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Berry Notes

Prepared by the University of Massachusetts Fruit Team

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CROP CONDITIONS:

Strawberry harvest is past peak and winding up in some locations with good yield in most cases but with some growers reporting a drop off in berry size in early varieties. This could be the result of the early dry conditions this spring but later varieties don't seem to show this problem. Some growers are also reporting increasing amounts of Botrytis Gray Mold following heavy rains and a few locations have reported Anthracnose Fruit Rot. New planting are doing well thanks to timely rains but weed pressure is also up. Pest pressure has generally been low except for some flare ups with two spotted spider mite early on; again likely due to the dry conditions in May. Timely predator releases have been effective at managing this pest. Keep an eye out now for foliar feeding of Black Vine Weevil and related species. Feeding injury is a distinct notching along the leaf margins. Anthracnose fruit rot has also been reported in some fields. See more about this in the Strawberry section. **Summer Fruiting Brambles** are starting to ripen with some locations already harvesting. Where winter injury was not too severe, the fruit set looks very good. Primocanes are growing vigorously and reaching 24-36 inches in height. Watch for evidence of Potato Leaf Hopper, which has appeared recently, and will show damage on rapidly growing primocanes. **Blueberry** harvest is also approaching. Early varieties are showing color or beginning to ripen. Bird netting should be in place for those using it. Bird deterrent devices should also be in place before ripe fruit is present. Blueberry Maggot is likely to be showing up soon. Protect now if you've had this pest in the past. **Currents and Gooseberries** are also nearing harvest. Look for Powdery Mildew, Spider Mites and Currant Borers at this time. **Grapes** are sizing up and looking fairly good considering the winter injury potential. Some varieties did not fair well, but those with greater winter hardiness are holding up well. The post bloom period is key for the control of many disease problems of grapes. See more on this below.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for an approximately one week period, June 11 through June 17. Soil temperature and phenological indicators were observed on or about June 17. Total accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments for the 2015 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 2015 Accumulation)	Soil Temp (°F at 4" depth)	Precipitation (1-Week Gain in inches)
Cape Cod	107	548	63	0.75
Southeast	109	546	75	0.68
North Shore	128	583	76	0.36
East	138	665	68	0.56
Metro West	123	624	65	0.53
Central	n/a	n/a	n/a	n/a
Pioneer Valley	137	757	69	1.76
Berkshires	120	605	66	2.32
AVERAGE	123	618	69	0.99

n/a = information not available

(Source: UMass Landscape Message #14, June 19, 2015)

STRAWBERRY

Using Bio-Control Nematodes to Manage Strawberry Root Weevil

Laura McDermott, CCE Eastern NY Commercial Horticulture Program

Last fall [2013], a northern NY grower applied entomopathogenic nematodes to his field to assist in controlling the root weevil complex that consists of Strawberry root weevil, *Otiorhynchus ovatus* (SRW) and Black vine weevil, *O. sulcatus* (BVW). ENYCHP educators Amy Ivy and Laura McDermott participated in the application under the direction of Dr. Elson Shields and Tony Testa.



The biocontrol nematodes being used in this study are native and have been found to control alfalfa snout beetle across northern NY. The beneficial nematodes are applied in the evening to avoid desiccation. The grower was able to apply the nematodes using his boom sprayer with all the filters and screens removed from the nozzles. The grower left a control plot, so it will be relatively easy to

see if these nematodes have an effect. The most time consuming part of the application process was screening and rinsing the nematodes out of the substrate they have been raised in.

BVW is the larger of the two weevils and the more likely to be the problem as it has a larger host complex. The adult beetle has small yellow patches on its back. They feed on foliage, leaving characteristic notch marks on leaf margins, although this damage is usually insignificant to plant vitality, it is valuable for detecting their presence. They are 1/4-to 1/2-inch long. The larvae are white with tan heads, and have no legs. They feed on small roots and can quickly reduce the vigor of plants, causing plant death if larvae are numerous.



Adult BVW and larvae, upper left; Adult Strawberry root weevil and larvae, lower right



BVW adult feeding on strawberry leaves; note characteristic notching.

Adult root weevils can still be present after harvest; however traditional chemical control measures of the adults should be taken early before egg laying begins in late spring. Eggs that were laid in the soil prior to or during harvest will hatch into young larvae that begin feeding on roots this fall. Root weevil larvae overwinter two to eight inches deep in the soil. You can actually scout for root weevil larvae now, but they are even smaller than in the spring and very difficult to see.

