MSU Extension Publication Archive

Archive copy of publication, do not use for current recommendations. Up-to-date information about many topics can be obtained from your local Extension office.

Bean Rust
Michigan State University
Cooperative Extension Service
Patrick Hart, USDA/SEA-AR; Fred Saettler, Plant Pathology
June 1981
2 pages

The PDF file was provided courtesy of the Michigan State University Library

Scroll down to view the publication.

discontinued

MSU Ag Facts

File: 27.372

BEAN RUST

Extension Bulletin E-893

By Patrick Hart and Fred Saettler*

Revised June 1981

*Extension Specialist, and Research Plant Pathologist, USDA/SEA-AR, Department of Botany and Plant Pathology

BEAN RUST, a disease caused by the fungus *Uromyces phaseoli typica*, infects leaves and pods, but rarely stems or branches of beans (*Phaseolus vulgaris*). Most dry and green beans, but not soybeans, are susceptible to rust. Although infections occur on both upper and lower leaf surfaces, symptoms are usually seen first on the lower surfaces as small, white, slightly raised spots. As these spots enlarge, yellow, chlorotic spots appear on the upper surface of the leaf. On the lower leaf surface, opposite to the chlorotic areas, mature reddish-brown pustules form, then rupture the lower surface and release large numbers of spores (urediospores). Secondary pustules may develop around the margin of the primary pustule and merge with the original pustule.

When environmental conditions are favorable, rust can develop rapidly and cause the leaves to drop before the pods have matured. Yields can be substantially reduced in such cases. Pod infections do not contribute significantly to yield losses. Rust has increased in importance in Michigan because of increased acreage of very susceptible pinto beans.

Life Cycle

The bean rust fungus completes its entire life cycle on a single host. This is in contrast to other rust fungi that require an alternate host plant to complete their life cycle. For example, wheat stem rust spends part of its life cycle on wild barberry plants.

Three spore types are produced by *U. phaseoli typica* (urediospores, teliospores, basidiospores). When plants die or mature, black pigmented **teliospores** (resting or winter spores) are produced in the pustules and survive the winter on plant debris. In the spring, teliospores germinate to produce small spores called **sporidia** or **basidiospores.** Basidiospores are blown to healthy bean plants and serve as the source of primary inoculum for the new bean crop. **Urediospores** are produced in rust-colored pustules on bean leaves throughout the growing season. Such spores are responsible for rapid disease spread. Urediospores are transported in air currents to adjacent plants or to plants in neighboring fields, sometimes many miles away, often resulting in numerous infection centers within a field.

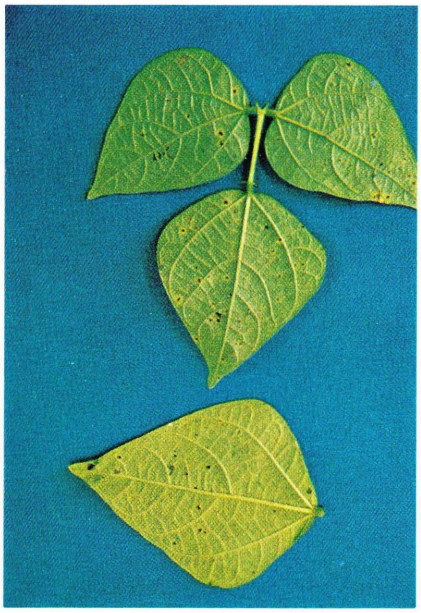

Fig. 1. Very early stages of rust infections seen on the undersides of bean leaves.

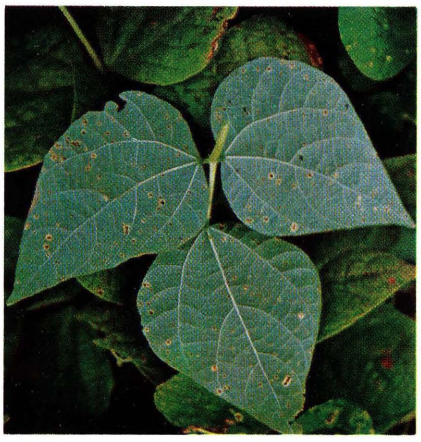

Fig. 2. Advanced rust pustule development on the undersides of leaves.

Environmental Factors

Epidemics of bean rust are more likely to occur in years when the environment favors long periods of continued leaf wetness. Ten to fifteen hours of continual leaf wetness from rain or dew are required for infection to occur. Temperatures from 71 to 79°F are optimum for infection and disease development. Temperatures below 59°F and above 90°F may kill or retard growth of the fungus. Approximately 10 to 15 days are required between initial infection and production of secondary urediospores.

