

## Sugarcane Ratoon Stunting Disease <sup>1</sup>

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Ratoon stunting disease (RSD) is considered by many to be the most important disease affecting sugarcane production worldwide. It can cause a 5 to 15% loss in crop yield without the grower even knowing his fields have been infected. The disease is caused by a bacterium. RSD has no easily recognized external symptoms, only stunting of growth that may not always be apparent in the field. Furthermore, even when stunting of growth is noticeable, it could be caused by other factors, including poor cultural practices, inadequate moisture or nutrient deficiency. During dry weather, the diseased cane will often show signs of drought stress earlier than healthy cane, but with adequate moisture, visual detection of differences may be difficult or impossible.

RSD resistance is present in several cultivars, but no cultivar is completely immune to infection. In Florida, CP 88-1762 is susceptible and CP 89-2143 moderately susceptible, and a clean seed cane program is recommended. Yield loss in Florida for the 1988-89 season was estimated at 5%. This might not seem like much until one considers the absolute numbers. Florida grows over 400,000 acres of

sugarcane each season. The 1988-89 loss in raw sugar value was estimated at \$92 per acre or \$36.8 million.

### SYMPTOMS

Although there may be no externally conspicuous symptoms of the disease, internally there is usually an orange-red discoloration of the vascular bundles containing the water-conducting tissues (xylem) at the basal nodes of the stalk (Figure 1). Similar discoloration is also associated with other sugarcane diseases so it is not a totally reliable indicator of RSD. The discoloration of RSD, however, does not extend into the internodes as it does with some other diseases. Usually adjacent nodes in mature stalk should also show similar discoloration if it is RSD infection.

In some clones, very young shoots may have a pink discoloration in the immature nodes near the apical meristem. Again, this symptom is not a reliable indicator of RSD but may serve as an aid in detection of the disease at an early stage.

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**Figure 1.** Discoloration of sugarcane vascular bundles caused by ratoon stunting disease.

In diseased fields where stunting is apparent, the shortening of stalks is not usually uniform from stool to stool. Such fields may show an "up and down" appearance.

## CAUSAL AGENT

The RSD causing organism, *Clavibacter xyli* subsp. *xyli*, is a small aerobic bacterium. There has been a suggestion to reclassify the pathogen to the genus *Leifsonia* but a consensus on the new name has not developed. Although it can be isolated from diseased cane, it is very difficult since it is slow growing and must be grown on specialized culture media.

Historically, diagnosis of RSD has been difficult because there are no definitive external symptoms and internal symptoms do not develop adequately in all varieties. Reliable diagnosis of the disease can be performed using microscopic and/or serological techniques. Phase contrast microscopic techniques have proven to be rapid but are not as sensitive as serology for RSD detection. Serological techniques

include direct fluorescent-antibody staining, dot blot immunoassay and the Enzyme-Linked Immunosorbant Assay (ELISA). Recently a variation of the dot blot immunoassay technique was developed to diagnose the disease and to assess its severity. The technique is called the Tissue Blot Immunoassay (TBIA) and can rapidly test large numbers of sugarcane samples for RSD. This technique has been used to screen clones for RSD resistance and determine disease incidence of seedfields.

## SPREAD OF THE DISEASE

The RSD bacterium is transmitted through seed cane taken from diseased plants. Because symptoms of the disease are not readily visible, the bacterium may be spread unwittingly from one area to another. Stalks in potential seedfields can be randomly sampled and serologically assayed to determine RSD incidence.

RSD can be readily transmitted by knives and mechanical harvesting machines that become contaminated with pathogen that is contained in juice from diseased stalks. Transmission by harvesting machinery is very significant.

Cane chewing animals may be capable of transmitting the disease when they gnaw on a diseased stalk and then a healthy one. Not much is known about this means of transmission or its significance.

There are new reports that the pathogen survives in the soil after harvest to re-infect healthy plants. The extent of infection by the pathogen surviving in the soil is not known.

The effects of the disease are usually more severe in ratoon crops than in plant-cane crops. This is especially true following a drought, or other stressful crop condition, which usually increases losses due to RSD.

## PREVENTION AND CONTROL

Since RSD bacteria are easily transmitted mechanically, sanitation is important in preventing healthy cane from becoming infected. All cane cutting implements should be protected from contamination

from diseased cane or be disinfected before use on healthy cane. Disinfection can be achieved by heat or chemicals.

Chemical disinfectants that may be used on cane cutting knives include Lysol, Dettol, ethanol, Mirrol and Roccal. At least 5 minutes of contact with the cutting surface is needed to assure disinfection, but a shorter disinfection time will be partially helpful.

Heat treatment of seed cane before planting is used to eliminate bacteria prior to the establishment of seed cane nurseries. Hot-water treatment (50° C for 2-3 hours) is the method most commonly used to control RSD. A serological assay can be used to monitor the effectiveness of the heat therapy. Due to reinfection, heat therapy has to be repeated to ensure disease-free seed cane.

The use of resistant clones has been shown to control RSD. CP 72-2086 has been grown in Florida without either hot-water treatment or sanitation with less than two percent disease incidence in sampled fields. Although no varieties have been found that are completely immune to infection, some are more or less resistant to RSD injury. The USDA-ARS Sugarcane Field Station at Canal Point, Florida, initiated a screening program for RSD resistance in the variety development program in 1989. The level of RSD resistance has increased in the cultivars released from the program. CP 78-1628 and CP 80-1743 are moderately resistant.