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Crop Pest Management Series
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Edible Bean Disease and Disorder Identification

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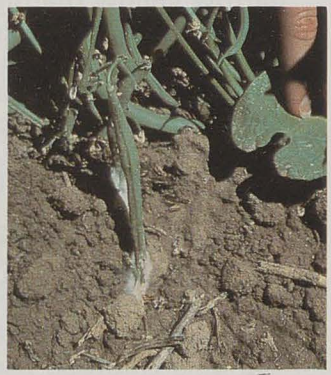
1. White mold, cottony growth on adzuki bean

2. White mold, cottony growth on pinto bean

3. White mold, sclerotia, close up

4. White mold, germinating sclerotia

5. White mold, initial infection on pod



6. White mold, internal pod infection on kidney bean

7. Bean rust, early (fleck) stage on pinto bean

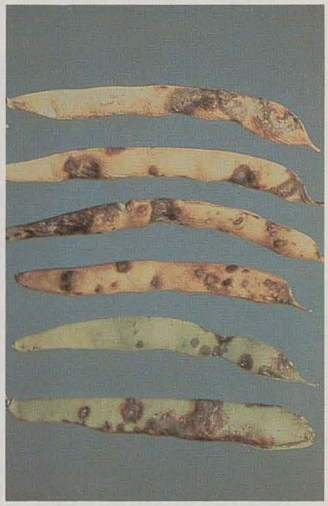
8. Bean rust, summer spore stage (urediospore) on pinto bean

9. Rust pustules (spore clusters) on pods of pinto bean

10. Bean rust, overwinter spore stage (teliospore) on pinto bean

11. Common blight symptoms on navy bean

12. Common blight symptoms on pods



13. Halo blight symptoms on edible bean

slides continued on page 4

WHITE MOLD

The characteristic symptom of white mold is a white cottony growth near the stem base (1, 2).* The fungus also produces sclerotia, which are black, hard mats of mycelium in or near the cottony growths (3). Sclerotia survive adverse (winter) conditions in the field. The disease starts when the plant growth covers the space between the rows and when the soil surface is cool and moist enough for sclerotia to germinate (4). Initially the fungus colonizes plant debris and then spreads to plants in the row. Infection will kill some plants and severely reduce the yield of those plants with only pod infections (5, 6).

White mold is caused by the fungus *Sclerotinia sclerotiorum.* High humidity and temperatures between 60° and 70° F. favor the growth of this fungus.

Crop rotation helps prevent the build up of enough inoculum to cause white mold in edible beans. A rotation of three to four years between beans and other susceptible crops is recommended. Sunflowers, potatoes, sugar beets, and soybeans should not be grown in close rotations with edible beans since they are susceptible to white mold. Small grains, corn, or forages are recommended in a rotation with edible beans to prevent increase of white mold inoculum.

One to two applications of the fungicide Benlate has provided good control of white mold. When applying this fungicide, it is very important that the first application be made when the field is in 10 to 25 percent bloom, and the second application should be made after the full bloom stage or during late bloom. Benlate applications should be considered if white mold has been a problem on the field in previous years, or when cool conditions are forecast for the last month of the growing season.

RUST

Rust appears first as small chlorotic pale spots (lesions), usually slightly yellow with a small dark center (7). As the disease progresses, these spots enlarge and are covered with brick-red rust (summer) spores, which spread the disease (8, 9). With cooler weather these lesions will develop black (overwintering) spores (10).

Bean rust is caused by the fungus *Uromyces phaseoli* var. *typica,* and symptoms appear 10 to 15 days after infection. The earlier these symptoms appear the greater the potential for crop yield reductions.

