

IDENTIFICATION OF RESISTANT SOURCES TO WHIP SMUT OF SUGARCANE CAUSED BY *SPORISORIUM SCITAMINEUM*

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ABSTRACT

Whip smut causing pathogen in Sugarcane has the potential to cause substantial losses to farmers. Sugarcane cultivars which are susceptible, should be replaced with resistant ones that have desirable yield attributes. Twenty four Sugarcane genotypes were selected for artificial inoculation to identify resistant genotype to smut disease. Setts dipped in smut spore suspension before planting and collected data on production of smutted whips in genotypes. Among the genotypes tested, 2016 V130 was found resistant, while 2016 V 35, 2017 V 16, 2018 V 42, 2018 V 48, 2018 V 53 and 2018 V 79 were found moderately resistant to smut pathogen.

Key words: Genotypes, Resistance, Screening, Smut, Sugarcane

INTRODUCTION

India is the second major country producing 435 million tonnes of sugarcane from an area of 5.37 million ha. (First advance estimates, 2024-25, Ministry of Agriculture & Farmer's Welfare, India). Sugarcane production is affected by different biotic and abiotic stresses particularly plant diseases. Among the sugarcane diseases, whip smut is a major disease caused by a biotrophic fungus, *Sporisorium scitamineum* resulting in severe yield losses globally (Su *et al.*, 2016). The intensity of the disease depends on two major factors, viz., level of resistance in the plant genotype and virulence level of the pathogen. The disease severity of sugarcane smut varies greatly, ranging from 10-80%, depending on the climatic conditions, the prevalence of pathogen races and the susceptibility of the sugarcane

varieties under cultivation in a given area (Monteiro Vitorello *et al.*, 2018 and Nalayani *et al.*, 2021). Due to frequent evolution of pathogen races it is essential to introduce resistant varieties to compete over. Therefore, screening genotypes for smut resistance should be done as continuous process. Due to overlapping of most of the characteristics within the species, there is a need for information on pre detection and diagnostics strategies to manage the smut causal organism (Rajput *et al.*, 2021). Whip smut disease being the reason for substantial losses in cultivation of susceptible cultivars, the varieties should be replaced with resistant ones to minimize losses. The most potential and cheapest method of controlling sugarcane diseases are the growing of resistant cultivars. Until now, the most effective management strategy for

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Table 1. Disease rating scale (Amrate *et al.*, 2019) for smut disease of sugarcane

S.No.	Percent Infestation	Reaction
1	0-1%	Resistant (R)
2	1-10 %	Moderately resistant (MR)
3	10-20 %	Moderately susceptible (MS)
4	20-30 %	Susceptible (S)
5	Above 30%	Highly susceptible (HS)

sugarcane smut is the cultivation of resistant cultivars (Sundar *et al.*, 2015; Sundar *et al.*, 2018). Hence, screening of sugarcane genotypes for smut resistance was undertaken to identify resistant sources.

MATERIAL AND METHODS

The screening field trial was conducted for three consecutive years (2021-22, 2022-23 and 2023-24) in Sugarcane Research station at Vuyyuru of Acharya N.G Ranga Agricultural university, Andhra Pradesh, India. Twenty four sugarcane genotypes with good qualitative and quantitative parameters were selected for smut screening studies. The varieties, 87 A 298 and 2003 V 46 were used as susceptible, resistant checks respectively for this study. Freshly collected smutted whips from previous season crop were air dried by keeping under shade and the teliospores of *Sporisorium scitamineum* were collected in butter paper bags and were stored in desiccators. Artificial inoculation was done by Sett dip method. Two budded Sugarcane setts were inoculated by soaking in a smut spore suspension (1×10^6 spores/ml) for 30 minutes. A sticker / spreader at 1 ml/ 2 litres was added to spore suspension. The concentrations of teliospores were standardized by using haemocytometer.

Data on number of smutted whips per stool, smut incidence per population, sprout count and number of tillers per plot were

recorded. Data collection on smut incidence in sugarcane genotypes began one month after planting. Data on germination count and tiller population were taken at 45 days and four months after planting respectively. Except sprout and tiller count, the data collection was continued upto harvesting at fortnight intervals for the sugarcane genotypes under study. Percent disease incidence of the smut was computed using formula as indicated below.

RESULTS AND DISCUSSION

Sugarcane genotypes which promoted to yield trials were screened for smut disease as the disease primarily spreads through setts and soil borne inoculum and causes significant losses in productivity of this crop. Twenty four genotypes including check varieties were evaluated during 2021-22, 2022-23 and 2023-24 season for their reaction to smut disease. The susceptible sugarcane stems were observed to be relatively small and the internodes are long. based on the disease rating scale, genotypes were categorized as resistant, moderately resistant and susceptible, susceptible and highly susceptible. Each genotype was screened for 3 consecutive years to identify the resistant source. Out of 24 genotypes screened, one genotype (2016 V130), was found resistant and seven genotypes (2016 V 35, 2017 V 16, 2018 V 42, 2018 V 47, 2018 V 48, 2018 V 53

$$\text{Smut incidence (\%)} = \frac{\text{Total member of infected stools / plot}}{\text{Total member of stools / plot}} \times 100$$

Table 2. Reaction of Sugarcane genotypes to smut disease (Disease incidence observed over three years)

S.No	Variety/genotype	Percent smut infection	Smut Reaction
1	2016 V 35	7.3	MR
2	2016V74	10.8	MS
3	2016V130	0.0	R
4	2017 V2	11.6	MS
5	2017 V4	11.6	MS
6	2017V13	13.9	MS
7	2017V15	12.0	MS
8	2017V16	4.3	MR
9	2017 V 23	11.5	MS
10	2017 V 42	12.8	MS
11	2017V57	12.0	MS
12	2017 V70	11.0	MS
13	2018V7	12.5	MS
14	2018V38	11.0	MS
15	2018V42	2.8	MR
16	2018V47	3.1	MR
17	2018V48	1.4	MR
18	2018V53	2.2	MR
19	2018V57	12.0	MS
20	2018V60	11.0	MS
21	2018V78	14.6	MS
22	2018V79	2.4	MR
23	87 A 298 (SC)	30.4	S
24	2003V46 (RC)	0.0	R

and 2018 V 79) were found moderately resistant to smut pathogen. The varieties, 87 A 298 and 2003 V 46 were used as susceptible and resistant check respectively for this study.

CONCLUSION

The genotypes rated as resistant against whip smut of sugarcane can be exploited for development of smut resistant variety of sugarcane whereas genotypes rated as susceptible can be exploited as susceptible

check for screening against smut disease of sugarcane. Development of resistant varieties is the eco-friendly and sustainable option to control the smut disease of sugarcane.

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