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# Asian Soybean Rust – Frequently Asked Questions III: Control with Fungicides

*Pat Phipps, Extension Plant Pathologist, Tidewater Agricultural Research and Extension Center*
*Erik Stromberg, Extension Plant Pathologist, Department of Plant Pathology, Physiology, and Weed Science, Virginia Tech*
*David Holshouser, Extension Soybean Specialist, Tidewater Agricultural Research and Extension Center*
*Elizabeth Bush, Special Research Associate, Department of Plant Pathology, Physiology, and Weed Science, Virginia Tech*

## Are fungicides effective against Asian soybean rust (ASR)?

There are effective fungicides for controlling ASR. Since there are currently no soybean cultivars with acceptable levels of resistance to ASR, fungicides will be necessary to control this disease. University, USDA, and industry fungicide trials have been underway in Africa, South America, and the southeastern United States. Fungicide efficacy, application timing, and management strategies have been established and will continue to be refined. Current research data give plant pathologists and the industry a basis for recommendations in the United States. However, environmental conditions and soybean cultivars grown in Virginia are not identical to those in South America, Africa, and other parts of the southeastern U.S. More work is needed to firmly establish the best strategies for the conditions and soybean cultivars in Virginia and other parts of the country.

## Will there be enough fungicide available to treat all my acres?

This will depend on when and where ASR appears and on the severity of the outbreak. Most effective fungicides are either labeled or have been approved via the Section 18 Emergency Quarantine Exemption. The crop protection industry has put mechanisms in place to prevent individuals from hoarding fungicides and has taken steps to ensure that fungicides will be available to areas of the country that need them.

## Are there concerns regarding development of resistance to fungicides among the ASR population?

Triazoles and strobilurins are among the fungicide classes registered for use on soybean to control ASR. There is a risk of resistance development with triazoles and, particularly, strobilurins. To ensure that these fungicides retain their activity against soybean rust, adhere to the following guidelines:

- Limit solo applications (e.g. applying only a strobilurin or only a triazole fungicide). When a single fungicide class is used, apply only one strobilurin or two triazoles per growing season.
- Do not apply consecutive solo applications of fungicides in the same class. Instead, alternate fungicide classes during the season (e.g. follow a strobilurin spray with a triazole spray, or vice-versa).
- Use the rate recommended on the label.
- Use a premixed fungicide product, containing both a strobilurin and a triazole. This allows more than a single mode of activity against ASR and decreases the likelihood of resistance development.

Finally, growers should monitor fields after fungicide use. If resistance development is suspected, contact the local Extension agent, certified crop advisor, and/or pesticide vendor.

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## Are there Section 18 emergency exemption labels for fungicide control of ASR on hosts other than soybeans?

There is a Section 18 Emergency Exemption package for specialty legumes that was not included in the Section 18 for soybean. It is unknown whether the Section 18 status will be granted for specialty legumes in time for the next growing season.

## If I apply fungicides to my soybeans, will ASR spores from nearby untreated fields re-infect my treated soybeans?

Refer to the specific product label for minimum respray intervals. When applied correctly, fungicides continue to offer protection from infection by the fungus for a period of time, which varies by product, and is specified on the product label.

Keep in mind, however, that new leaves produced after the initial fungicide application will not be protected. Therefore, fields need to be scouted on a regular basis for signs of infection of new leaf tissue.

## Which maturity group should I spray first?

Crops in vegetative stages should not be treated with fungicides. For crops in reproductive stages, spray the maturity group most at risk first. Determining the most at-risk maturity group is complicated. Generally, a crop in an earlier reproductive stage will be more at risk than a crop in a later reproductive stage. A more detailed answer, including some scenarios, can be found in the May 2005 issue of the Virginia Soybean Update newsletter at *http://www.vaes.vt.edu/tidewater/soybean/soybeanup/soybeanup.html.*

## What steps will be taken to protect people and the environment when growers are advised to spray soybean fields with pesticides?

