FIELD FACTS

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Common Rust of Sunflower

Common rust (*Puccinia helianthi*), also named "red rust" in some areas, is the most widespread form of sunflower rust in the US and Canada. However, within North America four other rust species are found on sunflower – nutsedge rust (*P. canaliculata*), cocklebur rust (*P. enceliae, P. massalis*, and *P. xanthii*), and *Coleosporium helianthi.* Economic infestation levels of these additional rusts have never been reported; therefore, this article will only report on *Puccinia helianthi* or common rust. At least 25 different races of *P. helianthi* rust have been confirmed in North America.

Disease Description and Development

Common rust is native to North America and is characterized by cinnamon-red colored pustules on the leaves or other plant parts (Figure 1). One foolproof way to identify rust from other leaf diseases is to physically rub the pustules with thumb and forefinger. This causes common rust to smear, similar to iron rust. Rust thrives in warm and humid environments with typical infection occurring during the mid to late summer months. Extended dewy conditions highly favor rust formation.

Figure 1. Black-colored common rust pustules on the underside of a sunflower leaf in the later part of the growing season. This is the most common location and time of infection.

Confection type hybrids are generally more susceptible to rust (and other diseases) when compared to oil types and should be managed accordingly.

Figure 2. Aecial cups – an early season stage that indicates the onset of common rust infestation.

The common rust fungus overwinters in infected sunflower residue as teliospores (thick walled, resting spores). These teliospores germinate in the spring to produce basidiospores that are available to infect young sunflower plants the following spring with adequate conditions. A couple of different spore stages can occur (Figure 2) in the early season from basidiospores to the repeating uredial stage. The biology and life cycle of this pathogen enable infection to occur at any time during the growing season and for rust stages to repeat rapidly under favorable conditions.

Disease Symptoms and Management

Yield Loss

Common rust limits yield by reducing green leaf area resulting in limitation of photosynthesis (energy production). Rust not only impacts yield, but also influences oil content, seed size, test weight and kernel-to-hull ratios.

Timing of the infection has a critical role in the disease's influence on grain yield. Early infections that are left uncontrolled lead to the greatest yield reductions, whereas late infections may have little yield influence. Yield reductions of 50% have been documented when susceptible hybrids were infected early in the growing season. Other agronomic issues such as stalk lodging may result from fields that have large infestations of common rust.

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Fungicide Application

Two primary fungicide classes are currently utilized and labeled to control common rust in the northern plains – strobilurins (Headline and Quadris) and triazoles (Folicur 3.6F or its generics). Strobilurins are generally regarded as "protectant" type fungicides and should primarily be applied before the disease appears or at early onset of the disease with weather conditions highly favorable for disease development. Triazoles have "systemic" properties and should be applied when the disease is noticeably present in the crop.

Typical treatment threshold for first application (planning for triazole application) is at 2 to 3% pustule coverage on the upper four leaves of the plant during the R5 growth stages (flowering). Fungicide applications should be made before the R6 to R7 growth stage (flowering complete) for maximum economic impact. Research shows that applications after the R6 to R7 growth stage are generally not economic.

Research-based recommendations are less consistent in predicting economic success when rust infestation begins to approach the 2 to 3% level during the vegetative and/or bud stages. More research is needed in order to make definitive recommendations, but the following are the two most discussed strategies:

1) Plan for two applications of fungicide. Apply a triazole fungicide first when the upper four leaves show ~2% infestation and then apply a strobilurin as the second fungicide at the early stages of flowering. This is a **conservative** approach that aims to reduce disease risk and maximize crop value. It also has the advantage of utilizing different modes of action to help prevent the development of fungicide resistance by the disease.

2) Apply the triazole fungicide at a strong 3% infestation level. This slight delay may provide enough additional time of residual protection to eliminate the need for a second fungicide application (if weather cooperates). This approach offers some protection to the crop at a **lower cost**, but the risk of crop damage by the disease is higher.

Tank mix options can include most all common insecticides (e.g., Asana XL) for seed weevil or other sunflower head-infecting insects. Please consult your local crop protection retailer for options, and read and follow all label instructions.

Cultural Control

Prevention/Avoidance – Foliar diseases can be transmitted from field to field by equipment and weather which moves infected residue, as well as by wind-blown spores. To help minimize spreading the pathogen in this way, harvest highly infected fields last, clean equipment of crop residue before moving from one field to another, and utilize tillage on infected sunflower stubble after harvest

- **Reducing Sunflower Residue** – Utilize longer crop rotations (four years between sunflower crops) and tillage, when practical, to reduce the amount of sunflower residue with rust spores remaining on the soil surface.
- **Resistant Hybrids** - There are only a few current hybrids that contain strong levels of genetic resistance to common rust (e.g., Pioneer 63M91). The specific parent lines providing resistance have been identified by researchers; therefore, genetic resistance can be bred into future varieties. However, rust is known to have many different "races" and the rate at which these races populate and continue to diversify complicates the breeding for resistance. Continued screening of sunflower genetic material (including wild sunflower types), identification of any new strains or races of rust, and recombination of resistant genetics into improved hybrids are all instrumental in providing a successful long-term plan against this disease.
- **Planting early** to minimized the late-season infection time frame
- **Avoiding high plant populations** that provide a more humid canopy (therefore suitable environment for the disease to thrive)
- **Avoiding high nitrogen rates** (less vegetative growth thus less humidity)
- **Controlling other disease hosts** – wild and volunteer sunflowers in the area

Remember, cultural control practices only reduce (do not prevent) disease occurrence.

