



AGRONOMIC SPOTLIGHT



FUNGAL FOLIAR DISEASES OF ONION

- » Fungal foliar diseases of onion generally occur during periods of wet weather or overhead irrigation.
- » Cool temperatures favor downy mildew, while warmer conditions favor purple blotch and *Stemphylium* leaf blight.
- » An integrated management system of crop rotation, water management, sanitation, and foliar fungicides can be used to manage these diseases.

FOLIAR DISEASES

The bulb of an onion, the harvested product, develops as a result of the leaves of the onion plant producing sugars through photosynthesis, and these sugars then being translocated into the developing bulb. Anything, including disease, that impairs this process will impact the yield and quality of onion production. Fungal foliar diseases can cause necrosis of the leaves, and may cause onion tops to die prematurely. Loss of green tissue also reduces the uptake of sprout inhibitor treatments, resulting in reduced storage life of the bulbs. Also, if onion tops die while erect, moisture can get into the neck, leading to bacterial problems in storage.

Three of the most impactful foliar diseases are downy mildew, purple blotch, and *Stemphylium* leaf blight. These three diseases are dispersed by wind and splashing rain and develop most readily during wet conditions. They produce lesions on the leaves, and all three can be managed using similar strategies.

IDENTIFICATION – SYMPTOMS

Downy Mildew. The first visual evidence of infection by the downy mildew pathogen is the formation of brownish-purple, velvety growth on the leaves (Figure 1A), which is easiest to spot early in the morning while dew is present.¹ This growth is the formation of spore-like sporangia, which are used to spread the pathogen and initiate new infections. Pale green lesions develop on infected areas of the leaf. With time, these lesions become yellow in color and then brown and necrotic. As they expand, the lesions eventually girdle the leaves, causing them to collapse. Downy mildew also infects seed stalks and bulb tissue, resulting in bulbs that become soft and shriveled in storage. This disease usually first appears in small patches, but under favorable conditions, it can spread rapidly through an entire field.²

Purple blotch. Older leaves are more susceptible to infection by the fungus that causes purple blotch, so symptoms usually appear on those leaves first. Lesions initially develop as water-soaked areas with white centers, and these lesions



Figure 1. Symptoms of (A) downy mildew and (B) purple blotch. Howard F. Schwartz, Colorado State University, Bugwood.org

often form first near the tips of leaves. With time, the edges of the lesions turn brown to purple.³ Dark brown concentric circles develop in the lesions (Figure 1B), a result of the fungus producing spores at night. Lesions expand and eventually girdle the leaf, resulting in leaf collapse. The fungus can grow through the neck (top) of the bulb and infect the internal, fleshy scale. Infected bulb tissue is initially bright yellow but, with time, it turns a red-wine color.

***Stemphylium* leaf blight.** Similar to purple blotch, lesions from *Stemphylium* infection are initially small, light yellow to brown in color, and appear water-soaked. However no purple color develops with *Stemphylium* lesions. As they develop, lesion centers turn brown to tan in color. Multiple small lesions can expand and coalesce, causing a blighting of large areas of the leaf. *Stemphylium* often starts on dead leaf tissue, especially tipburn.⁴ The pathogen only infects the leaves, not moving into the bulb tissue, but loss of photosynthetic area can greatly reduce bulb size.

FAVORABLE CONDITIONS

All three of these pathogens can infect onions and other *Allium* species, including garlic, leeks, shallots, and chives.⁵ The pathogens can survive on volunteer onion plants in the field, infested plant debris, and on discarded bulbs in cull

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piles. All three diseases are favored by wet conditions, and infection occurs when films of water are present on plant surfaces.

Downy mildew is favored by cool, wet conditions. Optimal conditions include relative humidity levels above 95% and 1.5 to 7 hours of leaf wetness.² Temperatures between 50° and 55°F are most favorable, although the disease can develop at temperatures between 39° and 77°F. The disease is less common in southern growing areas where conditions are often too warm for disease development.⁵ Sporangia (spore-like structures) produced by the pathogen can spread long distances in the wind. Once sporangia land on an onion plant, they can either germinate directly, causing a single infection point, or they can produce several swimming spores (zoospores) that spread in the water on plant surfaces and initiate multiple infections.

