Southern Rust of Corn and Its Management in South Texas

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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 mm diameter), orange pustules (see Fig. 1) that are mainly on the upper sides of leaves. In comparison, common rust (also shown in 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 (frequent rain) during the season.

Hybrids vary in their degree of susceptibility to this disease. With very susceptible hybrids, a high severity of rust (>50% 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% to 45%, 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 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 (e.g. 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 showing in the upper leaves. The benefits of a fungicide application will be affected by hybrid susceptibility, 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 highest risk from severe disease development and will probably benefit from a fungicide application.

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

Severe epidemics of this disease do not occur annually. The most recent epidemics in the Upper Coast were 2012 and 2007. The sporadic occurrence of the disease makes it difficult to get good data on hybrid susceptibility from variety 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's not known whether the yield would have been higher, had there been a timely fungicide application.

Leaf wetness (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.

Steps to Making a Decision to Spray a Fungicide:

1. Is it southern rust? (See Fig. 1)
   No. Continue to scout.
   Yes. Go to 2.

2. What is the severity on lower leaves? Is at least 3% to 5% of the leaf area of at least 50% of the plants affected (see Fig. 2 for an estimation of 3% to 5% leaf severity)?
   No. Continue to scout.
   Yes. Refer to Table 1 to determine benefit from spraying.

Fig. 2. Guide illustrating approximately 3% to 5% leaf area covered by southern rust pustules.

Table 1. Possibilities of benefits of spraying for southern rust depending upon the crop stage when it is first detected.

Crop Stage	Possible benefit from spraying	Comment
Vegetative	**No**	
VT (tasseling)	Maybe, with a late-planted & very susceptible crop	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)	**No**	

What fungicide to spray?

In the Upper Coast area, 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 Coast data, 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 (i.e. before extensive pustule development on the leaves attached to the ears, or higher leaves). Performance of different fungicides may vary greatly under more 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 needed for economical management of southern rust in the Upper Coast.

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*	Don't apply later than R4
Aproach	*picoxystrobin*	
Headline	*pyraclostrobin*	
SINGLE MODE OF ACTION ACTIVE INGREDIENT(S): TRIAZOLE CLASS (FRAC 3):		
Product	***Active ingredient(s)***	***Comments***
Tilt; Propimax	*propiconazole*	
Topguard	*flutriafol*	80-day PHI
Tebuzol: TebuStar	*tebuconazole*	
Proline	*prothioconazole*	
Prosaro	*prothioconazole + tebuconazole*	No adjuvant use between V8 and VT
Domark	*tetraconazole*	" " "; don't 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 ingredients***	***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
Fortix; Preemptor	*fluoxastrobin + flutriafol*	No adjuvant use between V8 and VT; 80-day PHI
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*	Don't apply when there is environmental stress
Stratego YLD	*trifloxystrobin + prothioconazole*	No adjuvant use between V8 and VT
Zolera	*fluoxastrobin + tetraconazole*	" " "; don't 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 ingredients***	***Comments***
Priaxor	*pyraclostrobin + fluxapyroxad*	No adjuvant use between V8 and VT
MIXTURE – TRIAZOLE (FRAC 3) + PYRAZOLE-CARBOXAMIDE (FRAC 7):		
Product	***Active ingredients***	***Comments***
Lucento	*flutriafol + bixafen*	
MIXTURE – STROBILURIN (FRAC 11) + TRIAZOLE (FRAC 3) + PYRAZOLE-CARBOXAMIDE (FRAC 7):		
Product	***Active ingredients***	***Comments***
Trivapro	*azoxystrobin + propiconazole + benzovindiflupyr*	
Miravis Neo	*azoxystrobin + propiconazole + pydiflumetofen*	
Revytek	*pyraclostrobin + mefentrifluconazole + fluxapyroxad*	

The fungicides in Table 2 are grouped by chemical class, with the corresponding 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 can't be Quadris or other FRAC 11 fungicides. The fungicide for the subsequent application should then be a triazole or fluxapyroxad. 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 in the Upper Coast area suggests that for southern rust control, one fungicide application per season would be sufficient. **April 26, 2020**