

## PLANT DISEASES

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Alfalfa diseases can be serious problems. The major diseases can be checked primarily by resistant varieties supplemented by good sanitation, including clean seed and clean machinery and irrigation water, control of weed hosts, and crop rotation.

### CONTENTS

Verticillium Wilt .....	1
Anthracnose .....	2
Bacterial Wilt .....	3
Sclerotinia Crown and Stem Rot.....	4

has become a major disease problem in the Pacific Northwest. This disease can increase rapidly and may infect more than 50% of the plants in a hay field within two to four years after initial infection. Loss of plants in a field generally does not affect seed yield as severely as it does hay yields.

**PLANT DISEASES** are usually not as serious in alfalfa seed as in alfalfa hay production. Management for maximum seed yield involves fewer irrigations and fewer harvest operations, both of which help reduce the onset of disease. Furthermore, alfalfa can tolerate stand reductions without showing significant seed losses. This is due, in part, to the large number of flowers produced and fertilized in a moderately populated alfalfa stand.

However, Verticillium wilt and other diseases are sometimes major concerns. Serious problems may occur when disease organisms such as the Verticillium wilt fungus are carried on or in seed, or when alfalfa or crops in rotation with alfalfa act as a reservoir for a disease organism which infects later crops. Seed growers should be aware of disease problems in their area and avoid attempting to grow seed of susceptible varieties in known problem areas.

### VERTICILLIUM WILT

Verticillium wilt, caused by *Verticillium albo-atrum*, has been a very destructive disease of alfalfa for several decades in northern Europe and recently



Alfalfa plant showing Verticillium wilt symptoms. Infected stems remain erect and have wilted, chlorotic leaves.

Verticillium wilt is caused by a soilborne fungus that spreads readily in the form of spores and mycelium in diseased plant material carried by the wind, water, and on farm equipment. Mycelium and fungus spores can be carried on the surface of seed and in plant debris in seed lots. It is known that the Verticillium organism can be carried within seeds, but the extent of seed transmission in the spread of Verticillium wilt has not been established. Moderate temperatures favor growth of the disease organism, while stress created by warm weather promotes the appearance of symptoms. These symptoms are most prominent just prior to first harvest and in the fall.

Leaf symptoms generally first appear on single stems on scattered plants in a field and then progress to several stems and eventually to all stems on a plant. Leaves on affected stems wilt and lose their green color. Characteristically, a V-shaped segment at the leaflet tip, or one side of the leaflet, or the entire leaflet may become chlorotic and lose its green color. Chlorotic areas are often a tan to copper or orange color. Regrowth appears normal, but symptoms soon recur and plants finally die. Roots of infected plants may show internal brown or light orange streaks or general brown or light orange discoloration near the crown.



Symptoms of Verticillium wilt on alfalfa leaves. Segments of the leaflets are chlorotic and some leaflets are wilted and twisted.

Symptoms of Verticillium wilt are similar to those of Fusarium wilt. Confirmation of either disease is accomplished by pathogenicity tests. Either disease may affect one or more stems on a plant. The major difference is that Fusarium-infected stems actually wilt, while Verticillium-infected stems remain erect with only the leaves wilting. A cross section of the root in a Fusarium-infected plant shows a distinct red or rust colored streak while Verticillium is an indistinct yellow to brown or light orange. Root discoloration may be absent in Verticillium-infected plants.

Control of Verticillium wilt consists of resistant varieties and sanitation practices. High quality clean seed should be planted. Seed treatment with Thiram or other registered fungicides will help reduce infection due to contaminated material in the seed. All machinery should be cleaned and disinfected before leaving infected fields. It is also helpful to cut noninfected fields first to reduce the amount of disease inoculum carried from one field to the next. Crop rotations with three to four years out of alfalfa should be effective in reducing disease incidence. Several weeds are hosts of the alfalfa strain of *Verticillium albo-atrum* and managing weeds during and between alfalfa plantings may help control Verticillium wilt. The following weeds and crops can harbor the Verticillium fungus with very mild or no symptoms:

- shepherdspurse (*Capsella bursa-pastoris*)
- buckhorn plantain (*Plantago lanceolata*)
- ladysthumb (*Polygonum persicaria*)
- common groundsel (*Senecio vulgaris*)
- wild mustard (*Brassica kaber*)
- curly dock (*Rumex crispus*)
- black nightshade (*Solanum nigrum*)
- eggplant (*S. melogena*)
- Watermelon (*Citrulus vulgaris*) and cantaloupe (*Cucumis melo*) are very susceptible.

## ANTHRACNOSE

Anthracnose is caused by the fungus *Collectotrichum trifolii* which attacks the lower stems and the crown of alfalfa plants. It is found in alfalfa grown for seed production and may be a more serious problem than

generally recognized because of the crown rot phase of the disease.

