

Sugarcane Rust Disease ¹

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Since 1978, sugarcane production in Florida has been threatened by sugarcane rust caused by *Puccinia melanocephala*. This fungal pathogen is now found almost everywhere sugarcane is grown. The spread of the disease has had considerable economic impact. Screening for resistance has become an integral part of Florida sugarcane breeding programs. However, due to genetic variability within the pathogen population, resistance to the disease has not been stable. An example of this is CP 70-1133, an important variety grown for years without any sporulating pustules developing on it. Now, this same cultivar would be classified as moderately susceptible. Other important commercial clones have also demonstrated increasing susceptibility to sugarcane rust over time.

Yield loss assessment due to rust is difficult, but realistic estimates have been obtained. During 1988, rust was particularly severe on the variety CP 78-1247 in Florida. A comparison of CP 78-1247's yield that year with a variety of equal yield potential revealed yield losses of nearly 40% (averaged over 13 different locations where the varieties were grown

side-by-side). Another yield loss study, conducted by establishing a near disease-free check using a fungicide as a means for comparison, demonstrated losses of 20-25% on a moderately susceptible variety, CP 72-1210. This particular variety dominated the Florida sugarcane industry during the late 1980s, occupying as much as 60% of Florida's sugarcane acreage. Based upon the acreage of CP 72-1210 during the 1987 rust epidemic and using a conservative estimate of 20% yield loss, economic losses on CP 72-1210 during this single season were estimated as surpassing \$40 million.

SYMPTOMS

Sugarcane rust is mainly a disease of the leaf. The earliest symptoms are small, elongated yellowish spots that are visible on both leaf surfaces. The spots increase in length, turn brown to orange-brown or red-brown in color, and develop a slight, but definite, chlorotic halo (Figure 1). Lesions typically range from 2-10 mm in length but occasionally reach 30 mm. They are seldom more than 1-3 mm in width. Infections are usually most numerous toward the leaf

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tip, becoming less numerous toward the base. Pustules, which produce spores, usually develop on the lower leaf surface (Figure 2). Certain cultivars, however, may have some pustules on the upper surface.



Figure 1. Rust lesions on sugarcane leaf.

Pustules may remain active over a considerable period of time and spore production is highly dependent upon climatic conditions. However, eventually lesions darken and the surrounding leaf tissues become necrotic.

On a highly susceptible variety, considerable numbers of pustules may occur on a leaf, coalescing to form large, irregular, necrotic areas. High rust severities may result in premature death of even young leaves. Severe rust has caused reductions in both stalk mass and stalk numbers, thereby reducing cane tonnage.

CAUSAL AGENT

Sugarcane rust is caused by the fungus *Puccinia melanocephala*. An obligate parasite, the pathogen incites new infections only on living host tissue.

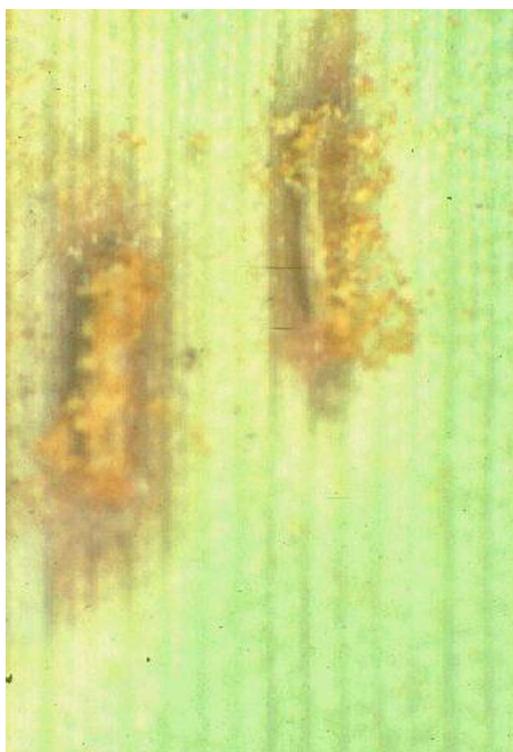


Figure 2. Rust pustules on lower leaf surface.

Changes in varietal susceptibility to rust have been observed over the years, suggesting the existence of fungal variants.

SPREAD OF THE DISEASE

Rust spores are very well-suited to dissemination by air currents. In fact, rust spores are so well-adapted for atmospheric transport that it has been hypothesized that the original source of rust in the Americas came from the continent of Africa via high altitude trans-Atlantic winds. On a more local scale, rust epidemics have been demonstrated to develop in the direction of prevailing winds.

Leaf wetness and atmospheric temperature are the environmental factors most influential for rust development. Several hours of free moisture on the leaf surface at a favorable temperature is necessary for successful spore germination and infection, and hence, spread of the disease. While long dew periods and rainfall events both contribute to leaf wetness, rainfall events are not quite as favorable for rust development. Heavy rains tend to remove spores from the atmosphere, rendering them infective if they land on the soil.

There are reports that high soil moisture also strongly favors infection. Presumably, high soil moistures would increase the humidity within the canopy, lengthening the duration of leaf wetness.

The optimal temperatures for spore germination are between 15° to 30° C (60° to 85° F). Under favorable moisture conditions, however, infection may occur within the temperature range of 5° to 34° C (40° to 90° F). In Florida, rust is most severe from February to May since its development is favored by the cool to moderate temperatures. Plants that are 3 to 6 months old are also prevalent during this period and the crop appears to be most susceptible at this stage.

Several soil factors may also significantly influence rust infection levels on sugarcane. Studies have shown rust levels to be higher on sugarcane grown on low pH soils than on high pH soils, particularly when high levels of phosphorus and potassium nutrients are present in the soil.

PREVENTION AND CONTROL

The best means of control for sugarcane rust is to grow resistant varieties. However, resistance has not been stable or durable on certain varieties, presumably because of rust variants. For this reason, it is highly recommended that growers diversify their varietal holdings. In this way, they will not have a predominance of one variety, should a rust variant develop that is capable of infecting that particular variety. Varietal diversification may play an important role in holding down the overall area-wide disease pressure, thereby reducing the natural selection pressure for one particular rust variant. It is believed that this may assist in preserving the durability of host plant resistance in current resistant varieties.

Although a number of chemicals are registered for foliar disease control on sugarcane, including sulfur and the phosphonics, chemical control of sugarcane rust does not offer enough economic return to be used at present.

Since soil factors have been identified as being associated with rust infection levels on sugarcane, avoid growing susceptible varieties in areas with low

soil pH and/or high levels of P and K nutrients. Sugarcane grown in fields receiving recent applications of cachaza or mill mud is typically very prone to rust. If possible, plant these fields with varieties that have demonstrated, durable rust resistance.