The weevils attack roots of high value horticulture crops, and over a few years will cause rapid decline and eventual plant death.

To scout for these pests, follow the protocol below:

- In the spring, watch for areas of weak growth. Dig in the root zones, checking for the white grub like root weevil larvae.
- When weevil adults emerge, watch for leaf notching especially on sucker growth near the ground.
- After dark on warm, calm nights, scout fields with a flashlight. Black vine and strawberry root weevils will be found feeding on top of the foliage.
- Look for adults in the dead plant material and weeds at the base of plants.
- In the fall, check areas that show weak growth and redden prematurely. The larvae be found in the fall but are much smaller than in the spring.

Participating Farmers: Bob Rulf, Rulf's Orchard

Funding: NNY Capacity Building Grant

Editor's Note: This is a summary and the one that follows are from talks given at the October 3, 2014 Cornell Small Fruit Open House in Ithaca, NY; they are reprinted here for the benefit of those who were not able to attend in person. (*Source: New York Berry News. Vol. 12. No. 9., Oct. 2014*)

Anthracnose Fruit Rot of Strawberries

Andy Wyenandt – Rutgers University

Anthracnose fruit rot can cause serious losses if not controlled. Symptoms of anthracnose include the development of circular, sunken lesions on infect fruit. Often pinkish/tan colored spore masses will develop in the center of lesions. Anthracnose in strawberry is caused by *Colletotrichum acutatum*. Spore production, germination and fruit infection are favored by warm, humid



weather. The fungus can overwinter on infected plants, in plant debris or on weed hosts. Spores are dispersed by splashing water and can infect green and mature

fruit.

Control begins with protectant fungicides from flowering through harvest. Begin sprays no later than 10% bloom or prior to disease development and continue on a 7 to 10 day interval. Use the higher rate and shorter intervals when disease pressure is high. Do not make more than two consecutive applications of fungicides other than Captan or Thiram before switching to a fungicide in a different chemical class. Maintain continuous coverage of Captan and/or a FRAC Group 11 fungicide, by applying the following combinations:

Application #1:

- Captan–3.7 lb 80WDG/A or Thiram 4.4 lb/A 75 WDG tank-mixed with
- Pristine–18.5 to 23.0 oz 38 WG/A or Cabrio–12.0 to 14.0 oz 20EG/A

Application #2, apply one of the following:

- Captevate–3.5 to 5.25 lb 68WDG/A

- Captan–3.7 lb 80WDG/A or OLF

Application #3:

- Captan–3.7 lb 80WDG/A or OLF or Thiram 4.4 lb/A 75 WDG tank-mix with
- Pristine–18.5 to 23.0 oz 38WG/A or Cabrio–12.0 to 14.0 oz 20EG/A

For subsequent applications, rotate among the following fungicides or fungicide combinations:

- Captan–1.9-3.7 lb 80WDG/A or OLF

- Elevate–1.1 to 1.5 lb 50WDG/A plus Cabrio–12.0 to 14.0 oz 20EG/A
- Pristine–18.5 to 23.0 oz 38WG/A
- Switch–11.0 to 14.0 oz. 62.5WG/A plus Cabrio–12.0 to 14.0 oz 20EG/A

When wet weather persists or during bloom, include Elevate or Switch to improve Botrytis control.

(*Source: Rutgers Plant & Pest Advisory, May 4, 2015*)

Keeping Strawberries Fresh for Market

David Handley, University of Maine Cooperative Extension

Strawberries are highly perishable and can fall into decay very rapidly if not handled properly. Train your pickers and sales people regarding how to keep the fruit in the best condition possible all the way from the field to the customers, in order to maintain the best quality and prolong shelf life. Pickers should be careful not to bruise fruit during harvest, and not to put damaged fruit into the containers. All harvested fruit should be cooled immediately to slow respiration. This will greatly extend shelf life and reduce the incidence of post-harvest fruit rots. Strawberries cool most efficiently if harvested early in the morning before they build up any field heat. Place fruit into refrigerated storage quickly and keep it out of direct sunlight. Fruit should be stored at 32° Fahrenheit and 95% relative humidity. Cold air should be moved through the boxes or flats of fruit with a circulating fan and/or exhaust fan to cool most efficiently. Placing a

sheet of plastic over the trays in the cooler can reduce moisture build up on the berries. Temperatures lower than 32°Fahrenheit may freeze the fruit and ruin its fresh quality. A small, well-insulated building cooled with air conditioners and fans can provide effective temporary storage for strawberries. If you don't have refrigeration facilities, keep the fruit as cool as possible by harvesting when air temperatures are cool, and keeping it out of direct sunlight. Transport the fruit to market as quickly as possible, and harvest only what you think you can sell in a day. (*Source: Strawberry IPM Newsletter No. 6 – June 18, 2015*)

