

Asian Soybean Rust

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Soybean rust (SBR) was first reported in 1902 in Japan and has been an important disease in Asia and South America for many years. SBR recently became an important disease in the continental U.S. It was first reported in 2004 in Louisiana and was confirmed in eight other states including Arkansas the same year. Since 2004 SBR has been observed on average three of every five years in AR. Yield losses (30 to 80%) have been reported in other countries; however, yield losses in the U.S. have remained low due to early detection and timely application of fungicides.

SBR (also called Asian soybean rust or Australasian soybean rust) is caused by the fungus *Phakopsora pachyrhizi*, which requires a living host to survive. Typically, symptoms are observed first on the leaves in the lower canopy at or after flowering (R1 to R3). Lesions appear as small, 2.0 to 5.0 mm tan or reddish brown angular spots on leaves. Lesions are often observed first at the base of the leaflet near the petiole. Volcano-shaped pustules (uredinia, Fig. 1&2) can be observed within the lesion on the underside of the leaf. When pustules are mature, they rupture and exude spores (urediniospores) that cause new infections. Pustules can be observed in the field with a 20x hand lens (Fig. 1 and 2), but may be misdiagnosed as bacterial pustule by untrained observers. As disease progress and secondary infection occurs, leaves begin to turn yellow and defoliate (Fig. 3). Severely diseased plants may completely defoliate resulting in fewer and smaller seeds.

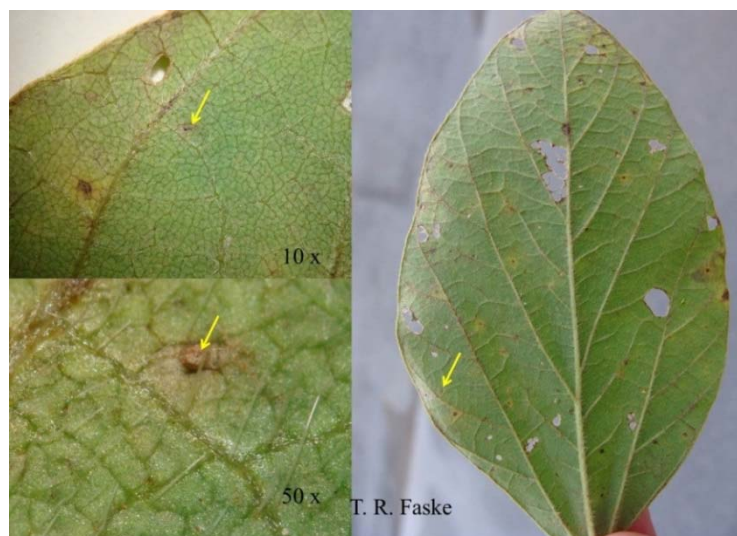


Figure 1. Soybean rust pustule (yellow arrow) development at no magnification (right) and 10x and 50x magnification.



Figure 2. Numerous soybean rust pustules on the lower leaf surface of a soybean leaf. Photo by M. Emerson.



Figure 3. Defoliation of soybean leaves caused by soybean rust. Photo by M. Emerson.

Soybean is the most important agronomic host of *P. pachyrhizi*, but the fungus can parasitize several other members of the Fabaceae (legume) family including kudzu and common bean. Soybean rust does not overwinter in Arkansas, so each year new infectious spores must be disseminated from gulf coast states where it overwinters mainly on kudzu. Soybeans are

susceptible to rust at any stage of development, but are most susceptible during the early reproductive stages. Conditions that favor disease are extended periods of leaf wetness over a wide range of temperatures (61 to 82 °F). Temperatures above 86 °F retard disease development. Infection can occur within 6 to 12 h under optimum conditions and new spores can be produced within 7 to 10 days after infection. A single uredinium can continue to produce spores for a 3 week period. Thus, when conditions favor disease there is a high potential for spore production and secondary infection.

Management of SBR relies mainly on fungicides. Although fungicides are effective at managing SBR, both the type of fungicide applied and timing of application are critical in disease management. Strobilurin fungicides are effective as protectants and should be applied prior to disease presence whereas triazole fungicides, which are systemic, can be effective after disease has been observed in the field. Triazoles, however, are also most effective when applied prior to disease development. Although data is limited in Arkansas, a fungicide applied after 10% disease incidence in the lower canopy under favorable environmental conditions in a South American field trial did not completely control rust. Since rust must be reintroduced each year into the state, early detection is crucial to management. An ongoing service provided to soybean growers in Arkansas is a network of sentinel plots and regular inspection of kudzu, and early planted commercial fields to detect initial infections and provide early warning of disease presence in the state. Details of rust movement through the U.S. can be found on the IPM PIPE website or Arkansas Row Crops Blog. This early warning system allows timing of fungicides in high risk fields for maximum effectiveness. In general this will include a fungicide application during the early stages of reproduction (R1 to R3) and a second application made 14 to 21 days after first application. Applying a fungicide after the R6 growth stage may not provide a significant economical return; however, untreated fields may supply spores to later planted soybeans in the area. A management tactic that appears to be effective in minimizing losses from SBR is simply planting early to avoid infection by late season dissemination of spores from surrounding states or areas. Conversely, producers planting late-season soybeans or double-crop soybeans should budget for a fungicide application.