

EVALUATION OF SOME BRAZILLIAN SUGARCANE VARIETIES FOR THE RESISTANCE TO SUGARCANE SMUT PATHOGEN, *Sporisorium scitamineum*, IN SRI LANKA

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Introduction

Among the biotic constrains for increasing sugarcane production in Sri Lanka, sugarcane smut disease plays a major role. This disease is caused by a Basidiomycetes fungus, *Sporisorium scitamineum* and it is spreading very fast in all sugarcane-growing areas causing serious crop losses. The development and severity of sugarcane smut disease depends on the resistance of the sugarcane varieties and the environmental conditions. Genetically, sugarcane varietal reaction to smut disease has been identified as polygenic, and therefore, varietal resistance is the most applicable method in the management of this disease. As such, the development of resistant varieties to this disease is one of the major objectives in sugarcane breeding programs in almost all sugarcane-producing countries including Sri Lanka.

In order to facilitate the directional breeding for high-yielding smut disease resistant sugarcane varieties, identification of genetically-diverse parents is essential. To fulfil this requirement, screening of the sugarcane varieties with a wide genetic variation is important to study their reactions to this disease. In this study, the reaction of eleven (11) Brazilian sugarcane varieties to smut disease was assessed to identify the resistant/tolerant parents for sugarcane hybridisation in Sri Lanka. It will help to produce high-yielding smut disease resistant sugarcane varieties.

Methodology

A field experiment was carried out at the research farm of the Sugarcane Research Institute, Udawalawe, where the annual average rainfall is about 1450 mm during 2009 - 2010 using the varieties, SP 83 2847, SP 85 3877, SP 86 155, SP 87 365, SP 87 369, SP 89 1115, SP 90 1107, SP 90 1638, SP 90 3414, SP 90 3723 and SP 91 1047 imported from Brazil with a wide genetic variation. Three-budded setts obtained of each variety was artificially inoculated with the spore suspension 1×10^6 spores per mL of *Sporisorium scitamineum* using the standard vacuum inoculation technique and incubated in polythene bags at room temperature for 12 hours. Three-budded setts of the standard varieties, namely, Co 740, Co 775, M 351 57, Co 997, Co 1001 and PH 56 226 treated in the same manner were also planted along with the test varieties in one-metre-row plots in three replicates in Randomised Complete Block Design to evaluate the resistance of the varieties to smut disease. Smut disease incidence of each variety was recorded at monthly intervals from 2 to 12 months after planting. Then the average observed disease percentage was obtained for each variety by calculating the arithmetic average of the percentage disease incidence measured in three replicates. Then a calibration curve was fitted by regressing the average disease incidence of the standard varieties (Y) against the previously assigned smut disease ratings for the standard varieties (X). Based on the data obtained, observed percentage disease incidence of test varieties was calculated.

Then, by referring the derived calibration line, disease ratings for the test varieties were obtained based on their observed disease incidences.

Results and Discussion

The calibration curve derived using the standard varieties are shown in Figure 1.

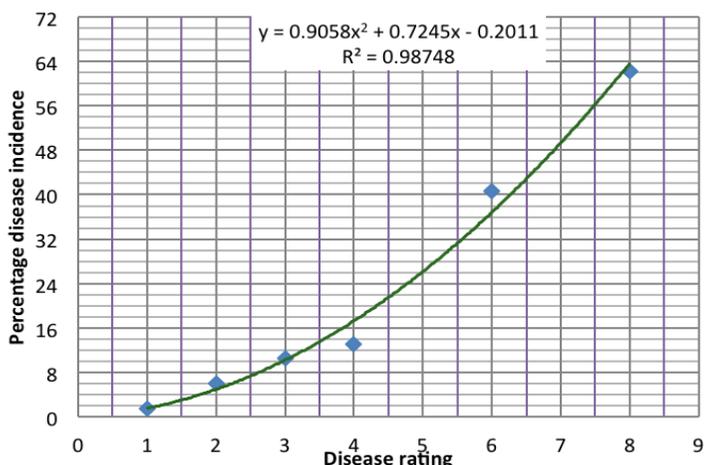


Figure 1. The calibration curve established for smut disease

The equation derived for the calibration curve was $Y=0.905x^2 + 0.724x - 0.201$; $r^2= 98 \%$ where Y is the percentage disease incidence observed and X is the smut disease rating previously assigned.

The currently-used standard varieties and their observed disease incidence, estimated disease incidence and estimated rating based on the calibration equation are summarized in Table 1.

Table 1. Observed and estimated disease incidences and estimated ratings of standard varieties

Standard variety	Disease percentage	Known rating	Disease reaction	Observed incidence	Estimated incidence	Estimated rating
Co 740	0.0-3.0	1	HR	1.45	1.43	1
Co 775	4.0-6.0	2	R	5.95	4.87	2
Co 1001	7.0-9.0	3	R	10.58	10.12	3
Co 997	10.0-12.0	4	R	13.01	17.18	4
M 351 57	26.0-35.0	6	S	40.67	36.72	6
PH 56 226	51.0-65.0	8	HS	68.28	63.51	8

Note: HR- Highly Resistant, R-Resistant, S-Susceptible, HS - Highly Susceptible

The ratings assigned to each test variety based on their observed disease percentages are summarized in Table 2.

The behaviour of the test varieties and the standard varieties during the experimental period is graphically shown in Figure 2.

Table 2. Average disease incidence of the test varieties and their rating

Test variety	Average Disease Percentage	Rating	Disease reaction
SP 83 2847	21.42	5	Susceptible
SP 85 3877	20.50	5	Susceptible
SP 86 155	11.34	4	Resistant
SP 87 365	36.41	7	Susceptible
SP 87 369	6.83	3	Resistant
SP 89 1115	41.08	7	Susceptible
SP 90 1107	6.21	2	Resistant
SP 90 1638	5.86	2	Resistant
SP 90 3414	58.32	8	Highly Susceptible
SP 90 3723	1.48	1	Highly Resistant
SP 91 1047	3.27	1	Highly Resistant

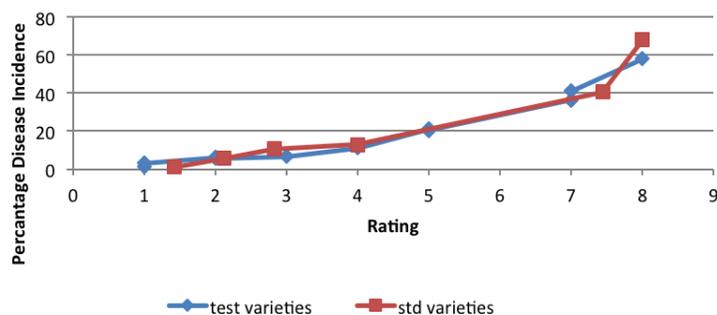


Figure 2. Behaviour of test varieties and standard varieties in the field

All the standard varieties have shown previously proven disease status. There were no deviations of the standard varieties from their normal behaviour. Therefore, we can conclude that all the test varieties also have shown their estimated values to smut disease.

The results revealed that out of eleven test varieties six varieties, namely, SP 86 155, SP 87 369, SP 90 1107, SP 90 1638, SP 90 3723 and SP 91 1047 are highly resistant against the smut disease while the other varieties are susceptible to this disease.

Conclusions and Recommendations

Based on the results of this study, it can be concluded that the varieties, SP 86 155, SP 87 369, SP 90 1107, SP 90 1638, SP 90 3723 and SP 91 1047 could be utilised as parent clones for hybridization programs in the production of resistant clones for sugarcane smut in sugarcane crop improvement in Sri Lanka.

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