Plant Disease and Insect Advisory

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Oklahoma State University
127 Noble Research Center
Stillwater, OK 74078

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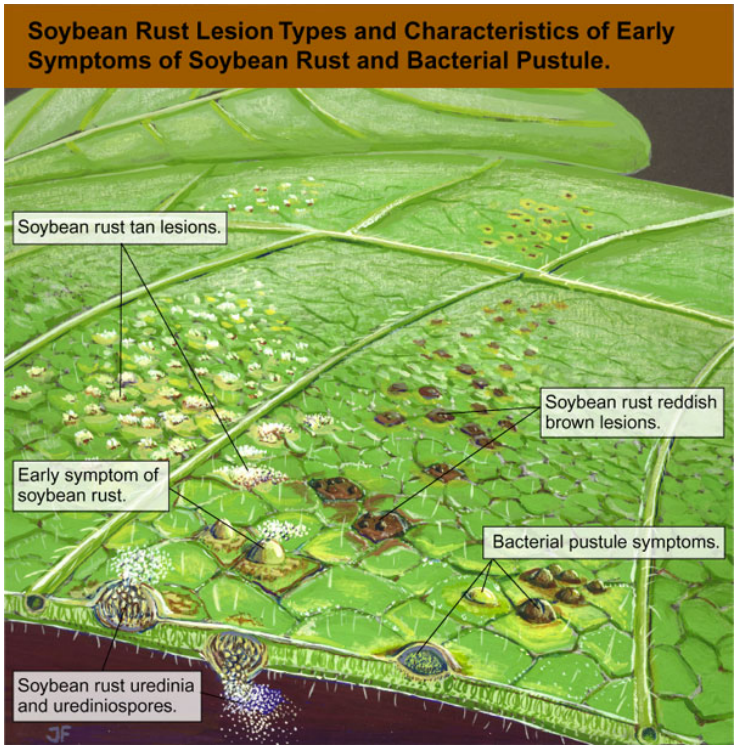
Soybean Rust Update (Is it fact or fiction?)

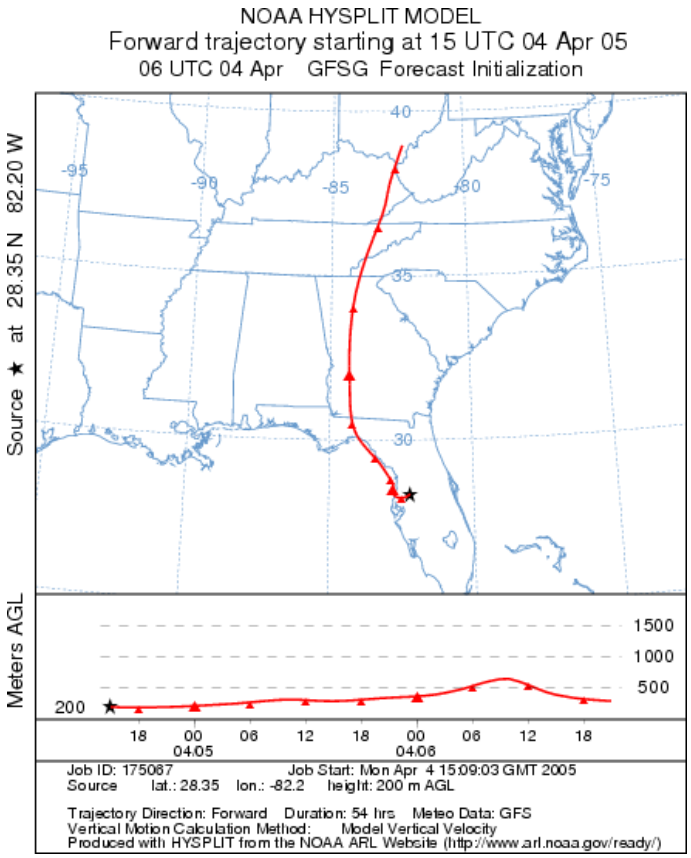
John Damicone, Extension Plant Pathologist

The discovery of soybean rust in several southeastern states last fall has greatly heightened awareness of this disease and its threat to soybean production in the U.S. Many growers are scared about the prospects of planting soybeans because of rust. Based on discussions with growers during winter meetings, several points about rust and its threat to soybean production in Oklahoma warrant further discussion.

