

## Leaf Scald of Sugarcane *Xanthomonas albilineans*

**Hosts:** Sugarcane (*Saccharum officinarum*). The common name sugarcane also applies to various *Saccharum* spp. Other hosts include grasses, such as narrow-leaf signal grass (*Brachiaria piligera*), cogon grass (*Imperata cylindrica* var. *major*), and buffalo grass (*Paspalum conjugatum* and *Buchloe dactyloides*).

**Disease common name:** Leaf scald.

**Pathogen:** *Xanthomonas albilineans*.

**Historical information:** Leaf scald was recognized as a bacterial vascular disease of sugarcane in the 1920s in Java, Australia, and Fiji. It was soon discovered in several other countries, including the Philippines in 1923, Mauritius in 1928, and Hawaii in 1930. Most early reports suggest that the disease was present well before it was recognized, probably resulting in spread to other countries when infected sugarcane varieties were widely distributed for breeding. Severe losses were encountered in the varieties represented by the noble canes (*Saccharum officinarum*), widely grown in the early 1900s. The disease was controlled by replacing the susceptible noble canes with resistant cultivars, which were hybrids of *Saccharum spontaneum*.

### Disease Cycle

**Inoculum:** Sources of inoculum are infected planting material, stubble, and alternate hosts.

**Transmission:** Transmission is mainly by infected cuttings used as planting stock, by invasion of wounds during mechanical operations, including cane harvesting and planting, and by wind-blown rain under some conditions.

**Infection:** The pathogen colonizes xylem elements and produces albicidins (a family of phytotoxins and antibiotics), which block DNA replication in prokaryotic organisms and plastid development in plants, causing chlorosis in emerging leaves. Albicidins interfere with host resistance mechanisms, allowing systemic invasion. Strains vary in virulence.

**Symptoms and signs:** Figure 1 shows characteristic chlorosis of emerging leaves and typical white “pencil-line” streaks along with necrosis, wilting, and inward curling of the leaves. The disease can be latent for long periods without showing symptoms, depending upon the variety. Detection therefore necessitates isolation of the bacterium or use of sensitive molecular assays. The disease typically begins with the development of white “pencil-line” streaks following the veins on the leaf (Fig. 2). These lines usually develop diffuse yellow borders and may become reddish and necrotic (Figs. 3 and 4). Additional symptoms may include necrotic zones at leaf margins and extensive chlorosis of emerging leaves (Fig. 5). The term “scald” for the disease comes from the withering and necrosis that typically commences where the “pencil lines” meet the leaf margin and then spreads back along the lines. Further development of symptoms leads to vascular reddening and cavity formation in invaded stems, production of side shoots, and rapid wilting and death of plants. Following invasion of the stalks, large areas of leaves may become chlorotic because of toxin-induced failure of chloroplast development. Susceptible varieties may show wilting and inward curling of the leaves (Fig. 6). They also may develop side shoots with chlorosis and white “pencil-line” streaks, the result of systemic invasion (Fig. 7). A sudden wilting and death of mature stalks, often without previous symptom expression, is characteristic of the acute phase of the disease (Fig. 6). The onset of this condition generally follows a period of stress, especially prolonged drought. Figure 8 shows a field with a susceptible variety in the foreground and more resistant varieties in the background.

**Survival:** The organism survives in planting stocks but does not appear to survive for long periods of time in soil or in decomposed cane trash.

### Disease Management

Use of resistant varieties of sugarcane is a major control method. When susceptible or moderately resistant varieties are used, it is important to plant clean material and maintain hygiene to reduce disease spread between planted blocks. Stem cuttings used as planting material can be decontaminated by soaking in water for 24 h followed by hot-water treatment (3 h at 50°C). Tools and equipment, such as cane-cutting knives and harvesters, must be sterilized with disinfectants, such as Lysol, alcohol, or bleach, if contamination is suspected.



Figure 1. Plant with chlorosis of emerging leaves, typical "pencil-line" symptom, necrosis, and wilting with inward curling of the leaves. (Courtesy R. Birch)



Figure 2. Early stage of disease with "pencil-line" white streaks on leaf. (Courtesy R. Birch)



Figure 3. Necrotic leaf lesions (close-up). (Courtesy D. Teakle)



Figure 4. Brown, necrotic leaf lesions. (Courtesy S. Schenk)



Figure 5. Systemically invaded sugarcane stalk with extensive chlorosis of emerging leaves. (Courtesy R. Birch)



Figure 6. Acute symptoms of diseased, wilted leaves that have an inward curl and extensive necrosis. (Courtesy R. Birch)



Figure 7. Some side shoots with chlorosis and "pencil-line" symptoms, the result of systemic invasion. (Courtesy R. Birch)



Figure 8. Field with susceptible variety in foreground and more resistant varieties in background. (Courtesy R. Birch)