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The Control of Common Blight and Rust in Field Beans

JOHN L. WEIHING

THE two most common diseases of field beans in western Nebraska are rust and common blight. Rust, which was especially severe in 1949 and 1950, appears only in occasional years. Common blight, however, can be expected in at least some fields every year. Over the years it has caused more reduction in yield and seed quality than any other single factor.

COMMON BLIGHT

Symptoms

The most conspicuous common blight symptoms are found on the leaves. An infected leaf has large, brown, dead areas that are irregular in outline. Between the dead and healthy green tissues there is often a narrow, greenish-yellow band (Figure 1).

The earliest symptoms are small, greasy or oily appearing spots on the underside of the leaf. As these spots age, the affected area gradually enlarges and changes to light green. Finally the area becomes dry, brown and brittle, and appears burnt. Several of these spots may enlarge until nearly the entire leaf is involved.

This disease may also appear on the stems and pods (Figure 2). Places of infection on these structures are at first dark green. As the

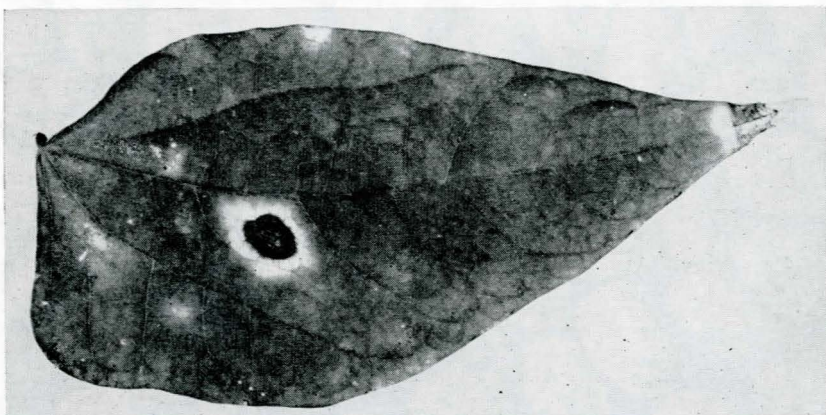


FIGURE 1.—A bean leaflet with two prominent common blight lesions, one near the center and the other at the tip. The several small but pronounced light areas distributed over the lower half of the leaflet are young developing lesions. Spots such as these continue to enlarge and cause the leaf to die.

affected areas age, they become dry and take on the appearance of reddish-brown streaks or spots.

Common blight causes yellowish or varnished spots on light-colored seed (Figure 3). If the entire seed is infected it may become



FIGURE 2.—Common blight on the bean pod. The darker areas on the pod are dark green and are caused by common blight infection.



FIGURE 3.—Common blight symptoms on bean seed. The seeds on the left were taken from pods infected with common blight as shown in Figure 2. The seeds on the right came from healthy pods. Infected beans become shriveled and discolored; white beans discolor yellow whereas tarnished brown areas are found on pinto beans.

wrinkled and yellow. Discoloration is not so apparent on the naturally colored seeds.

The stems of plants from infected seed are often girdled by a reddish canker or dark stem rot. The stem girdle causes the plant to break over easily, especially during storms. In the daytime, plants from infected seed often wilt before those produced from healthy seed.

The symptoms of common blight should not be confused with damage resulting from sunburn or wind-blown sand. Early in the season when the plants have only one or two trifoliate leaves, considerable injury is likely to occur from sun and sand. The injury begins as small, brown or bronze patches on the upper surface of the leaf. This affected area increases in size and results in large islands of dead tissue. The dead tissue is thin and brittle, and readily crumbles when dry.

Source of Infection

Common blight is caused by a bacterial organism¹. This organism lives over from year to year in the infected bean foliage and seed. Common blight bacteria can withstand drying and have been known to live on or in bean seed for as long as the seed remains viable.

Beans planted in a field in which common blight occurred the previous year will very likely become severely infected. Rain and wind will carry the bacteria from the old diseased foliage to the growing plants, resulting in infection.

Plants grown from infected seed will probably be diseased. These diseased plants will serve as a source in spreading the common blight to nearby healthy plants. Heavily infected seed may not even germinate or may produce "snake heads" or other types of deformed plants.

Field Spread of Common Blight

Moisture and warm temperatures are essential for the initial infection of healthy tissue. Wounds are not necessary. The common blight bacteria are readily carried in dew or rain drops. Water droplets blown from diseased to healthy leaves are the most common means of spreading the disease. Of course, anything that will transport water droplets, such as cultivator tools or people or animals walking through the field, will distribute the disease.

Distribution and infection are greatly increased during heavy rains accompanied by driving winds and hail. Heavy rain causes water-soaking of the bean leaves. Water-soaked leaves are much more susceptible to infection than leaves of average moisture content. Dust storms may also spread the organisms, sometimes over a wide area.

