ALABAMA COOPERATIVE Extension SYSTEM

Your Experts for Life

ANR-1310

ALABAMA A&M AND AUBURN UNIVERSITIES

Asian Soybean Rust in Alabama

History

Asian soybean rust (ASR) is caused by the fungus *Phakopsora pachyrhizi*. This fungus originally was identified in Japan in 1902 and has since traveled across Asia, Africa, and South America before being discovered in the continental United States in 2004. This disease is primarily spread by spores carried on wind currents. ASR spores may have been carried to the Southeastern United States by winds associated with Hurricane Ivan.

Symptoms

Symptoms of ASR begin on the lower leaves of infected plants as small leaf lesions (Figure 1). On the upper leaf surface, initial symptoms may be small, yellow specks in the leaf tissue (Figure 2). These lesions darken and may range from dark brown or reddish brown to tan or gray-green in color (Figure 3). The lesions tend to be angular to somewhat circular in shape and may be concentrated near leaf veins. Initially, lesions are small, barely larger than the point of a pin. Mature lesions may be somewhat larger, and lesions may merge, killing larger areas of leaf tissue.

Pustules form within leaf lesions, primarily on the lower leaf surface (Figure 4). These may appear to be small, raised blisters or calloused bumps (Figure 5). As the pustules mature, they begin to produce many light-colored, powdery spores that emerge through holes in the cone-shaped pustules (Figure 6). Masses of spores may accumulate as small mounds at pustule openings. The pustules and spores are difficult to see without magnification. A hand lens with a magnification power of 20 times or greater is needed to observe this disease in the field.

Infected leaves usually turn yellow and drop prematurely (Figures 7 and 8). Complete defoliation of a plant can occur 4 to 6 weeks after initial infection (Figure 9). Prematurely defoliated plants have fewer pods, fewer seeds per pod, and smaller seeds, all of which result in yield loss.


Figure 1

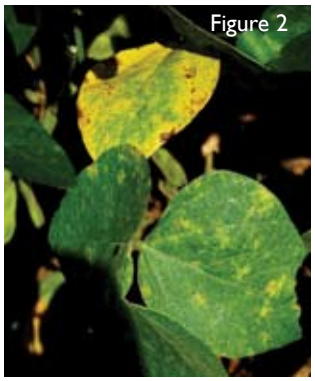
Figure 2


Figure 3


Figure 4

Several other soybean diseases look similar to ASR, especially in the early developmental stages. These include bacterial blight, bacterial pustule, downy mildew, Septoria brown spot and target spot.

Survival and Development

Initially, it was thought that ASR would only occasionally overwinter along the Gulf Coast due to its inability to withstand cold weather or to survive outside host tissue, except as short-lived spores (urediniospores). However, a recent survey showed that the pathogen survived in protected areas on kudzu as far north as Montgomery, Alabama, during the mild winter of 2005 to 2006 (Figures 10 to 13). Although temperatures during most winters kill back

kudzu throughout most Alabama, during unusually warm winters, both kudzu and ASR may survive further north than previously anticipated. ASR could pose a significant risk to soybeans if a mild winter is followed by a warm wet spring, favoring rapid development and early-season spread of the pathogen.

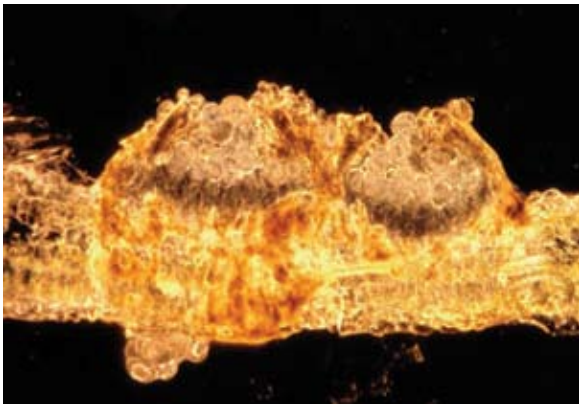

Figure 5, left; Figure 6 below

ASR spores depend on storms and favorable tracts of wind to move from overwintering sites into new regions. Infection and disease development are favored by extended dew periods and frequent rain. Infection can occur during a broad range of temperatures (59 to 84 degrees F) but will be slowed during extreme temperatures. Spots caused by ASR can be seen on leaves in as few as four days after infection and rust pustules may appear after about ten days. One pustule can produce spores for about 3 weeks. A rapid increase in disease incidence and severity usually coincides with canopy closure. Soybean plants are susceptible to soybean rust at all stages of development, but symptoms are most common during and after flowering.

The disease has been found on soybeans, kudzu, Florida beggarweed, lima beans, kidney beans, and scarlet runner beans in the United States.

Management

Detecting ASR early is the key to successfully managing the disease. The best time to make the first fungicide application for ASR is when the risk of infection is high, but before infection actually occurs. Disease control may be limited if the first fungicide application is made after ASR is firmly established (greater than 10 percent incidence in the midcanopy) within a field. Soybean growers must be aware of ASR advisories for their areas to apply fungicides at the proper time.

