413-545-2311 <http://soiltest.umass.edu/>

CONNECTICUT

UConn Soil Nutrient Analysis Lab, 6 Sherman Place, U-5102, University of Connecticut, Storrs, CT 06269-5102, phone: 860-486-4274, fax: 860-486-4562 email: soiltest@uconn.edu forms and pricing, visit the website at <http://www.soiltest.uconn.edu/>.

NEW HAMPSHIRE

University of NH Analytical Services Lab - Spaulding Hall, Room G28A, 38 Academic Way Durham NH 03824
(603)862-3200

<http://extension.unh.edu/agric/agppts/soiltest.htm>

PRIVATE

Brookside Laboratories - 308 South Main St. New Knoxville, OH 45871 Telephone: 419-753-2448
<http://blinc.com>

Spectrum Analytic - 1087 Jamison Rd. Washington Court House, OH 43160 Telephone: 800-321-1562

<http://www.spectrumanalytic.com/>.

Bird Management Options For Fruit Growers

Catherine Lindell, Michigan State Univ.



A male American Kestrel. Providing nesting boxes for kestrels, which are known to feed on smaller, fruit-feeding birds, is a long-term strategy for reducing populations of birds that cause damage and crop loss on fruit farms. Photo: Greg Hume.

Many birds eat fruit to help meet their water requirements in addition to their energy requirements. In dry years like 2016, when other water sources are limited, birds many depend on fruit to a greater extent than usual. A number of growers are reporting high bird activity in their fruit.

The quickest bird deterrents to deploy are auditory and visual scare devices, like units that play bird distress calls and inflatable tube men. Birds habituate to many deterrents quickly, however, so the devices are more likely to be effective if they go on and off randomly, are moved frequently and are used in concert. For example, a recent study showed that the deterrent effect of combined

auditory and visual deterrents lasted more days for ring-billed gulls, which are known to eat fruit, compared to when a visual or auditory device was deployed on its own.

Keeping track of “hot spots” for bird activity on your farm and targeting those spots with sustained and vigorous deterrent effort may help. Harvesting ripe fruit in a timely manner will reduce the availability of the fruit to birds and may reduce losses. Light deterrents, like lasers, deter some bird species. However, keep in mind that evidence for their effectiveness has come primarily in low-light situations, like at dusk or at night.

Bird management strategies that take more lead time and investment include physical barriers like netting that can be employed in short-stature crops. Ideally, netting should be on a frame so it does not lie on the fruit and be anchored to the ground. Otherwise birds can still access the fruit.

Over the long term, growers should think about habitat management. Our previous work has shown that in some contexts where there is less fruit, like edges of fruit blocks adjacent to non-fruit, percent bird damage can be higher. Arranging blocks to minimize non-fruit edges could lower the amount of the crop at risk for bird damage. Growers can also consider improving habitat for species that may deter pest birds. We have found remains of fruit-eating birds in nest boxes we installed for American kestrels, which are small predatory birds, in cherry orchards and blueberry fields. As an added benefit, kestrels eat voles and pest insects.

In very high-damage contexts, growers can consider [applying for a permit for lethal control of birds](#). However, the permit application process may take a number of weeks. For more information, see “[Do I need a permit to control wildlife on my farm?](#)” by [Michigan State University Extension](#).

Bird damage may be more intense in dry years as birds turn to fruit to meet their nutrition and hydration needs. Fruit growers can employ one or more bird deterrent strategies.

The [Federal Aviation Administration](#) has new rules regarding Unmanned Aircraft Systems (drones) that will take effect in August 2016. Once drone technology is a bit less dependent on human direction, it may be useful in deterring birds.

Each farm is unique and should be assessed for potential risk factors. See pages 211-218, **Sample Bird**

Management Plan, of "[Managing Bird Damage to Fruit and Other Horticultural Crops](#)" for more information.

For information about **deploying kestrel nest boxes**, please email me, Catherine Lindell, at lindelle@cns.msu.edu.

(*Source: Michigan State Fruit & Nuts News, June 30, 2016*)

Honeyberries, Haskaps, Blue Honeysuckle: Is There Commercial Potential For Wisconsin?

Brian R. Smith, UWisconsin-River Falls

Many of you have read or heard a few references to this group of species used as a commercial crop around the world but there are many questions left unanswered as to what the potential is in the Midwest, and specifically, Wisconsin. The subject of Honeyberries will be divided into two articles covering a total of six sections: 1. What are honeyberries and where do they come from? 2. Interesting facts about honeyberries. 3. Uses/products made from honeyberries. 4. Yields, profitability and marketing. 5. Site and growing requirements. 6. Cultivars and nursery sources.



