# Powdery Mildew in Cucurbits

*Podosphaera xanthii*

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

Powdery mildew is a very widespread fungal disease in cucurbits. Infections can cause early defoliation and premature fruit ripening, affecting fruit set, size, quality, and storability. Once crops are infected with powdery mildew, they also become more susceptible to other diseases. The common name "powdery mildew" is also found in other crop groups, but those are different fungi that cannot infect cucurbits (e.g. powdery mildew in strawberries is different from the powdery mildew in cucurbits). 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

## Early symptoms

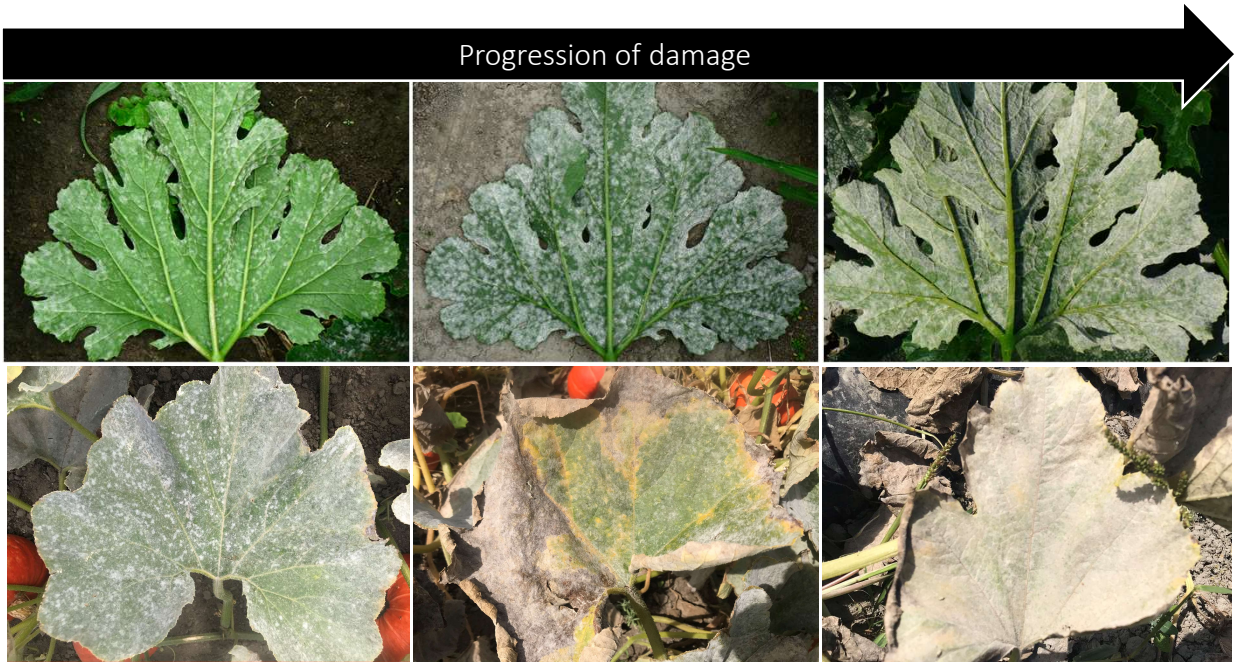
- Small white-grey spots on underside of leaves.
- Starts on older and shaded leaves.
- Yellow splotches on top of leaf opposite to white spots.

## Developed symptoms

- Upper and lower sides of leaves covered in white growth.
- Severe infections cause leaves to turn brown, wither, and die.