Because ASR initially develops in the lower canopy, thorough coverage of the foliage, including deep penetration of the canopy, is essential for effectively applying fungicides to manage the disease. Fungicides are best applied at higher gallons per acre, higher pressures, and with different nozzles than are used to apply herbicides.

The period from first bloom through pod fill is the most critical time to control ASR. Fungicide applications before bloom or after full seed may not produce an economical return. Current data indicate that fungicide applications are not needed in the early vegetative growth stages. However, spraying just prior to bloom may be beneficial if ASR is prevalent and if the grower has a late-planted crop or a very late-maturing variety, or both.

Symptoms of ASR are most common and increase most rapidly during the reproductive growth stages of soybeans. The first fungicide application should be made before rust has appeared on more than 2 percent of the leaves in the crop canopy. One to three fungicide applications may be needed, depending on the growth stage when the disease is first detected and on subsequent environmental conditions. Spraying after pod fill is not recommended for controlling ASR due to lack of a yield response. In addition, many fungicides cannot be sprayed after this stage due to label restrictions.

Several factors affect fungicide choices. Some fungicides are preventative, meaning they will protect the crop from infection if applied before

Figure 7



Figure 8, top left; Figure 9, top right; Figure 10, above


Figure 11, top; Figure 12, above

the disease reaches a field. Other fungicides are curative, meaning they can be applied soon after infection has taken place and still be effective.

Growers in Alabama currently have three fungicide groups from which to choose:

Chlorothalonils. These products are purely preventative and must be applied before rust infection. Bravo and Echo are currently labeled for use on soybeans in Alabama.

Chlorothalonil fungicides offer multiple sites of action, are not absorbed, and remain on the leaf surface. They have a longer residual period and a longer preharvest interval (42 days) than other available fungicides. Thorough coverage of all leaf surfaces is important.

Strobilurins. These products must be applied as a preventative measure before infection. Azoxystrobin (Quadris) and pyraclostrobin (Headline) are available in this class. Trifloxystrobin is also available as part of a premix (Stratego. See "Premixes" below). Strobilurins are absorbed by the soybean leaf and slowly translocate within the plant. Because they have a single-site mode of action, plants may become resistant if the products are overused or misused. Strobilurin fungicides are restricted to one application per season unless combined with another active ingredient.

Triazoles. These products range from protective to curative. Curative, in this case, means that the fungicide will kill new rust infections, but it will not cure infections already in existence. Triazole compounds include flutriafol (Topguard), cyproconazole (Alto), metconazole (Caramba), myclobutanil (Laredo) tebuconazole (Folicur), and tetraconazole (Domark), among others. Triazoles are also single-mode action materials, but they tend to have shorter residual periods and move through the plant faster than strobilurins. Because of rapid absorption, some triazoles move beyond the leaf to other parts of the plant. However, none of the triazoles available are true systemics; they only

Figure 13

protect the tissues on which they are deposited. Due to resistance concerns, consecutive applications of triazoles should never be made.

Premixes. Several premixes of strobilurin and triazole compounds are available, including Quilt and Stratego. Combinations provide both curative activity from the triazole plus longer residual protection from the strobilurin. These products should be used when rust is an immediate threat to an area, but the disease has not yet been observed in the field. Growers also have the option of tank-mixing a strobilurin with a triazole on their own.

Caution: The user must read the label requirements for each chemical being used and follow current guidelines, including those for harvest restrictions after spraying. Check with the chemical company representative or your regional Extension agent before using any fungicide.

In the long term, planting resistant soybean varieties may be the more practical, economical means of managing ASR. However, all commercial varieties of soybeans currently available are highly susceptible to the disease. Both public and private soybean breeders are working to identify sources of resistance and to incorporate resistance in soybean varieties suitable for production in the United States.

Summary

ASR is a disease that is here to stay. When weather conditions favor rapid disease development and spread, and when growers fail to manage the disease with fungicides, ASR can cause significant yield losses to soybeans in Alabama. Growers must be aware of the location of ASR in the Southeast United States at all times as it can move long distances on wind currents in a short period of time. Growers in South Alabama need to be most aware of its location because the pathogen is able to overwinter on kudzu more readily along the coast. Therefore, fields in South Alabama are at a higher risk of early infection from ASR. Growers in Central and North Alabama should monitor the movement of the disease through advisories provided by the Alabama Cooperative Extension System and should apply fungicides when the threat of ASR is high. Fungicides will help control ASR if applied correctly and in a timely manner.

ALABAMA COOPERATIVE Extension SYSTEM

Your Experts for Life

ANR-1310

Edward J. Sikora, Professor and *Extension Plant Pathologist,* Entomology and Plant Pathology; **Dennis P. Delaney,** *Extension Specialist,* Agronomy; **Mary A. Delaney,** *Epidemiologist,* Entomology and Plant Pathology; **Jacqueline Mullen,** *Extension Plant Pathologist,* Entomology and Plant Pathology; Auburn University, Alabama.

For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

10M, **New October 2007**, ANR-1310