



FactSheet

Extension

Ohio State University Extension Fact Sheet

Plant Pathology

2021 Coffey Road, Columbus, OH 43210-1087

Soybean Rust

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Soybean rust is a foliar disease which has for many years been found mainly in Asian countries such as Taiwan, Thailand, Japan, India, and more recently South Africa, Paraguay, Brazil and Argentina. *Phakopsora pachyrhizi* is one of the fungal species known to cause soybean rust and is the most aggressive. This species was identified in US soybean production fields in November of 2004. US cultivars are thought to be highly susceptible to this fungus, and efforts are underway to identify partial resistance or slow rusting traits. Fungicides have proven to be very effective in managing this disease and this will be the primary means of management for the first several years.

Symptoms

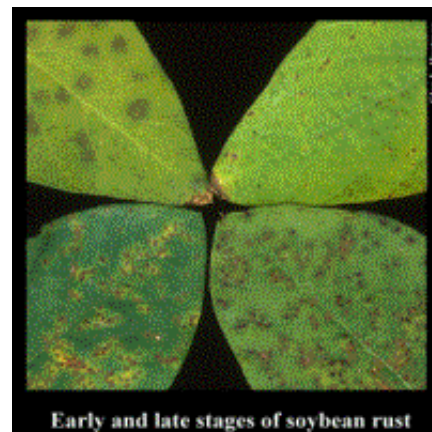
Lesions first appear as small chlorotic and irregularly shaped spots, turning tan to brown or reddish as the disease progresses. Lesions are usually confined to the veins or close to the veins, and are very, very small, less than the size of a leaf hair. Spores form predominately on the underside of the leaf and can be abundant. Soybean rust causes premature defoliation leading to yield losses, fewer seeds per pod, decreased number of filled pods per plant and early maturity. The early stages of the disease may be confused with bacterial pustule (*Xanthomonas axonopodis* pv. *glycines*), Septoria Brown Spot, Downy Mildew and Bacterial Leaf Spot. At later stages, the key diagnostic feature of soybean rust is the presence of egg shaped pustules that are filled with cream to tan colored spores.

Disease Cycle

Soybean rust is caused by the fungi *Phakopsora pachyrhizi* and *P. meibomiae*. The host range of both species is quite broad, with at least 41 and 34 natural hosts for *P. meibomiae* and *P. pachyrhizi*, respectively. These additional hosts can serve as overwintering reservoirs for the pathogen, as well as build-up of inoculum. The pathogen is well adapted for long-distance dispersal, because the spores can be readily carried by the wind, making it an ideal means for introduction to new, rust-free regions. The primary means of dissemination are spores, which can be carried long distances by wind or splashed by

rain within fields.

The environmental conditions that favor disease development are extended periods of leaf wetness accompanied by temperatures of 59 to 82°F. Temperatures above 86°F retard the development of disease. Spores are generally produced 10 days after infection, and are released after about three weeks. Spores are continually released, as long as moist and moderate temperatures are present. The pathogen is not spread by seed. Soybean plants are susceptible to rust at any stage, but disease severity depends on the developmental stage of the plant at the time of infection.



Early and late stages of soybean rust.

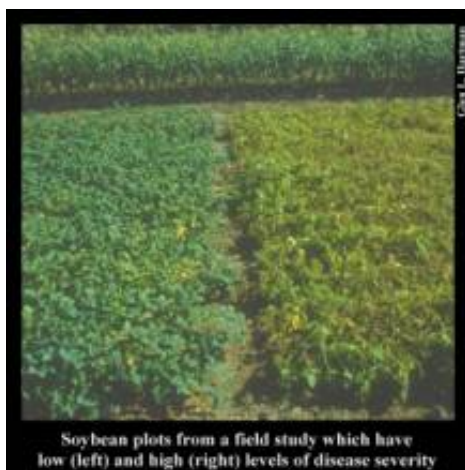
Photo by Glen L. Hartman.

If this pathogen arrives or becomes established in this area, the role of overwintering or secondary hosts in the survival of the rust is not known. However, current epidemiological models or predictions indicate that it is unlikely that this fungus will overwinter in the north central part of the US. The leaf-infecting spores can only survive in the presence of the host.

Future Management

Identifying stable sources of resistance to this pathogen and development of resistant varieties are in initial stages. The primary means will be with fungicides and many materials are being evaluated in South America at this time.

It is important to detect infection in the field early because this disease progresses rapidly and decisions to apply fungicides must be made as early as possible. Soybean rust in the early days following infection can be found on the lower, first leaves of soybean plants.



Soybean plots from a field study which have low (left) and high (right) levels of disease severity.
Photo by Glen L. Hartman.

Control of soybean rust will not be an easy task, and there is no straightforward approach that would seem applicable to every situation in every country where this disease occurs.

Fungicide applications should help in reducing the epidemic development in some production areas. Several fungicides and application programs are currently being evaluated and proceeding through Section 18 emergency exemptions and Section 3 full labeling of products. As fungicides are labeled and the economic value of applications become known we will post this information on the Ohio Field Crop Disease web site. (www.oardc.ohio-state.edu/ohiofieldcropdisease)

Varieties with partial resistance that minimize yield losses have provided some success in controlling soybean rust. Planting cultivars with resistance to rust pathogens has been very successful in other crops (wheat and corn for example). We expect that this will be a type of partial resistance in which, fewer lesions with a reduced number of spores will develop. Depending on the environment and the levels of spores in the area, fungicides may still be needed.

What to do if you find it ...

In the early stages of rust moving into an area there are some extra precautions that you will want to take. If you find rust in a field please take note. Rust spores adhere very easily to clothing and boots. Put on disposable spray suits, change and wash before moving to the next location. The wind and rain will

spread the spores much more efficiently than a human. But when a new pathogen enters into a region extra precautions are often warranted.

A protocol has been established by the USDA. If you suspect soybean rust is present in your fields in Ohio, collect samples. Don't be skimpy, 20-30 leaves with distinct lesions should be adequate. Place them in a plastic bag and immediately ship them to:

C. Wayne Ellett Plant & Pest Diagnostic Clinic
110 Kottman Hall
2021 Coffey Road
Columbus, OH 43210
614-292-5006
ppdc@osu.edu

We will verify if this is rust or bacterial pustule. Since soybean rust has now been identified in the US, samples will be verified in our clinic or in the Regional Plant Diagnostic Clinic. This confirmation is to determine the type of strain of rust, mild or aggressive. This will help in developing management programs.

Additional information is available at:

USDA APHIS - www.aphis.usda.gov/ppq/ep/pestdetection/soybean_rust/soybeanrust.html

American Phytopathological Society - <http://www.apsnet.org/online/feature/rustadvice/>

NC-IPM - <http://www.ncpmc.org/soybeanrust>

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