UNIVERSITY OF IDAHO
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HALO BLIGHT

By H. S. Fenwick and L. L. Dean

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A BASIS FOR QUALITY

The Idaho seed bean industry can only retain or hope to expand its market on the basis of quality. In Idaho-grown bean seed, quality is synonymous with freedom from seed-borne pathogens. It matters very little from the standpoint of seed production that yields of beans in Idaho are usually not reduced by halo blight. The mere presence of a trace amount of the bacteria in a seed lot renders that seed unfit for planting in most areas where Idaho-grown bean seed is normally purchased. Every bean grower in Idaho, whether he produces seed beans or dry edible beans, should be concerned with the early discovery of infested fields in order that the disease may possibly be brought under control, and spread from field to field arrested. Dry weather during the growing season will help reduce the problem of halo blight, but the Idaho bean seed producer must be prepared to do all he can to control this disease.

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ure 1. A halo blight lesion. One of the first symptoms the disease.

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As a bean grower, you will need to recognize halo blight should it occur on your farm or in the vicinity of your farm. The colored plates in this bulletin will assist you in identifying the disease. Keep the bulletin in a convenient place for ready reference.

Most Idaho bean growers have never seen halo blight. Only 77 Idaho bean fields were identified as being infested with halo blight during the 1964 crop year. If you suspect infection among bean plants in your field, notify your seed company fieldman or your county agent. If this is done, steps can be taken to assist you and other Idaho growers in the production of high-quality, disease-free seed beans for which Idaho has been well known.

What is the first visible symptom of halo blight?

Look closely at the upper surface of the leaf in Figure 1, above. You will see a small water-soaked area similar to a grease spot. This is usually, but not always, surrounded by a yellow halo. The lesion and halo usually become prominent on the leaf 6 to 12 days after invasion by the halo blight bacteria.

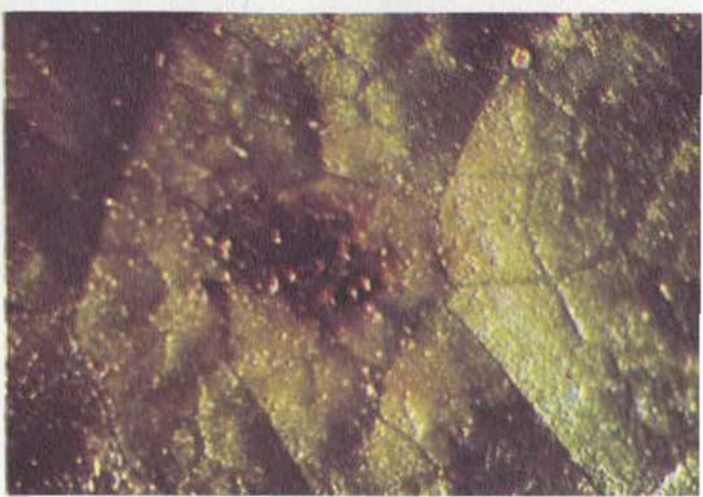

Figure 2. An individual leaf lesion, greatly enlarged. This is typical of those found on diseased plants 5 to 10 days after infection has occurred. If infected plants are present in your bean field, this may be the first symptom of halo blight which you find. Be particularly alert for such leaf lesions 1 to 2 weeks after summer rain or hail storms occur on your farm.

How does the leaf lesion develop?

Leaf lesions usually enlarge rapidly to become as much as ½ inch across. These lesions, which at first appear dark green, quickly become reddish-brown in the center. Usually a chlorotic zone or halo becomes prominent surrounding the lesion. These may be isolated on the leaf or they may be so closely spaced that the whole involved area of the leaf becomes chlorotic.

Are there other symptoms?

Yes. Chlorosis may develop in the young trifoliate leaves in the top of the plant as in Figure 3. This is an important aid in detecting halo blight. The diagnostic leaf, pod or stem lesions may frequently be found by close examination of such chlorotic plants. Plants which develop lemon-yellow color in the younger top leaves should be examined carefully for lesions on the older portions of the plant. Do not overlook the possibility of a lesion or bacterial exudate at the point of attachment of the primary or cotyledonary leaves with the stem.

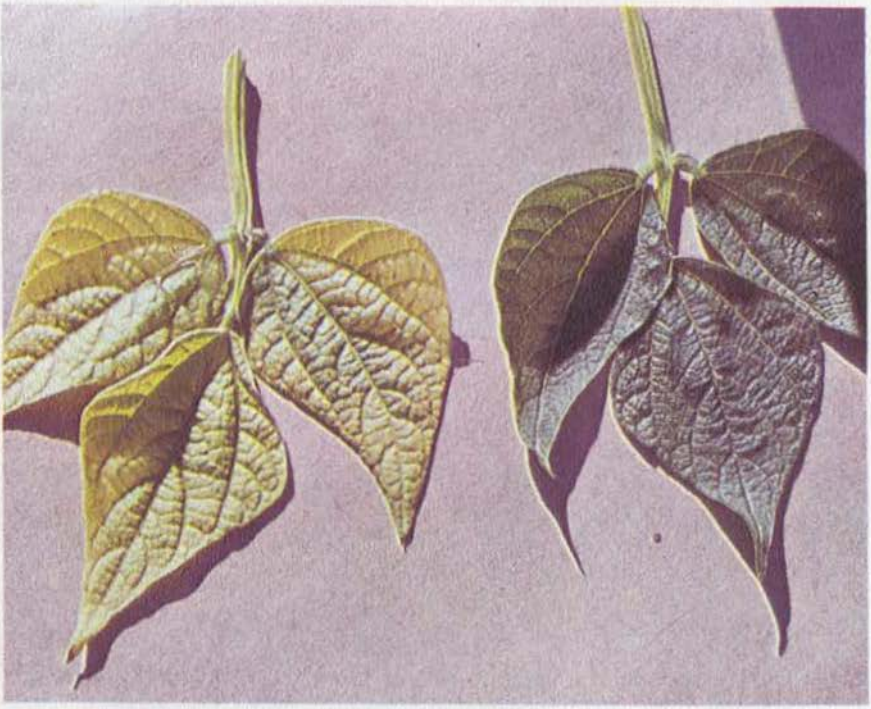

Figure 3. Chlorosis in young trifoliate leaves, another symptom of halo blight.

