Downy Mildew in Onions

Pernospora destructor

A BC Small-Scale Farmer's IPM Guide- *Guide series, March 2021*

Downy mildew is a widespread fungus-like disease in onions and other Alliums. Infections rarely kill onion plants but will cause early leaf dieback and infect the neck of the bulb, making greens unmarketable and reducing bulb size and storage quality. Once crops are infected with downy mildew they also become more susceptible to other diseases. Note: the common name "downy mildew" is used in other crop groups, but those are different fungi that cannot infect onions (e.g. the downy mildew in beets is different from the downy mildew in onions). This manual contains integrated pest management (IPM) guidelines geared towards small-scale production, but they are applicable to any operation wanting to improve pest identification, monitoring and management.

Identification

Bleached spots

Collapsing leaves

Severe stage

Downy mildew often first appears as yellowish spots on the upper sections of onion leaves, which then become fuzzy in appearance. It usually starts in patches in the field. The severity of the disease can increase rapidly and quickly spread through the field under ideal conditions.

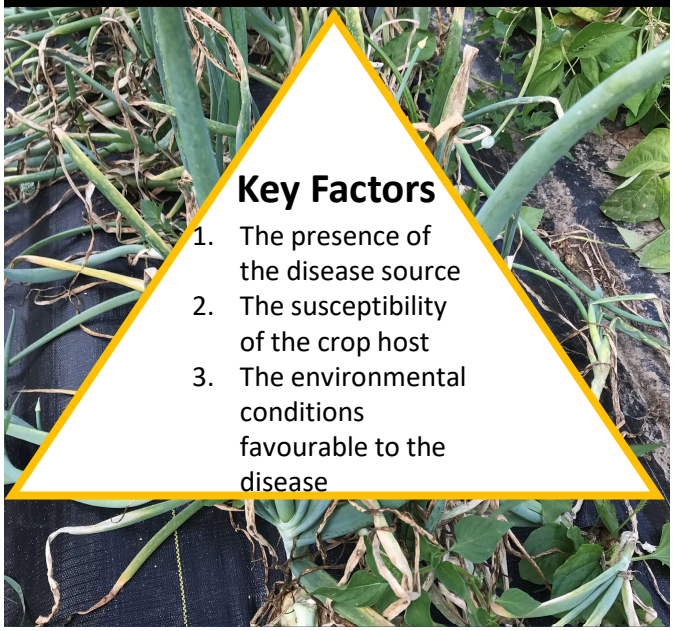
Look for:

- Collapsing leaves with a pale, yellow, bleached appearance.
- Grey-purple fuzzy mould on leaves.
- Patches of dead/wilted leaf tips.

Grey-purple fuzzy mould

Conditions

There are three key factors (also known as the 'Disease Triangle') that account for downy mildew disease severity:



Source of disease

- Airborne spores (can be windblown long distances).
- Other nearby infected fields.
- Overwinters in infected crop residue left in fields, or in nearby cull piles.
- During the season, spores can be produced from established infections in 11-15 day cycles, with disease pressure increasing with each successive cycle.

Susceptible tissue

- Green leaves are at risk at all growth stages, from early looping stage to harvest.
- Over-fertilized, succulent leaves are most at risk.
- Leaves crowded or shaded by other plants/weeds get infected first.

Favourable environment

- Associated with cool and wet conditions.
- High humidity, cool temperatures (<22˚C), dense plant growth.
- If conditions are humid (2-6 hours of wetness), spores can be produced within 3-14°C.
- If conditions are dry, no spores are produced at temperatures above 13°C.
- Rain is not needed for infection if heavy dew is present.
- Generally, spores form at night, disseminate during the day, and infect the leaves they have landed on in the morning hours.

Associated pest: thrips

Thrips are insects that use their rasping and sucking mouthparts to feed on onion leaves. Their damage weakens plant cells, and increases susceptibility to downy mildew infection.

Look for:

- Small (<2mm) elongated insects, yellow to brown in colour.
- Silvery white to tan strips, speckling, or mottling on leaves.

