Summer Fungal Leaf Diseases

Fungal leaf diseases can be a problem for Florida blueberry growers during summer months, including anthracnose, Phyllosticta leaf spot, rust, and target spot. This post is a quick reference guide to identifying these diseases from the symptoms (although some of these diseases can have symptoms that appear to be similar) and suggested chemical controls. Additional information on leaf diseases can be found in UF EDIS Publication PP348, Florida Blueberry Leaf Disease Guide (https://edis.ifas.ufl.edu/publication/PP348).

Anthracnose

This disease is commonly observed after harvest in Florida and continues through the summer. Symptoms are circular to irregularly-shaped lesions, usually at the edges of leaves, expanding from ¼ inch to greater than ¾ inch in diameter. The centers of lesions are necrotic and can be brown to dark-brown, with bull's eye patterns sometimes present (Figure 1).

Figure 1. Anthracnose leaf spot lesion.
Credits: P. Harmon

There are several fungicides labeled for anthracnose on blueberry in Florida, including DMI fungicides such as Indar™, Orbit™, Quash™, Quilt Xcel™ and Proline™. These can be used in rotation or in tank mixtures with compatible products from another group to help prevent fungicide resistance, including Luna Tranquility™, Abound™, Pristine™, Switch™, and captan. Single applications of Bravo™ can also be used after harvest. Applications work best before

symptoms become severe. On susceptible varieties, applications to manage foliage health through flower bud differentiation should begin after post-harvest pruning, with reapplications according to label instructions through September. Anthracnose resistance to Abound™ has been confirmed in central Florida, so it should be tank-mixed with another fungicide like a captan product.

Phyllosticta

Phyllosticta leaf spot is more common later in the summer than anthracnose (August-September). Symptoms are brown leaf spots with irregular borders, surrounded by a purple or dark brown margin, and size ranging from small (less than 1/8 inch) to larger than one inch (Figure 2). A characteristic feature is the presence of tiny black fungal pimples within the lesions, although other fungi can have similar structures.

Figure 2. Phyllosticta leaf spot symptoms.
Credits: P. Harmon

There are no published fungicide recommendations for the management of Phyllosticta leaf spot management on blueberry, although in other crops related diseases are managed with applications of the contact fungicide Bravo™. Applications are suggested after harvest and approximately every two weeks thereafter (up to 6 weeks) within label instructions.

Rust

New rust leaf infections can begin in spring during or just after harvest, and disease activity increases again in early fall. Symptoms are typically observed first on upper leaf surfaces as small, somewhat angular yellow to reddish brown spots that may turn black over time before defoliation occurs. Yellow and orange spores are produced on the underside of leaves opposite the lesions on the surface (Figure 3).

Figure 3. Rust reproductive spores on the leaf underside.
Credits: P. Harmon

Applications of fungicides are the best method of control. Systemic fungicides can move into the infected leaves and potentially stop rust development. However, most products will only reduce or delay the amount of sporulation because fungicides do not effectively kill the fungus inside the leaf. Fungicides do a better job protecting against new infections, so making repeated applications to maintain a protective residue on the leaves is key to preventing the disease.

In the evergreen system, Chlorothalonil (sold as Bravo^{TM} and others) applications for rust management can be made starting late fall, before bloom. Chlorothalonil is a contact fungicide that cannot be used after bloom, and that some growers have concern about causing leaf burn in the heat of summer. Chlorothalonil has efficacy for several diseases and applications made when disease pressure is generally low (but as it starts to increase) make good sense. As the season progresses, growers should scout for rust disease, walking rows, turning over leaves

with spots, and looking for the orange spore masses. As rust starts to increase on the interior lower canopy leaves, consider using Proline™ (prothioconazole), which has stood out in some published research as an excellent choice among DMI products for rust. Other products with reported excellent effectiveness include Qulit Xcel™ (azoxystrobin and propiconazole) and Propulse™ (fluopyram and prothioconazole). Other DMI's with longer preharvest intervals (PHI) can also be considered if rust increases before bloom (e.g., Indar™, Tilt™). They will have some efficacy, and this will leave Quash™ and Proline™ (with a 7 day PHI) as options for any flare-ups closer to harvest. Abound™ and Pristine™ both also have rust efficacy and make for good rotation partners with one of the DMI products. If applied at or after bloom, consider tank mixing a captan product with Abound™ or Pristine™, because of the widespread anthracnose ripe rot resistance to these products. One or more of these options employed in the late fall to pre-bloom period should do a good job of keeping rust severity low through harvest. Fungicides with different modes of action should be used in rotation or in a tank mix and as part of an integrated post-harvest foliage management strategy.