Close monitoring of environmental conditions (temperature and moisture) and the location of ASR will provide the information needed to make informed treatment decisions. Forecasting models are being developed and communication mechanisms are in place to ensure that timely treatments can be made and unneeded sprays avoided. Virginia also conducts a soybean aphid and ASR monitoring program. This intensive scouting program will alert producers when and if ASR arrives in Virginia and of appropriate management options. Fungicide application recommendations will only be made when they are considered necessary by plant pathologists at Virginia Tech through Virginia Cooperative Extension. Additionally, the safety and biological impact of a fungicide are criteria evaluated by EPA before allowing a Section 18 registration.

## How many fungicide sprays will be needed in a season to control ASR?

Based on current research, if ASR arrives in Virginia during the reproductive stages (R1-R6), soybean producers will most likely need to apply from one to three fungicide applications to obtain optimal disease control. The number of fungicide applications, if any, depends on when ASR arrives, expected weather conditions, and the cost effectiveness of disease control (i.e. yield potential of the field, the expected price per bushel, cost of fungicide application, etc.).

In Brazil during the 2003/2004 season, it was estimated that 95 percent of the acreage was treated with either one or two sprays. The number of sprays increased to an average of two to three sprays in the 2004/2005 season. Short-season cultivars had less exposure to the disease and, therefore, only required one spray, whereas long-season cultivars needed two to three applications to achieve adequate protection.

In Georgia and Alabama, the first spray was deemed most important in controlling the disease in 2005. Therefore, do not delay fungicide applications when Virginia Cooperative Extension recommends treatment.

## How much will it cost to control ASR?

Fungicide application costs could range anywhere from $10 to $50 per acre, depending on the ASR arrival date, the product used, number of applications, and spray equipment (i.e. owned or custom applied, aerial or ground). To minimize cost, one should stay abreast of Virginia Cooperative Extension recommendations and make applications only when recommended.

## Which fungicides are most effective?

There are three classes of fungicide with activity against ASR. Products vary in regard to plant uptake, distribution in the plant, mode of action, efficacy, residual activity, phytotoxicity, and resistance development potential. The key difference among these fun-

gicides is whether they are a **protectant** or **curative** fungicide.

**Protectant** fungicides prevent fungi from successfully infecting and/or penetrating host tissue. Protectants include chlorothalonil and the strobilurins (azoxystrobin, pyraclostrobin, trifloxystrobin, etc.). These products must be applied before spores have germinated and/or penetrated the plant tissue to be beneficial.

If ASR has already infected the plant, then **curative** fungicides must be used. These have a limited ability to slow or halt the development of existing infections. Only triazoles (myclobutanil, propiconazole, tebuconazole, tetraconazole, etc.) have curative activity. However, once ASR begins to sporulate on plant tissue their efficacy is reduced. The rule of thumb is that fungicide applications will not be beneficial if more than 10 percent of the leaves on the lower to mid-canopy are infected with ASR.

While reports from Africa, South America, and other parts of the southeastern United States have shown differences in performance of individual fungicides, those results are not always directly applicable to growing conditions and soybean cultivars grown in Virginia.

## Will fungicides applied for controlling ASR also control other diseases that might be present in the crop?

Fungicide treatment for ASR should also provide incidental control for some other soybean foliar diseases. There are a number of foliar soybean diseases, such as frogeye leaf spot, brown spot, and Cercospora blight, which were found to be prevalent in Virginia soybean fields during 2004 and 2005. Depending on the efficacy of the product, other diseases may be controlled by fungicide applications for ASR. Check product labels for other diseases listed.

## Which fungicide should I use to control ASR?

This will depend on whether ASR has been detected in the area or has already infected the plant. If ASR risk is high based on reliable reports and observations, the crop is in a reproductive stage, and ASR has not been detected in the area, then a strobilurin or a premix (strobilurin + triazole) is recommended. If ASR risk is high, based on reliable reports and observations, the crop is in a reproductive stage, and ASR is present at barely detectable levels (1 percent to 10 percent of observed leaves) in the area, then a triazole or premix (triazole + strobilurin) is recommended.

