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SOUTHERN RUST OF CORN AND ITS MANAGEMENT IN SOUTH TEXAS

Tom Isakeit*

Southern rust, caused by the fungus Puccinia polysora, is the most important foliar disease of corn in the Upper Coast region of Texas. In some wetter years, when very susceptible hybrids are grown, it may require a fungicide treatment to minimize yield loss. The symptoms of this disease are slightly raised, circular (1 to 2 millimeters in diameter), orange pustules (Fig. 1) that are mainly on the upper sides of leaves. In comparison, common rust (Fig. 1), caused by the fungus Puccinia sorghi, is seen early in the season and never progresses to cause economic damage in this area. Common rust produces elongated, dark red pustules. Southern rust pustules can also occur on stalks and husks. Initially, southern rust occurs on the lower foliage and progresses to the upper canopy during the growing season. The severity of disease in the upper canopy is increased by wet conditions such as frequent rain during the season.

Hybrids vary in their degree of susceptibility to this disease. With very susceptible hybrids, high severity of rust (>50 percent of leaf area covered) on upper canopy leaves can lead to premature drying. This may affect yield, primarily by reducing kernel weight. In one experiment, yield loss ranged from 4 percent to 45 percent, with the higher loss occurring in late-planted corn. This data was based on a comparison of near-isogenic crosses, but data comparing yield between fungicide-treated and non-treated hybrids is sparse. Consequently, there are no established thresholds for the economical use of a fungicide.

The purpose of a fungicide application is to protect the upper leaves of the plant during the period of kernel development. If it is applied too early, such as during the vegetative stage, it may not protect the critical leaf tissue, and another fungicide application may be necessary. Since all fungicides work by preventing pustule development in some manner, they need to be applied before a significant amount of disease is present in the upper leaves. The benefits of a fungicide application will be affected by hybrid susceptibility, the timing of infection, and environmental conditions that support disease development. A late-planted, highly susceptible hybrid in a growing season with frequent rain showers is at the highest risk of severe disease development and will probably benefit from a fungicide application.

Severe epidemics of this disease do not occur annually. The sporadic occurrence of the disease makes it difficult to get good data on hybrid susceptibility from a variety of trials. However, in one of the South Texas trials, some of the hybrids that were very susceptible to rust also ranked high for yield. In this trial, it is not known whether the yield would have been higher had there been a timely fungicide application.

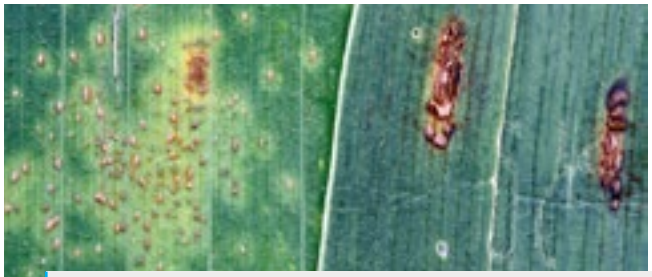

Figure 1. Pustules of southern rust caused by *Puccinia polysora* (left) in comparison with common rust pustules caused by *Puccinia sorghi* (right). Common rust is seen on foliage early in the season, but its development is hindered by high temperatures. The amount of southern rust increases over the growing season if warming temperatures occur with frequent rain or heavy dews.

Leaf wetness, such as rain or dew, is necessary for infection by wind-blown spores. Infection is optimal with 16 hours of dew at 80ºF, although the fungus can infect over a temperature range of 54º to 97ºF. The turn-around time from infection to new spores ranges from 9 to 12 days.

*Professor and Extension plant pathologist, Texas A&M AgriLife Extension, The Texas A&M University System

STEPS TO MAKING A DECISION TO SPRAY A FUNGICIDE:

1. **Is it southern rust? (See Fig. 1)**

   No. Continue to scout.

   Yes. Go to Step 2.

2. **What is the severity on lower leaves? Is at least 3 percent to 5 percent of the leaf area of at least 50 percent of the plants affected? See Figure 2 for an estimation of 3 percent to 5 percent leaf severity.**

   No. Continue to scout.

   Yes. Refer to Table 1 to determine the benefit of spraying.

Figure 2. A guide illustrating approximately 3 percent to 5 percent leaf area covered by southern rust pustules.

TABLE 1. POSSIBILITIES OF BENEFITS OF SPRAYING FOR SOUTHERN RUST DEPENDING ON THE CROP STAGE WHEN IT IS FIRST DETECTED.

CROP STAGE	POSSIBLE BENEFIT FROM SPRAYING	COMMENT
Vegetative	None	
VT (tasseling)	Maybe, with a late-planted and very susceptible hybrid	May need a second spray
R1 (silking)	Yes	May need a second spray
R2 (blister)	Yes	Less likely to need a second spray
R3 (milk)	Yes	No second spray needed
R4 (dough)	Maybe, with severe disease pressure	No second spray needed
R5 (dent)	Less likely	No second spray needed
R6 (black layer)	None	

WHAT FUNGICIDE TO SPRAY?

