

Healthy seedcane propagation and distribution manual against sugarcane white leaf disease

Sugarcane white leaf disease (SCWLD) is one of the most devastating diseases affecting sugarcane production in Asia. In Thailand, which is the world's second-largest exporter of sugar, SCWLD is considered to have the most serious effect on sugarcane production. The pathogen of SCWLD is phytoplasma, and effective treatments against SCWLD have not yet been developed. Two leaf hoppers, *Matsumuratettix hiroglyphicus* and *Yamatotettix flavovittatus*, are known as vector insects. From the results of our study in a severely infected commercial sugarcane field, the probability that the seedcane was already infected with SCWLD was high. Therefore, it was highly possible that healthy seedcane distribution was effective for reducing SCWLD occurrence. Sugarcane is a plant species grown through vegetative propagation. Its intergenerational propagation rate is low, multiplied only by a factor of approximately seven to ten per generation. Thus, to propagate a sufficient amount of healthy seedcane, a propagation system extending across multiple generations is required. On the other hand, healthy seedcane propagation in the spread area is difficult because vector transmission occurs frequently. In order to solve this problem, we developed the "Healthy seedcane propagation and distribution manual against SCWLD" for sugar mills and public institutions interested in healthy seedcane production.

The manual is composed of a preface and three chapters (Table 1). Chapter 1 describes a healthy seedcane propagation method and an effective seedcane distribution method. It also recommends that management techniques should be combined depending on the field sanitation level (Fig. 1). According to the results of the verification test, low-risk seedcane could be propagated by this technique (Figs. 2 & 3). Chapter 2 presents a simple protocol for SCWL disease detection using the loop-mediated isothermal amplification (LAMP) method. This method should be used "to obtain healthy seedcane as a source for propagation" and "to evaluate the latent disease probability." Chapter 3 describes a protocol for producing healthy seedcane using the tissue culture method. The products could be used as seedcane for the 1st propagation field.

This manual is available in both Thai and English. As a measure against SCWLD in each region in Thailand, domestic sugar factories in particular are expected to make use of the Thai language version in the production and distribution of healthy seedcane. The English version is similarly expected to be used not just in Thailand but also in other countries that are affected by SCWLD. In any case, users are advised to check and confirm current pesticide treatment regulations in their respective countries.

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Table 1. Contents of the manual

	Chapter title	Contents
Preface		Basics of SCWLD and purpose of this manual
Chapter 1	Propagation Field Management and Healthy Seedcane Product Distribution	Damage caused by the SCWLD, ecology of the pathogen and the vector Management of the healthy seedcane propagation field and efficient distribution methods of the products
Chapter 2	Experimental Protocol: Detection of SCWL Disease by LAMP Assay	Detection protocol of SCWLD pathogens from latent plants
Chapter 3	Protocol for Producing Disease-Free Sugarcane Seedlings Through a Tissue Culture Process	Disease-free sugarcane seedling production protocol by tissue culture techniques

Generation	Propagation stage	Field sanitation level	Field management*				
			Isolated field	Large area cultivation	Removal of diseased stalks	Pesticide treatment	Evaluation of the latent disease probability
G0	Tissue culture/Introduction from a low-risk region						
G1	1 st propagation field	AAA	○	○	2 times/month	○	○
G2	2 nd propagation field	AA	○	○	1 time/month	○	○
G3	3 rd propagation field	A	×	×	1 time/month	○	○

* ○ : required × : not required

Fig. 1. Complete overview of the healthy seedcane propagation system



Fig. 2. Sugarcane in the verification test field for 1st propagation

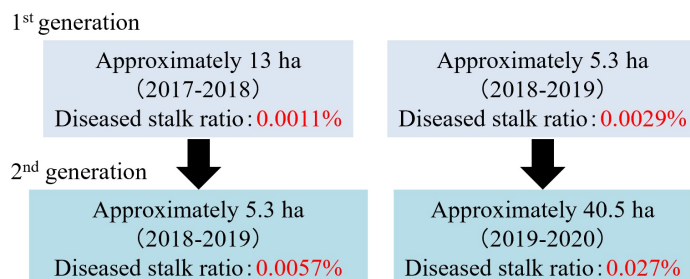


Fig. 3. Results of the healthy seedcane propagation verification test

These fields were managed following the propagation system described in Fig. 1. Compared to newly planted fields in the same region, disease prevalence was extremely low. The infection ratios of commercial sugarcane fields around the verification test area were 0% to 20% (from 32 fields, mean 5.8%: median 5%). Several farmers and sugar mills commended these products as acceptable and healthy seedcane.