RASPBERRIES/BLACKBERRIES

Potato Leafhopper in Brambles

Sonia Schloemann, UMass Extension

ID/Life Cycle: Leafhoppers are small, green, bullet-shaped insects which take flight quickly if disturbed. The nymphs are lighter colored and do not fly. They are easily identified by their habit of moving sideways when disturbed. Potato leafhoppers don't overwinter in New England but are blown up every year from the south on storm fronts. There are multiple generations every year.



Damage: The potato leafhopper feeds on the underside of leaves leaving small chlorotic areas and causing a downward cupping of the leaves. Most feeding is the upper, more succulent leaves on primocanes and often causes a stunting of those canes.



Management:

Monitoring: Scouting is especially important in new raspberry/blackberry plantings and on primocane fruiting

varieties. Scout by brushing the leaves with the hand and looking for small adult leafhoppers flying off. Examine the underside of injured leaves to see if nymphs are present. There are no thresholds established for potato leafhoppers. Consider control if there are one or two nymphs per leaf and leaf curl is evident.

Control strategies:

See [New England Small Fruit Management Guide](#) for more information on recommended materials and rates

Cultural/Biological: Follow recommended practices in table below.

Chemical:

- Apply recommended insecticides when large populations of nymphs are noted on the leaves or symptoms become apparent.
- If repeat applications are needed, rotate insecticides from different IRAC groups to reduce the chance of resistance development in the pest.

Conventional(PHI)	Organic OMRI listed (PHI)	Cultural Practices
Assail 30SG (1) Actara 25WDG (3) Admire Pro (3) Malathion 57EC (1) Malathion 8F (1) Sevin XLR Plus (7)	Aza-Direct (0) AzaGuard (0) Neemix (0) Safer Brand #567 (0)	Avoid proximity to alfalfa plantings, which provide a major source of potato leafhopper population build-up.

*= Restricted Use Material -- Read labels thoroughly for application rates and restrictions (REI, PHI, etc.)

BLUEBERRY

Blueberry Maggot

Cesar Rodrigues-Saona, Dean Polk, Gene Rizio, Rutgers University

As of June 12, no BBM adults have been seen in the traps that we have up. Insects are arriving a little later than usual this year, but we expect them soon.

Life Cycle: There is 1 generation per growing season. BBM overwinters in the soil below blueberry bushes enclosed in a brown puparium buried 1 to 2 inches deep in the soil. Pupae lay dormant until environmental conditions become suitable to emerge as adults (early through mid-June). Peak emergence and migration from wild hosts continues from mid-July through mid-August. Female blueberry maggot flies do not begin laying eggs until 10 days after emergence, typically corresponding to when the blueberry fruit turns blue. Adult females live for about 30 days, feeding on nectar, dew, and honey dew. Female flies lay 1 egg per berry under the fruit skin, which hatches in 5 to 7 days. Maggots feed for about 3 weeks inside ripening and harvested fruit. The full-grown larva is about 7/16 to 1/2 inch long and white. The body is tapered, with an indistinguishable head at the narrow end. As the larvae mature, infested fruit become soft and watery, and drop to the ground. The cycle is perpetuated for the following year as larvae then pupate in the soil under the bushes from which they have dropped. Pupae may remain in the soil for up to 2 - 3 years.

