Managing Sunflower Rust

In the last week, sunflower rust pustules (uredia) have been found in sunflower fields in North Central North Dakota. This stage is the economic stage of sunflower rust, and appears as dusty cinnamon-brown pustules and dusty brown spores (Figure 1). The occurrence of uredia in fields is a couple weeks earlier than last year, and given that the crop is later in some areas, there is cause for concern. Sunflower rust has the ability to be devastating if environmental conditions are favorable and the disease is left untreated. Fortunately, fungicides are available for disease management. This article is intended to provide some critical information on the pathogen and management of the disease based on research data, observations from last year, and understanding of this and other rust systems.

Assumptions. Since rust was widespread in 2008, it is reasonable to believe that ample inoculum to start an epidemic of rust exists in the production region, particularly in areas where rust was observed last year. Additionally, since the rust pathogen has completed its sexual cycle in the last two growing seasons (evidenced by the aecial stage) we should assume that the races could be different than in previous years. Thus, we should assume that there is the possibility that 'resistant' sunflowers may no longer be resistant.

Environment. Even though the pathogen is present…there is no guarantee of an epidemic. The sunflower rust pathogen needs free moisture (dew or fog) to cause infection. Rainfall itself is not necessarily important; rust can cause problems even if it dries up, but free moisture is critical. Rust likes moderate to warm temperatures. Anything below 55 or above 85 degrees is going to slow down the epidemic. Rust can spread fast in a favorable environment; the time from infection to the production of new spores in only 10-14 days in optimum conditions.

Scouting. Getting into your field and looking for rust is very important. Cinnamon-brown pustules will occur on the top or bottom of the leaves. When the plant is actively putting out new leaves, you will most likely find the pathogen on the lower leaves, where dew is apt to be found for longer periods of time.

Fungicides. Folicur®, Headline®, and Quadris® are all available for management of sunflower rust. All the fungicides will reduce rust, but the fungicides act differently. Folicur has good systemic activity, and has more 'kickback' than the other two products, and thus has more 'curative' activity on existing infections. As a result, Folicur® is a better product to apply if you already have a significant amount of rust in your field. Headline® and Quadris® should be thought of as protectants for rust, although they have some systemic activity. Both products are most effective if they are applied just before rust is found or when rust is occurring at a low level.

Rate. Folicur is labeled at 4-6 fl oz, Headline at 6-12 fl oz, and Quadris at 6.0-15.5 fl oz. Folicur® at 4 fl oz has has been shown to effectively manage rust in numerous crops. For Headline® and Quadris®, the length of disease management may be related to the rate. In rust trials done in North Dakota in 2009, we used a 9 oz rate for both products. Rust is a potentially serious threat to sunflowers, and I do not recommend below-label rates.

The maximum allowable rate in a season for Folicur® is 16 fl oz, 24 fl oz for Headline®, and 28 fl oz Quadris (however, if the Quadris® chemisty, (Azoxystrobin), is used in a seed treatment product like Dynasty® that contributes to the total allowable rate. So if Azoxystrobin seed treatment was used, use 0.45 lb a.i./A to calculate the maximum allowable for the chemistry). The PHI for Folicur® is 50 days, 30 days for Quadris®, and 21 days for Headline®. However, applications made close to physiological maturity are not going to benefit the crop.

Herbicide Mixtures. With such an early occurrence of rust in some fields, there is a tendency to want to throw in a fungicide with herbicide applications. **This is a potentially dangerous approach.** We know fungicides should not be mixed with some herbicides (Assert®) and we have little to no data for other herbicides. Furthermore, responses from company technical representatives ranged from 'you're on your own', to 'be extremely careful' to 'I don't like the idea'. Unfortunate consequences can result, especially when things heat up.

My feeling is to do a good job taking care of the biggest problems you have right now, and worry about the others when they become the biggest problem. Right now, I think weed control is the biggest problem, so do a good job with that.

