Massachusetts IPM Berry Blast 5/27/11

IN THIS BLAST:
STRAWBERRY:
BACTERIAL ANGULAR LEAF SPOT

RASPBERRY:
RASPBERRY FRUITWORM

BLUEBERRY:
BLUEBERRY MAGGOT FLY

STRAWBERRY

Bacterial Angular Leaf Spot on Strawberries

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Angular leaf spot, caused by the bacterium Xanthomonas fragariae, seems to be a problematic in numerous strawberry plantings this spring. This disease is favored by cold, wet conditions, so given the weather conditions we've had across the state this spring, it's no surprise that we are seeing problems. The bacteria get spread within a planting by splashing of water droplets. Needing to use overhead irrigation for frost protection can make the problem worse.

It is important to note that because this disease is caused by a bacterium, rather than a fungus, fungicides used to control other diseases will not help have an effect on angular leaf spot.

Symptoms can vary a bit in coloration depending on the plant variety, weather conditions, and time of year. Key diagnostic features, however, are that the lesions are confined by the small veins of the leaf and the infected areas appear as a lighter color when leaf is held up to the light, as the bacteria cause the tissue to clear. Thus, the lesions have a blocky or "angular" appearance, sometimes referred to as a "windowpane" effect. As infected areas accrue, blocks of damage tissue die and turn a brown or red-brown color. In the photo below on the left, there is a small amount of infected tissue on a young leaf, so tiny areas of infected tissue are seen. In the photo on the right, more tissue has been infected for a longer period of time.

When infected tissue is viewed with light shining on it, instead of through it, the infected areas appear dark. In the photos below, recently infected tissue can be seen on the leaf underside as blocky dark green areas which turn black as the tissue dies. Once the tissue dies, the infection is obvious on both the upper and lower leaf surface. Again, note the angular shape of infected areas.

Angular leaf spot also affects the fruit cap (calyx). The caps may have a blackened appearance if they have not had an opportunity to dry out, and after a dry spell may be described as brown rather than black. This is the symptom that often gets people's attention as the fruit becomes unsalable.

Botrytis gray mold, caused by a fungus, can also turn caps brown. If the caps turn brown and you don't know which disease is causing the caps discolor, check to see whether leaf symptoms of angular leaf spot are also present, and if they are, this is likely the problem. If they aren't, gray mold may be the issue. An additional clue is that if gray mold is the problem, the berry tissue will also eventually turn soft as it become infected, whereas ith angular leaf spot, the berry tissue remains normal in appearance. The berry often doesn't develop much eetness with either one, presumably because sugars cannot be translocated into the fruit normally.

Angular leaf spot and leaf scorch, a disease caused by a fungus, are also easily confused so here are photos to help you tell the difference. These photos are of the same two leaves, held differently so sunlight either shines down on them, or through them. The primary disease affecting the leaf on the left is leaf scorch, and the one on the right, angular leaf spot. In the photo on the left, where sunlight is shining down on the leaves, the leaves appear very similar. In the photo on the right, where leaves are held up so that sunlight shines through the leaf, you can see that light does not shine through the leaves with leaf scorch on the left, but the "windowpane" effect of angular leaf spot can be clearly seen. Note that in these two leaves, there is some of each disease present on each leaf.

No strawberry varieties have resistance to angular leaf spot. It is systemic within plants, and cannot be eradicated. The bacteria can also invade the plant's vascular system, causing a general decline, but this is less commonly seen than other symptoms.

Cultural controls consist of minimizing the amount of overhead irrigation used, and any practices that encourage drying of foliage such as keeping plantings weeded. Straw mulch can help minimize water droplet splashing, and avoiding moving equipment or harvesters through wet foliage will minimize the spread of inoculum. As mentioned above, commonly-used fungicides don't help with controlling this disease. Copper can help though phytotoxicity symptoms, which will appear as a general reddening or purpling of the leaves, may appear if more than four or five sprays are used. Avoid applications when temperatures are warm (higher than the mid-70s). Copper also tends to accumulate in the soil, so routine use without a reason is not recommended. Making applications early in the season will minimize infected leaf material, and prior to wet spells as temperatures become warmer may help to protect the caps. The main purpose of copper sprays is to protect tissue from infected bacterial slime, so if you are in a dry period, you can skip sprays for a while and save them for when you might need them later. **Copper hydroxide formulations may be more effective than copper sulfate formulations**.