Monitoring and Management: Determining the onset of adult fly activity is essential to the control of BBM as protective sprays must be applied in the 7 – 10 day period before oviposition begins. Regular monitoring of blueberry maggot emergence is done with yellow baited sticky traps. A trap and lure system has been developed that increases blueberry fly capture. Pherocon AM yellow sticky boards baited with ammonium acetate work effectively in monitoring blueberry maggot flies. Traps should be hung in a ‘V’ orientation within the top 6 – 8” of the bush canopy, not above it, with the yellow surface facing down. Sometime this means cutting away a little foliage so it doesn’t stick to the trap. If the trap is hung above the foliage then fewer to no maggot flies will be caught. The traps should ideally remain open at a 90° angle. As the trap gets wet, it loses form and gets heavier. Use of a #14 or 12 wire in place of the plastic coated wires that come with the traps will help maintain proper orientation and shape. Traps should be placed at least a week before first flies are expected to emergence (early June in NJ). Traps should also be changed every 2 weeks, since the ammonium acetate will volatilize off the traps. Place traps on field borders near wooded areas, with a few traps in the field interior.



Trap Orientation and Placement – Upside down tent or ‘V’ in top 6” of canopy

(Source: Blueberry Bulletin, Vol. XXX, No. 9, June 9, 2014)

Blueberry Maggot Insecticide Options

Material	Rate/A	REI	PHI	Rating
Diazinon 50W	1 lb	5 days	7 days	G
Imidan 70WSB	1.33 lb	24 hr	3 days	E
Lannate 90SP	1 lb	48 hr	3 days	G
Malathion 8	1.5 pt	12 hr	1 day	G
Sevin 80WSP /4F	1.5 lb / 3 pt	12 hr	7 days	G
Asana XL	8 oz	12 hr	14 days	G
Danitol	10 2/3 – 16 oz	24 hr	3 days	G
Hero	4 – 10.3 oz	12 hr	1 day	G
Provado 1.6F	6–8 oz	12 hr	3 days	G
Actara	4 oz	12 hr	3 days	G
Assail 30SG	4.5 – 5.3 oz	12 hr	1 day	E
Rimon	20-30 fl oz	12 hr	8 days	G
Delegate	6 oz	4 hr	3 days	F
Surround	25 lb	4 hr	day of harvest	suppression
Entrust	2 oz	4 hr	3 days	suppression
GF120	20 oz	4 hr	day of harvest	F

E=excellent, G=good, F=fair, suppression=suppression only

Assail, Provado, Actara, Rimon, and Delegate are reduced-risk/OP replacement products.

Surround, Entrust, and GF120 are organically-approved insecticides.

Disease Management Considerations for Winter-injured Blueberries

Annemiek Schilder, MSU Extension, Department of Plant, Soil and Microbial Sciences

With winter injury hitting blueberries hard in 2015, it is easy to contemplate giving up on some fields altogether. If you have decided to forego harvest because there is not enough fruit to justify harvesting, or even if you do harvest but the crop is reduced, you are most likely looking for ways to reduce inputs. You may also decide it is time to try field renewal or replanting.

Therefore, I have put together several scenarios that would minimize fungicide input costs.

Field is in bad shape and of a low-yielding cultivar – use this opportunity to replant

If you remove an old field, consider if there have been virus issues in the past. If blueberry shoestring virus (BSSV) is present, you may want to check for aphids and make sure they are killed before bushes are removed to stop them from moving and spreading the virus to neighboring fields. It may be that the bush grinding process will destroy the aphids as well, in which case an insecticide is not needed.

If there have been symptoms of tobacco ringspot virus (TRSV) or tomato ringspot virus (ToRSV), it is a bit more complicated as these viruses are spread by dagger nematodes in the soil. Virus-carrying dagger nematodes can live for at least a year if not longer and could spread the virus to the new planting. In that case, [Michigan State University Extension](#) recommends having old plants tested for TRSV and ToRSV and soil tested for dagger nematodes. It is a good idea to have soil tested for plant parasitic nematodes anyway as high numbers could cause replant problems by feeding on the roots of young plants. If virus and dagger nematodes are present, there are only a few options:

- Soil fumigation with Telone 35 to kill all soil life.
- Seed in a grass or cereal cover crop and practice strict broadleaf weed control for at least one year and preferably two years before replanting to blueberries. This approach will reduce nematode numbers, but more importantly, will disrupt the virus life cycle. The virus cannot live in grasses, but can survive in dandelions and other broadleaf weeds.
- Another option, if only ToRSV is present, is to replant with the cultivar Bluecrop, which appears to be tolerant to ToRSV, but not TRSV.

When replanting, buy certified virus-tested planting material to avoid bringing in viruses in the planting in the first place. This will be well worth the higher price for the plants. Remember that tissue culture in and of itself is not a guarantee the plants are virus-free, they have to be certified by lab-testing the mother plants.

