

Chapter 3

The Importance of Risk Assessment

*X. B. Yang, Iowa State University
Alison Robertson, Iowa State University*

Correct assessment of the risk of soybean rust is key to making effective and economical fungicide applications. Like corn and wheat rusts, soybean rust spreads from south to north during the growing season. Thus, it is possible to assess progressive risk of soybean rust over a growing season and use this information to make informed fungicide-use decisions.

Three factors are key in determining the risk of soybean rust movement into more northern soybean production regions:

- The extent of soybean rust during the spring and early summer in the Gulf Coast area, which determines the amount of spores available to blow northward.
- The July-August weather that determines how favorable local conditions are for soybean rust development.
- Forecasted or observed northward movement of soybean rust spores in weather systems and rust observations in sentinel plots.

Producers in many soybean production areas in North America may be able to assess the risk of seasonal outbreaks using the following steps throughout the year:

- **March**
Monitor information

(Figure 3.1 and Figure 3.2) on the occurrence of soybean rust in the Gulf Coast states (Alabama, Florida, Louisiana, Mississippi, and Texas) and Georgia. This will be an early indication of the likelihood of rust spore movement into more northern production areas as the season progresses.

- **April, May, and June**
Closely monitor reports on soybean rust occurrence in Alabama, Louisiana, Mississippi, and Texas. These states comprise the region that might act as a rust pathway to the north. Georgia is also a state to watch, but has less predictive impact than the other states. If outbreaks occur on soybean plants or kudzu in any of these states during this period, the spores are likely to reach northern soybean regions as early as July.

A network of sentinel plots stretching from the Gulf Coast and into the upper Midwest and Canada provides critical ground-truth information on the actual occurrence and progress of soybean rust in North America (see Chapter 4). Check the USDA public soybean rust web site (www.sbrusa.net) to monitor the northward movement of this disease and to gain access to state-

specific commentaries and recommendations developed by state Extension specialists.

Factors to Consider in Determining Risk

The decision to spray or not to spray fungicides for control of soybean rust is complex. Fungicides are highly effective at controlling soybean rust, but there are several factors to consider in making spray decisions to manage soybean rust. It still is expected that although soybean rust could affect soybean production throughout North America, it will be endemic in the southeastern states and seasonal in northern states. Disease epidemics are also likely to vary from season to season. Thus, spray decisions (*i.e.*, determining the need to spray, when to spray, and the number of sprays) will be different from region to region and season to season. Generally, a fungicide should not be applied for soybean rust control until the risk of infection is high.

These criteria are the basis of soybean rust risk assessment:

1. Crop Stage

Data from the southeastern United States indicates that the most critical period for soybean rust management is from beginning flowering (R1) through full seed (R6). In other

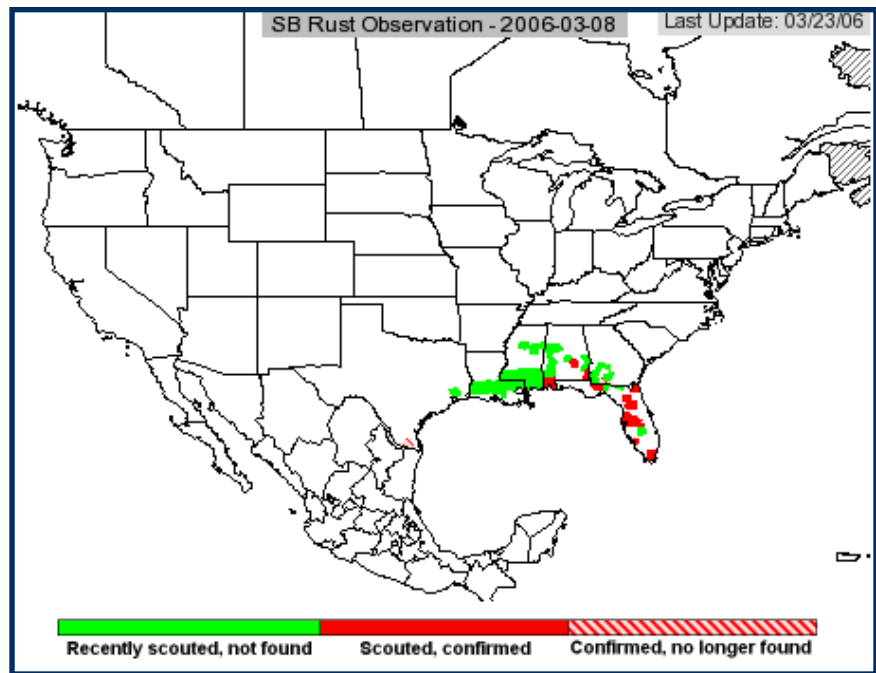


Figure 3.1. USDA maps (www.sbrusa.net) depicting soybean rust overwintering sites during 2006.