What are honeyberries and where do they come from? Honeyberries are found within the rather large Honeysuckle family *Caprifoliaceae*, which encompasses about 14 genera and 400+ species of shrubs, woody climbers and a few herbaceous types.

Of the 14+ genera, only the genus *Lonicera* contains the edible and commercial honeyberries/haskaps. Within the *Lonicera* genus, the species *caerulea* is the primary source of importance. There are several subspecies of *caerulea*; *edulis* and *kamtschatica*, which are at the foundation of what is currently called the true honeyberry (found in eastern Siberia/Mongolia) and *emphyllocalyx*, which is called the haskap and found on Hokkaido Island in Japan. Russian and Japanese selections (and more recently, some North American wild selections) of these subspecies of



Lonicera caerulea have served as the basis for breeding new adapted cultivars for North America. As one might expect, there is considerable variability in this germplasm from so many different geographic locations. For this article, I will

use the term "honeyberry" from here on to simplify things.

Honeyberries are long-lived, very winter-hardy, multi-stemmed shrubs ranging from 2-7 feet with grayish-green foliage, yellow to white flowers and typically fruit that can be anywhere from round to oblong, but typically resembles a tubular blueberry and can vary from blue to reddish-purple, or even black. The ½-2" fruit usually weigh about 1.3-2.5 grams and are very edible, straight from the bush (unlike our *Aronia* friends) and can have widely different flavor mixes that would include hints of sweet blueberry, raspberry, plum or black currants and various small doses of bland, bitter, sour or astringent overtones. Considerable variation also exists in bloom time and harvest; some honeyberries ripen with strawberries and a few do not ripen until almost *aronia* season (mid-late August).

Dr. Maxine Thompson at Oregon State University and Dr. Robert Bors from the University of Saskatchewan have initiated breeding programs to improve the honeyberry for growing in North America. They have already released a series of cultivars that have greatly improved fruit size, flavor, adaptation and even some specifically for machine harvesting. It would appear that the University of Saskatchewan breeding program is introducing cultivars more adapted to our climate.

2. Interesting facts about honeyberries:

- Honeyberries are not at all invasive like other members of the honeysuckle family
- Many honeyberries are winter-hardy to between -40°F and -50°F
- Honeyberries can live 50 years or more
- Honeyberries have 2-3X the level of antioxidants of highbush blueberries
- Honeyberries can grow in soils ranging from clay to sand
- Honeyberries have more vitamin C than an orange
- Honeyberries do not appear to be susceptible to many pests and could be good candidates for organic production
- Over 200 cultivars of honeyberries have been released in the last 60 years
- There are already about 1,200 acres of honeyberries planted in Canada, with estimated 75% of this in Quebec
- Some Russian cultivars were deliberately bred to be bitter-

tasting for adding to Vodka and have hurt the reputation of the “good-tasting” cultivars

- Small, cream-colored blossoms can withstand spring frosts down to 21°F.

3. Uses/products made from honeyberries: Honeyberries can be used as a fresh ‘dessert fruit’ or can be frozen en masse or as IQF. Honeyberries can be dried into honey “raisins” or used in any typical drink or dessert, including smoothies, jams and dessert toppings, pies and cakes, ice cream, muffins, juice and yogurt. Honeyberries can even be made into wine or blended in wine coolers.

4. Yields, profitability and marketing: Honeyberry plants are somewhat slow to reach full fruit production but should have some decent harvestable yields (2-5 lb./bush) by year 3 or 4. By year 6, they should be close to full production and range anywhere from 5-12 lb. /bush. Mechanical harvesting can be used on certain upright cultivars like ‘Tundra’. Growers in Quebec seem to prefer the Oxbo/Korvan 9000 harvester. It can run at about 1 mph and will harvest 10 A/day. Most growers feel that a mechanical harvester is economically feasible with a 10 acre + orchard and can be used for up to a 40-acre

orchard. Smaller, tractor-drawn versions run about \$80,000. Growers that rent harvesters in the larger acreage areas pay around \$3,500 per 400 hours of use. For individual hand harvesting, a seasoned picker can harvest 6.5 - 11lb/hr. It would take 28 people working 8 hr./day for 4 days to harvest an acre by hand. The cost/lb. for hand harvest is about \$1-\$1.20, which would add up to about \$9,000. Honeyberries in the U.S. are selling for between \$5 and \$8/lb retail. Machine-harvested berries typically run \$3-\$4/lb.

