

# Winter Greens: Diseases and their Management

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With the rapid growth in winter marketing opportunities, more growers are using their hoop houses (high tunnels) for winter greens production. Growers face a different set of challenges in carrying plants through the short-day, low-light conditions and cold temperatures of December and January. A common strategy for getting through this period is to plant beds early so that the greens reach nearly marketable size by mid-December, then 'bank' these plants for harvest through the low-light period. Each season is different, and the planting dates that work in one year might not give the same results in the next. A warm fall will result in faster, more succulent growth of lettuce and Brassica greens. Warm temperatures also favor higher humidity in the hoop house, and greater need for ventilation.

Conditions that allow for greens growth will also favor disease spread. If disease is present, the first step in determining a control strategy is an accurate diagnosis of the problem. Contact the UMass Disease Diagnostic Lab at 413-545-3209 for more information.

**Downy Mildew** diseases are caused by a group of fungus-like organisms: they are not true fungi, and are similar to *Pythium* and *Phytophthora* species. Downy Mildew pathogens are host specific. Downy Mildew of lettuce is caused by *Bremia lactucae*, while Downy Mildew of Brassicas is caused by *Peronospora parasitica*. Downy Mildew of lettuce will not affect brassica crops and vice versa. These diseases thrive under the cool, wet conditions of spring and fall and those found in winter greenhouses. Night temperature of 43-50 °F and daytime temperatures over 70°F are ideal. Downy Mildews need wet leaves and high relative humidity (greater than 85 %) to cause disease; under these conditions, disease can occur very rapidly and is difficult to control.

**Symptoms** of Downy Mildew start as yellow to light green, irregular leaf lesions which can become purple to dark brown and are delimited by leaf veins. Under humid conditions, the fungus sporulates on leaf undersides, producing white, tan, gray, or purple downy growth. Symptoms will vary along with the host plant. Infections that occur at the seedling stage can become systemic and dormant. Initial foliar symptoms on true leaves consist of angular, yellow lesions on the tops of leaves with fluffy, white mycelial growth on leaf undersides. Lesions enlarge in wet conditions and become tan and papery.

**Source.** Seed could potentially be an important source of inoculum. Spores may also be transported from bed to bed in the greenhouse in moving air or splashing water. Oospores in crop debris or weeds may also be an important source of inoculum; if present, Downy Mildew may persist and accumulate in the soil. Previously infected crops can cause infection of subsequent lettuce crops especially when the crop is not fully decomposed.

**Management.** The first tactic in disease management is to provide the required cultural conditions for plant growth and development. Management of Downy Mildew diseases consists of managing relative humidity in the greenhouse, strict sanitation, and preventive fungicide applications where possible. It is critical to keep relative humidity below 85 % to decrease sporulation on infected plants and stop germination of spores on healthy plants. This can be done by venting, even in winter. In heated houses, heating will fill the greenhouse with warm, drier air. As many weeds can host Downy Mildew, weed management is important in prevention and management of the disease.

If Downy Mildew is present:

- Remove and destroy the infected crop and crop residue.
- Provide adequate ventilation.
- Seed or transplant at lower densities to reduce moisture in the canopy.
- Do not replant the same beds with the same crop family. Allow enough time for crop debris to decompose completely. This may require 1-2 year rotations and requires careful record keeping and planning. Consider rotating whole houses among crop families, rather than combining multiple crops in each hoop house.

To prevent outbreaks:

- Start with certified, disease-free seed and use resistant cultivars if available.

- Increase plant spacing for better air circulation.
- Irrigation practices play an important role in Downy Mildew epidemics. Overhead irrigation promotes disease by increasing leaf wetness periods and relative humidity within the plant canopy. Water in the morning so that plants will dry quickly. Subsurface drip irrigation results in a less conducive environment for Downy Mildew.
- Fungicide applications. Oomycete-specific fungicides are most likely to be effective. Effective organic fungicides are not available. Lettuce: Ranman, Alliette, Revus and Ridomil Gold Bravo. Check label for allowed greenhouse uses. See New England Vegetable Management Guide for more details.

### **Rhizoctonia**

*Rhizoctonia solani* causes damping-off, root rot, crown rot, web blight, and stem canker in a wide range of greenhouse grown crops in both seedling trays and ground-grown plants. It is favored by a warm and wet environment. *Rhizoctonia* is a natural inhabitant of the soil and can survive there indefinitely in the form of sclerotia or mycelium. In addition to its direct impact *Rhizoctonia* infection provides an entry for secondary, soft rot bacteria. This fungus is more active in the upper portion of the soil. The occurrence of *Rhizoctonia* crown rot is influenced by previous crop, the length of time between crops, and the particular isolates present.

**Symptoms:** A major symptom in seedlings and young plants is crown rot, which results in the death and decay of older leaves and may lead to plant collapse. You may first notice the decay of leaves that grew from the crown, as in lettuce or tatsoi. Under very high humidity in a dense canopy, a spiderweb-like white growth of the mycelium from plant to plant (called 'web blight') often develops. *Rhizoctonia* is common in seedling trays, where it may infect seedlings throughout the entire tray.

### **Management:**

- Provide conditions for healthy growth of seedlings: adequate spacing, good air circulation, fertility. Under winter growing conditions, lack of warmth and light or unexpectedly lush growth can foster outbreaks of *Rhizoctonia*.
- Sanitation: Remove and dispose of infected crop debris rather than tilling it in.
- Avoid planting into soils with undecomposed crop residue as *Rhizoctonia* has a wide host range and persists in crop debris. Allow time for decomposition of crop residue before reseeding greens. Note: tomatoes set out for high tunnel production (especially larger transplants) are not as highly susceptible as small-seeded crops like greens, but can become infected.
- Avoid spread by people. The pathogen is easily introduced into the growth medium by soiled hands, tools, flats, and colonized transplants.
- Moisture management: Ensure air circulation, control weeds, and avoid over-irrigation.
- Biological control agents *Trichoderma* (RootShield, Planter Box) and *Streptomyces* (Mycostop, or Actinovate) applied to the soil between crops may reduce disease.
- Control Fungus gnats and shore flies. Fungus gnats and shore flies may cause wounds and also introduce and spread this fungus within a crop. Biological and chemical methods are available for controlling these insects.
- Avoid mechanical damage, which can predispose plants to *Rhizoctonia* infection.
- Keep hose-ends off floors as *Rhizoctonia* can persist in dirt and debris on concrete floors.
- Use soil-less growing medium and clean pots and flats.
- Fungicides: Quadris, Endura, and Rovral 4F are registered on lettuce. Terrachlor is registered on Brassica crops.

For more information see the UMass Floriculture website

<http://extension.umass.edu/floriculture/fact-sheets/damping-bedding-plants-and-vegetables>

The Floriculture website has a wealth of fact sheets on greenhouse insects, diseases, and crop production. See also the **New England Vegetable Management Guide** for updated section of vegetable transplants.

--M. Bess Dicklow and Ruth Hazzard. Sources: MB Dicklow, Tina Smith.