Figure 4. Bacterial exudate, often found on the stem near the first or second node as halo blight progresses in the plant.

How are the stems and leaf petioles affected?

Water-soaking in spots or streaks may be particularly apparent at the point of attachment of a branch or a petiole with the main stem. Brownish discoloration of the vascular system may become evident as the disease progresses. Surface cankers as well as bacterial exudate similar to the droplet in Figure 4 may form on the stem in the vicinity of the first or second node. Heavily podded plants may break over at this point. The exudate of halo blight is cream- or sliver-colored.

What do pod lesions look like?

Pod lesions look much like leaf lesions. Figure 5 shows lesions on both green and mature pods. In the early stages of development these appear as water-soaked spots. Later as the pods mature, distinct, often sunken lesions form. Note those on the yellow or "buckskin" pods in Figure 5. The center pod, fourth from the left, shows a typical suture infection. This extends the length of the pod, indicating generally the area invaded by the bacteria. It is quite probable that many of the seed contained in these pods have been invaded or contaminated by the bacteria which cause halo blight.

Figure 5. Halo blight pod lesions. Color and general appearance, when examined closely, will usually be sufficient to distinguish between halo blight and pod lesions caused by parasitic or saprophytic fungi common in Idaho.

What is general effect of halo blight upon plant?

Halo blight may be manifested in various ways. Any of the symptoms described and illustrated may occur. Symptoms may vary from complete killing of infected plants to very indistinct symptoms which are not easily found. Infected plants at relatively high temperature may not develop typical halos around lesions. Pod lesions may occur without conspicuous leaf lesions. Careful observation is important. The disease is not always easily found in Idaho bean fields even when present. Scattered plants which develop a lemon-yellow color, Figure 3, in the younger top leaves should be examined carefully for any or all of the diagnostic symptoms such as leaf, pod, or stem lesions, and bacterial exudate.

Does infected bean seed appear different?

Infected bean seed may not appear different from non-infected seed. Occasionally, however, infected seed may be shriveled or discolored. It is usually not possible, however, by ordinary visual examination, to distinguish infected from non-infected bean seed.

What are the typical symptoms of primary or seed-borne infection?

It is not always possible to determine whether infection in a plant resulted from seed-borne bacteria or whether the disease originated from bacteria spread from an adjacent infected plant. This is particularly true if the plants have been damaged by hail.

Frequently plants arising from infested seed will develop a cankerous reddish-brown lesion and bacterial exudate at the point of attachment of the primary leaves. As pod development progresses the plant may break over at this weakened node.

Soon after bean seedlings emerge it is occasionally possible to find well developed lesions on the primary or cotyledonary leaves which may be indicative of seed-borne infection. If weather conditions are favorable for development of halo blight such seedlings may be killed rather quickly.

It is very likely, however, that seedlings infected from infested straw in the field soil would also exhibit symptoms similar to those incited by the seed-borne bacteria.

Will dry weather eliminate the disease?

Dry weather will not necessarily destroy the organism responsible for halo blight. If an infected plant is killed while quite small it may be covered with soil during cultivation, and the bacteria would not likely be splashed by rain or hail onto surrounding plants. An infected plant may appear to recover from the disease under dry conditions. Any time before harvest, however, that the weather again becomes favorable, the bacteria can be spread to surrounding plants.

Figure 6. Infected plants may fail to grow normally and remain stunted such as these. This field was subjected to severe rain and hail storms several weeks before it was photographed.

What effect does temperature have upon halo blight?

High temperatures restrict the degree of yellowing in halo blight infected plants and halos may not develop around leaf lesions at high temperatures. A toxin produced by the bacteria causes the halo and the chlorotic symptoms. Temperatures above 20 C. (68 F.) restrict production of the toxin. Temperatures below 20 C. (68 F.) are more favorable to toxin production. More vivid symptoms also occur in halo blight infected plants at temperatures below 20 C. (68 F.) than at temperatures above 24 C. (75 F.). More infection sites occur and larger numbers of plants become infected, however, at moderately high temperatures than at low temperatures.

How is halo blight spread?

The bacteria which causes halo blight are spread from area to area chiefly through infested seed. Local spread from plant to plant may be accomplished by splashing rain or sprinkler irrigation, hail, man, insects, animals, and farm equipment. The pathogen may be spread widely by any means which can carry it. This includes seeds, man, insects and other animals, wind blown soil particles, and wind blown plant parts.

How is the disease carried over from year to year?

The bacteria which cause halo blight overwinter in or on infested seed and probably on plant debris in the field. The pathogen then invades the young bean seedlings when they germinate and the disease cycle begins again.

How does the infection spread to the seed?

There is some disagreement among plant pathologists on this question, and more detailed research is needed to answer this question fully. Some suggest that the bacteria multiply within the leaf tissue, invade the veinlets, pass into the veins, and spread systemi-