There is a perception that rust is now present in nine states. It is true that soybean rust was confirmed in nine states last fall. There is good meteorological evidence that rust spores were moved into the U.S. from northern South America by Hurricane Ivan last September. This outbreak had no effect on the 2004 crop because it occurred late in the season when the crop was already made. The disease was mostly found on scattered plants that still had green leaves in fields of mostly mature plants. Because the soybean rust fungus is an obligate parasite, survival in an area depends on the availability of green vegetation of suitable host plants. Soybean rust has a wide host range including several crop and non-crop legume species. While the host range in nature is not well defined, kudzu, a perennial noxious weed that is widespread in the southern U.S., is a known host upon which soybean rust is known to reproduce. Winter freezes in the U.S. have severely limited over-wintering of the soybean rust fungus. However, soybean rust has been recently identified to be over-wintering on kudzu in two locations in west central Florida. Climatologists have estimated that soybean rust is unlikely to survive winters in most areas of the U.S. except for extreme south Lousiana, south Texas, and Florida. In Brazil where it is probable that soybean rust will over-winter most years, the disease has been and will likely remain a consistent problem that affects soybeans each year, sometimes attacking early in the crop's development. In the U.S., outbreaks will likely arise from long-distance movement from



south to north each year, thus being a more sporadic problem. Areas where rust occurs late in the season will likely escape damage despite the presence of the disease.



Weather conditions in a region further complicate the rust situation. Climatologists predict that Oklahoma is a fringe area for rust-favorable weather. Projections are that extended periods suitable for rust development will occur once every two to three years. Therefore I expect that rust will be an occasional problem in the state. Predicting where and when comes down to the good old disease triangle. For rust to develop, we will need the crop, the presence of the fungus, and favorable weather for disease development.

Monitoring the risk for introduction of soybean rust into Oklahoma will be done in two ways. Firstly, North Carolina State University has an excellent system for forecasting the long range spread of plant diseases and have developed very useful web-based programs for tobacco blue mold and cucurbit downy mildew. They have adapted this system for soybean rust and are already making forecasts on the movement of spores from the infected kudzu in Florida (http://www.ces.ncsu.edu/depts/pp/soybeanrust/). For each confirmed source of soybean rust in a region, forecasts of long-range spore transport are made using maps that project trajectories along which spores are likely to travel. Included are risk estimates that incorporate weather effects on spore survival, likelihood for deposition (washout), and favorability of weather along the trajectory pathway for infection. We will be regularly monitoring this program during the growing season. Secondly, there is a concerted national effort to establish sentinel plots of soybeans for monitoring the presence of rust. Sentinel plots will be established in five location in Oklahoma and frequently monitored for the presence of rust. Alerts from the forecast program and any positive detections will be immediately made.

Numerous fungicides are available for control of soybean rust, either through federal registrations (Sec. 3) or emergency exemption (Sec. 18). Oklahoma and other soybean producing states have received approval, pending identification of soybean rust in the state, several fungicides for rust through an emergency exemption. Table 1 lists the fungicides that will be cleared for use on soybean rust.

Table 1. Fungicides available for control of soybean rust

Common name	Trade name	Fungicide group	Rate	Registration status
azoxystrobin	Quadris	strobilurin (11)	6.2 – 15.4 fl oz	Sec. 3
pyraclostrobin	Headline	strobilurin (11)	6.0 – 12.0 fl oz	Sec. 3
chlorothalonil	Bravo, Equus	chloronitrile (M)	1.5 – 2.0 pt	Sec. 3
myclobutanil	Laredo EC	DMI – triazole (3)	4.0 – 8.0 fl oz	Sec. 18
tebuconazole	Folicur	DMI – triazole (3)	3.0 – 4.0 fl oz	Sec. 18
tetraconazole	Domark 230ME	DMI – triazole (3)	4.0 – 6.0 fl oz	Sec. 18
propiconazole	Tilt, Propimax	DMI – triazole (3)	4.0 – 8.0 fl oz	Sec. 18
propiconazole + trifloxystrobin	Stratego	DMI – triazole (3) + strobilurin (11)	5.5 – 10 fl oz	Sec. 18
propiconazole + azoxystrobin	Quilt	DMI – triazole (3) + strobilurin (11)	14 - 20 fl oz	Sec. 18
pyraclostrobin + tebuconazole	Headline SBR	strobilurin (11) + DMI – triazole (3)	7.8 fl oz	Sec. 18

The maximum number of applications per season will be two for any one of the products, or any product and a combination product with the same active ingredient. There may be an amendment that allows for three total applications, but no more than two of the same product or active ingredient. Since soybean rust has not occurred in the US during a soybean cropping season, there is no local data on fungicide efficacy and application timing. USDA/ARS has conducted efficacy trials in South America and Brazil, and industry has conducted efficacy trials in South America. A summary of these trials is posted on my web site (http://entoplp.okstate.edu/profiles/damicone.html) under the "peanut and soybean" disease link. There are also price estimates for some of the products that were obtained from local dealers and a description of the soybean growth stages in this handout. Application timing in soybeans is almost always reported by growth stage and it is important to be able to recognize these stages.

