2005

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Published by University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

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NF634

Fungicides to Manage Soybean Rust: What are the Product Differences?

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If Nebraska soybean producers find themselves needing to apply a fungicide for soybean rust this year, it will be important to choose an effective product based on the stage of disease development in the specific field. Timing of the first application should depend on when soybean rust is detected in nearby areas of the U.S. Sentinel plots will be place throughout U.S. soybean producing states to serve as early indicators of potential problems. It will be important for all producers and crop managers to be aware of where soybean rust is being detected to pursue a treatment that provides the maximum return on investment for any fungicides being applied.

Based on experiences in other parts of the world, it is critical that a fungicide application be made prior to significant rust development in the field. The critical window of protection for the soybean crop will be from flowering (growth stage R1) through full seed (growth stage R6). Some researchers in South America suggest that at 20 percent disease severity, the leaf damage is already too great for a fungicide to help. Currently, there is no efficacy data from the United States so all recommendations are based on fungicide trials in South America. Fungicides available for Nebraska soybean fields are listed in *Table I.*

One fungicide group often discussed for soybean rust management is the triazoles. Triazoles include products with myclobutanil, propiconazole, tebuconazole and tetraconazole. These products provide rapid systemic activity with the ability to kill the rust fungus once it infects plant tissues. A triazole or triazole-strobilurin mix should be used if soybean rust is present in the field.

The second group of fungicides is the strobilurins which include azoxystrobin, pyraclostrobin and trifloxystrobin. This group has some systemic activity, but the strobilurins are not as rapidly absorbed as the triazoles. This group is also not as systemic as the triazoles and does not appear to be as effective in killing the fungus once it is established in the plant. Strobilurins should be used only in preventative application or in combination with a triazole if rust is present in the field.

The final product is the contact fungicide chlorothalonil, which is strictly a protectant and has activity only on the leaf surface when the rust spore is germinating. Since this product is not systemic, the residual activity can be affected by environmental conditions (specifically rain or irrigation). Chlorothalonil is generally considered to have a shorter residual activity and will need to be reapplied more frequently than the systemic products. More research is needed with this product to support the suggested longer residual activity claim being made by some.

Resistance Management Issues

While resistance to fungicides has not been detected in the soybean rust fungus to date, it is in all our best interests to follow resistance management strategies. Given the airborne nature of this disease, when resistance develops it will be a problem for everyone. Resistance to strobilurins and triazoles has been found in many other fungi and impacts disease management worldwide. Strobilurins are active on a single site in the mitochondria of a fungus and pose the greatest risk of resistance development in the soybean rust fungus. Because they have activity on a single site, they are not affected by the rate of product used. Therefore, resistance development will not be favored if lower rates are used for the strobilurins.

Resistance to triazoles will be favored if reduced rates are used. The triazoles are active at a different site of the fungus, in the cell membrane. To avoid potential resistance problems do not use rates lower than recommended for triazole products.

Chlorothalonil is a multi-site active product, and thus, poses little risk of resistance development in fungi. There are no reports of resistance in the literature. In the future we may see the chlorothalonil products used in resistance management strategies.

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Issued April 2005

Table I. Products approved for management of Asian soybean rust in Nebraska as of April 1, 2005. Registration is pending for Orius. No more than two applications may be made with any given Section 18 active ingredient. Section 18 labels must be in the user's possession at the time of application.