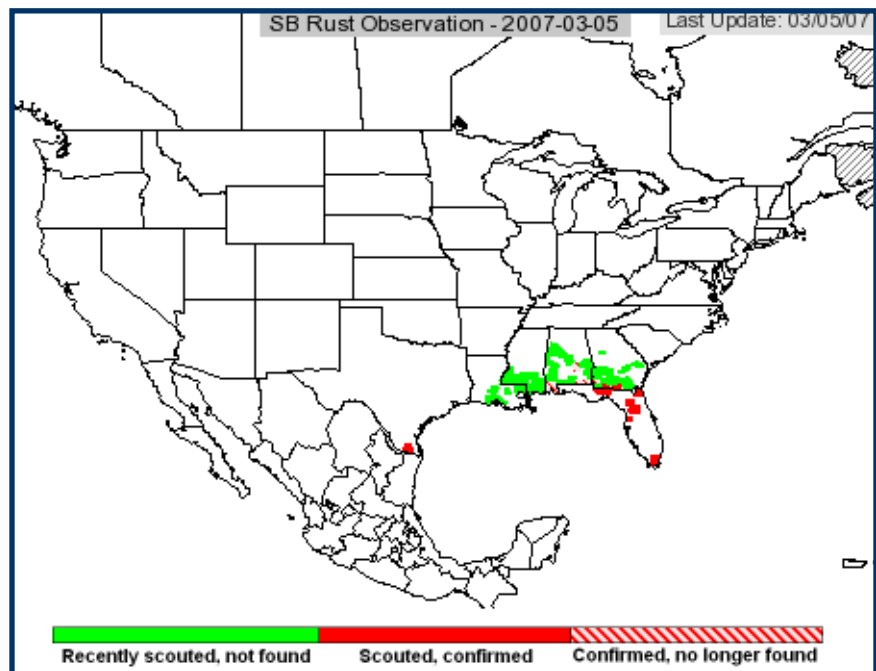


Figure 3.2. USDA maps (www.sbrusa.net) depicting soybean rust overwintering sites during 2007.

words, fungicide sprays before beginning flowering or after full seed may not produce an economical return. However, there are limited data from Brazil showing that fungicide applications made during the vegetative stages are occasionally economical. The same is true for fungicide applications at R6 in the southern United States.

2. Output from Soybean Rust Forecasting Systems

Outbreaks of disease are highly associated with rain and especially above-normal rainfall patterns. Forecasting systems can be effective decision-making tools for managing soybean rust. These systems can be simple, with disease forecasts being based on observations from sentinel plots, or with forecasts being based on complex computer models, rust spore movement, and current and predicted weather. Computer models have been developed for soybean rust forecasting and are currently being applied. (See Chapter 5 for more information on soybean rust modeling efforts.)

3. Results of Scouting, Detection, and Diagnostic Activities

The sentinel plot system has been used effectively in the southeastern United States to indicate when fungicide application is necessary. Spray warnings are given once soybean rust is found in sentinel

plots. Because soybean rust is usually first observed on plants of more advanced growth (beginning flowering [R1] or later), the sentinel plantings have provided an opportunity to observe the first signs of the disease BEFORE the disease gets a foothold in neighboring production fields. In addition, sentinel plot data from the Southeast has been very useful to soybean producers in the Mid-South, Midwest, Northeast, and Canada who are attempting to establish their soybean rust risk.

For those producers who would rather wait for local rust disease development before deciding to apply a fungicide for soybean rust control, field scouting can be done, but great care must be taken. It is very easy to miss the early stages of soybean rust in a field, and there is significant risk that by the time you see the disease, it may be too late to get complete control. To determine if soybean rust is present and at what level, a thorough visual examination of soybean plants in fields, over time, is crucial. When walking through fields, periodically stop and closely examine the soybean plants. Look down into the lower plant canopy because this is where initial soybean rust pustules usually first develop. Closely examine the undersides of leaves for tell-tale pustules of soybean rust. Be sure to examine several sites throughout each field; do not restrict scouting activities to the edges of fields.

