



**United States Department of Agriculture Position Statement
On *Phakopsora pachyrhizi* Urediniospore Trapping
2005 Soybean Rust Coordinated Framework
August 11, 2005**

A proposed component of Asian soybean rust (ASBR) monitoring in the United States is sampling rain water (wet deposition) and air (dry deposition) for early detection of urediniospores of *Phakopsora pachyrhizi*. Urediniospores (shortened to “spores” in most public ASBR communications) are the principal fungal structures responsible for spread of ASBR. The utility of early detection using spore traps is currently under study and should be considered experimental. Other rust spores are likely to be present, so it is important to use validated procedures to assure *P. pachyrhizi* is correctly identified. Spore trapping research is expected to provide insight into ASBR epidemiology and improve systems for early warning and timely disease management.

Spore Trapping Objectives

1. Aerobiology. The date when spores are first detected in a new area would be compared to the model-predicted date of spore deposition in a new area where ASBR symptoms have not yet been observed in the field (sentinel plot or otherwise). These data will help to validate the aerobiological model (http://www.aphis.usda.gov/ppq/ep/soybean_rust/sbrandhi11_17_04_files/frame.html). Most likely the movement of spores from the southern plains will follow the same route as urediniospores of other rust species. Spore traps will not only be used to validate aerobiological models, but also help locate inoculum sources. The “spread” models start from a defined inoculum source, but further studies are needed to determine the precise source of inoculum within the US and surrounding regions.
2. Latent period. The time from the first date when spores are trapped to when disease expression is observed would be compared to the model-predicted date for ASBR symptom expression. These data will help to validate the modeled latent period (e.g. under ideal environmental conditions for infection, it would be the time from infection to the production of new urediniospores).
3. Spore production. In cases where the number of spores trapped are quantified (e.g. spores counted directly or estimated through future molecular methods), the data will help to validate the model(s) that estimate spore production and/or spore dispersal.
4. Early warning. When spores are first trapped in a new area, surveillance (sentinel plots or otherwise) should be stepped up according to model projections of favorable conditions for disease development nearby, as communicated via the State specialists’ direction for when and where to survey.

Major Spore-Trapping Efforts

Organizations other than those identified below are involved in spore trapping, but only the major efforts are described herein.

USDA, Agricultural Research Service (ARS). The role of ARS in spore detection is described within the document, “A Coordinated Framework for Soybean Rust Surveillance, Reporting, Prediction, Management and Outreach”, available on the USDA soybean rust website at <http://www.usda.gov/soybeanrust/>. Within the “monitoring program” section of that document, ARS has committed to analyzing rain samples for the presence of *P. pachyrhizi* spores to provide early warning and assist with model calibration of predicted spore deposition concentrations and timing prior to symptom development in the field. A PCR assay will be used to test 124 National Atmospheric Deposition Program (NADP) sites. Samples will be collected weekly and mailed to a central processing lab (NADP, Illinois State Water Survey) where they will be filtered. Filters will be sent to the ARS lab for analysis on a weekly basis. The spore deposition data collected by the program will be relayed to the Soybean Rust Monitoring and Prediction System.

Syngenta. A passive-design trap samples air like a weather vane in the Syngenta system, where the opening to the trap is pointed towards the wind and any material in the air is then impinged onto a glass slide coated with petroleum jelly. The traps are to be sampled at least once a week. The slides are express-mailed to scientists at the University lab who Syngenta has arranged to examine the slides, and the results relayed to both the sampler and Syngenta. USDA is informed (the Animal and Plant Health Inspection Service (APHIS) and the Cooperative State Research, Education, and Extension Service (CSREES)) if the lab scientists believe the spores are *P. pachyrhizi*. Syngenta then posts the information on the Internet (<http://www.soybeanrust.com>), realizing the presence of spores does not necessarily indicate that ASBR symptoms are present on host plants in nearby fields. Rather, finding *P. pachyrhizi* spores indicates a need for vigorous scouting in that area (similarly, absence of spores does not mean ASBR symptoms are not present on hosts in the area). Initially, Syngenta’s intent was to visually verify and then run PCRs to determine if the suspect spores were *P. pachyrhizi*. However, with so few spores present in the traps, it has not been possible to validate the procedure to differentiate *P. pachyrhizi* from other rust species via PCR. Syngenta began by deploying 100 traps in the southern US. The objective was to detect initial inoculum in the region, ideally 7-14 days before a sentinel plot (or local susceptible host) would show ASBR symptoms. Syngenta plans to move the trap north to new areas after spores are confirmed as "positive" several times in the trap’s current location, or when ASBR is found nearby. However, they have placed a few traps in more northern States just in case there is farther northward progression than might be expected.

ASBR Identification

The relationship between *P. pachyrhizi* spore presence in a location and ASBR symptom appearance is not yet understood. Therefore, USDA's confirmation of ASBR uses infected host tissue rather than spores. Samples should first be sent to the National Plant Disease Diagnostic Network (NPDN) or State laboratory prepared to receive diagnostic samples for a given State. These laboratories will send samples suspected to be infected with *P. pachyrhizi* to APHIS, if a potential new State or new host record for the US (http://www.aphis.usda.gov/ppq/ep/soybean_rust/sbridv4.pdf).

Both APHIS and the NPDN should be notified when spores suspected to be *P. pachyrhizi* are trapped, but spore samples are not required to be sent to APHIS nor the NPDN laboratory for identification. The party who collects the spore sample is responsible for diagnostics, unless specific arrangements have been made with a particular laboratory. Spore trap results are not routinely posted on the USDA soybean rust website because of the experimental nature of the effort.

Summary

USDA believes spore trapping could prove useful in future surveys and modeling efforts; however USDA also believes there are many challenges and questions that need to be resolved before spore data can be used most effectively. Therefore, spore trap observations need to be put into the context of what is known about ASBR epidemiology and observed behavior in the US. USDA urges a collaboration of those who are collecting spore data this year so that in the future scientifically accurate interpretations may be conveyed to the public, particularly in forecasts and alerts for growers.

“SBR Spore Detection ver6.doc”