Suggestions for reduced-cost fungicide programs in winter-injured blueberry fields, and disease management considerations for replanting or renewal fields.

Field is in bad shape – mow off all canes and allow to renew

Remove as much of the old and diseased wood from the field as possible and burn it. In this case, we should aim to protect new growth from diseases and make sure not to push canes too hard with fertilizers so as not to predispose them to fall frost injury or infection by Phomopsis. If the field had a bad case of

Phomopsis, hopefully most of the inoculum has been removed with the old canes, but one or two fungicide sprays (for instance with Quash, Indar, Tilt, Phostrol or Pristine) may be helpful to protect new growth from any remaining spores lurking in cane pieces. These fungicides are best applied during big flushes of growth and before rainy periods. Since there will be no fruit, the pre-harvest intervals are not of concern.

For cultivars that are susceptible to leaf rust, which may result in early defoliation, scout frequently and keep an eye out for rust pustules from mid-July through September. As soon as the first rust pustules are seen, a Pristine (excellent) or Indar/Quash/Tilt (good) spray can be applied to prevent further infection. This works well if you scout frequently. In organic fields, Serenade or Double Nickel 55 can be used for leaf protection; adding a sticker-extender can improve efficacy of these products.

Field has low crop – will not be harvested

Since no fruit will be harvested, protection for fruit rots is not needed. While growers may be concerned with build-up of inoculum, they should be able to take care of that with one or two dormant sprays and a diligent fungicide program next year. Therefore, the main concerns this season are with cane diseases and possibly leaf rust. If there is a lot of Phomopsis cane blight, prune out and burn diseased and dying canes to remove as much inoculum as possible. If you can't remove them from the field, make sure to chop the canes into small pieces to speed up decomposition. Protect new growth during flushes of growth at least once and preferably twice with effective fungicides, such as Indar, Quash or Tilt. Pristine is also effective, but is probably too expensive in this scenario. Phostrol or another phosphite fungicide may also be helpful; these products are highly systemic and work like Aliette.

For cultivars that are susceptible to leaf rust, scout frequently and keep an eye out for rust pustules from mid-July through September. As soon as the first rust pustules are seen, a Pristine (excellent) or Indar/Quash/Tilt (good) spray can be applied to prevent further infection. This works well if you scout frequently. In organic fields, Serenade or Double Nickel 55 can be used for leaf protection; adding a sticker-extender can improve efficacy of these products.

Field has moderate crop – will be harvested

In this case, you would follow your normal program, but using fewer sprays (only apply at critical timings) and use less expensive products. Critical timings after bloom would be early green fruit, first blue fruit, during flushes of new shoot growth and right after mechanical harvest. You can also use lower rates, but this is advised only for protectants that are not vulnerable to fungicide resistance development. The least expensive products for blueberries are sterol

inhibitors (e.g., Tilt, Indar, Quash: \$12-18 per acre), phosphites like Phostrol (\$7-18 per acre), copper products (\$5-15 per acre), Captan (\$7-18 per acre) and Ziram (\$10-14 per acre). You can further save by buying generic products and by adding adjuvants that can improve coverage and retention. Scout fields frequently to look for disease symptoms and rust. (*Source: Michigan Fruit Crop Alert, June 16, 2015*)

GRAPE

Important Sprays for Grape Disease Management

Bruce Bordelon, Purdue University

Grapes are at the critical post-bloom time period, which is a key time to control important diseases such as Phomopsis, black rot, downy mildew, and powdery mildew. The next few sprays will be critical in controlling fruit infections. Growers should pay extra attention to getting thorough coverage and use the best fungicides available. Recent widespread heavy rains may dictate shorter time intervals and appropriate use of adjuvants. The Midwest Small Fruit and Grape Spray Guide [And the 2015-16 New England Small Fruit Pest Management Guide] lists a wide range of products recommended. The most common approach is a tank mix of one of the sterol inhibitors (aka demethylation inhibitor) such as Rally or generic tebuconazole for black rot and powdery mildew plus a protectant for downy mildew and Phomopsis. The 66-day PHI for mancozeb means it can no longer be used in most situations, so another protectant such as captan, ziram or phosphoric acid is recommended. Rotating with one of the strobilurins such as Abound, Sovran, or Flint, or combinations products that contain them such as Pristine, Quadris Top, or Adament, is a good option.

