Southern Rust of Corn

Rusts are fungal leaf diseases that can spread rapidly in corn fields when wet weather patterns persist over a large geography for an extended period of time. Rust outbreaks generally occur during the ear-fill period of corn growth. In the U.S., rusts historically develop first in southern corn fields and then may spread into primary corn-growing states (Figure 1). Movement is by windblown spores that travel northward with prevailing weather systems.

Two kinds of rust can affect corn in North America - southern and common rust. Although these rusts have similar life cycles on corn, their impact on the crop is very different, as yield loss in hybrid corn is generally much higher for severe southern rust epidemics than for common rust outbreaks. Consequently, it is important for growers to recognize which rust disease is occurring. This article will focus on southern rust symptoms, its life cycle, weather conditions that promote its development and characteristics that distinguish it from common rust.

So. Rust Development, Life Cycle and Symptoms

Southern rust is favored by periods of high relative humidity and high temperatures - ideally, in the 80s and 90s (°F). Consequently, southern rust usually occurs later in the growing season and is more prevalent in southern states. Southern rust does not occur as often from year to year as common rust, but it is usually more severe when it does occur. The disease can develop very rapidly during warm, humid conditions, and its effects can be devastating.

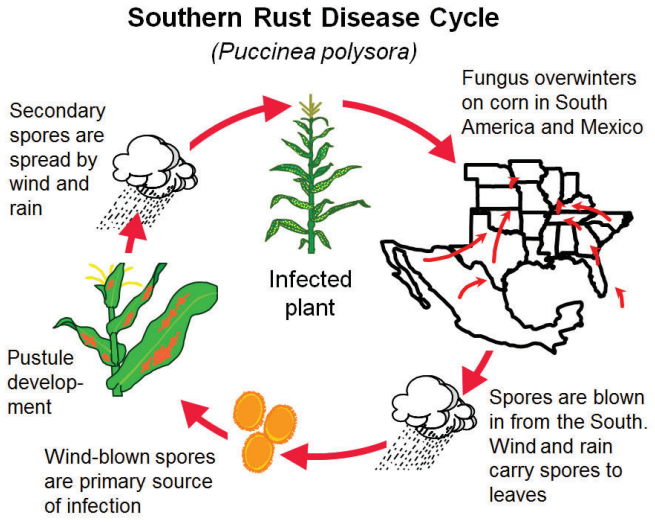

Figure 1. Southern rust disease cycle.

Southern rust looks very similar to common rust, but several characteristics distinguish the two (Table 1 and Figure 2). Southern rust pustules are usually confined to the upper leaf surface, while common rust is found on both upper and lower surfaces. Southern rust is more orange or reddish-orange in appearance, while common rust is red or cinnamon-brown. Southern rust pustules have a circular or "pinhead" appearance, while those of common rust have an elongated, jagged appearance (Figure 2).

Table 1. Distinguishing characteristics of common vs. southern rust.

	Southern Rust	Common Rust
Ideal Environment	Moist, warm to hot (77+ °F)	Moist, cool to warm (60 to 77 °F)
Appearance of Pustules	Small circular, pin-head appearance	Large, circular to elongated
Color of Pustules (spores)	Reddish orange	Brown to cinnamon-brown
Location of Pustules	Upper leaf surface	Both upper and lower leaf surfaces
Tissues Infected	May also infect husks	Infects leaves only

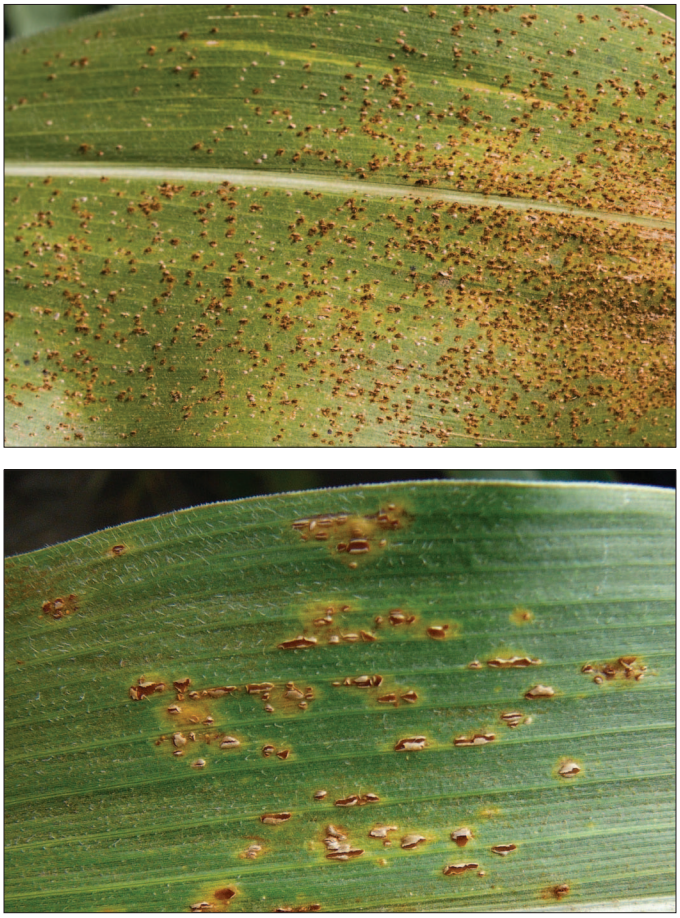

Figure 2. Typical symptoms of southern rust (top) and common rust (bottom) on corn leaf.

