

Ratoon stunting disease

Introduction

Ratoon Stunting Disease (RSD) was discovered by BSES pathologists in 1944. It is now recognised worldwide as probably the most economically important disease of sugarcane. RSD is found in all districts in eastern Australia, but it has not been found in Western Australia. The incidence of the disease is associated with the degree to which control measures are followed. Generally, RSD is present in fewer than 5% of fields in Australia, although in some districts RSD incidence is much higher.

Causal organism

The disease is caused by the bacterium *Leifsonia xyli* subsp. *xyli* (Davis *et al.*) Evtushenko, which infects the xylem (water transport) vessels of the sugarcane plant. The bacterium is rod shaped, typically with a slight bend and measures 0.25-0.5 µm by 1-4 µm.

Symptoms

RSD produces no easily visible symptoms other than stunting. Diseased fields often have an 'up-and-down' appearance due to differing levels of stunting in adjacent stools. The only other visible symptoms are red-orange dots or 'commas' in the vascular traces in the nodal tissue (which can be seen when stalks are sliced open with a sharp knife), and a faint pink discoloration of the growing point of young plants. These symptoms are not always present, and some varieties can show similar symptoms when not infected.

Yield loss

RSD causes yield losses from 5-60% depending on the susceptibility of the variety and the weather conditions. Yield losses are higher when the cane is suffering moisture stress. Over a range of conditions, the average yield loss is 15-20%.

Diagnosis

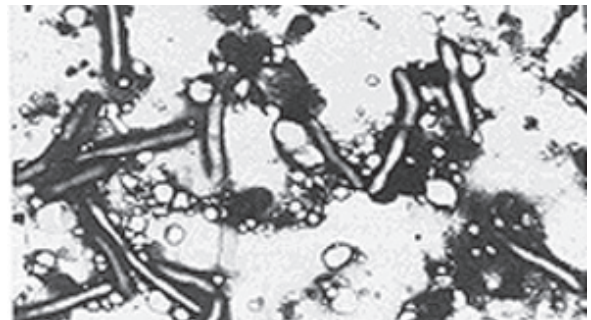
The bacteria that cause RSD are most readily found in sugarcane sap extracted by blowing compressed air through a stalk piece. The bacteria can be observed by an experienced person using a phase-contrast microscope at 1000 times magnification, a method that is used in many areas for rapid diagnosis of RSD. For large numbers of samples, the evaporative-binding enzyme-linked immunoassay (EB-ELISA)

is used to diagnose the disease.

In this test, antibodies specific to the bacterium are combined with other ingredients to give a colour reaction when bacteria are present. The SRA RSD laboratory tests approximately 30,000 samples each year using EB-ELISA for the Australian sugarcane industry.

A polymerase chain reaction (PCR) test is available for research purposes. This powerful test can detect as few as 1-10 bacteria.

Sampling for RSD diagnosis involves collecting at least 16-20 stalks throughout a field. Selecting stunted stools in a field can increase the chances of detecting the disease if it is present.



RSD bacteria under an electron microscope.



Red dots in nodes of RSD infected stalk (top) compared to a healthy stalk (bottom).

Spread

The two primary methods of spread of the disease are by planting infected cuttings and by use of contaminated cutting implements.

The bacterium is highly contagious and can be spread for many metres down a row after a planter or harvester cuts a diseased stalk or plant.

Any implement that cuts the stalk or comes in contact with the freshly cut end of the sett or billet readily spreads RSD. Some of the more common implements that can spread RSD are cane knives, whole-stalk and billet planters, stool splitters, harvesters, cane-stripping machines, haul-out vehicles used to transport billets to planters and chain saws used to trim bundles of stalks. The recirculating fungicide spray system on planting machines can carry the bacteria and spread the disease.

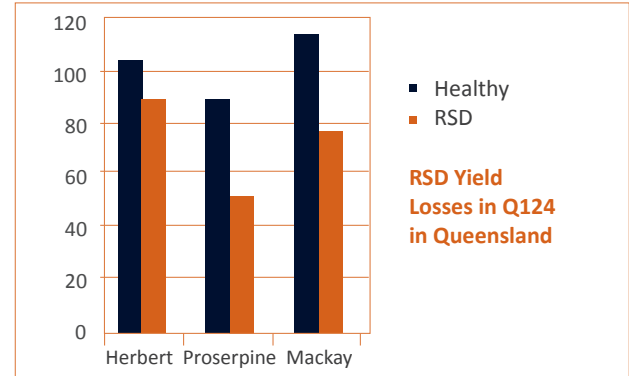
An implement can be disinfected by:

- Removing all soil and plant material with water and detergent under high pressure.
- Knives and parts of machines that come in contact with cut surfaces should be treated with a registered product containing 0.1% benzalkonium chloride (Cane Knife Steriliser) or didecylidimethyl-ammonium chloride (SterimaX). The disinfectant should be left in contact with the implement for 5 minutes before use.
- On harvesters: the base-cutter, butt-lifter roller, chopper-box and extractor fans should be disinfected when cutting cane to be sent to the mill. When cutting billets for planting, the whole feed-chain should be disinfected, as well as the base-cutter, chopper-box and extractor fans.

If diseased volunteer plants from the previous crop are present, the newly planted crop can become infected with RSD during the first harvest. The practice of 'ploughout-replant' (when a new crop is planted within a few weeks of ploughing out the previous crop) has resulted in a sharp increase in the incidence of RSD.

Management

Control has been effective in most districts of the Australian sugarcane industry. The keys to controlling the disease are planting disease-free (approved) seed and preventing re-infection by disinfecting planting and harvesting equipment. In districts where there is either a high acceptance of approved seed or a high percentage of plant sources inspected for RSD each year, the disease has been kept at low levels. Some districts with initially high incidence of RSD have steadily reduced the incidence of the disease by promoting approved



seed and conducting plant-source inspections. Disease-free seed is produced for distribution to farmers by repeatedly hot-water treating (50°C for 3 hours) nucleus or mother-plot cane. It is essential that disease-free (approved) seed is planted into fallow ground with no volunteers.

Resistant varieties

Some varieties have partial resistance to RSD (eg. Q200[®] and Q208[®]) and disease spread is restricted in these varieties. Many highly productive varieties, such as Q155, KQ228[®] and Q242[®] are highly susceptible and may lose substantial yield if infected. SRA has never actively selected varieties for resistance to RSD because other control strategies have been successful. Varieties are rated for resistance, but this rating is only used as a guide for growers and extension staff.

For further information

If you would like further information on control of RSD contact your local adviser.

References

- David MJ, Gillaspie AG Jr, Harris RW, Lawson RH. 1980. Ratoon stunting disease of sugarcane: Isolation of the causal bacterium. *Science* 210, 1365-1367.
- Davis MJ and Bailey RA. Ratoon stunting. In: *A guide to sugarcane diseases* (eds Rott P, Comstock JC, Croft BJ and Saumtally AS. CIRAD/ISSCT, Montpellier).
- Croft B, Magarey R and Whittle P. (2000) Disease management. In: *Manual of cane growing* (eds Hogarth DM and Allsopp PG. SRA, Brisbane.