

Fiji leaf gall

Introduction

Fiji leaf gall (formerly Fiji disease) has caused serious epidemics in the Australian sugarcane industry. The worst epidemic occurred in the 1970's and early 1980's in the Southern districts, when the variety NCo310 was widely grown. This variety was susceptible to the disease and highly favourable to the insect that spreads the disease. Initially growers tried to manage the disease with disease-free seed schemes, roguing and plough-out of heavily infested fields. No highly resistant varieties were available.

By the mid-1970's, the spread of the disease was so rapid in the Bundaberg district that large teams of field workers were employed to inspect fields and all seed cane was shipped in from disease-free seed plots in outlying districts. Even with these control measures, the disease continued to spread rapidly, and most growers close to the centre of the epidemic could only grow a plant and first-ratoon crop before disease levels were so high that they had to plough-out and replant.

Towards the end of the 1970's, BSES identified a few highly resistant varieties. These varieties were able to bring the epidemic under control. In Bundaberg and Isis districts only highly resistant varieties were grown for 10-15 years. No Fiji leaf gall has been found in these districts for more than 20 years. A small number of infected plants have been reported in recent years in the Rocky Point, Broadwater and Harwood mill areas.

In 1980, at the peak of the epidemic in Bundaberg, Fiji leaf gall was found for the first time in Sarina and later Mackay. The variety NCo310 was also widely grown in these districts at the time. With the experience from the Bundaberg epidemic, the Central region was able to quickly remove susceptible varieties and Fiji leaf gall caused minimal losses in this district. No Fiji leaf gall has been reported for more than 15 years in the Central region. Fiji leaf gall has never been reported in commercial crops north of Bowen.

Casual organism

Fiji leaf gall is caused by a virus (*Fiji disease virus*). The virus particles are 70 um in diameter and have an icosahedral shape. The virus is concentrated in the phloem cells in galls on leaves.

Symptoms

The diagnostic symptom of Fiji leaf gall is the galls that form on the underside of the leaf blade and midrib. The galls vary in size from 1 mm to up to 200 mm in length, <1 mm to 3-4 mm in width and up to 1-2 mm in height. By rubbing a fingernail over a suspected gall you can feel the raised gall. The galls can be green or white.

Fiji leaf gall can cause severe stunting, profuse tillering and death of plants. Leaves are often shorter than normal and have a ragged edge, giving the appearance that an animal has bitten the top of the plant. The leaves can be darker green. The growing point often dies, causing side-shooting on stalks. Stunting is particularly severe in ratoon crops and when infected stalks are planted.

Yield loss

In susceptible varieties, Fiji leaf gall can cause 100% yield loss and failure of ratoon crops. The yield loss is directly related to the percent of plants infected.



Typical Fiji leaf galls.



Typical stunting and profuse tillering caused by Fiji leaf gall.



Adult planthopper.

Diagnosis

Fiji leaf gall can be diagnosed from the characteristic galls. The galls are formed from a proliferation of the phloem cells, and examination of a cross section through the galls under a microscope with low magnification can be used to confirm that the gall is formed from these cells. Other gall-like structures form from tissues other than phloem cells. A highly sensitive molecular assay is available to detect the *Fiji disease reovirus* (reverse transcription - polymerase chain reaction or RT-PCR assay). This assay can detect the virus before symptoms develop and is used in quarantine to screen for the virus.

Spread

Fiji leaf gall is spread by a small insect known as a planthopper (*Perkinsiella* species, in eastern Australia the species is *Perkinsiella saccharicida* Kirk) and by planting infected seed cane. If a young planthopper nymph feeds on the phloem of an infected plant, it can pick up the virus. The virus multiplies in the planthopper, and it is able to transmit the virus for the rest of its life. Older nymphs and adults cannot acquire the virus. The planthoppers are restricted to sugarcane and reach their maximum populations during the summer months. Populations of the planthopper play a key role in development of epidemics. During the 1970s, extremely large populations of the planthopper played a major role in the epidemic in Bundaberg. Warm humid weather and lush crops with high nitrogen content favour the planthoppers. Disease spread is greatest when young plant or ratoon crops coincide with favorable conditions for the planthoppers. Predators, particularly an insect that feeds on the planthoppers' eggs, can restrict the buildup of planthopper populations. Planting infected seed cane provides a source of disease for further spread by the planthoppers. Seed cane is also important in spread between farms and districts. Volunteer plants can carry disease over from one crop to another.

Management

Control of Fiji leaf gall involves a combination of using resistant varieties, disease-free or approved seed schemes, and quarantine. Some level of varietal resistance is required to control the disease. When the conditions are conducive for planthoppers, and there is an initial source of the disease, varieties with high resistance may be required. Disease-free seed is important in the control of the disease. Disease-free nucleus seed can be provided from approved seed plots that are available in all districts. These plots should be isolated from commercial crops or be positioned in a low-risk area to prevent spread of the disease by the planthoppers. On-farm

plant-source inspections are also important to prevent planting of diseased seed. Cane planted in spring is more susceptible to infection because the plants are younger when planthopper populations are at their peak. Districts from Proserpine south have been affected by Fiji leaf gall, with Bundaberg experiencing a serious outbreak of the disease in the 1970s. Fiji leaf gall has not been recorded in districts north of Proserpine and strict quarantine regulations are in place to prevent spread to northern districts. Fiji leaf gall is regarded as a notifiable disease under *Queensland Plant Protection Act 1989* and any person finding the disease must report the finding to a Plant Protection Act Inspector within 24 hours. There are also restrictions on planting and cultivating cane that is infected with Fiji leaf gall. Fiji leaf gall is currently controlled through the use of clean planting material and planting of resistant varieties. Only approved varieties may be grown in Queensland and varieties approved under grower contracts in New South Wales. Varieties that are highly susceptible to Fiji leaf gall are not approved for districts where the disease is active. Roguing diseased plants or ploughing out heavily diseased fields can reduce the spread of the disease by removing sources of infected plants. Roguing is only viable when small numbers of infected plants are present and requires labour intensive inspections.

Resistant varieties

Varieties that are resistant to Fiji leaf gall are essential to control the disease. All clones in the SRA/CSIRO selection program are screened for resistance. Crosses between susceptible parent clones are not made, thus reducing the number of susceptible clones coming through the program. SRA is developing better methods of rating new varieties for resistance to Fiji leaf gall. The methods involve breeding planthoppers on infected plants in the glasshouse and exposing varieties to a standard number of planthoppers. Varieties are rated on the percentage of infected plants and the severity of disease symptoms.

For further information

If you want further information on Fiji leaf gall contact your local adviser.

References

- Smith GR. (2000). Fiji disease. 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.