## Will some fungicides cure the disease?

No currently labeled fungicide is known to cure the disease. The disease can be controlled with fungicides if ASR is barely detectable (less than 10 percent of leaves). If ASR is readily apparent by the naked eye in the mid canopy, fungicide application will not be beneficial and yield loss will occur.

## If curative fungicides will not cure ASR, why are they designated “curative”?

Triazole fungicides have the ability to inhibit or stop the development of infections that are already established. However, these curative fungicides do not have unlimited curative activity. Efficacy of curatives is reduced once sporulation begins. Therefore, even curative fungicides are of little use once ASR has become even moderately established in a field (i.e. greater than 10 percent ASR rust incidence).

## When should fungicides be applied?

Fungicides should only be applied when soybeans are in the reproductive stages (R1 up to R6) and when risk is high, based on reliable reports and observations. Most fungicide labels restrict applications after the R5 stage.

## What determines the use of a curative or protectant fungicide?

- If ASR risk is high based on reliable information, the crop is in a reproductive stage, and rust has not been detected in the local soybean crop, then a protectant fungicide is recommended.

- If ASR risk is high based on reliable reports and observations, the crop is in a reproductive stage, and ASR is present at barely detectable levels (1 percent to 10 percent of observed leaves) in the area, then a curative fungicide is recommended.

## Should I mix fungicide(s) and herbicide(s) for application?

Fungicides and herbicides should only be tank mixed if application windows overlap and treatment is warranted. Most herbicide applications are applied early,

in the vegetative stages. Spraying fungicides for ASR control during vegetative stages is not beneficial. Only if a "rescue" herbicide treatment is made after soybeans have entered the reproductive stages can one justify combining fungicides and herbicides. Only apply fungicides for ASR control when risk is high based on reliable reports and observations. Consult individual product labels for compatibility and other factors that might alter the efficacy of the products.

### Should I mix insecticide(s) and fungicide(s) for application?

Only apply insecticides when the insect pest levels are above threshold levels. If threshold populations indicate application of an insecticide is warranted **and** ASR risk is high based on reliable reports and observations, mixing insecticide(s) and fungicide(s) for application may be justified.

### Should I add adjuvants to fungicides for ASR control?

Many fungicide labels recommend adding surfactants, crop oil concentrates, or other adjuvants to fungicides for ASR control. Surfactants reduce the surface tension between the spray droplet and leaf. Certain adjuvants will improve penetration into the leaf. Therefore, the addition of adjuvants could improve fungicide efficacy.

However, the addition of adjuvants to some fungicides has resulted in increased soybean leaf burn or phytotoxicity. Most reports of phytotoxicity have been with the triazole family of fungicides. In addition, the severity of the leaf burn may be related to soybean cultivar. Until more is known about the potential phytotoxicity of fungicide-adjuvant combinations on soybean, one should only add adjuvants listed on the fungicide labels. Be sure to consult individual product for adjuvant compatibility and other factors that might alter crop phytotoxicity.

## Other ASR Resources

Asian Soybean Rust website at Virginia Tech – *http://www.ppws.vt.edu/ipm/soybeanrust/index.htm*

USDA Soybean Rust Tracking site – *http://www.sbrusa.net/*

North American Plant Disease Forecast Center – *http://www.ces.ncsu.edu/depts/pp/soybeanrust/*

The Southern Plant Diagnostic Network – *http://spdn.ifas.ufl.edu/soybean_rust.htm*

## Related Publications

*Asian Soybean Rust – Frequently Asked Questions I: Background and General Information*, Virginia Cooperative Extension publication 450-301

*Asian Soybean Rust* – Frequently Asked Questions II: Identification, Biology, and Ecology, Virginia Cooperative Extension publication 450-302

*Asian Soybean Rust – Frequently y Asked Questions IV: Cropping Systems and Cultural Practices*, Virginia Cooperative Extension publication 450-304

*Asian Soybean Rust – Frequently Asked Questions V: Monitoring, Tracking, and Scouting*, Virginia Cooperative Extension publication 450-305

*Asian Soybean Rust – Frequently Asked Questions VI: Sprayer and Nozzle Technology*, Virginia Cooperative Extension publication 450-306

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