¹ *Xanthomonas phaseoli* (E. F. Sm.)

Control

Two important measures can be taken to avoid common blight. (1) **Always plant disease-free seed.** Certified seed produced in Idaho is usually free of common blight. For climatic reasons, blight epidemics rarely occur in Idaho. Areas where blight epidemics occur occasionally are not good sources of seed because there is no way of predicting freedom from epidemics. Nebraska-grown seed should not be planted because some of the seed might be carrying the common blight bacteria. (2) **Wait at least two years before replanting a field to beans.** Blight can live over in bean straw for two years. Therefore, beans should not be planted on the same land for at least two years. Even though the previous crop may not have shown any infection, it is unwise to plant beans on the same land.

To avoid spreading blight, the bean grower should not work in his fields when the plants are wet.

No commercially grown varieties of dry bean have proved to be highly resistant to common blight. Attempts to certify field beans in western Nebraska have failed because of the difficulty in roguing blighted plants in the fields.

Seed treatment is of no value in the control of common blight. Spraying and dusting with fungicides and insecticides likewise have not proved to be practical measures for control.

RUST

Symptoms

Generally, bean rust is first found in the lower parts of a field where it develops on the undersides of the lower leaves. Rust spots are about the size of pinheads and protrude through the leaf surface, giving the appearance of many rust-colored eruptions (Figure 4). When the lower side of an infected leaf is rubbed, the fingers will be colored a rusty-red. This is not true for common blight which is sometimes confused with rust.

The earliest symptom of rust is small white specks or flecks on the underside of the leaf. Within a few days these break open into the rust-colored lesions. As the disease continues to develop it breaks through the upper leaf surface, exposing a red lesion on the upper leaf surface as well as below. A week or so after many pustules have appeared, the entire leaf begins to turn yellow. Later it turns brown, shrivels, dries up, and falls from the plant. Often a seriously affected bean field looks as if it had been scorched.

Bean rust attacks mainly the leaves. During heavy epidemics, however, it may be found on the pods and tender parts of the stems and branches.

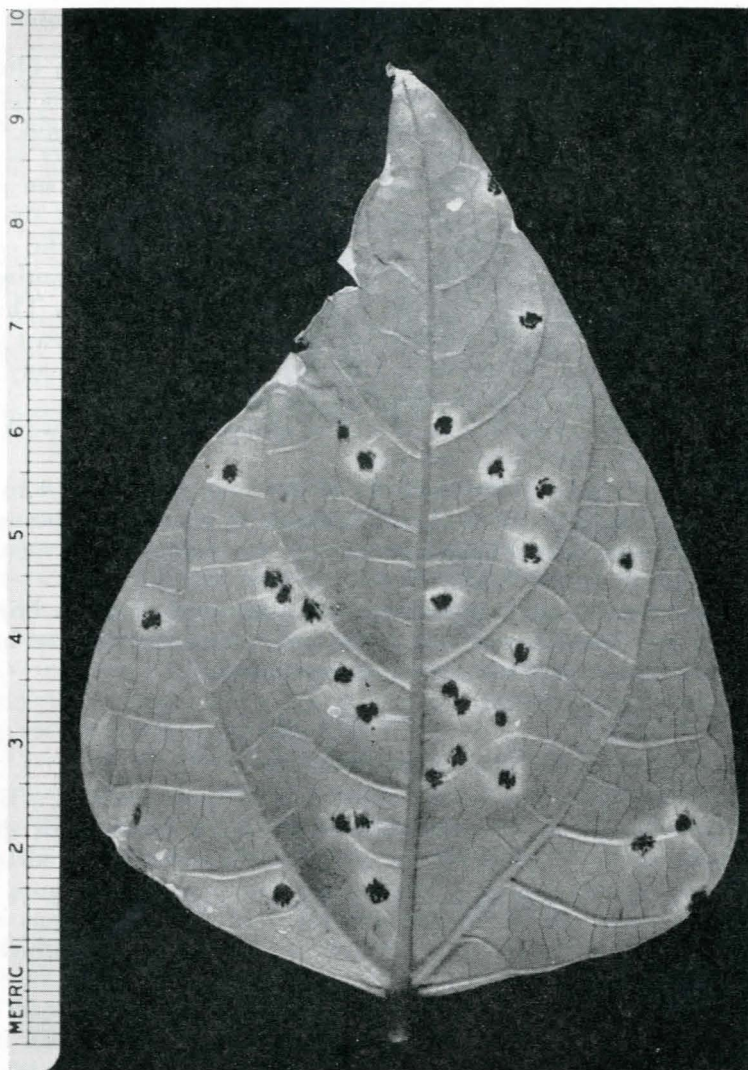


FIGURE 4.—The dark spots shown on the underside of the bean leaflet are rust pustules containing thousands of rust spores (rust seed). While the leaf remains green these spots are rust-colored, but when the leaf turns yellow and dies, the spots turn black.

