Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

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Berry News

ENYCH Program Educators:

Fruit
Laura McDermott
Cell: 518-791-5038
Email: lgm4@cornell.edu
Berries

James O'Connell
Phone: 845-691-7117
Email: jmo98@cornell.edu
Berries & Grapes

Dan Donahue
Phone: 845-691-7117
Email: djd13@cornell.edu
Tree Fruit

Anna Wallis
Phone: 443-421-7970
Email: aew232@cornell.edu
Grapes & Tree Fruit

Vegetables
Chuck Bornt
Cell: 518-859-6213
Email: cdb13@cornell.edu

Amy Ivy
Phone: 518-561-7450
Email: adi2@cornell.edu

Teresa Rusinek
Phone: 845-340-3990 x315
Email: tr28@cornell.edu

Crystal Stewart
Cell: 518-775-0018
Email: cls263@cornell.edu

Maire Ullrich
Phone: 845-344-1234
Email: mru2@cornell.edu

Kevin Besler
Phone: 845-344-1234
Email: krb98@cornell.edu

Business and Marketing
Bob Weybright
Phone: 845-797-8878
Email: rw74@cornell.edu

Jesse Strzok
Phone: 1-800-548-0881
Email: js3234@cornell.edu

Layout: Lindsey Pashow
Content Editor: Laura McDermott

Berry "To Do" List:

All crops

- Adult SWD have been found in traps throughout the Capital District and the Hudson Valley. Larvae have been found in ripening fruit using the salt extraction method in most locations where adults are reported. **SWD control should begin for all locations south of the southern tip of Lake Champlain and northern growers should be monitoring their fruit closely.**
- Visit http://www.fruit.cornell.edu/spottedwing/ for postings of first detections throughout the state and information on control.
- Know how to evaluate fruit for SWD infection – information about salt detection test was in the last newsletter.
- Plan to take foliar samples for nutrient analysis of all berries in early August. See instructions in the last newsletter.

Blueberries

- Continue to remover winter injured dead wood to prevent canker.
- Evaluate berries for disease and insect damage. Most of the fruit rots and fruit worms are controlled well before harvest. If you are seeing 5% or more of berries with damage (wholesale threshold will be lower) then you should definitely plan to take action next spring. Encourage pickers to pick berries evenly and completely.
- Evaluate for bird damage. Consider attending the bird management class this August.



From left to right: Anthracnose Fruit Rot, Cranberry Fruit Worm and Mummyberry. Harvest is a good time to evaluate pest pressure and plan to treat next spring. *Photos courtesy of OMAFRA*

Raspberries

- Fall raspberries are the most vulnerable to SWD. Manage aggressively.
- Summer raspberries are winding down; as spent fruiting canes are removed consider doing a bit of thinning to the new primocanes. Choose the largest, most robust canes to leave – and you can leave 5-7 canes per square foot, which will be thinned to 4-6 canes early next spring.
- Scout for canes infested by raspberry cane borer. These will have wilting tips and two dark rings of punctures on the canes where eggs have been laid. Cut off and destroy the wilted tips below the rings as soon as this damage is noticed.

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Strawberries

- Most growers have completed renovation. Make sure newly renovated berries are getting the minimum of 1" of water per week needed to kick start growth.
- **Fertilize Day neutral strawberries increasingly until 5-7# actual N/acre/week** is being delivered. The maximum nitrogen should be reached when plants are producing the most fruit. Inch up the fertility at each watering so that even growth is achieved. Foliar tests are very helpful with these plants.

Established Blueberry Fertilization and Tissue Testing

By *Gordon Johnson, Extension Vegetable & Fruit Specialist*

For established blueberries check the soil pH twice a year. Take a random composite 6-8 inch sample from the soil under the mulch in the spring and again in the fall. The pH should stay between 4.5 and 5.0. Sulfur should be added to lower the pH if it is above 5.0 or lime should be added to raise the pH if it has dropped below 4.2.