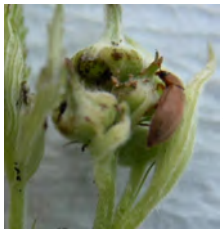
[*Copper products, such as Kocide and Cuprofix, applied on a preventive basis are the most effective products for control, but care has to be taken to avoid phytotoxicity, which manifests itself in purplish discoloration of leaves. Adding hydrated or builder's lime as a safener (e.g., 1 lb lime/lb copper fungicide) is recommended, particularly under cool, slow-drying conditions that promote copper uptake by the plant. Read the label of the copper product you are using to know whether and how much lime to add. Applying copper during periods of warm, dry weather will help avoid phytotoxicity.*]

Conventional	Organic (OMRI listed)	Cultural Practices
• Kocide 3000	• Champ WG • Cueva Fungicide Concentrate • Oxidate	• avoid irrigation as much as possible • when irrigation is needed, time it so there is a drying period from overnight dew before irrigation is started and/or between the end of irrigating to dewfall in the evening to allow for plant surfaces to dry • plant and renovate in ways that allow for good air circulation between and within rows • rotate infected fields out of strawberries as soon as possible

Read labels thoroughly for application rates and restrictions (REI, PHI, etc.)

RASPBERRY

Raspberry Fruitworm



Raspberry fruitworm is a small brown beetle that shreds leaves and lays eggs in raspberry fruit buds. Left uncontrolled, small white larvae with brown heads will develop inside the raspberry fruit, and can be found inside the cup at harvest.

There is some evidence suggesting that this insect is more of a problem in weedy plantings. If early damage is noted, (e.g., small holes chewed in flower buds and skeletonizing of leaves), cover sprays should be applied prior to bloom. Adults (beetles) tend to be most active and noticeable on plants in the early evening hours. Check buds and new growth on fruiting canes for this small brown beetle and the shredding it causes on new growth. Insecticide applications must be made before bloom.

Conventional	Organic (OMRI listed)	Cultural Practices
Delegate WG Pyrenone Crop Spray Sevin 4F Sevin XLR Spintor 2SC,	Aza-direct, Entrust Naturalyte PyGanic 5.0 EC	• avoid planting cultivated raspberries near wild raspberries that might harbor insect pests • avoid allowing raspberry field to become weedy which seems to lead to higher populations of this insect pest

Read labels thoroughly for application rates and restrictions (REI, PHI, etc.)

BLUEBERRY

Blueberry Maggot Fly

The adult is a black fly about 1/5" long with a pattern of dark and clear bands on its wings. The maggots are white, legless, and about 1/4" long when full grown. Flies alight on fruit to lay eggs under the fruit skin just as the fruit begins to turn blue. Maggots are later found in ripening and harvested fruit. Maggots feeding within developing fruits renders fruit unmarketable. Berries become soft and mushy. Undetected infested berries contaminate pack-out.

Red/green sticky spheres or yellow sticky rectangle traps baited with ammonium acetate can be used to monitor blueberry maggot populations in the planting. In large bushes, sticky traps should be hung in upper half of the canopy, suspended from wires and about 1-1/2 feet from the outer foliage. All fruit and foliage within 8 inches from the trap should be cleared away, and all traps positioned so that there is as much foliage and fruit surrounding them at this distance as possible. In small plantings, it may be possible to trap this insect out with sufficient trap density.

Conventional	Organic (OMRI listed)	Cultural Practices
*Asana XL Assail SG *Brigade WSB *Danitol 2.4 EC Imidan 70W Provado 1.6F	AzaDirect AzaGuard GF-120 NF Naturalyte Fruit Fly bait Surround WP	• Avoid planting near wild blueberries • Remove infested fruit as much as possible

Read labels thoroughly for application rates and restrictions (REI, PHI, etc.)
** restricted use material*

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