Sugarcane Smut Disease

P. Rott and J. C. Comstock

Sugarcane smut was first noted in Natal (South Africa) in 1877. It is caused by the fungus *Sporisorium scitamineum* (previously called *Ustilago scitaminea*). The disease is sometimes referred to as “culmicolous” smut of sugarcane because it affects the stalk of the cane. At one time or another, sugarcane smut has been important in nearly every sugarcane growing country in the world.

Sugarcane smut does not always pose a serious problem where it occurs. However, smut may remain unnoticed for years, then quickly devastate large areas of susceptible varieties. Hence, the disease has been called the “dread disease of sugarcane” by some and a “trivial disease with exaggerated yield losses” by others. Smut can cause significant tonnage losses as well as juice quality losses. Disease development is dependent on the environmental conditions and the resistance of the sugarcane varieties grown.

Sugarcane smut disease was first documented in Florida in 1978. However, commercial yield losses have been minimal even when moderate smut levels occurred. Since smut development is favored by hot dry weather, the wet Florida summers do not favor the disease.

**Symptoms**

The most recognizable diagnostic feature of a smut infected plant is the emergence of a “smut whip” (Comstock 2000). A “smut whip” is a curved, pencil-thick growth, gray to black in color, that emerges from the top of the affected sugarcane plant (Figure 1). These “whips” arise from the terminal bud or from lateral shoots on infected stalks. They can vary in length from a few inches to several feet long. The whip is composed partly of host plant tissue and partly of fungal tissue. Whips begin emerging from infected cane by 2–4 months of age with peak whip growth occurring at the sixth or seventh month.
Other smut symptoms may be evident before the characteristic whip is seen. Spindle leaves are erect before the whip emerges. Affected sugarcane plants may tiller profusely with the shoots being more spindly and erect with small narrow leaves (i.e., the cane appears “grass-like”). Less common symptoms are bud proliferation and leaf and stem galls.

Plants grown under stress conditions are more prone to develop smut. In 1997, smut was observed on CP70-1133, a resistant cultivar, grown on sand land under stressed conditions. Low incidences (less than 5%) of smut have been observed in a few sand land fields of CP78-1628 and CP73-1547 under stressed conditions. In 2014, several smut affected plants of cultivar CP88-1762 grown on muck soil were seen in an experimental field at the UF/IFAS Everglades Research and Education Center in Belle Glade, Florida (Figure 1). Dry and hot spring weather favors the disease.

**Causal Agent**

Although occurrence of several races of *S. scitamineum*, the sugarcane smut fungus, has been reported, the race picture is poorly defined at this time. Part of the problem is due to sugarcane variety-environment interactions causing test-to-test variability regarding pathogenicity. However, breakdown of resistance to smut due to appearance of new rust races has been confirmed in locations such as Hawaii and Taiwan, and worldwide genetic variation possibly linked to various pathotypes of *S. scitamineum* has also been reported (Sundar et al. 2012).

**Spread of the Disease**

Sugarcane smut is spread by microscopic spores. The spores are particularly adapted to aerial dispersal and can be spread over great distances by wind currents (Ferreira and Comstock 1989). The whip serves as a source of spores. It has been shown that approximately one billion spores per whip per day can be released into the air. Standing sugarcane plants become infected in the buds. Since many infected buds remain dormant until sugarcane stalks are cut for seed (stalks cuttings) and planted, the use of infected seed cane is another important way the disease is spread.

Strict quarantine measures are necessary in affected areas.

Windborne spores may settle on the soil of cropped or newly prepared fields. Disease-free seed pieces may become infected if planted in soil containing viable spores. The spores, however, only survive for a short time in the soil under normal soil moisture regimes.

Several species of insects have been consistently associated with smut whips and spores have been found on their bodies. These observations suggest insects could play a role in spore dissemination.

Although sugarcane smut has been reported on a few other members of the grass family, there are probably no important naturally occurring alternative hosts outside the *Saccharum* species.

**Prevention and Control**

Growing resistant sugarcane varieties is the best approach to smut control and has been used successfully in Florida. There is a strong genetic basis for resistance. Resistant varieties have been readily available and used to control outbreaks of smut in several countries, including Australia, where the disease was absent in the major sugarcane growing location (Queensland) until 2006.

Using disease-free seed cane is also very important for disease control. Care should be taken because this disease can be latent and show up only after planting. Disease-free planting material can usually be obtained by subjecting seed to a hot water treatment. Hot water treatment, however, may not be practical on a large scale and its effectiveness may be subject to varietal differences.

Roguing diseased stools has been successful in some instances usually in foreign countries where the lower wages allow repeated rouging. However, it is not practical for severe outbreaks involving commercial acreage. Roguing may be effective in seed nurseries where smut incidence is generally low. The use of alternate disease-free seed-fields is advised.

**References**