Source of Infection

Bean rust is caused by a fungus organism ². This fungus reproduces by means of spores. (Spores are equivalent to the seed of green plants.) During its life cycle it produces several different kinds of spores (Figure 5). The red material that is found in the spots on the green leaves is a mass of red spores far too small for the naked eye to discern. These very small spores are easily picked up and carried around

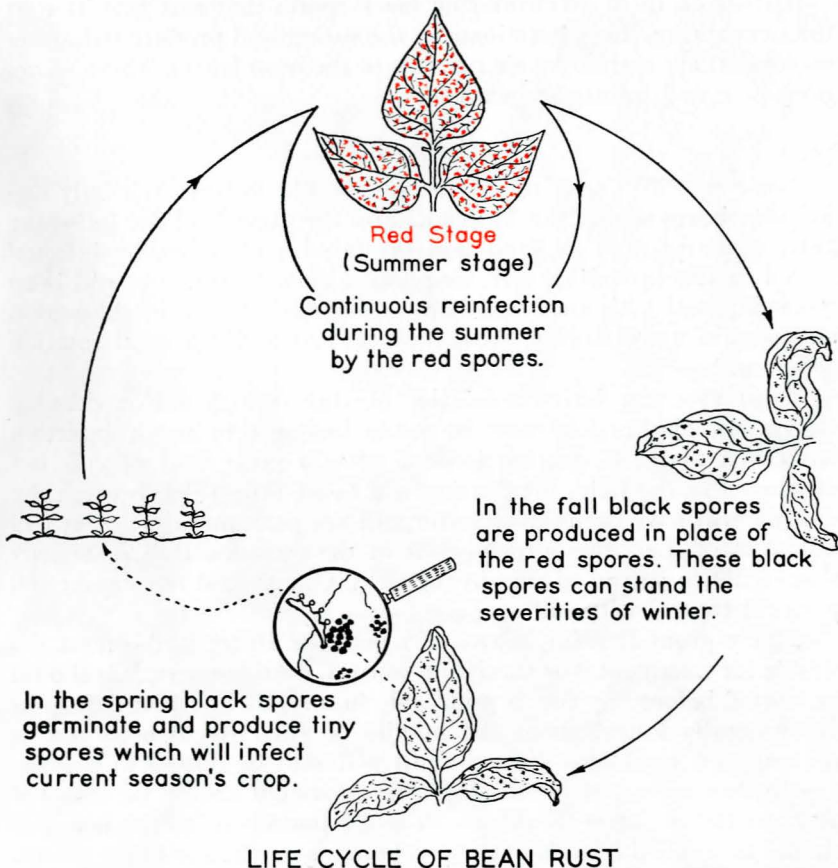


FIGURE 5.—Bean rust changes form in accordance with seasonal changes. The various forms are depicted here.

² *Uromyces phaseoli typica* (Arth.)

by air currents. When they fall by chance on the bean leaf, they germinate and send an infection tube into the breathing pores of the leaf. In 10 to 15 days a red spot containing thousands of spores (rust seed) is produced by this infection.

In the autumn this disease produces spores of another kind. These spores are black and are frequently called the winter spores. They arise in the same spots as the red spores. The black spores are very hardy and can live over the winter in the old bean straw. The red spores, which are called summer spores, are not so hardy. Most of them die during the winter.

It is from these overwintering black spores that rust gets its start the next spring. They germinate in the spring and produce still other spores that are carried by air currents to the bean leaves. These spores germinate and infect the beans.

Control

Since rust lives over the winter on the old foliage, it is only logical that beans should not be planted on the same land the following year. Beans planted on land that produced a crop heavily infected with rust the preceding year, or planted close to stacks of old bean straw infected with rust, will become infected earlier in the season and sustain more damage than those grown under a good rotation program.

Bean rust can be economically controlled with sulfur dusting. Of course, application must be made before very much infection has taken place. If dusting is done after a great deal of rust has developed in the field, the dusting will be of little value because the damage will have been done. Sulfur will not perform miracles. It will kill most of the rust spores present in the pustules, thus materially slowing down spread of rust in the field. One should not expect 100 per cent control with sulfur.

Finely ground sulfur (about 325 mesh or finer) is the most desirable for treatment. For maximum control, dusting operations should be started before any rust is noticeable in a field. The first rust spots are generally found about the middle of July. As soon as rust is noticed in a field, that field definitely should be dusted to prevent any further spread of the disease. The treatment should be repeated at 7- to 10-day intervals. About 20 to 25 pounds of sulfur per acre should be applied in each dusting, depending on the size of the plants.