The following is a Cost of Production>Returns table for Haskaps/Honeyberries that I have modified more accurately for the U.S. and describes two scenarios (hand and machine harvests) from Years 0-8. Sections have been summarized and converted to US dollars. Yields assumed are 750, 1,500, 2,250 and 3,375 lb/A, respectively, for Years 3, 4, 5 & 6. Years 7 and beyond assume a yield of 3,750 lb/A. Although it is difficult to confirm accuracy, it would appear based on the research that I have conducted for this article, that the following should be quite conservative figures. (*Source: Wisconsin Fruit News, Vol. 2, Issue 7 – July 7, 2017*)

Costs and Returns for Honeyberries

Est.	Variables \$/A	YR 0	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8
Costs	Land costs*	1,087	290	290	290	290	290	290	290	290
	Plants incl. royalty*	700	257	206	206	206	206	206	206	206
	Bird netting*	0	0	0	714	191	191	191	191	191
	Posts and wires for netting*	0	0	0	341	91	91	91	91	91
	Labor netting	0	0	0	610	610	610	610	610	610
	Labor Establishment	681	68	0	478	0	0	0	0	0
	Weed control and mowing	501	501	501	501	501	501	501	501	501
	Pruning	0	105	205	205	319	319	319	319	319
	Pesticides	69	69	69	69	69	69	69	69	69
	Bumblebee colonies	0	0	0	228	228	228	228	228	228
	Fertilization	50	50	100	146	196	196	196	196	196
	Hand harvest (scenario 1)	0	0	0	1,047	2,048	3,185	3,185	3,185	3,185
	Machine Harvest (Scenario 2)	0	0	0	446	887	1,338	2,007	2,230	2,230
	Total Costs Scenario 1	3,088	1,340	1,371	4,835	4,749	5,886	5,886	5,886	5,886
	Total Costs Scenario 2	3,088	1,340	1,371	4,234	3,588	4,039	4,708	4,931	4,931
Revenue	Scenario 1 \$5.46/lb	0	0	0	4,095	8,190	12,285	18,428	20,475	20,475
	Scenario 2 \$3.19/lb	0	0	0	2,393	4,785	7,178	10,766	11,963	11,963
Net Income	Scenario 1	-3,088	-1,340	-1,371	-740	3,441	6,399	12,542	14,589	14,589
	Scenario 2	-3,088	-1,340	-1,371	-1,841	1,197	3,139	6,058	7,032	7,032

AMORTIZATION (25% DOWN PAYMENT, 4% INTEREST RATE, 10 YEARS PAYBACK PERIOD). Based on Haskap Permaculture: A New Opportunity for Commercial Producers. Cost of Production Study 2014. Atlantic Canada and Northern Canadian Regions. Phytocultures Ltd.

UPCOMING MEETINGS:

- July 11, 2017** - *Massachusetts Fruit Growers' Association Summer Meeting*, all day. Cider Hill Farm, 45 Fern Ave., Amesbury, MA. Save this date. More information on the program will be available soon. When available the program will be posted at: <http://ag.umass.edu/fruit/upcoming-events>. **May 26, 2017** – *Early Season Blueberry Planning*. 3-5pm. Haynes Homestead, 172 Harvey Swell Rd., Colebrook NH, 03576. For more information see: <https://extension.unh.edu/events/files/41FC38F1-5056-A432-4FDE26C7DAEDAFC2.pdf>
- July 11, 2017** - *Strawberry Production at 4 Corners Farm*, 306 Doe Hill Road Newbury VT. 5-7 pm, July 11, 2017. The Gray family grows about 50 acres of fresh produce including 10 acres of strawberries. They use innovative plasticulture techniques, grow their own straw mulch, rotate with cover crops for soil health, and have tried many varieties and production systems over the years. Currently they have 11 different varieties in production. This workshop is free. For more information contact Vern Grubinger at vernon.grubinger@uvm.edu.
- July 12, 2017** – *UNH Tree Fruit Twilight Meeting*. 5:30-7:30. Windy Ridge Orchard, 1775 Benton Rd., North Haverhill NH. This twilight meeting will include a walking tour of the apple orchard, and the farm's new restaurant area and wine - sales/tasting area. The tour will include discussion identifying and managing tree fruit insect pests and orchard management. 1.5 PAT credits. For more information go to: https://extension.unh.edu/events/index.cfm?e=app.tag&tag=Tree_Fruit_Twilight_Meeting
- August 15-16, 2017** – *North American Strawberry Grower's Association Summer Tour*. Minneapolis MN. Join us for our 2017 NASGA summer tour as we head to Minneapolis, Minnesota to explore some of the wonderful farming operations of the area in a two-day adventure! For more information or to register, go to <http://nasga.org/n-american-strawberry-growers-summer-tour.htm>.

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