Impact on Crop

Yield loss in hybrid corn is generally much higher for severe southern rust epidemics than for common rust outbreaks. Yield loss due to rust depends on timing of infection, amount of leaf area damaged and location of damaged leaves on the plant. If significant damage to upper leaves occurs early in the life of the hybrid, yield losses will be higher. If damage is confined to lower leaves of the corn plant or occurs in the later reproductive stages of development, little economic loss would be expected. Consequently, the latest-planted corn in an area is at higher risk for yield loss due to leaf diseases. Southern rust spreads very

rapidly when conditions favor development. New infections may occur every seven days, so fields may be damaged very quickly, and epidemics may occur over large areas. Yield losses are highest when severe epidemics result in premature plant death well in advance of normal maturity.

Stalk quality is closely tied to leaf function. Loss of leaf area by disease lesions reduces the amount of photosynthate produced by the leaves. When the demand for sugars by developing kernels exceeds that produced by the leaves, the plant takes structural carbohydrates from the stalk to meet the need. The stalk is weakened, fungi invade and stalk rots develop. If lodging occurs, harvest losses may result.

Disease Management

Because southern rust is windborne and rarely overwinters in the U.S., rotation and tillage are not effective in managing this disease. Therefore, scouting fields and applying a fungicide if needed, selecting hybrids with genetic resistance (though limited), and timely harvest are the best management practices to reduce losses from the disease.

Scout Fields - Growers should scout corn fields to detect southern rust early; then monitor disease development, crop growth stage and weather forecasts. Fungicide application is warranted if: 1) rust is spreading rapidly or likely to spread and yield may be affected, or 2) disease level exceeds the threshold established by the local state extension plant pathologist. See the section below on fungicide application for more details.

Genetic Resistance - DuPont Pioneer researchers screen hybrids and parent lines for resistance and provide ratings for customers. Hybrids differ, but genetic resistance is limited; most hybrids are rated from 3 to 5 on a scale of 1 to 9 (9=resistant).

Monitor Fields for Early Harvest - Where leaf diseases have occurred, growers should monitor stalk quality as corn maturity progresses. To detect stalk rot, pinch stalks at internodes near the base of the plant or push plants sideways an arm's length at ear level. Stalk rot is indicated if plants break over rather than returning to vertical. Check stalks in several areas of the field, and consider early harvest if the field has 10 to 15 percent rotted stalks.

Fungicide Application

Timely foliar fungicide applications can help reduce leaf damage due to southern rust. Although precise economic thresholds for treatment are not available for all areas, it is clear that the chances for a profitable return from spraying are greater when rust outbreaks are severe and corn prices are high. To be profitable, fungicide applications must be made in a timely manner before rust has spread throughout the canopy, and before corn plants are near physiological maturity.

Achieving good coverage of the upper leaf canopy is also essential for successful control of rust with fungicides. For aerial applications, a minimum of 5 gal/acre of water should be used. For ground application, use a minimum of 20 gal/acre of water and hollow cone nozzles with spray pressure of at least 30 to 40 psi. However, spray pressures greater than 40 to 50 psi are not recommended because they create small droplets that do not penetrate to the ear zone. For ground applications at mature corn height, consider the following spray strategy: one nozzle spraying over the top of the plant and a drop nozzle on either side of the row to spray the ear leaf zone. Fungicides commonly used for southern rust management are shown in Table 2.

Table 2. Foliar fungicides commonly used to help manage southern rust in field corn[1].

Fungicide	Active Ingredients	Company
DuPont™ Aproach®	picoxystrobin	DuPont
Headline®, Headline® SC	pyraclostrobin	BASF
Headline AMP®	pyraclostrobin + metconazole	BASF
PropiMax® EC	propiconazole	DowAgroSciences
Quilt®, Quilt Xcel®	azoxystrobin and propiconazole	Syngenta
Stratego®	trifloxystrobin and propiconazole	Bayer
Stratego® YLD	trifloxystrobin and prothioconzole	Bayer
Tilt®	propiconazole	Syngenta

Silage From Rust-Infected Corn

The Integrated Crop Management Newsletter (Iowa State University) provided the following information about harvesting rust-infected corn for silage: "Producers who intend to chop and feed rust-infested corn silage may wonder about the forage quality and potential animal health risks. Forage quality may be lowered primarily because of the early death of the plant. Producers should monitor the crop to ensure that it is harvested at the optimum moisture content for ensiling (60 to 70 percent). There are no known toxic effects from feeding rust-infected corn silage. If the forage is ensiled, the ensiling process generally creates enough heat and acids to kill the fungus and detoxify the forage. In addition, the sugars and other by-products that are produced during the ensiling process should overwhelm any unpalatable tastes that the rust may impart (Munkvold and Farnham, 1999).

Source

Munkvold, G. and D.E. Farnham. 1999. Rust and other diseases are accelerating corn maturity. In Integrated Crop Management Newsletter, Sept. 13, 1999 issue. Ames, IA.

[1]This article is not intended as a substitute for the product label for the products referenced herein. Product labels for the above products contain important precautions, directions for use and product warranty and liability limitations that must be read before using the product. Applicators must be in possession of the product label(s) at the time of application. Always read and follow all label directions and precautions for use when using any pesticide alone or in tank mix combinations. Mention of a product does not imply an endorsement.