Production and release of urediospores is influenced by moisture and

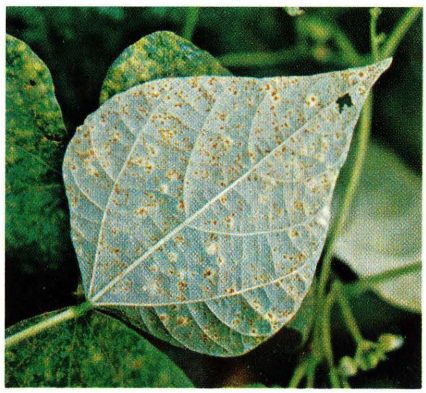

Fig. 3. Very late stage of rust infection and pustule development seen on the underside of bean leaves.

temperature conditions. More urediospores are produced when plants are exposed to high moisture conditions for short times. Spore release is greatest during dry, warm days immediately following a long dew period or rain.

Control

Crop rotation

Rust spores will not survive in the soil for more than one season; therefore, allow at least 2 years between bean crops to reduce the possibility of rust carryover from a previous crop. Bean rust is not seed-borne.

Sanitation

Avoid planting beans adjacent to fields where rust-infected beans were grown the previous year. Turn under bean refuse with a moldboard plow in the fall to allow the plant debris to decay and to reduce inoculum potential. Some plant refuse will remain exposed if a field cultivator or chisel plow is used.

Other practices

Pinto beans are very susceptible to rust and are usually planted during late May or early June. Such plantings serve as initial sources of rust inoculum in mid-late August. Navy beans planted in late June-early July can be severely damaged if rust infection occurs in August. Therefore, plant navy beans as early in June as possible. Rust is much less of a problem on the black turtle soup and kidney beans. If navy or pinto beans must be planted late, plant them next to fields of blacks or kidneys and not other navies or pintos.

Chemical control

Fungicides can be effective if they are properly applied. Rust infections that occur before flowering will reduce yields the most, and fungicide sprays applied during this time are the most effective. Check bean fields for the presence of rust beginning just after planting and at regular intervals thereafter until beginning of maturity. Rust infections occurring within 3 weeks of maturity will not reduce yields. Look for areas in your bean field that have 10 to 40 rust spots per leaf. Plants with rust infections in this range early in the season may benefit from a chemical spray program. However, if there are more than 40 infections per leaf throughout a wide area of the field, chemicals may not significantly increase yield. Fields that have fewer than this number of infections per leaf, but between 2 and 10, should be monitored carefully for any sign of disease increase and spread. You may find that rust infections are not uniformly distributed throughout a field, but often are limited to specific spots in a field. The rust in these spots can vary from mild to severe, and can be important sources from which rust spreads.

Fig. 4. Appearance of lesions on the upper surface of bean leaves directly opposite pustules. Note the yellow halo around each lesion.

An effective chemical control program can be achieved by spraying fields at 5- to 7-day intervals from the time rust is observed up to 3 weeks of full maturity. While this may be unrealistic in terms of costs, there may be no alternative in areas where rust is an important problem every year. A better approach to chemical control would be to spray only when the environmental conditions favor the disease. This means moderate temperatures (65-80°F) and conditions that allow leaf wetness to persist for 10 to 15 hours. This becomes a predictive problem; but in fields where rust is at the levels described above, preventative sprays should be applied if rain is expected or if heavy dews or fogs persist.

Fungicides can be applied by airplane or ground spraying equipment. Ground application can be very effective when the chemical penetrates the canopy and covers all the leaf surfaces, provided the plants are not damaged by the equipment. Several chemicals are registered for rust control and include maneb, zineb, and several copper compounds. Kidney, cranberry and pinto beans are susceptible to another disease called halo blight, and copper compounds may help control both rust and halo blight early in the season. Coppers will not control common blight, another disease that occurs later in the season. Navy beans are not susceptible to halo blight.

Follow all label directions on chemical usage carefully.

MICHIGAN STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE

MSU is an Affirmative Action/Equal Opportunity Institution. Cooperative Extension Service programs are open to all without regard to race, color, national origin, or sex.

Issued in furtherance of cooperative extension work in agriculture and home economics, acts of May 8, and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Gordon E. Guyer, Director, Cooperative Extension Service, Michigan State University, E. Lansing, MI 48824.

This information is for educational purposes only. Reference to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned. This bulletin becomes public property upon publication and may be reprinted verbatim as a separate or within another publication with credit to MSU. Reprinting cannot be used to endorse or advertise a commercial product or company.

1P-5M-6:81.JP.Price 35 cents