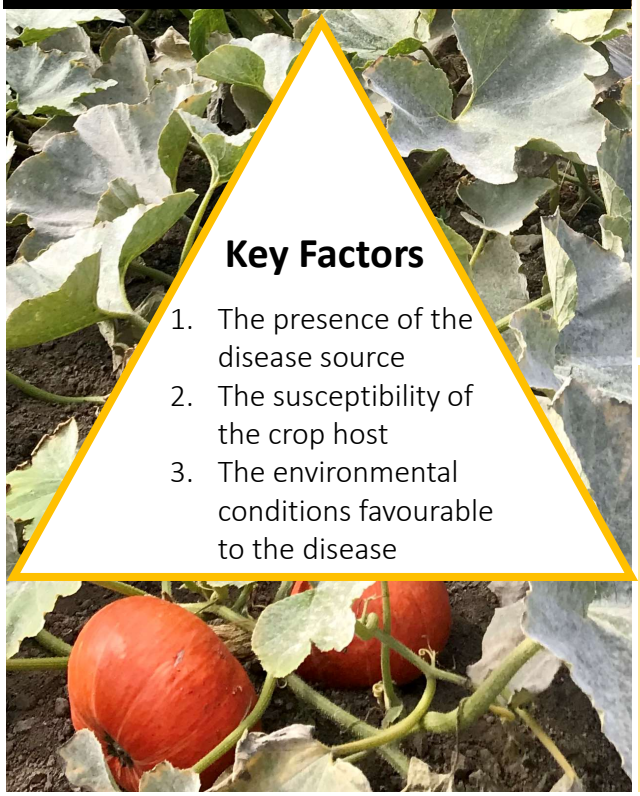
## Fruit symptoms

- Weak fruit stems (petioles) that break when harvesting.
- Low fruit counts and smaller fruit.
- Reduced overall fruit quality.




# Conditions

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




## Source of powdery mildew

- Airborne spores.
- Other infected fields nearby.

## Susceptible tissue

- Leaves most susceptible 16-23 days after unfolding.
- Older or compromised plants (crowded by weeds, over-fertilized, shaded) infected first.

## Conditions for infection and spread

- Dense plant growth, low light, excess nitrogen.
- High humidity increases the spread but infection can occur at relative humidity of less than 20-50%.
- Does not need free moisture on plants.
- Optimum temperature range of 20-27°C.

# How to Monitor

## Monitoring period and frequency

- Scan plantings for infection as soon as plants are transplanted or leaves emerge. The spread of this disease can happen rapidly in the right conditions so weekly visual checks are recommended.

## Key objectives for monitoring

**Initial infections:**

- Starting in June, walk through the field to look for any small white/grey growth forming on the leaves.
- Check in areas that are overgrown, shaded, or have had powdery mildew presence in the past.

**Increasing levels:**

- After finding the first symptoms, continue with regular checks (weekly) to monitor for any increases in infection levels.
- Watch for completely white-covered leaves or leaves that are yellow/brown and dying.

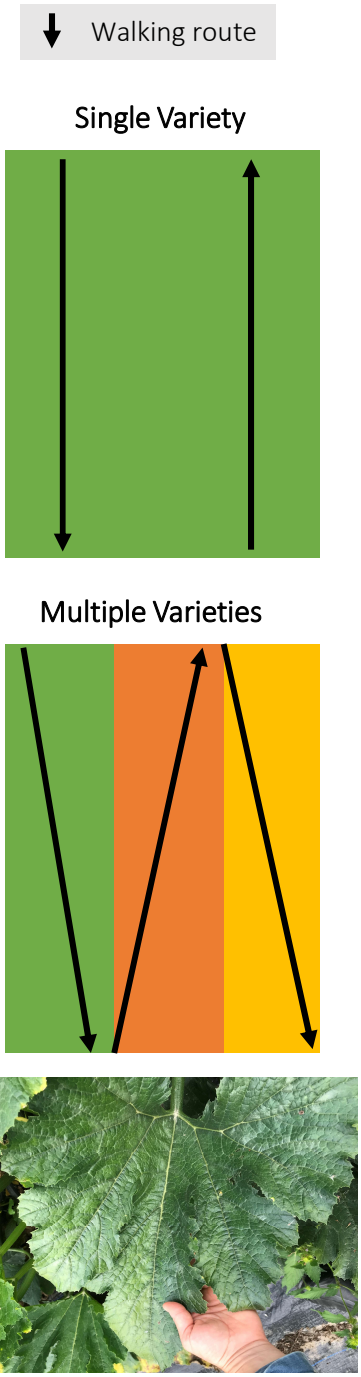
## Monitoring to track increases in disease infection levels

- Each planting/variety should be inspected.
- **Make one to two passes** through each planting.
- Stop at **10 locations per pass** and inspect **five leaves** per stop.
- **Record the number of leaves** with powdery mildew to track the percentage of infected leaves each week.

$$\text{Percentage of infected leaves} = \frac{\textit{total \# of leaves with powdery mildew}}{\textit{total \# leaves checked}}$$

## Record

Keep record of the numbers using a printout of the data sheet template provided in this guide.



