e-GRO Edible Alert

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Common diseases of hydroponic leafy greens and herbs

Hydroponic leafy greens and herbs are susceptible to several diseases that reduce plant quality and marketability. The purpose of this e-Gro Alert is to point out the symptoms, cultural management, preventive fungicide controls and further resources for five of the most common diseases. None of the available treatments are curative, so apply treatments preventively. For this Alert we selected Pythium root rot, powdery mildew, Botrytis blight, basil downy mildew, and Sclerotinia blight. As always, we recommend consulting with a diagnostic laboratory to positively identify diseases: doing so can save you much guesswork in terms of prevention and control.

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Disease free hydroponic lettuce is a thing of beauty!

Basil roots infected with pythium root. Symptoms include brown roots, sloughing away of outer roots and overall poor rooting. Photo credit: Neil Mattson, Cornell University.

The same basil plants as the photo to the left show poor shoot development and leaf yellowing due to poor nutrient and water supply from the impaired root system. Photo credit: Neil Mattson, Cornell University.

Pythium root rot

Commonly affected crops

- Spinach, arugula, basil, and lettuce

Signs/Symptoms

- Brown discolored roots, poor overall rooting
- The outer part of the root sloughs away while the inner portion remains behind (aka “rat tails”)
- Leaf wilting or yellowing (due to poor water and nutrient uptake by the roots)

Further resources

- Mattson, N. 2018. Pythium root rot on hydroponically grown basil and spinach. E-Gro Edible Alert Vol. 3, No. 1.

Sanitation and Cultural Control Measures

- Inspect new plant material prior to transplanting
- Use foot baths with active sanitizing agent for all workers entering a greenhouse
- Sanitize tools
- Test if water source harbors *Pythium* species and install a water treatment system
- *Pythium aphanidermatum* and *P. myriotylum* proliferate under warmer temperatures; use a chiller to decrease water temperature (to 72 °F, e.g.)

Preventive Fungicides

- Use preventive drenches with biofungicides at the seedling stage. Several are labeled for Pythium root rot management in greenhouses see: https://e-gro.org/pdf/E207.pdf

Powdery mildew on lettuce appears as gray-white powdery growth on upper leaf surfaces. Photo credit: Margery Daughtrey, Cornell University.

Rosemary is an herb that is susceptible to powdery mildew, note gray-white powdery growth on upper leaf surfaces. Photo credit: Margery Daughtrey, Cornell University.

Powdery mildew

Commonly affected crops
- Lettuce, rosemary, sage, mint

Signs/Symptoms
- Gray-white powdery growth on upper leaf surfaces and in some cases on stems or flowers

Further resources
- Flax, N. 2020. Powdery mildew management 101. E-Gro Edible Alert Vol. 5, No. 5.

Sanitation and Cultural Control Measures
- Remove infected plants (bag up and toss)
- Favored by humid nights and dry days, use venting and heating to control humidity
- Ensure good air movement with horizontal airflow fans
- Select more resistant cultivars

Preventive Fungicides (not an exhaustive list)
- *Bacillus subtilis* (e.g. Cease, Companion)
- *Bacillus amyloliquefaciens* (e.g. Triathlon BA)
- Potassium bicarbonate (ex: Milstop)
- *Streptomyces* (ex: Actinovate SP)
- Hydrogen dioxide (Oxidate 2.0)

Lettuce exhibiting signs of Botrytis blight (fuzzy growth, i.e. sporulation) under humid conditions. The lettuce plants had been grown under tight spacing with poor airflow. Photo credit: Neil Mattson, Cornell University.

Rosemary exhibiting fuzzy brown growth (sporulation) from *Botrytis cinerea* infection as well as brown rot of stems and wilting/death. Photo credit: Margery Daughtrey, Cornell University.

Botrytis (Gray mold)

Commonly affected crops

- Lettuce, rosemary and many other herbs

Signs/Symptoms

- Fuzzy grey/brown growth (i.e. spores) when humid)
- Soft brown rot on stem and older leaves
- Plant may eventually wilt and die

Further resources

- Bhatoa, G.S. and M. Mohyuddin. 2019. Managing Botrytis: A serious disease in greenhouse lettuce. Greenhouse Canada.

Sanitation and Cultural Control Measures

- Remove dead plant material
- Control humidity and avoid moisture on plant surfaces
- Ensure good air movement with horizontal or vertical airflow fans

Preventive Fungicides (not an exhaustive list)

- *Bacillus amyloliquefaciens* (e.g. Triathlon BA)
- *Bacillus subtilis* (e.g. Cease, Companion)
- Potassium bicarbonate (e.g. Milstop)
- *Streptomyces* (e.g. Actinovate SP, Mycostop)

Upper leaf surface of basil infected with downy mildew. Note yellowing (chlorosis) that appears in bands delimited by major veins. Photo credit: Margery Daughtrey, Cornell University.

Under side of basil leaf infected with downy mildew. Gray sporulation is evident. Photo credit: Margery Daughtrey, Cornell University.

