

Green grassy shoot disease (GGSD)

Introduction

Green grassy shoot disease (GGSD) was recognized for the first time in Thailand in the mid-1990s. Caused by a phytoplasma – a very small organism that lives in the phloem of the vascular bundles, the disease has caused serious yield losses in Thailand. GGSD is very similar to Grassy shoot disease (GSD), first seen in India in the 1940s. In 2006, GGSD was recognized for the first time in Vietnam and is currently causing a major disease epidemic in that country, particularly in Nghe An Province.

If GGSD was introduced to Australia, it could cause major yield losses to the sugar industry. Issues such as diagnostic techniques, resistant varieties and alternative hosts require research.

Causal organism

The disease is caused by a phytoplasma. These organisms infest the phloem tissues in the sugarcane vascular bundles. Phytoplasmas are difficult to detect, not only because of their small size (requiring an electron microscope) but because of the limited occurrence of the phytoplasma within the tissues.

Symptoms

The main symptom of GGSD is small, green, and profuse tillering at the base of the mature sugarcane stool. These tillers do not exhibit any white leaves, as with GSD.

When the crop is ratooned, emerging shoots (if there are any) consist of very small, green profuse tillers which fail to develop into mature stalks. Advanced infestations are characterized by very gappy ratoons and greatly reduced yields. Crops in Vietnam have decreased from 80 tonnes/ha in plant cane to 15 tonnes cane/ha in the first ratoon.

The differences between GGSD, GSD and WLD can be summarized as: GGSD does not show any white leaves, GSD has white leaves and grassy tillering, while WLD has white leaves but not grassy tillering.

Yield loss

GGSD is capable of causing major yield losses in susceptible varieties. The production of very small multiple tillers, and the

lack of mature harvestable stalks, means the disease has very serious consequences. Crop production at the NAT&L Quy Hop Sugar factory in Nghe An Province, Vietnam decreased from 1.2 m tonnes in 2007-2008 to 0.6m tonnes in 2008-2009 and a significant proportion of this decrease was due to severe GGSD. Failed ratoons mean very severe financial losses for cane farmers and GGSD is a major disease.



Above: Comparison of grassy tillers with healthy shoots in fields of MY55-14 in the Quy Hop sugar factory area (earliest symptoms in mature cane crop).

Diagnosis

Phytoplasma diseases may be diagnosed using molecular tools. General assays for phytoplasmas have been developed and primers for GGSD. However, more research is needed to ensure molecular assays are specific to GGSD (and assay results not confused by the presence of GSD or WLD). In the field, the disease is diagnosed by profuse grassy tillering with no leaf chlorosis (white leaves).

Spread

GGSD is spread principally through the planting of infested planting material. However, rapid spread in Vietnam indicates a potential insect vector. Similar phytoplasma diseases are spread by leafhoppers. The presence of a vector for GGSD has yet to be confirmed. The disease is not spread by cane juice, so machinery and knives do not spread the infection. Soil transmission of GGSD is also unknown.

Alternative hosts

Little is known of alternative hosts for GGSD. If there are any, they are likely to be closely related grasses. Further research on GGSD hosts is required.

Control

Planting of disease-free planting material is of prime importance. GSD and WLD are both largely eliminated from diseased planting material by hot water treatments (50°C for 2-3 hours) and early work with GGSD suggests a similar result. As for RSD, there is a low level of 'escapes' – stalks where the pathogen is not completely eliminated, so care in the selection of disease-free, or minimally diseased planting material is important (to minimise the chance of an escape).

There appears to be a very limited source of resistance in commercial varieties in either Thailand or Vietnam. Further work into resistance in commercial varieties is needed. The most important management options therefore are to eliminate badly diseased crops, replanting with disease-free planting material into fallow ground (no volunteers) and the selection of the most resistant varieties available.



Above: Grassy tillers adjacent to 'disease-free' plants in the susceptible variety MY55-14 in the NAT&L Quy Hop sugar factory, Nghe An Province, Vietnam.

If you suspect you may have seen any of these this disease please contact the exotic pest hotline on 1800 084 881, SRA, or your local Productivity Service