References

NDSU Extension Publication, A-1331, 2007. Sunflower Production. September 2007 edition. Univ. of North Dakota. http://www.ag.ndsu.edu/pubs/plantsci/rowcrops/a1331intro.pdf

Markell, Sam, 2010. Sunflower Rust. National Sunflower Assoc. *Webinar*, April 2010. University of North Dakota. http://www.sunflowernsa.com/media/news/details.asp?ID=206

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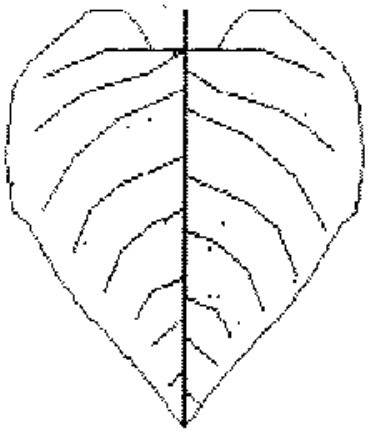
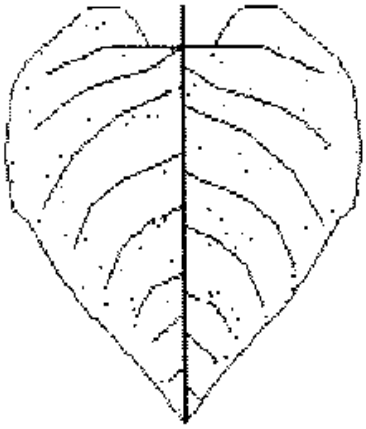
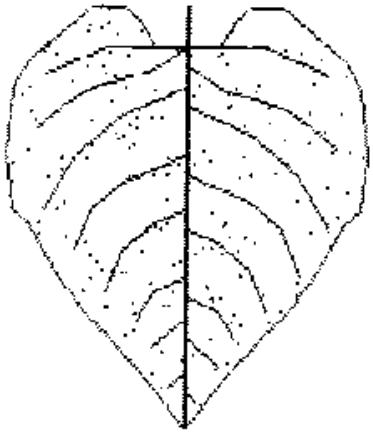
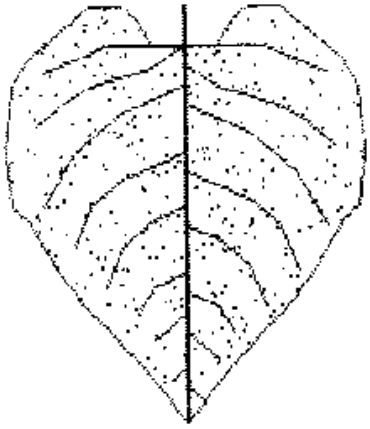
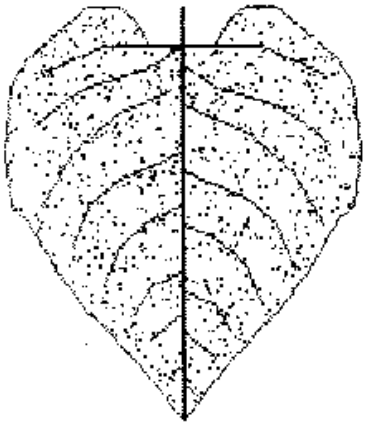
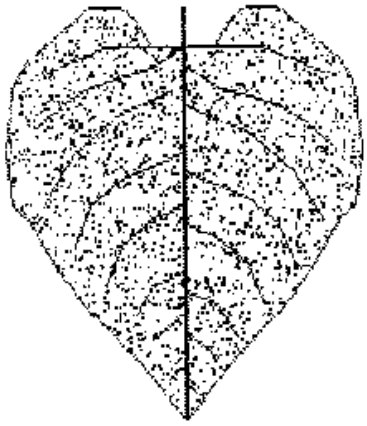
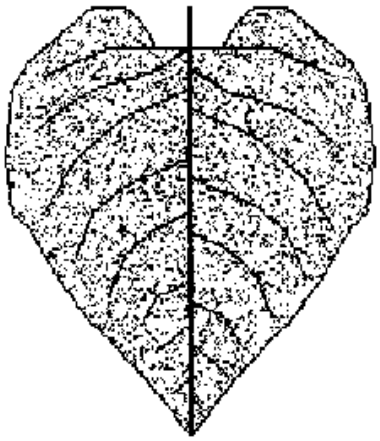
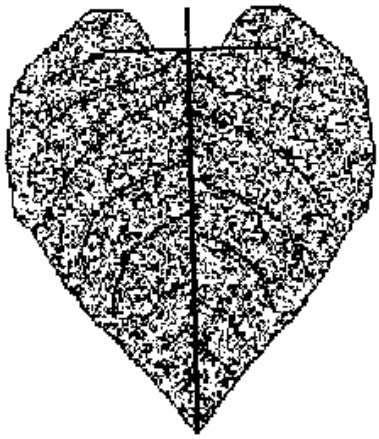
Diagrams of sunflower leaves to assist in determining rust infestation levels.

 **Leaf Area Affected .1%**	 **Leaf Area Affected .5%**	 **Leaf Area Affected 1%**
 **Leaf Area Affected 2%**	 **Leaf Area Affected 5%**	 **Leaf Area Affected 10%**
 **Leaf Area Affected 20%**	 **Leaf Area Affected 40%**	

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