In the reported efficacy trials, applications were made during the reproductive (R) growth stages. The first application was generally made at R1, although single applications were made in some trials at R3 or R5. In the USDA trials, up to three applications were made on 21 day intervals. Results show differences in the degree of control among fungicides. However, yield responses to the fungicides appear quite similar. Generally the triazole fungicides Folicur, Domark, and Laredo provided the best disease control and the protectant fungicide Bravo was least effective. Yield responses in the better trials ranged from 10 to 15 bu/A.

I have not developed specific recommendations for fungicide use in Oklahoma. I would consider a fungicide program if 1) yield potential is good and, 2) rust threatens (is found in the field or is reported nearby). I would probably favor a triazole fungicide because they tend to be cheaper and more effective than the strobilurins. Except for Stratego, the premix products also tend to be more expensive. There will be trials conducted at the Eastern Research Station in Haskell that evaluate yield response to fungicides in soybeans. Previous work in Oklahoma has shown that it in the absence of soybean rust, yield response to foliar fungicide is unlikely.

There is a perception that specialized spray equipment will be required to effectively apply fungicides for soybean rust. In row and vegetable crops where fungicides are routinely used, I know of no data that supports this idea. In fact, most studies that have compared various sprayer types and/or nozzles have shown little of any differences in resulting disease control. My

recommendation would be to focus on application timing and spray volume. Ground applications should be broadcast with flat-fan nozzles in a minimum of 15 gal/A, and aerial applications should be made in a minimum of 5 gal/A. Many of the fungicides will permit chemigation application. However, I would avoid this method of application. In peanuts, chemigation is effective for control of soilborne diseases. However, foliar disease control with chemigation has been marginal at best. Apparently residues remaining on the leaves from this high volume method of application are not sufficient to provide good disease control. Chemigation applications of triazoles in particular have been ineffective in controlling foliar diseases on peanuts.

In much of the information available on soybean rust, fungicides have been classified as protectant or curative. Generally all fungicides work best if they are applied before infection and all fungicides have protectant activity. The term curative is misleading because plants that are diseased cannot be cured. In fungicide science, the term "curative" generally refers to the ability of a fungicide, usually one with systemic properties, to eradicate infections at their very early stage, before symptoms appear. There is a lag period (about 9-10 days for soybean rust) between the times when the fungus enters the plant and symptoms appear. This is referred to as the incubation period. Fungicides with curative activity can stop infections from developing at some point during this lag period. Both the triazole and strobilurin fungicides are systemic, but the degree of systemic movement is greater for the triazoles than the strobilurins. Apparently, the triazoles have better curative activity on soybean rust. Their use would be advised where rust is already present in the field.

Finally, there is a perception that rust increases so quickly that a field can be killed in about 10 days. This perception is probably not accurate. Rust spores deposited in a field from a distant source will be at a relatively low concentration. Probably 2-3 disease cycles (generations) will need to develop before severe defoliation results. In the case of soybean rust, symptoms of the disease are easily overlooked when they develop in the lower canopy. Observations of the rapid killing of fields probably are likely the result of overlooking the early generations of rust present in the field. Early rust symptoms are not as obvious as for other rust diseases such as leaf rust of wheat. The pustules are quite cryptic and generally occur on the lower sides of leaves. Furthermore, a 20X hand lens is needed to visualize the pustules. The PowerPoint presentation on my web site (http://entoplp.okstate.edu/profiles/damicone.html) details symptom development, rust identification, and scouting guidelines.

Cabrio Registered on Spinach and Greens

John Damicone, Extension Plant Pathologist

Cabrio is the vegetable formulation of pyraclostrobin that is also marketed as Headline on other crops. Cabrio is a strobilurin fungicide with the same mode of action as azoxystrobin (Abound, Quadris). Cabrio recently received a supplemental label for spinach and leafy brassica greens (turnip and mustard greens, collards, and kale). In OSU trials, Cabrio provides superior control of white rust on spinach. The rate on spinach is 8 to 12 oz/A and the label permits two consecutive applications before alternating to a fungicide with a different mode of action. In contrast, the label for Quadris specifies a 1 to 1 alternation with a fungicide having a different mode of action. On Brassica greens, Cabrio is highly effective on Cercospora leaf spot, the major foliar disease on these crops in Oklahoma. In following the resistance management

guidelines, a problem on these crops is a lack of registered alternatives with a non-strobilurin mode of action. On spinach, Aliette and Ridomil Copper are available for white rust control. On Brasicca greens, there are no effective alternatives for Cercospora leaf spot. Fortunately, Brassica greens generally receive only one application per crop. The use of Quadris and Cabrio in the same spray program would not satisfy resistance management guideline and would consist of an off-label use. Results from OSU trials on white rust and Cercospora leaf spot control on these crops are available in OSU Vegetable Trial Reports that are published yearly. Current and past issues are on-line in Horticulture and can be accessed from my web page (http://entoplp.okstate.edu/profiles/damicone.html) by clicking on "vegetable crop diseases".