Fungicide						*Application Method/Gallons Water per Acre*[1, 2, 3]			*Use and Re-entry Information*		
Trade Name	*Active Ingredient*	*Class*	*Manufacturer*	*Registration*	*Rate/Acre (2 app./year)*	*Chemigation*	*Aerial*	*Ground*	*Re-entry Interval (REI)*	*Preharvest Interval (PHI)*	*Timing*
Bravo Weather Stik®	chlorothalonil	Chlorothalonil	Syngenta Crop Protection	Full	24 - 36 fl oz	Allowed, consult label	5 - 10 gpa	5 - 10 gpa	12 hours	Do not apply within 6 weeks of harvest [4]	Preventative
Echo® 720	chlorothalonil	Chlorothalonil	Sipcam Agro, Inc.	Full	24 - 40 fl oz	Allowed, consult label	5 - 10 gpa	5 - 10 gpa minimum	12 hours	Do not apply within 6 weeks of harvest [4]	Preventative
Echo® 90DF	chlorothalonil	Chlorothalonil	Sipcam Agro, Inc.	Full	1 1/4 - 2 lbs	Allowed, consult label	5 - 10 gpa	5 - 10 gpa minimum	12 hours	Do not apply within 6 weeks of harvest [4]	Preventative
Quadris®	azoxystrobin	Strobilurin	Syngenta Crop Protection	Full	6.2 - 15.4 fl oz	Allowed, < 1/2 acre-inch	5 gpa	Adequate for coverage and canopy penetration	4 hours	14 day PHI on beans, 0 day PHI for forage and hay	Preventative
Headline®	pyraclostrobin	Strobilurin	BASF Corporation	Full	6 - 12 fl oz [6]	Allowed, < 1/2 inch/acre	5 gpa	Adequate for coverage and canopy penetration	12 hours	Do not apply within 21 days of harvest or feeding hay	Preventative
Laredo® EC	myclobutanil	Triazole	Dow AgroSciences	Section 18	4 - 8 fl oz	Not allowed	5 gpa minimum	Adequate for coverage and canopy penetration	24 hours	Do not apply within 28 days of harvest [4]	Preventative & Curative
Bumper® 41.8 EC	propiconazole	Triazole	Makhteshin-Agan, Inc.	Section 18	4 - 8 fl oz	Not allowed	5 gpa minimum	15 gpa minimum recommended	24 hours	Do not apply after R5 (pod fill) [4, 5]	Preventative & Curative
PropiMax® EC	propiconazole	Triazole	Dow AgroSciences	Section 18	4 - 8 fl oz	Allowed, 1/4 - 1/2 inch sprinkler irrigation	5 gpa minimum	15 gpa minimum	24 hours	Do not apply after R5 (pod fill) [4, 5]	Preventative & Curative
Tilt®	propiconazole	Triazole	Syngenta Crop Protection	Section 18	4 - 8 fl oz	Not allowed	5 gpa minimum	10 gpa minimum (Min. of 15 gpa recommended)	24 hours	Do not apply after R5 (pod fill) [4, 5]	Preventative & Curative
Folicur® 3.6F	tebuconazole	Triazole	Bayer Crop Science	Section 18	3 - 4 fl oz	Not allowed	5 gpa minimum	10 gpa minimum (15 gpa recommended)	12 hours	May be used up to R6 (full seed) [4]	Preventative & Curative
Orius™ 3.6F	tebuconazole	Triazole	Makhteshin-Agan, Inc.	Pending	3 - 4 fl oz	Not allowed	5 gpa minimum	10 gpa minimum	12 hours	Do not apply within 30 days of harvest [4]	Preventative & Curative
Domark™	tetraconazole	Triazole	Isagro-USA	Section 18	4 - 6 fl oz (Only 1 appl. allowed/year)	Allowed, consult label	5 - 10 gpa	5 - 10 gpa minimum	24 hours	Do not apply after R5 (pod fill) [4]	Preventative & Curative
Stratego®	propiconazole + trifloxystrobin	Triazole + Strobilurin	Bayer Crop Science	Section 18	5.5 - 10 fl oz (7-10 fl oz recommended)	Not allowed	5 gpa minimum	10 gpa minimum (15 gpa recommended)	24 hours	Do not apply within 21 days of harvest [4, 5]	Preventative & Curative
Quilt®	propiconazole + azoxystrobin	Triazole + Strobilurin	Syngenta Crop Protection	Section 18	14 - 20.5 fl oz	Not allowed	5 gpa minimum	15 gpa minimum recommended	24 hours	Do not apply after R5 (pod fill) [4, 5]	Preventative & Curative

[1]Tank mixes. Consult label for specifics. Consider GPA before considering adding other pesticides to the tank mix as the high volume of water may cause materials to be less than optimally effective.
[2]All products have the potential to contaminate ground and surface water if used improperly through leaching, runoff and off-target application. Consult label for information pertaining to drift management and potential use restrictions near water.
[3]Use of adjuvants may enhance the performance of some products. Consult the label for more information or potential problems associated with the use of adjuvants.
[4]Do not feed soybean hay or threshings to livestock; do not allow grazing.
[5]Do not rotate to any crop intended for food, grazing or animal feed or bedding within 105 days of application unless rotational crop appears on product label.
[6]Application rate as low as approved reduced rate of 4.5 fl oz per acre can be used when tank mixed with a tebuconazole fungicide.