Apply nitrogen (N) in 2 applications every year to total 60 -80 lbs of actual N. Apply 150-200 lbs/acre of ammonium sulfate if pH is above 4.8 or 70-90 lbs/a urea if pH is below 4.8 at bud break. Apply the same amount again 4 weeks later. Additional N may be needed based on tissue tests. If a fertilizer injector is being used, the nitrogen can be split into smaller applications over the 6-8 week period after bud break when new growth is being produced.

P, K, Ca, Mg, and micronutrient additions in established blueberries should be based on tissue tests. Tissue tests are important tools for monitoring blueberry fertility. Leaf samples should be collected from mature leaves in the mid -portion of current season's growth the first two weeks after last harvest in July or August. A double hand full of leaves should be harvested from across the field, washed in tap water, dried and sent to a testing laboratory. Below are critical nutrient ranges for blueberries.

If levels are below these ranges then the plant is deficient. If deficiencies are found, use the following recommendations:

• Low N (if N is below 1.7 percent): Increase rate of N application by 10 percent for each 0.1 percent that sample is below desired level. If soil pH is above 4.8, use ammonium sulfate; if below 4.8, use urea. Apply half of the nitrogen fertilizer at bud break and the remaining half four weeks later.
• Low P (below 0.06 percent): Apply 180 pounds per acre superphosphate (45 percent P2O5) at any time.
• Low K (below 0.40 percent): Apply 400 pounds per acre potassium magnesium sulfate (K-mag) or 160 pounds per acre potassium sulfate in fall or early spring.
• Low Ca (below 0.4 percent): Refer to soil test and apply lime as needed if soil pH is below 4.0. Apply 1,000 pounds per acre calcium sulfate in fall or early spring if pH is above 4.0.
• Low Mg (below 0.2 percent): Refer to soil test and apply dolomitic limestone if pH is below 4.0. If pH is above 4.0, apply 250 pounds per acre magnesium sulfate or use potassium magnesium sulfate (K-mag) at 400 pounds per acre if K is also low. Apply in fall or early spring.
• Low Mn (below 50 ppm): Apply a foliar spray of manganese chelate at 6 pounds per 100 gallons per acre twice during the growing season. If product label offers a different recommendation, follow label recommendation.
• Low Fe (below 70 ppm): Apply a foliar spray of iron chelate at 6 pounds per 100 gallons per acre in late summer and again after bloom the following year, but check product label and follow its recommendation.

This information was taken, in part, from the Mid-Atlantic Berry Guide http://extension.psu.edu/publications/agrs-097/view

Element	Optimal range with normal
Nitrogen (N)	1.7-2.1 % with normal at 1.9 %
Phosphorus (P)	0.06-0.18 % with normal at 0.1 %
Potassium (K)	0.4-0.65 % with normal at 0.55 %
Calcium (Ca)	0.4-0.8 % with normal at 0.6 %
Magnesium (Mg)	0.2-0.3 % with normal at 0.25 %
Iron (Fe)	70-300 ppm with normal at 200 ppm
Manganese (Mn)	50-500 ppm with normal at 250 ppm
Zinc (Zn)	15-30 ppm with normal at 25 ppm
Copper (Cu)	5-15 ppm with normal at 11 ppm
Boron (B)	30-50 ppm with normal at 40 ppm

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Calendar of Events

Wednesday, August 19th— Limiting Bird Damage in Fruit: State-of-the-Art Pest Management Tactics (A Vertebrate Damage Management Workshop), 4H Training Center, 556 Middleline Rd, Ballston Spa, NY 12020. This comprehensive class will feature results and speakers from a multi-year, multi-state project that looked at several different fruit crops. $20/person registration includes lunch and is required. If you would like to attend the lecture via webinar, that option is available but you must register to get connection details. There is no charge for the webinar portion of the meeting. Registration will be available online by August. Check the ENYCP website for information: http://enych.cce.cornell.edu/

Tuesday, September 2nd – Exclusion Netting Workshop, 3-5 pm, The Berry Patch, 15589 NY Route 22, Stephentown, NY 12168. Registration is free, but we do recommend you register. Call Marcie at 518-272-4210 or email at mmp74@cornell.edu.