In South Texas, there is a lack of efficacy data based on side-by-side comparisons with replications. There are three classes of fungicides labeled on corn with different modes of action. Fungicides in the same class can differ in their activity and stability. Based on Upper Gulf Coast studies conducted with a limited number of fungicides, it appears that any of the labeled fungicides will do a good job if they are applied in a timely manner, such as before extensive pustule development on the leaves attached to the ears or higher leaves. Performance of different fungicides may vary greatly under severe disease pressure, but under lighter pressure, all the labeled fungicides should work well. Under some circumstances, it may be necessary to make a second fungicide application if the first fungicide was applied early in the season. Fungicides will have activity 2 to 3 weeks after application, so with an early season application, another application may be needed if disease pressure continues during the growing season. The use of a fungicide should be considered as a tool for risk management. If a fungicide is applied to a less-susceptible hybrid, or if weather conditions become too dry to support future disease development, then there is no benefit—just an added cost to production. More studies are needed to define the thresholds for the economic management of southern rust in the Upper Gulf Coast.

The fungicides in Table 2 are grouped by chemical class with the corresponding Fungicide Resistance Action Committee (FRAC) number. The FRAC number is a classification that can be used for resistance management. For example, in the event an additional spray is needed, if the fungicide label says to alternate a fungicide with one that has a different mode of action (FRAC number) and the fungicide was Headline (strobilurin class, FRAC 11), then the subsequent fungicide cannot be Quadris or other FRAC 11 fungicides. The fungicide for the subsequent application should then be a triazole or pyrazole-carboxamide. Fungicide mixtures (i.e., different FRAC groups) are less prone to resistance development because of two different modes of action, but labeling may still require fungicide rotation. At this time, limited data from the Upper Gulf Coast area suggests that for southern rust control, one fungicide application per season would be sufficient. Central Texas ("Blacklands"), which is generally drier, would have less disease pressure than the Upper Gulf Coast.

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TABLE 2. FUNGICIDES LABELED ON CORN. CHECK THE FUNGICIDE LABEL FOR ADDITIONAL RESTRICTIONS AND USE GUIDELINES.		
SINGLE MODE OF ACTION ACTIVE INGREDIENT: STROBILURIN CLASS (FRAC 11):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Quadris; Azoxystar; Trevo; Aframe	*azoxystrobin*	
Evito	*fluoxastrobin*	Do not apply later than R4.
Aproach	*picoxystrobin*	
Headline	*pyraclostrobin*	
SINGLE MODE OF ACTION ACTIVE INGREDIENT(S): TRIAZOLE CLASS (FRAC 3):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Tilt; Propimax	*propiconazole*	
Topguard	*flutriafol*	80-day pre-harvest interval.
Tebuzol: TebuStar	*tebuconazole*	
Proline	*prothioconazole*	
Prosaro	*prothioconazole + tebuconazole*	No adjuvant use between V8 and VT.
Domark	*tetraconazole*	No adjuvant use between V8 and VT. Do not apply later than R3.
SINGLE MODE OF ACTION ACTIVE INGREDIENT: PYRAZOLE-CARBOXAMIDE (FRAC 7):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Trivapro A	*benzovindiflupyr*	Apply with FRAC 3 or 11 fungicide.
MIXTURES – STROBILURIN (FRAC 11) + TRIAZOLE (FRAC 3):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Quilt; Quilt Xcel; Aframe Plus; Trivapro B	*azoxystrobin + propiconazole*	No adjuvant use between V8 and VT (Quilt Xcel).
Custodia	*azoxystrobin + tebuconazole*	No adjuvant use between V8 and VT.
Azure Xtra; RustEase	*azoxystrobin + cyproconazole*	
Fortix; Preemptor	*fluoxastrobin + flutriafol*	No adjuvant use between V8 and VT; 80-day pre-harvest interval.
Aproach Prima	*picoxystrobin + cyproconazole*	No adjuvant use between V8 and VT.
Headline AMP	*pyraclostrobin + metconazole*	No adjuvant use between V8 and VT.
Stratego	*trifloxystrobin + propiconazole*	Do not apply when there is environmental stress.
Stratego YLD	*trifloxystrobin + prothioconazole*	No adjuvant use between V8 and VT.
Zolera	*fluoxastrobin + tetraconazole*	No adjuvant use between V8 and VT. Do not apply later than R3.
Affiance	*azoxystrobin + tetraconazole*	No adjuvant use between V8 and VT.
Delaro	*prothioconazole + trifloxystrobin*	
Topguard EQ	*flutrialfol + azoxystrobin*	
Veltyma	*mefentrifluconazole + pyraclostrobin*	
MIXTURE – STROBILURIN (FRAC 11) + PYRAZOLE-CARBOXAMIDE (FRAC 7):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Priaxor	*pyraclostrobin + fluxapyroxad*	No adjuvant use between V8 and VT.
MIXTURE – TRIAZOLE (FRAC 3) + PYRAZOLE-CARBOXAMIDE (FRAC 7):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Lucento	*flutriafol + bixafen*	
MIXTURE – TRIAZOLE (FRAC 3) + PYRAZOLE-CARBOXAMIDE (FRAC 7):		
PRODUCT	**ACTIVE INGREDIENT**	**COMMENTS**
Trivapro	*azoxystrobin + propiconazole + benzovindiflupyr*	
Miravis Neo	*azoxystrobin + propiconazole + pydiflumetofen*	
Revytek	*pyraclostrobin + mefentrifluconazole + fluxapyroxad*	