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Sugarcane Leaf Scald Disease[1]

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Leaf scald was first recognized as a bacterial disease of sugarcane in the 1920s. It is a vascular disease caused by *Xanthomonas albilineans.* The disease has been found in at least 55 countries. Many of these countries are in the most productive sugarcane areas of the world.

Leaf scald is a disease with the potential to seriously limit the cultivation of susceptible varieties. The disease is insidious in that it may have a latent (asymptomatic) period that lasts for years. Leaf scald is further complicated by the fact that it may be manifested in a chronic phase or acute phase.

The disease was discovered on the mainland U.S. at the USDA Sugarcane Field Station at Canal Point, Florida in 1967. This sugarcane breeding station has been screening for resistance to leaf scald since its discovery.

The incidence of leaf scald in both the Canal Point (CP) sugarcane breeding program and in growers' fields has decreased from the 1990s when 10% of the clones in Stage II and 5-10% of the stools in the most severely infected fields of CP 80-1743 were affected with leaf scald at harvest. Although CP 80-1743 was moderately susceptible, yield losses were extremely rare because the percent incidence of leaf scald rarely exceeded 5% and only a 20-30% reduction in yield occurred in the symptomatic stalks. Fields with the highest incidence of leaf scald were usually under stressed conditions and fields without stress did not record notable losses. The cultivars released since CP 80-1743 have exhibited a lower incidence of leaf scald in growers' fields.

SYMPTOMS

Some plants infected with leaf scald do not display external symptoms. These plants are referred to as being latently infected and the mechanism of latent infection is not understood. There are also cases of apparent recovery in which symptoms subside and do not become visible until ratoon crop regrowth or after planting infected seed cane. However, during apparent recovery, the disease is in a period of latent infection in the affected cane.

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The chronic phase is characterized by several external symptoms. The most typical symptom is a white pencil-line streak about 1 - 2 mm wide on the leaf that extends from the midrib to the leaf margin running parallel to the veins (Figure 1). A diffuse yellowish border of varying widths runs parallel to the pencil line streak. The pencil line may have areas of reddish discoloration along part of its length. As the disease progresses, necrosis develops from the leaf tip or leaf margin.

Figure 1. Pencil-line mark on sugarcane leaf caused by leaf scald disease.

Leaf scald can also cause partial or complete chlorosis (scalding) of the leaf blade. Close inspection of these areas may reveal the diagnostic white pencil line or its reddish necrotic sections.

The disease can also cause shoots to be stunted and wilted. Usually, affected leaves turn a dull blue-green color before dense browning (a late symptom of the disease). Under stress conditions the whole stool may die. This has happened in a few fields of CP 80-1743 grown under stressed conditions.

On mature stalks, the spindle leaves become necrotic from the tips and moderate to profuse side shoots develop. Side shoots first appear at the bottom of the stalk and progress upward. These side shoots usually show the scalding and/or white pencil lines (Figure 2). The side shoots often die while quite small (<18 inches or 46 cm").

Figure 2. Sugarcane side shoots infected with leaf scald.

Internally, affected stalks may show bright to dark red streaks caused by necrosis of the vascular bundles. These streaks are most prominent at the nodes and are nearly always present at the juncture of side shoots and the stalk.

The acute phase is characterized by a sudden wilting and death of mature stalks, often without previous symptom expression. The onset of this condition generally follows a period of stress, especially after prolonged drought.

CAUSAL AGENT

The leaf scald bacterium has been found to be restricted to the xylem elements of the vascular bundles in the white pencil line streaks. It is not found in the surrounding chlorotic tissues. A phytotoxin has been isolated from chlorosis-inducing strains of *X. albilineans*. It has been proposed that this phytotoxin may inhibit chloroplast development and/or in some way disrupt photosynthesis.

Variants of the pathogen have been identified. Worldwide there are several serological strains of the bacterium. Within Florida two distinct genetic strains have been reported.

SPREAD OF THE DISEASE

Since leaf scald is a systemic disease which may be inconspicuous (latent) for lengthy periods of time, infected seed cane is a major cause of disease spread. Cutting knives, including those on machinery, are an important source of infection.

The pathogen can also survive in stubble. The organism does not appear to survive for long periods of time in soil or un-decomposed cane trash.

Alternative hosts may offer another means of pathogen survival. *X. albilineans* naturally infects several wild grass weeds, such as elephant grass *(Pennisetum purpureum).*

Besides transmission by cutting knives, evidence is accumulating to suggest aerial transmission. This may explain, in part, the recent spread of leaf scald.

The amount of damage caused by leaf scald appears to be influenced by environmental conditions. Periods of stress such as drought, waterlogging and low temperature are reported to increase the severity of the disease. The yield of stalks that are dead or have necrotic tops and leaves with numerous side shoots is decreased to 20 to 30% of that of symptomless stalks. Presently, there are very few plants showing these symptoms at harvest and leaf scald is not an economic problem at this time in Florida because of resistant varieties.

PREVENTION AND CONTROL

The best control for leaf scald is prevention and the replacement of susceptible varieties with resistant varieties. Due to the latency of leaf scald, however, growers should be alert for infection even in those varieties thought to be resistant.

Seed cane can be given a long hot-water treatment to kill the pathogen. In Australia, a 24-hour presoak in flowing water, followed by a 3-hour 50° C (122°F) treatment is used. The shorter 2-hour 50°C (122°F) treatment used for ratoon stunting disease would give partial control. The use of disease-free seed cane derived from a tissue culture process will also control the disease.

To prevent mechanical spread of the pathogen, all cane cutting knives, including those on mechanical harvesters, should be sterilized when coming from suspect fields. Disinfection of the knives can be accomplished by cleaning and immersing for several minutes in a suitable antiseptic solution, such as Lysol, alcohol or a dilute solution of bleach. Aerial transmission of the pathogen would also influence the length of time disease-free seed fields would remain disease-free. There are no known chemical or biological controls for this disease.