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## Fungicides, Herbicides and Soybean Rust, Do They Mix?

Soybean rust is now in the continental U.S. During November of 2004 the fungus was found in 8 southern states, including Tennessee and Missouri. It is more likely than not that rust will appear in Indiana soybean fields during 2005 and subsequent years. Currently, fungicides are the only effective means of control. If used properly, they can do a good job of preventing losses from this destructive disease. In an effort to hold down production costs, growers may be tempted to combine a herbicide and fungicide into a single application. This may not be the most effective utilization of either the herbicide or fungicide. The two still may best be applied separately.

### Drift and Nozzle Selection:

Drift is always a concern when applying herbicides. Drift reduction generally requires using application methods that increase the average droplet size. Droplets with volume median diameter of 400 micrometers ( $\mu\text{m}$ ) or more are specified on some herbicides labels. Droplet size is controlled by choice of nozzle and application pressure. Nozzles such as the Drift Guard Flat Fan, Greenleaf TurboDrop, Greenleaf AirMix, TeeJet Air Induction all provide a volume median diameter over 400  $\mu\text{m}$  (Hofman and Wilson). To reduce the number of fine droplets, pressure is usually set to the low side of the pressure range recommended by the nozzle manufacturer. Foliar applied fungicides inhibit the germination of spores on the leaf or halt the growth of fungal hyphae in the leaf. Effective control of soybean rust with a fungicide requires good canopy penetration and leaf coverage. Thus, fungicide application often requires smaller droplets, which are produced by using nozzles with smaller orifices and higher pressures than are used for herbicides. Experience with soybean rust in Brazil suggests that droplets should have a mean volume diameter less than 220  $\mu\text{m}$ . Many fungicide labels also address drift preventative measures. For example, the Quadris label recommends the use of drift prevention measures when apple trees are in the vicinity of application. Similar to some herbicide labels, the Stratego label specifies that it be applied only when the maximum wind speed is less than 15 mph.

Although the use of contact herbicides requires use of a fine spray pattern to increase coverage, there is a delicate balance between achieving good coverage and preventing drift. The consequences of damaging sensitive crops near by should weigh heavily for the use of drift prevention strategies. Fungicide drift may not cause obvious symptoms in non target plantings, but may result in less effective disease control in the target crop and could result in illegal residues on non target crops.



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## Timing:

Herbicide timing and fungicide timing may not coincide. There is some latitude in the timing of a post-emergent application of glyphosate, but it is recommended that annuals be sprayed when they are 4 to 6 inches high, and perennials when they are 6 to 12 inches high. Would this timing be appropriate for fungicide application? Until we have had direct experience with soybean rust in Indiana, we will not know what the best timing is for fungicide application, but based on experience in Brazil, we anticipate that fungicide applications would rarely be required before the R1 stage (beginning flowering) of development. Although several glyphosate products can be applied over the top of soybean until 50% of the plants are in bloom, a single application of glyphosate this late in the season would not be effective. Herbicide efficacy decreases as weeds become older and larger. Waiting to apply glyphosate until the R1 stage would reduce result in poor weed control. An initial application this late would not reduce competition between weeds and the soybean in time to prevent yield loss. Mixing a fungicide with glyphosate for application at the proper time for weed control would generally be much too early for rust control. This timing issue would be even more evident with the use of contact herbicides, where the application window is smaller and earlier than for glyphosate.

## Label Issues:

All pesticides come with a label, and this label is the law. The label gives directions of use, regulatory statements, environmental and worker safety, and recommendations on how to achieve the optimum efficacy of the particular product. Most labels for soybean herbicides and fungicides are vague on the matter of tank mixing herbicides and fungicides. A safe interpretation of the absence of a statement about tank mixing on a pesticide label is not to do it.

Fungicides are not mentioned on several product glyphosate labels as tank mix partners. In other cases, for example Roundup WeatherMax, the labels state that use of a fungicide with the herbicide can reduce efficacy. Fungicides labels also vary in what they state about adding herbicides. Some fungicide labels, like some herbicide labels, imply that mixing agricultural chemicals that are not listed on the label is not recommended. Other labels say nothing about tank mixing fungicides and herbicides at all. For a summary of herbicide and fungicide tank mix regulations seen on the labels see Table 1.

## Conclusion:

Although the idea of decreasing sprayer trips over the field is appealing to save both time and money, jeopardizing the efficacy of a herbicide or fungicide application can cost more in the end. Most soybean-producing states, including Indiana, have responded to the threat of soybean rust by submitting applications for emergency registration ("Section 18 registration") of additional fungicides to the U.S. Environmental Protection Agency (EPA). These labels, along with the standard product label, should be consulted before considering tank mixing the fungicide with an herbicide. Section 18 labels for soybean rust fungicides approved for use in Indiana can be found at < [http://www.ppd.l.purdue.edu/PPDL/SBR/SBR\\_IN\\_fungicides.htm](http://www.ppd.l.purdue.edu/PPDL/SBR/SBR_IN_fungicides.htm) >.

**Herbicide and fungicide label information is available for free from the following web sites**

CDMS

Greenbook

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Label language may change regarding the tank mixing of fungicides and herbicides in the near future, however, limited data exist regarding the effectiveness of fungicide:herbicide combinations. At this point it would be best to assume that fungicides and herbicides should be applied separately until the labels state otherwise and we have more information about optimal timing and potential antagonistic interactions.

Hofman, V. and J. Wilson. Choosing drift-reducing nozzles. North Dakota State University. FS 919.

**Table 1. Label restrictions concerning the tank mixing of herbicides and fungicides\*.**

Compound	Restriction
<b>(Herbicides)</b>	
Classic	Not addressed on label - recommends the two do not come in contact with each other during storage
Clearout 41 Plus	Not addressed on label
Cobra	Not addressed on label
Firstrate	Not addressed on label
Glyphomax	Not addressed on label
Glyphos	Not recommended over the top - may reduce efficacy
Mirage	Not recommended over the top - may reduce efficacy
Roundup WeatherMax	Not recommended over the top - may reduce efficacy
Select	Not addressed on the label - the label states that the applicator assumes any responsibility when tank mixing with products not specifically stated on label
Touchdown Hi-Tech	Not recommended - although fungicides are not addressed directly on the label, it is stated that tank mixes with pesticides NOT on the label may result in reduced efficacy
Ultra Blazer	Not recommended - physical incompatibility and possible decreased efficacy
<b>(Fungicides)</b>	
Bravo	Recommends not to tank mix other pesticides unless prior use has been effective
Echo	Not addressed on label
Folicur	Not addressed on label
Laredo	Tank mixes not addressed on label - several supplemental labels have been released concerning soybean rust
PropiMax	Not addressed on label - several supplemental labels have been released concerning soybean rust
Quadris	Tank mixtures with herbicides allowed in PRE applications
Tilt	Not addressed on label

**\*Information presented was drawn from labels and supplementary labels available at the time the article was written**

Information listed here is based on research and outreach extension programming at Purdue University and elsewhere.

The use of trade names is for clarity to readers of this site, does not imply endorsement of a particular brand nor does exclusion imply non-approval. Always consult the herbicide label for the most current and update precautions and restrictions. Copies, reproductions, or transcriptions of this document or its information must bear the statement 'Produced and prepared by Purdue University Extension Weed Science' unless approval is given by the author.