Wednesday, September 16th—Strawberry Low Tunnels, 3-5pm at Stanton's Feura Farm, 210 Onesquethaw Creek Road, Feura Bush, NY 12067. Take a look at a low tunnel in a day-neutral strawberry production system. This workshop is free, rain or shine. Call Marcie at 518-272-2410 to register.

Anthracnose Crown Rot of Strawberry

Source: North Carolina State University, http://content.ces.ncsu.edu/anthracnose-crown-rot-of-strawberry/ Edited by Laura McDermott

Anthracnose is an important disease of strawberry fruit, crowns, leaves, petioles and runners. Three related species of the fungus *Colletotrichum*, including *C. acutatum, C. gloeosporioides*, and *C. fragariae* can be associated with strawberry plants, but this article highlights Anthracnose Crown Rot (ACR) caused primarily by *C. gloeosporioides*. Disease control is difficult when environmental conditions are favorable, and the disease can be especially destructive to California strawberry cultivars when grown on plastic. The pathogen *tends* to be associated with the crown rot phase of anthracnose but can also affect other plant parts. The most diagnostic symptom of ACR is red and white marbling of the crown (Figure SS-1). However, initial symptoms of ACR include plant stunting and flagging of young leaves due to lack of water (Figure SS-2). Initially plants wilt in the heat of the day, which is often over-looked as drought or heat stress. In advanced infection, the entire plant will die (Figure SS-2). Cutting the crown lengthwise reveals white and reddish brown streaks, creating a marbled effect, or a firm rot (Figure SS-1).

Figure SS-1 Lengthwise cut through a crown with anthracnose crown rot showing the shades of red and white marbling. Frank J. Louws

Roots at the site of attachment to the crown tend to remain white and the entire root system tends to remain fibrous. This in contrast to Phytophthora crown rot where the lesion in the crown usually has a consistent dark red to brown discoloration, although it may be marbled, and the roots at the site of attachment are typically black and have a poor fibrous structure.

Disease Cycle

Infected strawberry transplants are the primary source of inoculum in fruiting fields. The pathogen may be present on active lesions but in most

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cases it is in a quiescent phase – i.e. it has infected green tissue but is not causing symptoms. This symptom-less phase of the disease cycle allows the pathogen to build up undetected and then disease expression occurs under favorable climate conditions (e.g. wet and hot) or when there are some type of chemical/physiological changes in the plant. In nurseries and sometimes in fruiting fields, the pathogen can originate from non-cultivated plant species, start off in the quiescent phase but rapidly move to the necrotic or symptomatic phase. Important plants include

Figure SS-2: Range of symptoms of ACR showing plants with early leaf wilt symptoms (top left); stunted plants showing wilt (top right); completely collapsed plants (bottom row) and crown discoloration (bottom right). Frank J. Louws

Virginia creeper (*Parthenocissus quinquefolia)*, wild and muscadine grape (*Vitis /Muscadinia rotundifolia)* and smilax (*Smilax rotundifolia)*. However, this pathogen species is complex and only about 10 to 67% of the *C. gloeosporioides* isolates from these non-cultivated plants are pathogenic on strawberry.

Once the disease starts, conidia spores are produced in abundance on petioles, runners, and upper crown tissue and are dispersed through rain-splash, especially wind-driven rain. Movement of machinery and workers through the field also may contribute to inoculum spread. Warm, humid conditions are optimal for this disease, thus cultural practices that encourage aeration and rapid drying of plants should be used. Straw mulches may help to reduce the dispersal of spores in splashing water, but plastic mulches provide a springboard for droplets, thus encouraging the spread of disease. Overhead irrigation can also contribute to disease spread.

Management

1. Use Disease-Free Plants
Resistant plants are not available. If you have had problems with this disease, talk to your supplier to make sure they are aware of that. There are diagnostic procedures but no protocol that has been universally accepted for testing nursery plants.

2. Crop Rotation and Manage Non-Cultivated Plants
Rotation out of strawberries for 2 or 3 years will help to rid the field of inoculum from infected plant tissues or infested debris in the soil. However, anthracnose crown rot does not commonly reappear a second year in a field unless the disease is re-introduced on contaminated plants. If the disease recurs in multiple years, local plants may harbor the pathogen and these non-cultivated plants should be removed with an emphasis on the species identified above.