Read the caution regarding fungicides that contain difenoconazole on page 16 of the Midwest Small Fruit and Grape Spray Guide. These include Inspire Super, Quadris Top, and Revus Top. Use caution when applying these to labrusca varieties and labrusca hybrids. Avoid adding adjuvants that may increase uptake or leaf burning may occur. I suggest you use these with caution until you know how your varieties respond.

Note that while phosphoric acid products are good protectants for downy mildew, they are quickly absorbed into the plant so very rain fast, however they have limited residual activity. Don't expect them to provide protection for more than 10 days. If downy has been a problem (and it has been for the past two years) consider including one of the downy mildew specific products such as Forum, Ranman, Revus, or Zampro. These next few sprays are critical to producing sound, clean fruit. (*Source: Facts for Fancy Fruit, Volume 15, Issue 6, June 12, 2015*)

Leaf Removal in Grapes

Bruce Bordelon, Purdue University

Immediate post-bloom through about 3 weeks post bloom is the most effective time for leaf removal on tight clustered varieties such as Vignoles, Seyval, and Pinot gris. Removal of 1 to 3 leaves in the cluster zone can greatly reduce risk of Botrytis bunch rot. Exposure to sun makes the berries less susceptible to Botrytis and removal of leaves opens the canopy so that sprays can

penetrate the cluster zone. Delaying leaf removal increases the risk of sunburn, as does removal of too many leaves, especially on the west side of the canopy. Most growers remove leaves only on the east side (on north-south running rows). (*Source: Facts for Fancy Fruit, Volume 15, Issue 6, June 12, 2015*).

GENERAL INFORMATION

Excessive Rain Promotes Phytophthora Diseases in Raspberries and Strawberries

Annemiek Schilder, MSU Extension, Department of Plant, Soil and Microbial Sciences

In a rainy year, there is a higher risk of diseases caused by Oomycetes, also called “water molds,” especially *Phytophthora* species, which thrive in waterlogged soils and areas with standing water for periods of time. They can cause rapid wilting and decline of plants or rotting of fruit. *Phytophthora* mycelium can survive in infected roots or fruit mummies or as hardy oospores in plant debris and soil. Oospores are known to remain viable in the soil for over 10 years. Oospores germinate under moist conditions, forming balloon-like sporangia that contain motile zoospores. The zoospores swim through the water-filled soil pores to susceptible plant parts and cause infection; wounds are not required. Infection is more likely during cool, rainy periods in fall and spring, but can occur throughout the growing season if conditions are favorable and susceptible host tissue is available.

Phytophthora diseases may be introduced to new sites through infected planting material or spread via runoff from infested fields and movement of soil on boots and equipment. Below are descriptions of different *Phytophthora* diseases in berry crops and [Michigan State University Extension](#) suggestions for management.

Phytophthora root rot of raspberries

Phytophthora root rot of raspberries (*Phytophthora megasperma*, *P. cryptogea*, *P. citricola* and *P. cactorum*) symptoms include a general lack of vigor and a sparse stand. Apparently, healthy canes suddenly decline and collapse during late spring or early summer. Infected plants frequently occur in patches, which may spread along the row. Because similar symptoms may be caused by other factors, like winter injury, cane borers, etc., suspect plants should be dug up and roots and crowns cut open to look for characteristic, brick-red discoloration and root rot. Rotted roots will eventually turn dark brown as the tissue decays. Sometimes a distinct line can be seen between infected and healthy tissues. Some *Phytophthora* root rot symptoms have already been seen in raspberries in Michigan.

Red stele of strawberries

Since most strawberries in Michigan are grown on light soils, red stele of strawberries (*Phytophthora fragariae*) is a relatively rare root disease, but it occurs occasionally in heavier soils. It may also occur in strawberries on plastic-covered beds that are overwatered. Infected plants are stunted and dull green and produce few runners. Older leaves turn prematurely yellow or red, and younger leaves have a metallic

bluish-green cast. Plants wilt and die rapidly during the first hot, dry weather of summer. Infected plants have very few new roots and many of the older roots are rotted. When the outside portion of the root is peeled off, the central portion (stele) is brick-red. This is in contrast to black root rot, the most common root problem in Michigan strawberries, where the stele is light in color while the rest of the root is brown to black. The optimum temperature for infection and disease development is 55-60 degrees Fahrenheit, although the pathogen may be active at temperatures as low as 40 F. Under favorable conditions, plants will show disease symptoms within 10 days of infection.