Downy mildew

Commonly affected crops

- Basil and arugula (these crops are affected by different species of downy mildew)

Signs/Symptoms

- Yellowing on upper leaf surfaces in bands delimited by major veins
- Irregular black spots may eventually appear on upper leave surfaces
- Underside of leaf may show gray sporulation

Further resources

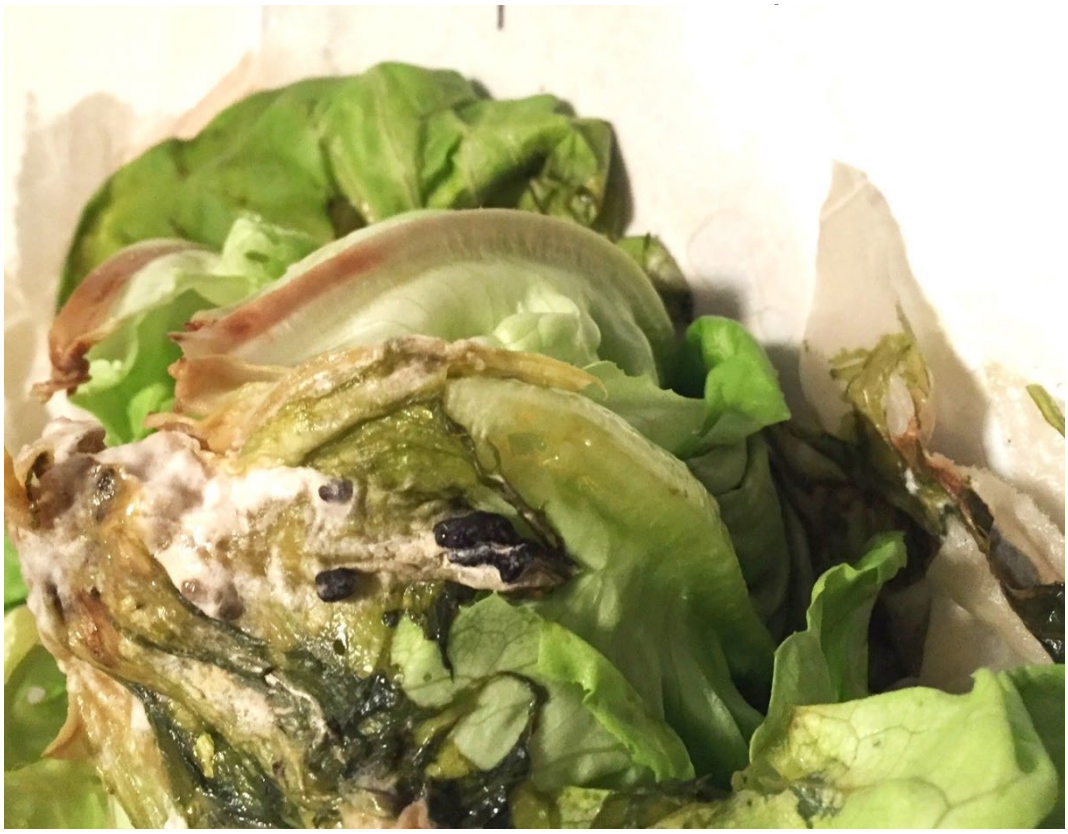
- McGrath, M. 2019. Managing basil downy mildew in the greenhouse. E-Gro Edible Alert Vol. 4, No. 7.
- McGrath, M. 2021. Downy mildew of Arugula. Cornell fact sheet.

Sanitation and Cultural Control Measures

- Start with pathogen-free seed
- Select resistant varieties
- Reduce leaf wetness (maintain low humidity, air circulation, and good plant spacing)
- Keep plants lit during the night or extend the day length: the pathogen needs at least 7 hours of darkness to sporulate
- Remove infected plants

Preventive Fungicides (not exhaustive list)

- Conventional: potassium salts of phosphorous acid (Fosphite) (Group 33); cyazofamid (Ranman)(Group 21); and mandipropamid (Revus) (Group 40).
- Organic: *Bacillus amyloliquefaciens* (Triathlon), hydrogen dioxide (Oxidate 2.0), neem oil (Triact 70), potassium bicarbonate (Milstop), and *Steptomyces* (Actinovate)



Advanced Sclerotinia blight of lettuce. Notice watery soft rot, water-soaked lesions on leaves, and white cottony mycelium. Also notice the black pellet-like sclerotia (i.e. hardened mass of hyphae which persist under extreme environments for subsequent growth).

Photo credit: Joanne Lutz, Griffin GGSPro

Sclerotinia blight (white mold)

Commonly affected crops
- Lettuce, cilantro (less common)

Signs/Symptoms
- Wilting of outer leaves
- Light brown lesions (water soaked)
- Watery soft rot
- White cottony mycelium (under humid/moist conditions)

Further resources
- McGehee, C. and R. Raudales. 2021. Stop the drop in greenhouse lettuce production. E-Gro Edible Alert Vol. 6, No. 16.

Sanitation and Cultural Control Measures
- Inspect incoming plants/liners
- Avoid growing outdoor/soil lettuce
- Avoid cool/damp conditions
- Maintain good airflow and avoid tight plant spacing
- Remove infected plants

Preventive Fungicides (not an exhaustive list)
- *Bacillus amyloliquefaciens* (Triathlon BA, Double Nickel)
- *Bacillus subtilis* (e.g. Cease, Companion)
- *Streptomyces* (Actinovate)

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