Since rust fungi, in general, require free moisture and/or high humidity to germinate and infect leaves, focus on shaded areas of the field, low spots, or areas of poor air circulation. If there are places in a field with a distinct yellowing or browning, these areas should be targeted in addition to the standard scouting pattern being used. If soybean rust is suspected, collect samples and carry or overnight them to your state's plant disease diagnostic laboratory. Alternatively, report the location to your local Extension office immediately. The earlier rust is detected, the more likely it is that fungicide applications will be effective.

Be aware that several other foliar diseases are easily confused with soybean rust, especially when rust is in the early stages of pustule formation. (See Chapter 12 on Similar Looking Diseases.)

4. Single vs. Multiple Fungicide Applications

The number of fungicide sprays required to achieve acceptable control of soybean rust will depend on five main factors:

- The stage of crop development when the disease first appears.
- The incidence and severity of infection as determined by crop scouting.
- Current and forecasted weather conditions.
- Price of soybeans.

- Cost of application.

The earlier in the growing season soybean rust is detected, the more sprays may be needed to achieve acceptable disease control. More than one application may be needed if the first application is made at or before beginning flowering (R1), and the weather continues to favor rust development. However, if growing conditions are hot with less than normal rainfall, soybean rust is unlikely to develop to damaging levels, and fungicide applications may not be needed at all. To avoid mistakes and possible crop failures, producers should discuss spray options with someone who is familiar with local farm operations and also familiar with soybean rust biology and the range of fungicide control options.

5. Timing of Fungicide Applications

When it comes to timing of application, there are two obvious mistakes, both of which can be very costly. Soybean rust can spread very quickly, and poor timing of fungicide sprays would be followed by disease-control failure. Spraying too early can result in the fungicide wearing off by the time infection occurs. Conversely, waiting until the disease has progressed too far to spray will not stop the disease. The ideal time to make the first fungicide application for soybean rust control is when the risk of

FUNGICIDE CLASS	PRODUCT	PREHARVEST INTERVAL
Chloronitrile	Bravo, Echo	42
Strobilurins	Quadris Headline	14 21
Triazoles	Caramba, Topguard Folicur Alto, Punch	21 30
	Bumper, Domark Laredo Propimax	28
Strobilurin & Triazole	Quadris Xtra	30

Table 3.1. Preharvest intervals for soybean rust fungicides.

infection is high, but before infection occurs; this is the purpose of sentinel plots and disease forecasting.

A word of caution: Each fungicide has a unique preharvest interval indicated on the product label (see Table 3.1 and Appendix Table B.2 for a full list). If a fungicide spray is needed for soybean rust control late in the season, this preharvest interval, which varies from as short as 14 days to as long as 42 days, may have a great impact on which fungicide you may legally apply. For some fungicides, the specific growth stage is listed — the number of days that a variety is at a specific growth stage will also vary from year to year and region to region. To avoid problems, it is prudent to ascertain a product’s preharvest interval BEFORE making an application.

6. Information Reliability

We are exposed to information from a wide range of sources — from the corner coffee shop to the Internet, to publications and newscasts. It is important that growers base fungicide spray decisions on information from unbiased, reputable sources. These include university cooperative extension services, government, industry or commodity group web sites, and newsletters or news releases from these organizations.

7. Understanding Risks Associated With Fungicide Spray Decisions

It is imperative that growers follow spray guidelines and adhere to the labeled rates for each fungicide. As previously mentioned, the method of

fungicide application is very important — fungicides must cover the whole plant and get into the canopy to be effective. If the correct equipment (nozzle type, pressure, adjuvants, and timing) is not used, there is considerable risk of failure. Failure to adequately control soybean rust will also occur when poor fungicide decisions are acted on, or when otherwise good decisions are not implemented properly. Either situation is likely to result in reduced economic returns.

Spray decisions may also have an effect on crop insurance claims filed. Therefore, it is essential to keep complete records of what was done and how spray decisions were made.

To be in compliance with the law, growers must have a copy of the Section 18/Emergency Use label in their possession when the product is applied.

Long-range weather predictions made in April and May, indicating that July and August weather conditions may favor rust outbreaks in the north, should be considered in risk assessment for soybean rust.

The current disease models use the weather predictions (precipitation and temperature) to calculate the risk of soybean rust. However, it must be understood that the predictions are subject to error. Thus, the most reliable way to establish the need to spray fungicides for soybean rust control continues to be early disease detection.