

# Soybean Rust and Common Soybean Leaf Diseases

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In September 2007, soybean rust was found in Iowa for the first time. It was first discovered in several states in the southern United States in November 2004. The rust pathogen can only survive on living plant material. Although the soybean rust fungus may not overwinter in the central or northern soybean production regions of the United States, it does survive the winter months on hosts, such as kudzu, in the southern United States.

It also may overwinter in Central America on susceptible crops.

Iowa State University Extension plant disease scientists expect that outbreaks of soybean rust in Iowa will happen only after several connected, timely events. The three primary events that must happen each crop season are

- the production of spores early in the season in the South, starting where the pathogen survived the winter,
- the spread of those spores from there to Iowa, and

- then the occurrence of weather in Iowa that is conducive for disease establishment and development.

Each event is equally important because an outbreak will not occur if one of those events is missing.

The early symptoms of soybean rust are similar to other diseases that are more common to Iowa soybean fields, so information on the similarities and differences between soybean rust and these diseases have been included in this publication.



Soybean leaf top showing rust



Soybean leaf bottom showing rust

Soybean field showing rust

## SYMPTOMS

Early symptoms of rust infection begin on the lower leaves deep in the canopy as small spots that increase in size and change from gray to tan or reddish brown usually on the lower leaf surfaces. Mature spots consist of small pustules (pimple-like structures) surrounded by slightly discolored dying areas with masses of spores on the lower leaf surface (Figure 1). Lesions are scattered within yellow areas that appear see-through (translucent) if the affected leaves are held up to the sun (Figure 2). Once pod set begins on soybean, infection can spread rapidly to the middle and upper leaves of the plant.

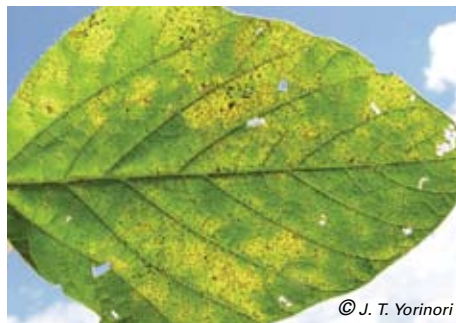
After infection, pustules (Figure 3) can be seen after about 10-14 days. The pustules produce masses of spores (Figure 4), and spore production may continue for weeks. Spores are easily spread by the wind. Soybean plants are susceptible to soybean rust at any stage of development, but symptoms are most common during and after flowering. The disease usually starts within the low to mid canopy and moves up the plant (Figure 5).

## DISEASE DEVELOPMENT

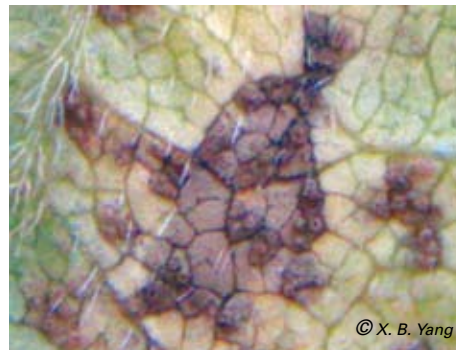
The development of soybean rust is favored by prolonged periods of leaf wetness (6–12 hours) and moderate temperatures of 60 to 85 degrees F. Extended periods of cool, wet weather or high humidity (75-80 percent) coupled with extended periods of cloudy weather during the growing



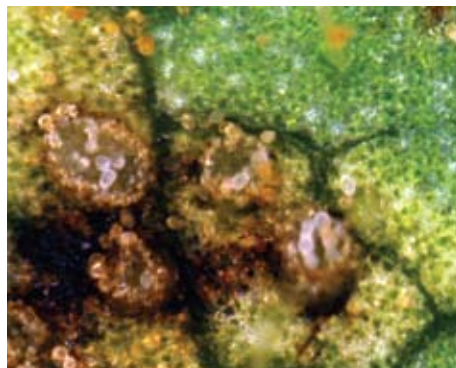
**Figure 1. Advanced disease produces spots usually clustered alongside the veins.**



**Figure 2. Yellow areas appear translucent.**



**Figure 3. Pustules (pimple-like structures) found on the underside of the leaf.**



**Figure 4. The pustules produce masses of orange to brick-red spores.**

season would favor soybean rust infection and eventual epidemics. Weather conditions in Iowa will not always favor widespread or severe rust development, even when spores are present. However, dense canopies may provide an ideal microclimate that encourages disease development.

## SCOUTING FOR SOYBEAN RUST

The national movement of rust should be closely followed. If rust development in the southern U.S. is slow, local scouting efforts can be delayed. If needed, local scouting should be before the R6 growth stage (late August).