Target Spot

Target Spot can be observed during summer and early fall when high humidity, temperatures between 79°F - 84°F, and moderate rainfall favor abundant fungal sporulation and rapid development of disease. Symptoms are angular to irregular, reddish-brown lesions, 1/3 to 3/8-inch in diameter, with color varying in concentric rings, resulting in a "target" or bull's-eye pattern (Figure 4). Symptoms can be similar to early symptoms of anthracnose leaf spot, and both diseases can occur on susceptible varieties at the same time. However, target spot lesions typically remain smaller, and fewer target spot lesions are required before defoliation occurs compared to anthracnose.

Figure 4. Target spot symptoms.
Credits: P. Harmon

Preventative fungicide applications where the disease is known to be present or careful scouting for initial disease symptoms are encouraged. No fungicide resistance is known at this time, and most fungicides that are used to manage anthracnose and rust should be effective against target spot. Chlorothalonil (Bravo and other products) specifically has a very broad-spectrum of fungal activity and is used to manage target spot effectively in other crops. Blueberry cultivars vary in their susceptibility to target spot and ongoing research will provide additional information. Growers should ensure good, even coverage and canopy penetration with spray equipment to increase the efficacy of the fungicide products they apply.

Cercospora (Gleocercospora)

Cercospora (Gleocercospora), a new disease on blueberries in Florida, was first observed in 2022 on Sentinel, and has been observed every year since, and on many additional varieties across farms from north central to south central production. The disease is listed in the American Phytopathological Society's *Compendium of Blueberry Diseases*, but no research has been conducted on it for the last 50 years or so. Quite a bit has changed since then in terms of names of fungi, and our initial investigation into the fungus suggests it is likely a *Psuedocercospora* sp.

The symptoms are distinct and vary slightly from the most susceptible varieties like Sentinel to more resistant varieties and selections. The symptoms are visible on upper leaf surfaces and tend to be angular in shape with colors ranging from dark reddish brown (Figure 5) to dark brown necrotic and a general yellowing of severely affected leaves. Some defoliation has been observed, but leaves can be held on the bush with a surprising amount of symptom. Sporulation of the fungal pathogen is typically visible on the underside of affected leaves, and appears as a dingy gray to black stain in the same angular shape as the upper leaf surface discoloration (Figure 6). Some varieties show abundant sporulation on the lower leaf surface, but little to no upper leaf symptom. The fungus produces spores in open clusters that can be seen as tiny black dots within the gray discoloration on the underside of affected leaves.

Figure 5. Cercospora leaf symptoms.
Credits: P. Harmon

Figure 6. Cercospora sporulation on leaf underside.
Credits: P. Harmon

Management

Horticultural inputs that help promote healthy vigorous plant growth are encouraged to reduce plant stress. Free water and humidity management in the canopy of plants can help reduce disease pressure of many fungal diseases. Specific recommendations include selective pruning and weed management to improve airflow and encourage drying of leaves and stems after rain, irrigation, or dew events. Avoiding overhead irrigation applications that extend leaf wetness may also help reduce the severity of common foliar diseases. Related fungi cause cercospora leaf spots on a diverse range of ornamental and crop plants and resistant varieties are used where available, like with sugar beet production. Fungicide resistance within cercospora species has been well-documented to several modes of action on beets and other crops and is something to look out for in blueberry as well, but it has not been confirmed for blueberry to date.

There are no fungicide recommendations specifically for cercospora (gloeocercospora) leaf spot on blueberry, but knowing what is effective for related pathogens can help give a starting point. The DMI fungicides are some of the most effective products used on related pathogens across multiple crop systems, with contact products that contain chlorothalonil and copper reported as less effective, but consistent. We use several of these for rust prevention during the periods of the year when gloeocercospora leaf spot tends to occur. Fungicides like azoxystrobin can work well for many related cercospora diseases of other crops, but resistance renders them ineffective where present. The blueberry disease has occurred on farms using a good rust fungicide program, so additional work is needed to know what additional inputs can be used to try to prevent severe disease. The economic importance of managing this disease and whether a return on fungicide investment in increased yields will be realized by attempting control is still unknown and is an equally important question.

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