Leather rot of strawberries

Leather rot of strawberries (*Phytophthora cactorum*), is an important fruit rot disease that may cause considerable losses, sometimes as high as 50 percent. In addition, infected berries have an unpleasant, pungent odor that can be detected in preserves even at low incidence. Excessive rainfall promotes the disease, as well as a lack of straw cover which allows berries soil contact or soil splash. The pathogen attacks fruit at any stage of development, but may also infect blossoms, often killing whole clusters. Infected green berries turn brown and leathery. When ripe berries get infected, they turn pink to light brown and become soft. Under wet conditions, a white, fuzzy growth may be seen on infected berries, containing sporangia that can be rain-splashed to surrounding berries. At the optimum temperature of 62-77 F, only two hours of wetness are needed for infection and the disease can spread very quickly. The berries eventually mummify and overwinter on the ground.

Management

To manage *Phytophthora* diseases, moisture management is foremost. Chemical fungicides may be used to prevent infection, but will not cure dying plants or rotting fruits. They are best used in an integrated program with other practices, including:

- Selecting a site with good drainage or improving drainage and reducing soil compaction.
- Avoiding planting next to a barn or shed where water from the roof may puddle.
- Planting on raised beds at least 10 inches high; mix a porous material like bark, but not sawdust or peat, into the bed to improve aeration.

- Avoiding previously infested sites or planting resistant cultivars if the site has a history of red stele. Red stele-resistant strawberry cultivars include Allstar, Earliglow, Guardian, Midway, Redchief, Redglow, Scott, Sparkle, Sunrise and Surecrop and day-neutral cultivars Tribute and Tristar. However, none are resistant to all races of the pathogen.
- Rotating out of raspberries or strawberries for five to 10 years; however, the efficacy of this is questionable as the pathogen is very long-lived.
- Cultivating infected fields last, cleaning equipment and reducing runoff from infected areas.
- Using disease-free planting material from a reputable nursery.
- Pre-planting root dips and foliar sprays with a phosphite fungicide (e.g., Aliette, Phostrol) or post-planting ground or drip applications of Ridomil Gold may be advisable. Phosphites can be applied

all season while Ridomil Gold is usually applied to the soil in spring and fall.

- Pre-planting soil fumigation with soil sterilants (e.g., Telone C-35) is effective, but expensive and toxic to all soil life, including beneficial microbes.

Specifically for leather rot:

- Apply a layer of straw to prevent berries from touching the soil.
- Plant rows in the direction of the prevailing wind and avoid excessive growth to reduce moisture in the planting.
- Pick fruit frequently and early in the day; remove rotting berries and dispose of them – do not leave them in the field.
- Use effective fungicides, such as phosphites (Aliette, Phostrol, etc.), Ridomil Gold or strobilurins (e.g., Abound and Pristine).

(*Source: Michigan State Fruit Team Alert, June 23, 2015*)

UPCOMING MEETINGS:

June 24, 2015 - *UMass Agricultural Field Day* at UMass Crop and Animal Research and Education Center, River Rd. S. Deerfield MA from 9:30am-4pm. Tour the farm and learn about the agricultural research projects happening this summer. Lunch included! Projects will include but are not limited to:

- Cover Crops in Potato Production
- Dual-Purpose Cover Crops for Fall Nutrient Capture and Additional Forage Production
- Production of Quality Malt Barley in New England
- Hardwood Biochar Amendment of Agricultural Soils
- Growing Mustard as a Biofumigant Cover Crop
- Evaluation of Reduced Risk Pesticides for Cabbage Root Maggot Control

Contact Kelly Kraemer at kkraemer@umass.edu or 413-545-5221 for more information.

August 14 – 16, 2015 - *NOFA Summer Conference*, UMass Amherst Campus, Amherst MA. This year's main conference features 144 individual sessions with 27 different topic areas. Workshops address organic farming, gardening, land care, draft animals, homesteading, sustainability, nutrition, food politics, activism, and more. The theme for this year's Conference is "Healing the Climate, Healing Ourselves: Regeneration through Microbiology". For more program information and to register go to: <http://www.nofasummerconference.org>.

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