Wheat Disease Update

Bob Hunger, Extension Plant Pathologist

I made the following observations on a trip this past week (April 5-7) to central and southwestern Oklahoma.

- Stripe rust is still present, but fields in southern and central Oklahoma are starting to appear more necrotic rather than being covered with actively sporulating pustules. However, there are exceptions to this, with wheat in some fields still producing lots of stripe rust spores. The best examples of this was a field of Tomahawk near Altus (Figure 1) and fields of 2174 (Figure 2) and OK 102 near Apache. As you can see in Figure 2, there are plenty of spores still being produced.
- In the variety trial near Apache, the wheat ranged from late GS 8 to 9 to not quite GS 10 (boot stage). In this trial and in fields around Apache, there was stripe rust, powdery mildew, stripe rust and leaf rust, and I know that fields have been sprayed for both.
- Leaf rust is starting to appear more frequently on the mid and upper canopy leaves. This seemed to be especially true on the variety Jagalene.
- Rick Kochenower (Area Research & Extension Specialist – Panhandle) reported on April 1 that he has seen high levels of rust in variety trials and fields in the panhandle. This is not typical for the panhandle, but this year there has been the proper combination of environment, pathogen and host to facilitate rust infection and disease development.
- There are lots of "barley yellow dwarf virus (BYDV) spots" in many fields from Stillwater to southwestern Oklahoma.
- As Roger Gribble reported last week, the variety trial at Kingfisher is relatively clean – as is the wheat from I-35 at Guthrie west to Watonga. I did find some greenbugs and bird cherry-oat aphids low in the plants (but very few spots of BYDV) and a few sporulating stripe rust

stripes in Custer. The variety trial at Kingfisher was mostly at growth stage (GS) 8-9 (flag leaf emerging to emerged).

- Still no samples received of wheat streak mosaic or high plains virus have come to the diagnostic lab, and I didn't see any suspects on this trip.

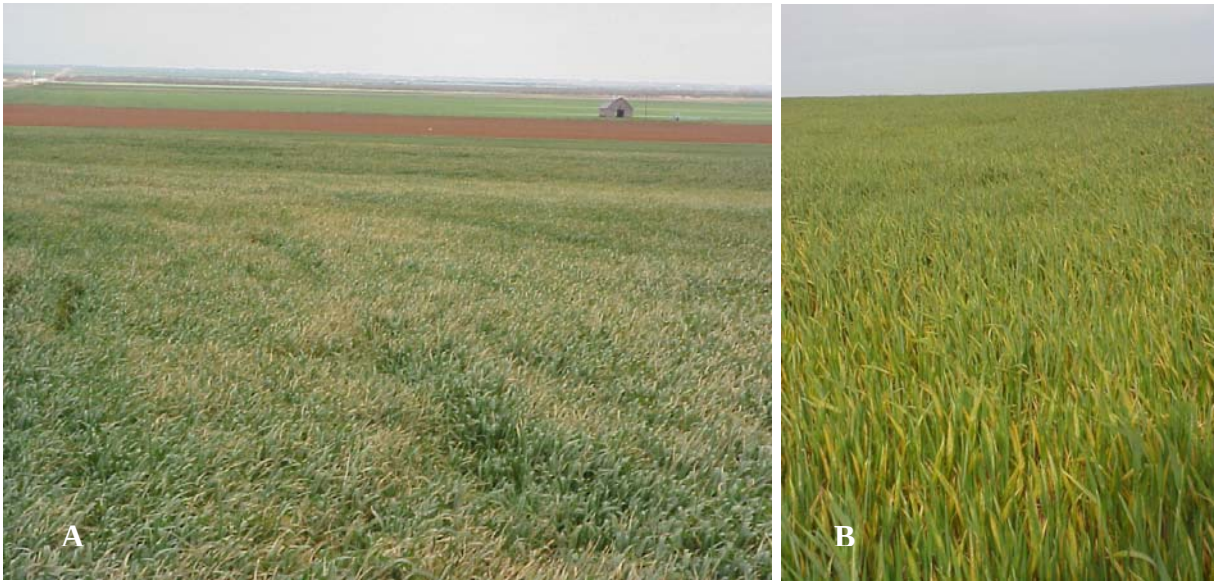


Fig 1. Stripe rust on Tomahawk near Altus, OK on (A) March 22, 2005, and (B) April 5, 2005.

Fig 2. Spores of stripe rust from a field of 2174 near Apache, OK on April 5, 2005.

Dr. Richard Grantham
Director, Plant Disease and Insect Diagnostic Laboratory