Cultural practices are important in slowing initial infection by this fungus. Three to four year rotations are recommended for control of this disease. Following bean harvest all refuse should be plowed under as completely as possible, because refuse is a primary source of inoculum for the next growing season. Chemical control of early rust infection is easily accomplished when the disease is identified in the early stages. Fungicides such as coppers, manebs, and zinebs will control the disease. For details see Agriculture Extension Service Plant Pathology Fact Sheet No. 20 (1975), *Pinto Bean Rust Control with Fungicides.*

COMMON AND HALO BLIGHT

Common blight first appears as small translucent water-soaked spots on the leaf. As these spots enlarge, the tissue within each dies and forms brown lesions with a narrow yellow margin (11). In some cases, a yellow bacterial discharge may be seen. Water-soaked sunken lesions are also found on the pods (12). These lesions turn brownish-red with age. The bacteria may also infect the vascular system, destroying the node and killing branches. Infected seed is discolored and shriveled.

Halo blight may have symptoms similar to common blight, but a distinguishing characteristic of halo blight lesions is a large yellow halo around the individual spots (13, 14). This chlorotic zone or halo may be as large as one-half inch in diameter. The discharge found in these lesions will be a cream or silver color. Systemic plant infection with these bacteria causes stunted plants with small, chlorotic trifoliolate leaves.

Common blight is caused by *Xanthomonas phaseoli,* and halo blight is caused by *Pseudomonas phaseolicola.* These bacteria are introduced to a new area by infected seed. Organisms overwinter in seed or plant debris left in the field. Common blight development is favored by relatively high temperatures; halo blight infection is favored by relatively cool conditions. Damp weather favors the spread and development of both diseases.

Disease free seed can prevent these diseases. A three to four year rotation provides ample time for any pathogenic

*numbers refer to photos on pages 1 and 4

bacteria in plant debris to die. Seed treatment with streptomycin has not proven effective in eliminating these bacterial blights, but it may reduce the incidence of disease resulting from surface contamination of the seed. Copper fungicides have been used for controlling bacterial blights, however, research has not shown these fungicides to be effective against the bacterial blights in Minnesota.

An additional bacterial blight caused by *Pseudomonas syringae* (brown spot) can also attack edible beans, but it has distinctly different symptoms (15). The same control measures used for halo and common blight are recommended.

ROOT ROTS

Root rotting fungi present in the soil live on decomposing vegetation. These fungi attack bean plants whenever the fungus population is large and soil and weather conditions are favorable. *Fusarium solani* and *Rhizoctonia solani* commonly cause root rots in Minnesota edible beans.

The *Fusarium* root rot may be identified by reddish colored lesions on the taproot, which later turn brown (16). This discoloration may extend up to the soil line. Plants seriously infected are stunted and will have yellow leaves, and branch roots that develop from the taproot are killed. *Rhizoctonia* root rot may cause the seedlings to be twisted and stunted. Reddish-brown cankers appear on the roots partially below or at the soil line and often girdle the stem (17). Plants infected with *Rhizoctonia* may be stunted and have yellow leaves.

Rotation is very important in controlling the root rots. Rotation of three to four years between bean crops is effective in preventing the build up of these soil pathogens. Other crops such as sunflowers and potatoes, which are susceptible to these fungi, should not be used in a close rotation with edible beans. Corn, alfalfa, and small grains are generally considered good rotation choices.

DAMPING OFF

Severely infected plants die shortly after germination or emergence, but damping off is also suspected when there are occasional spaces in a row where plants have not emerged, or when plants wilt shortly after emergence. These wilting plants soon die and dry up, leaving additional bare spaces in the rows. This disease is caused by several types of soil fungi.

Good quality seed is very important in preventing damping off. Cracks in the seed coat permit soil borne pathogens to enter. Poor quality, weathered seed may rot in the soil before germination. Seed treatment is available to protect against many fungi known to cause damping off. Seed should always be treated with fungicide to help prevent this particular disease.

COMMON BEAN MOSAIC VIRUS

Common bean mosaic virus stunts the plant and causes mottling and leaf malformations (18). Trifoliolate leaves affected with mosaic usually have irregular shaped, light yellow and green patches and may also show considerable puckering (19). Infected leaves are narrower and longer than normal, with downward cupping. Bean plants attacked early in the season are yellowish, dwarfed and spindly. Dark necrotic lesions are sometimes found on the roots, petioles, and leaf veins. The virus can be spread by direct contact, by insects, and by seed.