3. Monitor Crop
Periodic scouting of a field, especially during warm and wet weather, will enable early detection of anthracnose. As soon as disease is discovered, immediately remove and destroy infected and surrounding plants to help reduce inoculum levels. Killing the plants with herbicide will initiate spore production by the pathogen, and if these plants are not removed the problem will be aggravated. In most cases, infected plants die within 30 to 45 days after transplanting. However, the amount of plant death typically remains limited in fruit production systems, unlike anthracnose fruit rot that can damage a whole crop. Nitrogen levels should be kept at the required level, since high nitrogen levels in the soil favor fungal development. Keep foliage dry and reduce water splash by use of drip irrigation to help lower conidial dispersal and spread of the pathogen. *Editor's Note: For more information about how nutrient levels may affect the severity of this disease, see* *http://www.plantmanagementnetwork.org/pub/php/research/2009/strawberry/*

4. Chemical Control
Current fungicide recommendations are available in the *2015 Cornell Pest Management Guidelines.* Captan, Pristine, Switch and several other fungicides are labelled. One to 2 foliar sprays targeted toward the crown when hot wet weather is forecasted can reduce disease spread.

Diagnostic Procedures
One of the first indications of anthracnose crown rot on strawberry plants is the development of drought symptoms limited to foliage originating from a single crown. Plants with anthracnose crown rot also have nicely developed root systems, in contrast to the rotted and feeble root systems of plants with *Phytophthora* crown rot or black root rot. A

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telling symptom of infection by *C. fragariae* or *C. gloeosporioides* can be found when the crown is cut open longitudinally; a marbling with distinct red and white areas and their interface is present.

If strawberry crowns are suspected of having athracnose crown rot but no signs of the pathogen are evident, sporulation can be induced by placing crowns in a moist chamber for 24 to 48 hours.

Traditionally, morphological characteristics such as conidial shape, the presence or absence of setae, and colony color have been used to differentiate *Colletotrichum* species. These traits, however, are highly variable among isolates and often subject to interpretation. The morphological differences between *C. fragariae* and *C. gloeosporioides* are too subtle for reliable differentiation when cultured on PDA. To make measurements and morphological observations of conidia and setae, isolates should be cultured on strawberry leaf agar (SLA) under continuous fluorescent light.

ITS sequence analyses is the most reliable way to identify species of *Colletotrichum*. The internal transcribed spacer regions, including the 5.8 rDNA, can be amplified using universal primers ITS1 and ITS4 as part of a standard PCR protocol.

SWD Spray Programs Simplified

For berry growers trying to manage SWD in multiple crops, the inconsistencies in labels for insecticides is frustrating and potentially expensive. In an effort to help growers streamline decision making, entomologists and extension specialists at Cornell keep an updated list of all NYS labelled chemicals that also includes days to harvest, re-entry intervals, total number of applications per season and chemical classes in addition to relative effectiveness. For U-Pick farms, days to harvest may be one of the most important considerations and certainly effectiveness should be prioritized. The other important consideration is pesticide resistance. The chemical class should be rotated at least after two back to back sprays – I'm suggesting a simplified schedule for all crops. I'm sure there will be growers that do not agree with my suggestions – perhaps they don't like a particular material because of smell or ease of application – but this is an option for those growers that are trying to simplify their lives!

For conventional growers of late season blueberries, fall raspberries and day-neutral strawberries:
Rotate Delegate (for strawberries you need to use the spinetoram Radiant) weekly with Malathion and Assail. In blueberries Delegate has a 3 DTH which is a pain, but if you are at the end of the season it might work to your advantage.