Timing. This is the million dollar question. We have a good idea of the appropriate spray timing when rust shows up during flowering, but have much less experience when it shows up early. Last year, personnel from industry (Vision Research Park, Northern Ag Management, some of the fungicide technical personnel) and myself, watched disease progression in a field near Mohall, ND. Uredia were first found around the 4th of July, and favorable environmental conditions occurred for much of the growing season. An application of Headline® was made at the bud stage (R1), followed by an application of Folicur® approximately two weeks later at early flower (R5.1). The field averaged approximately 1400 lb/A, and we estimated the untreated strip at about 200 lb/A with unmarketable quality. There was speculation that a third application near R6 would have added some more yield. In this expample, Folicur® was not labeled at the time of the first application; had it been, Folicur® would have likely been applied first and followed by Headline®.

When rust shows up later (during or after bloom), the data on fungicide efficacy is a little more clear. Approximately fifteen years ago, an Israeli pathologist developed an application threshold for Folicur®. He calculated that a spray at an average of 3% disease severity on the upper four leaves (using rust severity diagrams, Figure 2) would prevent economic loss. To evaluate this, and test a threshold for strobilurins (Headline® and Quadris®), timing trials were done in Langdon, Casselton, and Carrington in 2008, using Headline® and Tebuzol® (Folicur® generic), and additional fungicide trials were done to evaluate more products labeled and unlabeled products. Trials done in North Dakota in 2008 do not disagree with the 3% percent threshold for Folicur®. However, data suggested that a lower threshold (0-1% perhaps) is most appropriate for Headline®. In one timing trial using Headline® (Carrington Timing Trial 2008), disease was significantly higher when Headline® was applied a week prior to the disease symptoms, and when Headline® was applied at a severity of 7% on the upper four leaves, than an application of Headline® at approximately 1-1.5% severity (Figure 3). Statistically significant yield loss occurred at the 7% severity application.

In head to head comparisons (Carrington Fungicide Trial 2008) made at approximately 1.5-2% severity, all treatments reduced disease. However, rust was statistically lowest in Folicur® treated plots, statistically higher in plots treated with Headline®, and statistically higher than that in plots treated with Quadris®. Statistical differences in yield could not be measured. In a head to head comparison made within a few days of pustule development (0% severity, Casselton Timing Trial 2008), disease severity at R9 was statistically lower in plots treated with Headline® than in plots treated with Tebuzol®, although both reduced disease. However, disease severity was the same between the two products when applied at approximately 0.2-0.7% in the trial, and yield differences could not be determined.

Given this information, and what we know about the products, I believe the best threshold for a Headline® or Quadris® application is probably around 0-1%, while the Folicur® (and generics) threshold of 3% is probably appropriate. All chemicals have their benefits; Folicur ® is more effective at higher disease levels, but it is possible that the strobilurin products will protect longer, especially at higher rates.

This and additional data from the 2008 ND trials is available in a research report at http://www.sunflowernsa.com/research/research-workshop/documents/Markell_Rust_09.pdf, or search for my name at the National Sunflower Association website to find the report.

Below are my observations and what I would recommend

1. Rust is already in some fields.
2. Don't rely solely on resistance since we don't know what races are present this year.
3. Scout
4. Control your weeds without fungicides (don't mix herbicides and fungicides)

5. *If rust is already present in your field.*
Keep a very close eye on it. If environmental conditions are favorable, and spread is occurring, you may have to consider an early spray to protect the crop. However, if rust is light, wait until more leaves are out, or even until bud (R1).

6. *If rust shows up soon in your field.*
Keep an eye on dew and temperature
Monitor for spread, and do not let it get out of control
Consider a spray to protect the upper leaves, perhaps as early as bud (R1) and again in early flower (R5.2 - R5.5) if the environment is favorable.

7. *If rust shows up in the reproductive stages.*
Keep an eye on severity in upper four leaves
Try a 3% severity threshold for Folicur®, and a 0 to 1% (assuming rust present on mid-canopy leaves in the field) severity threshold for Headline or Quadris. If possible, wait until early flower (R5.2 or so) for the initial spray.

8. *If rust shows up after flowering is complete (R6)*
You are most likely in the clear.

9. Don’t underestimate the disease, but don’t panic. Last year rust was very severe in some areas (Bottineau County for example), but some fields escaped totally unscathed. However, it is critical to begin scouting your fields for rust.

10. Get more information if you need advice and always read and follow the labels.

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Figure 1. Sunflower rust uredia.

Figure 2. Sunflower rust severity diagrams.