Purple blotch requires long periods of leaf wetness (12 hours or more) and relative humidity levels above 90% for infection to take place.⁴ The optimum temperature for infection by and growth of this pathogen is 77°F, with little growth below 55°F. So this disease proliferates most readily during conditions that are warmer than those most favorable for downy mildew. Like downy mildew, the spores of this pathogen are spread by wind and splashing rain. Symptoms on the leaves develop very quickly, often within one to four days after infection, and new spores can be produced as soon as five days after infection.

Stemphylium leaf blight is favored by extended periods of leaf wetness and warm temperatures, similar to the conditions needed for purple blotch. Leaf wetness is necessary for infection by this pathogen, and rain lasting more than 24 hours can result in multiple infections that coalesce into large blighted areas of the leaf.¹

MANAGEMENT

Several management strategies can be used to control all three of these foliar diseases. First, avoid planting diseased transplants, and inspect transplants for disease symptoms prior to planting. Some of these pathogens can be found on seed, but it is not clear how effective seedborne inoculum is in initiating disease on seedlings or mature plants. Planting treated seed is always recommended.

It is important to implement good sanitation practices to reduce the amount of inoculum present. Bury plant debris, eliminate volunteer onion plants, and remove cull piles, all of which can be sources of these pathogens. Crop rotations of three to four years away from onion and related crops will help prevent the buildup of inoculum of these three pathogens.

Orient planting rows in the direction of the prevailing winds to promote good airflow in the canopy and reduce local relative humidity levels. Avoid overhead irrigation or apply sprinkler irrigation in the morning so that plant foliage dries prior to nightfall. Also, the promotion of good field drainage helps to lower humidity levels within the dense canopy.² Cultural practices that minimize tipburn, including proper fertility and irrigation, and selection of varieties that are not prone to tipburn, may reduce losses due to Stemphylium.

Initiate fungicide applications at the first signs of disease in the growing area. Several fungicides are available for each of these diseases, and some fungicides are effective for multiple diseases. Growers should be aware of the labeled limitations for of the number of applications or amount of product that can be applied per season, as well as any pre harvest interval (PHI) restrictions. There are also restrictions on applications to exposed bulb tissue with some fungicides. Application intervals may need to be shortened, according to label instructions, if conditions are particularly favorable for disease development. Check current state Extension recommendations for specific fungicides to use for each of these diseases. Fosetyl-AI, chlorothalonil, and mancozeb are commonly recommended for downy mildew control. Mancozeb, chlorothalonil, and iprodione have been show to be effective in suppressing purple blotch, and boscalid and pyraclostrobin have also been shown to be effective for this disease. Fewer fungicides have been found to effectively control Stemphylium leaf blight, but iprodione, boscolid, and pyraclostrobin have been shown to suppress this disease.⁴

Sources:

¹ Schwartz, H. and Mohan, S. K. 2008. Compendium of onion and garlic diseases and pests, second edition. APS Press, St. Paul, MN.

² Davis, R. M. and Aegerter, B. J. 2008. Onion and garlic: Downy mildew. UC Pest Management Guidelines. University of California IPM.

³ Reiners, S. and Seaman, A. (Eds). 2016. Cornell Integrated Crop and Pest Management Guidelines for Commercial Vegetable Production.

⁴ Langston, D. B. 2014. Diseases of Vidalia onions. In Onion production guide. Eds., Boyhan and Kelly. University of Georgia Extension. B 1198-2.

⁵ Lorbeer, J. and Andaloro, J. 1984. Onions-downy mildew. Cornell University Vegetable Crops Fact Sheet: page 737.2.

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology Development & Agronomy by Monsanto.

Individual results may vary, and performance may vary from location to location and from year to year. The information provided in this communication may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about onion diseases. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with this specific crop.

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