The only satisfactory methods of control are use of resistant varieties and good quality seed. Removing infected plants from the field reduces the amount of secondary spread but may be costly on large acreages.

BRONZING

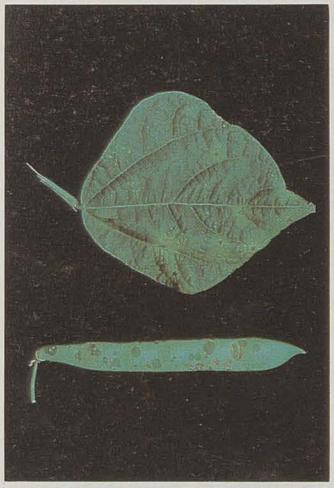
Bronzing of leaves can be caused by sun scalding or by ozone. Sun scalding is caused by the concentration of the sun's heat on leaf tissue. Ozone damage is caused by an air pollutant that originates from large cities and power plants. Polluted air can travel long distances at high altitudes and follow down drafts into bean fields.

Damage from ozone usually appears as small sunken necrotic lesions on the upper leaf surface. The leaves then develop a bronzed appearance as the lesions enlarge and extend deeper into the leaf interior. Older leaves appear to bronze more readily than younger leaves. Severely bronzed leaves drop off prematurely, causing yield reduction.

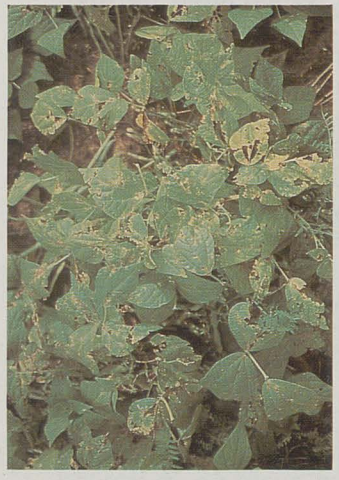
Sun-scald bronzing is most apparent on the side of the row receiving the most direct rays from the sun. Bronzing symptoms (20) are usually most obvious during the later part of the growing season.

There is no control for bronzing, and no data are available in Minnesota showing the extent of yield reduction.

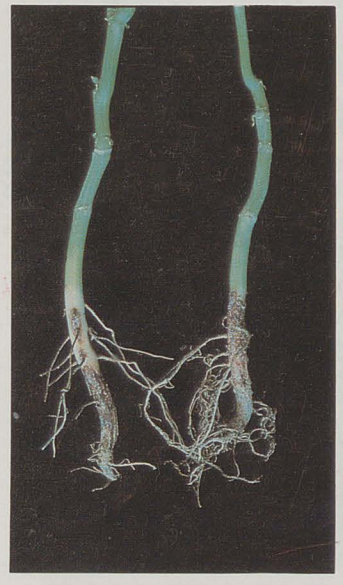
14. Halo blight symptoms on leaf and pod of edible bean



15. Brown spot (*Pseudomonas* sp.) on edible bean



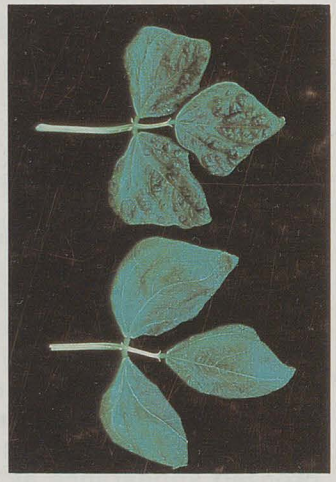
16. *Fusarium* sp. rot on edible bean



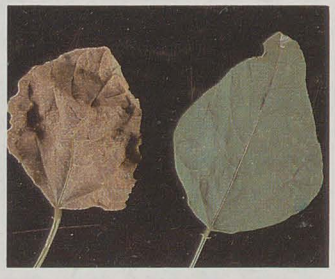
17. *Rhizoctonia* sp. rot on edible bean

18. Bean common mosaic virus symptom on edible bean

19. Bean common mosaic virus symptom on trifoliolate leaves



20. Bronzed versus healthy leaves



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