For conventional growers of late season blueberries, and day-neutral strawberries:
Rotate Brigade, Malathion and Assail – weekly applications, all have 1 DTH with the exception of Malathion in strawberries. All have good to excellent efficacy, they are relatively inexpensive. Some growers object to the smell of Malathion, but a few of the newer formulations are much less odiferous.
For organic growers the choices are more limited. Entrust and Pyganic are labelled for all crops. AzaSol is available for both strawberries and raspberries and Molt-X is labelled for raspberries in NYS. You are limited to 3 applications of Entrust each season, and for good reason. The manufacturer and extension professionals are very concerned with potential resistance of this product.

Optimize control by combining a good chemical program with excellent cultural management. Plants should be aggressively pruned to promote air circulation. Weeds should be controlled. Irrigation should be done with trickle systems. And pickers should be removing infested fruit and picking thoroughly. Also, the equipment used is very important. Adequate pressure and good coverage should be evaluated using water sensitive cards.

All of these suggestions are just that. There are more options available but this is an effort to simplify the choices. Growers should consider what other pests they are trying to control and choose products that provide good efficacy for those pests as well. For a complete list of options, please consult the SWD insecticide reference charts: http://www.fruit.cornell.edu/spottedwing/pdfs/swd-insecticides-berries-ny.pdf.

2015 Weather Table—The weather information contained in this chart is compiled using the data collected by Network for Environment and Weather Applications (NEWA) weather stations and is available for free for all to use. For more information about NEWA and a list of sites, please visit http://newa.cornell.edu/ This site has information not only on weather, but insect and disease forecasting tools that are free to use.

2015 Weekly and Seasonal Weather Information

	Growing Degree Information Base 50^{O} F			Rainfall Accumulations		
Site	**2015 Weekly Total** 7/19– 7/27	**2015 Season Total** 3/1 - 7/27	**2014 Season Total** 3/1 - 7/27	**2015 Weekly Rainfall** 7/19-7/27 (inches)	**2015 Season Rainfall** 3/1 –7/27 (inches)	**2014 Total Rainfall** 3/1 - 7/27 (inches)
Albany	**149.1**	**1665.0**	**1578.0**	**0.27**	**12.99**	**16.71**
Castleton	**173.6**	**1556.9**	**1493.8**	**0.16**	**15.09**	**16.6**
Clifton Park	**184.6**	**1594.5**	**1429.6**	**0.19**	**12.04**	**16.99**
Fishkill	**178.2**	**1599.5**	**Na[1]**	**0.03**	**5.17**	**Na[1]**
Glens Falls	**255.6**	**1421.3**	**1418.0**	**0.58**	**12.23**	**19.75**
Griffiss	**153.4**	**1326.3**	**1324.0**	**0.87**	**19.88**	**20.31**
Guilderland	**178.0**	**1496.0**	**1436.5**	**0.16**	**13.78**	**Na[2]**
Highland	**193.3**	**1686.8**	**1582.8**	**0.21**	**16.14**	**21.46**
Hudson	**189.0**	**1679.1**	**1600.9**	**0.39**	**13.15**	**23.79**
Marlboro	**185.0**	**1611.0**	**1523.3**	**0.27**	**12.5**	**20.21**
Montgomery	**185.0**	**1653.2**	**1552.0**	**0.12**	**0.55**	**17.45**
Monticello	**153.9**	**1292.2**	**1226.0**	**0.51**	**8.92**	**7.27**
Peru	**163.9**	**1335.6**	**1349.6**	**1.03**	**15.19**	**16.71**
Red Hook	**177.6**	**1593.1**	**1566.6**	**0.32**	**15.11**	**11.07[3]**
Wilsboro	**156.0**	**1296.8**	**1296.3**	**2.54**	**20.14**	**11.0**
South Hero, VT	**170.3**	**1380.3**	**1384.6**	**0.91**	**17.11**	**17.77**
N. Adams, MA	**153.6**	**1279.8**	**1271.0**	**0.32**	**14.63**	**16.87**
Danbury, CT	**183.7**	**1513.7**	**1425.5**	**0.17**	**14.96**	**19.39**

Na[1]: The Fishkill site is new for 2015 so there is no historical data to report.
Na[2]: The Guilderland weather station was not properly reporting precipitation data in 2014 so no data will be shown for this site.
*Precipitation data for this site did not start until May of 2014.

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