Infected stems have straw-colored sunken areas that are oval to diamond shaped with dark borders. They may contain small, black fruiting structures (acervuli) that are visible with a hand lens. Fruiting structures are more prevalent under center pivot irrigation. Stems wilt suddenly to form a characteristic "shepherd's crook" as the infected areas coalesce and girdle the stem. Dead straw-to white-colored shoots may be seen scattered throughout the field. These straw-or white-colored stems and leaves should not be confused with "white flagging" caused by stem nematodes.

Infected crowns will have a bluish black discoloration and stems may be dead and broken off at the crown. Crown infections predispose plants to winter injury or may kill plants directly.

The anthracnose fungus overwinters in plant debris and in stems and crowns of infected plants. The

disease is favored by warm weather and moist periods of rain, dew, and irrigation.

The severity of anthracnose can be reduced by growing resistant varieties, proper irrigation management, and cleaning plant debris from equipment before leaving a field.



Anthracnose lesion on alfalfa stem.



Symptoms of anthracnose in alfalfa, including a dead shoot with typical "shepherd's crook."

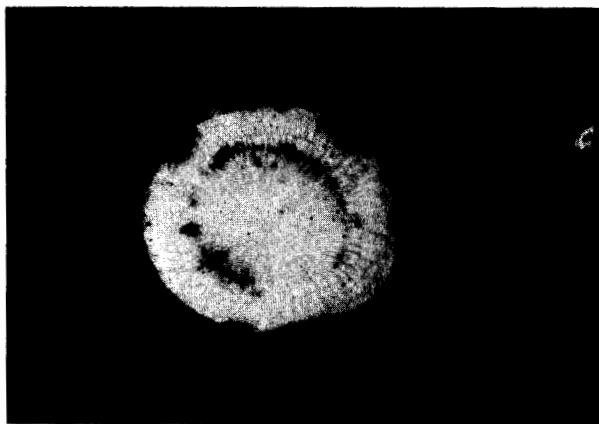
### BACTERIAL WILT

Bacterial wilt is caused by the bacterium *Corynebacterium insidiosum*. It can be a serious problem in most alfalfa production areas if resistant varieties are not grown. Infected stands of susceptible varieties may become unproductive in three to four years.

Infected plants are usually scattered throughout a stand and are stunted and yellow-green in color. Leaflets are yellow, reduced in size, and are cupped or curled upwards. Taproots of infected plants have a yellowish brown discoloration in the outer vascular tissue. The entire vascular area is discolored in severely infected plants.

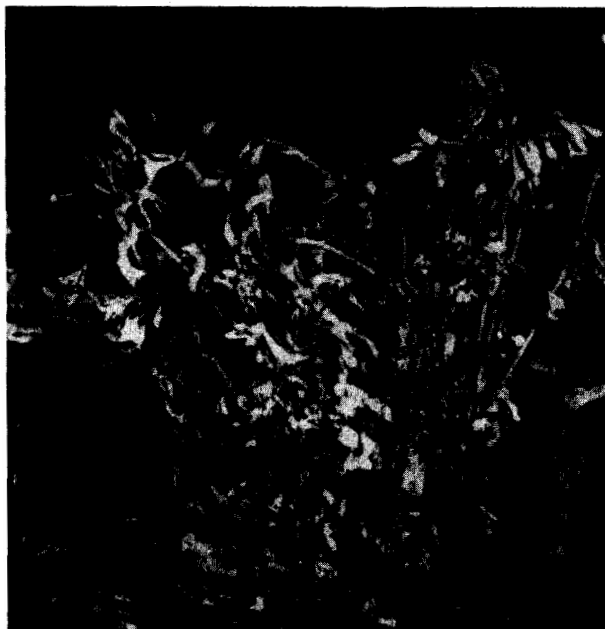
The bacterial wilt organism survives to a limited extent in seed and very readily in infected plant root material in soil. It infects plants through wounds in the roots and crown, and eventually enters and plugs

the vascular tissue of the plant. The bacteria are spread by water and farm equipment.



Cross section of alfalfa taproot showing discoloration in outer vascular tissue caused by bacterial wilt.

Control can be achieved by growing resistant varieties and managing stands to minimize injury to alfalfa crowns and roots.



Symptoms of bacterial wilt on alfalfa foliage.

## SCLEROTINIA CROWN AND STEM ROT

Sclerotinia (*Sclerotinia trifoliorum*) may be a problem in solid seeded seed production fields when excessive top growth becomes lodged and matted under high moisture conditions in spring and early summer. Large numbers of sclerotia (resting bodies) are produced to provide severe infection in subsequent years. The disease is characterized by a white, fluffy mycelium growing externally on the alfalfa stems and leaves. Leaves and stems become slimy as the organism destroys plant tissue. Large numbers of ascospores are produced and discharged into the air to establish infection in a widening area.

There are no resistant varieties. Control is accomplished through planting clean seed (free of sclerotia), establishing seed production fields with spaced rows instead of broadcast or close drilled rows, avoiding application of nitrogen in the spring, and avoiding excess top growth through control of water and beat back of top growth in early May. Deep plowing can be used to bury sclerotia to reduce future infection after alfalfa is taken out.