Finding early infection (low incidence and severity) while in the field is very difficult. Shaded areas in a field or areas with dense canopy should provide the best environment for rust development, so these areas should be scouted. If rust is suspected, a minimum of 100 leaves per field should be collected from the lower-to-mid canopy. Detecting low levels of soybean rust typically requires incubating samples for 24 to 48 hours and observing them under laboratory conditions by a trained diagnostician.

In the event that soybean rust has become severe enough to be identified in the field, it may be identified by examining the underside of leaves for pustules using a hand lens.

## Brown Spot

*Septoria glycines*

Causes small, irregular-shaped, dark brown spots scattered on the upper and lower surface of leaves. Adjacent spots frequently join together to form dead blotches. Late in the season, affected leaves may turn yellow or orange-brown and drop prematurely.

This disease is very common, and is usually one of the first to appear on young plants, starting at V2 stage. It begins at the bottom of the plant and moves up the plant if conditions are favorable (warm and wet).



### How does this differ from soybean rust?

Spots more angular; no pustules on the underside of the leaf.

## Bacterial Blight

*Pseudomonas savastanoi* pv. *glycinea*

Causes small, angular, yellow-to-brown spots surrounded by yellow halos. The angular spots enlarge and join together producing large, irregular dead areas. The centers of old dead areas tear away so infected leaves have a ragged appearance.

This disease is seen on the leaves at the top of the plant. It is very common and usually one of the first to appear on young plants, starting at V2 stage. It is common after heavy rains and if temperatures remain cool.



### How does this differ from soybean rust?

Angular spots; ragged leaves; no pustules on underside of the leaf.

## Bacterial Pustule

*Xanthomonas campestris* pv. *glycinea*

Causes small, yellow-green spots with angular reddish-brown centers. The spots may join together to form large, irregular dead areas that rupture and tear away during windy, rainy weather. Pustules may be seen on the underside of the leaf surface.

This disease is seen on the leaves at the top of the plant. Favorable conditions are high temperatures and higher-than-average rainfall.



### How does this differ from soybean rust?

Pustules not associated with each lesion; pustules do not have spores; pustule openings are cracks instead of round pores.

## Frogeye Leaf Spot

*Cercospora sojina*

Causes small angular spots with gray centers and distinct purple to reddish brown margins. In older spots, dark fungal structures form in the center of the spot and the spots look like frog eyes.

This disease is found in the mid and upper canopy during warm and humid weather. It usually occurs in mid to late season.



### How does this differ from soybean rust?

Spots are larger; spots have dark, defined edges; no pustules on underside of leaf.

## Cercospora Leaf Blight

*Cercospora kikuchii*

Starts as a mottled purple-to-orange discoloration that becomes orange or bronze. The leaves become leathery in texture.

Usually occurs on topmost three to four trifoliate leaves and on the upper surface of the leaf in warm, wet weather. It usually occurs in mid to late season.



### How does this differ from soybean rust?

Only upper leaf surface discolored; few spots and no pustules on underside of the leaf.

## Downy Mildew

*Peronospora manshurica*

Causes light-green to yellow, irregular shaped spots on the upper surface of the topmost leaves. On the underside of the leaves, the fungus may be seen growing out of the center of the spots.

Usually occurs on topmost three to four trifoliate leaves and on the upper surface of the leaf in warm, wet weather. Usually occurs in mid to late season.



### How does this differ from soybean rust?

Spots are larger; no pustules on underside of leaf; fuzzy fungal growth may be seen.

## MANAGEMENT

Currently no rust-resistant soybean varieties are available for Iowa growers. However, a world-wide effort is underway to identify new sources of resistance and determine the stability of the few sources of resistance currently identified.

At best, cultural practices like row width, different plant dates and tillage may have minimal, inconsistent positive effects on rust management.

Fungicides currently are the only viable option for management of soybean rust. For effective and economic control, fungicides should be applied as close to the time soybean rust initially infects plants in a field. In most cases, this means that fungicide decisions will have to be made at a time when the risk is high, but before the time when rust is detectable in the field.

More information on fungicide use for management of soybean rust can be found in the publication *Managing Soybean Rust with Fungicides* or by visiting

[www.soybeanrust.info](http://www.soybeanrust.info)

or

[www.oardc.ohio-state.edu/SoyRust/index.htm](http://www.oardc.ohio-state.edu/SoyRust/index.htm).

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## Iowa Soybean Rust Team

To help Iowa producers prepare for soybean rust, Iowa State University, the Iowa Soybean Association and the Iowa Department of Agriculture and Land Stewardship formed the Iowa Soybean Rust Team.

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Figure 5. Early rust infection symptoms appear on the lower leaves deep in the canopy.