Thrips nymph

Thrips adult

Associated pest: purple blotch

Onion plants weakened by downy mildew can also become more susceptible to infection by purple blotch. It is common to see a pest-complex of thrips, downy mildew, and purple blotch all present together.

Look for:

- Early infection: small, water-soaked lesions, sometimes with white centers.
- Later infection: lesions turn brown to purple, surrounded by a zone of yellow.

Purple blotch progression

How to Monitor

Monitoring period and frequency

- Scan plantings once a week from green leaf presence (no later than mid-June) to harvest.
- **Start early -** watch for early symptoms, especially under cool and humid conditions.
- **Regular checks-** this disease can spread rapidly in the right conditions so a regular monitoring protocol is recommended.

For downy mildew

- Monitor to detect timing of first infections and to track severity of infections over time.
- Look out for high risk areas (shady, weedy, dense foliage).
- Also look for and record presence of purple blotch.

For thrips

- Pull back leaves near the growing tip.
- Look for thrips and their damage. Also look for insect predators.
- Track increases in thrips and their damage over time.

When to Act

There is no specific action threshold for downy mildew. Actions are focused on preventing the initiation of primary infections so that the foliage is not compromised early in onion growth and bulb formation. **Consider the following risk factors** to help determine if you should intensify monitoring efforts or enact some form of management:

❑ Time of year
- The highest risk period for downy mildew is generally mid-June to late September.
- The earlier the onset of infection, the greater risk to bulb size/quality.

❑ Weather

Tracking environmental conditions is very important for assessing downy mildew risk. Conditions are high risk when:
- High relative humidity during pre-dawn hours.
- Extended heavy dew up to around 10 am.
- Low temperatures during the previous 24 hrs.
- Consider taking preventative spray action when conditions are humid and temperatures are <22˚C.

❑ Thrips pressure
- High thrips early in the season indicates a higher risk for early season downy mildew infection.

How to Manage

Select as many management options as possible based on what fits your operation.

❑ Crop rotation
- Spores may persist in the soil. Use a crop rotation of three years out of onions or other Alliums.

❑ Minimize overwintering sources
- There is a high risk of overwintering spores persisting in the soil. Destroy onion plant debris and cull piles.

❑ Minimize high humidity
- Plant in the direction of prevailing winds, avoid using wind breaks.
- Manage plant density and spacing.
- Avoid overhead irrigation. Use drip irrigation if possible.

❑ Reduce susceptible tissue
- Avoid over-application of nitrogen as an overproduction of succulent leaves promotes disease.
- Eradicate volunteer onions or weeds in the Allium family.

❑ **Reduce thrips feeding damage**

- Help the establishment of natural predators. Look out for orius, a notable predator of thrips.
- Consider a spray if thrips damage is increasing and thrips predators are not increasing.
- Registered pesticides used in **organic production** for management of thrips in onions include the active ingredient Spinosad. Always check with your organic certification body before using any pesticide products.
- Please refer to the **BC Vegetable Production Guide** for current organic and conventional spray options for thrips in onions.

Orius adult

Orius nymph

❑ **Suppress with chemical controls**

- If this is a recurring issue early in the season in June, apply preventative sprays.
- Registered pesticides used in **organic production** for management of downy mildew in onions include the active ingredient *Bacillus subtilis*. Always check with your organic certification body before using any pesticide products.
- Please refer to the **BC Vegetable Production Guide** for current organic and conventional spray options for downy mildew in onions.
- Always read the label prior to applying any pesticide products.

References and Links:

BC Production Guide – Dry Bulb Onions, Green Bunching Onions
https://www2.gov.bc.ca/gov/content/industry/agriservice-bc/production-guides/vegetables
Pacific Northwest Plant Disease Management Handbook – Onion, Downy Mildew
https://pnwhandbooks.org/plantdisease/host-disease/onion-allium-cepa-downy-mildew
Ontario Crop IPM – Onions, Downy Mildew
http://www.omafra.gov.on.ca/IPM/english/onions/diseases/downy_mildew.html

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