# When to Act

**There is no specific action threshold for powdery mildew.** Powdery mildew infections can rarely be completely avoided in fields. Therefore, the main goal is to keep the disease pressure low and use management techniques to avoid early onset of infection (which will have the biggest impact on yield). **Consider the following risk factors** to help determine if you should enact some form of management:

Risk factors:

❑ Time of year
- Infection occurs post-fruit initiation in mid-summer.
- Late July and August are critical months for management.
- The earlier the onset of infection, the greater risk to fruit size/quality.

❑ Weather
- Optimal temperature range of 20-27°C (slows at temperatures over 26°C).
- High humidity promotes the spread (however, leaf moisture is not needed).

❑**Symptoms present -** Fungicide applications should be applied at first sight of symptoms when conditions are conducive.

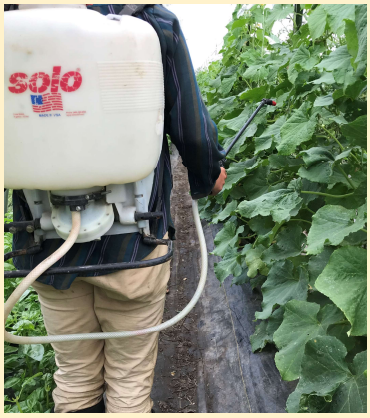
❑**History of infection -** If this disease is a recuring and damaging disease on your farm, begin sprays before any symptoms are found when conditions are conducive.

# How to Manage

## Cultural control

- **Plant resistant varieties:** Many powdery mildew resistant varieties are available, this is noted in seed catalogues.
- **Rotate** crops to reduce disease build-up. A minimum two-year rotation out of cucurbits may help. When replanting sites, plant newer fields upwind of older fields, as the older plants could be a source of infection.
- **Encourage airflow** by following spacing directions based on variety recommendations. This is very important to help reduce the risk of favourable disease conditions. Overcrowded plants create a shady, more humid environment and weaker plant growth, which can help encourage infection. Managing weeds will help increase airflow throughout the planting, as well as other growing practices such as trellising and properly spacing plantings.
- **Avoid over-applying nitrogen:** Apply fertilizers based on field soil results and nutrient recommendations. Overfertilized plants can be more susceptible to infections.

## Chemical control




- **This disease usually requires multiple applications,** and it is important to rotate between products with different modes of action to reduce the risk of resistance build-up in a field.
- Registered pesticides used in **organic production** for management of powdery mildew in cucurbits include the active ingredient potassium bicarbonate, *Streptomyces lydicus, Bacillus subtilis, e*xtract of *Reynoutria sachalinensis,* garlic powder, and mineral oil. These active ingredients provide suppression only. Begin spraying as a preventative measure or as soon as symptoms are observed in the field. 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 powdery mildew in cucurbits.
- Always read the label prior to applying any pesticide products.

**References and Links:**

BC Production Guide – Cucurbits
https://www2.gov.bc.ca/gov/content/industry/agriservice-bc/production-guides/vegetables/cucurbits
Cornell Extensions Powdery Mildew Factsheet
http://vegetablemdonline.ppath.cornell.edu/factsheets/Cucurbits_PM.htm
Ontario Crop IPM
http://www.omafra.gov.on.ca/IPM/english/cucurbits/diseases-and-disorders/powdery-mildew.html#advanced
University of Minnesota Extension
https://extension.umn.edu/diseases/powdery-mildew-cucurbits
PNW Pest Management Handbook
https://pnwhandbooks.org/plantdisease/host-disease/cucumber-cucumis-sativus-powdery-mildew

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# Powdery Mildew in Cucurbits Data Sheet Template

| Date | Planting ID | Pass Location | # of samples per pass | # of leaves sampled per pass | # of leaves with PM | Percentage of leaves with PM | Comment |
|---|---|---|---|---|---|---|---|
| *Example row: 05-Aug-21* | *North Field* | *North edge* | *10* | *50* | *5* | *10%* | *Disease pressure is increasing* |
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