



SCREENING OF SUGARCANE GENOTYPES FOR RESISTANCE TO EARLY SHOOT BORER, *CHILO INFUSCATELLUS* SNELLEN

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ABSTRACT

The studies on screening of early, mid and late maturity sugarcane genotypes for resistance to early shoot borer, *Chilo infuscatellus* Snellen was carried out at CCS Haryana Agricultural University, Regional Research Station, Karnal during 2016-17 crop season. Nineteen sugarcane genotypes of different maturity groups were screened for their relative degree of tolerance based on dead heart formation against early shoot borer, *C. infuscatellus*. Among the nineteen genotypes screened, fifteen genotypes viz., Co 0238, CoH 167, Co 0237, CoH 160, Co 0118, CoH 56, CoH 92, CoJ 64, CoH 110, CoS 767, CoH 119, Co 1148, CoH 150, CoH 99 and Co 5011 were least susceptible against this pest and 4 genotypes were moderately susceptible. None of the genotype was recorded highly susceptible against this borer.

Keywords: Sugarcane, *Chilo infuscatellus*, screening and genotypes

INTRODUCTION

Sugarcane is a long duration crop with luxuriant vegetative growth. Major sugarcane growing countries are Brazil, India, China, Thailand, Pakistan, Mexico, Australia, Philippines, Argentina and Colombia. It is an important commercial cash crop grown in India, supporting the second largest agro-based industry. In India, sugarcane occupies an area of 4.51 million hectare with annual production of 305.25 million tones and productivity of 67.57 tones per hectare; whereas, in Haryana it occupies an area of 0.11 million hectare with the production of 8.53 million tones and productivity of 74.21 tones per hectare (Anonymous, 2016).

There are a number of causes responsible for low yield of sugarcane but losses caused by insect-pests are of prime importance. One of the major constraints in maximizing production is losses due to insect-pests, as sugarcane plant is vulnerable to attack by various insect-pests right from germination till to the harvest of the crop. Sugarcane is vulnerable to several insect-pests at all the stages of crop growth, both in sub-tropical and tropical regions of the country and this problem is more serious in the sub-tropical region than in tropical regions of the country. Sugarcane by virtue of its growth provides homogenous agro-ecosystem and thereby serving as abundant source of shelter and food to a host of organisms over considerable period of year (Chaudhary, 2008). Sugarcane is damaged by a number of insect-pests during its crop growth. In India, 211

species have been recorded, out of which 18 species have attained major pest status (David and Nandgopal, 1986). Among various insect-pests, termites, borers, pyrilla, whiteflies and bugs attack the crop and cause heavy losses in yield and quality. Among these pests, borers are the key factors in causing crop losses in plant stand and number of mill able canes which results in huge loss of sugar (Sharma *et al.*, 2011). Borers are the major pests attacking sugarcane throughout growth period, starting from germination to harvesting of the crop in the field. Amongst tissue borers, early shoot borer, *Chilo infuscatellus* Snellen; top borer, *S. nivella*; root borer, *E. depressella* and stalk borer, *C. auricilius* are major pests in subtropical region. Early shoot borer, *C. infuscatellus* attacks in early phase of plant growth by entering laterally through holes in the shoot and damage complete cane by boring producing 'dead hearts'. Its caterpillars destroy about 20 per cent of the young shoots during April to June (Dhaliwal and Atwal, 2004). *C. infuscatellus* destroys approximately 60 per cent of the mother shoots, 35 to 43 per cent of tillers and 15.8 to 41.8 per cent reduction in yield (Jhansi, 2009). In India, this species is widely distributed particularly in sugarcane growing parts of the country (Karnataka, Bihar, Haryana, Punjab, Uttar Pradesh, Gujarat and Tamil Nadu).

C. infuscatellus has become very serious pest in recent years in sub-tropics; thus, it is very necessary to find out management strategies for this pest. Adoption of resistant genotype is the most practical and valuable tool

for minimizing pest attack, as it is compatible with other methods of pest control.

MATERIAL AND METHODS

Nineteen sugarcane genotypes of different maturity groups were screened against early shoot borer, *C. infuscatellus* at CCS Haryana Agricultural University, Regional Research Station, Karnal during 2016-17 crop season. The genotypes were planted on 11th March, 2016 in plots of size 3.0 m x 6.0 m with a spacing of 75 cm (6 m row length in four rows) in a randomized block design in three replications.

Observations on shoot borer damage were recorded from two middle rows of 6 m row length at 30 days interval up to 120 days after planting (at 30, 60, 90 & 120 DAP). The observations on total number of shoots and number of dead hearts due to *C. infuscatellus* were recorded in each genotype. At each observation, dead hearts of plants were pulled out. The dead hearts removed were added to the count of previous dead hearts to estimate the cumulative number of dead hearts. Cumulative incidence up to 120 DAP were calculated. The number of bored plants were also calculated on the basis of cumulative percentage. On the basis of cumulative incidence, genotypes were categorized as least susceptible (below 15% dead hearts); moderately susceptible (15.1-30% dead hearts); highly susceptible (>30% dead hearts) (AICRP, methodology, 2013).

Statistical analysis: The data on the screening of different sugarcane genotypes against *C. infuscatellus* were subjected to Analysis of Variance (ANOVA). Data in percent was subjected to angular transformation.

RESULTS AND DISCUSSION

The data on infestation of sugarcane genotypes by *C. infuscatellus* (Table 1 & 2) revealed that there were significant differences among different sugarcane genotypes in respect of susceptibility to *C. infuscatellus*. The mean cumulative dead heart formation ranged from 4.1 to 18.4 per cent (Table 1). Minimum dead heart formation was observed in Co 0238 (4.1%) and maximum in Co 7717 (18.4%). Based on their susceptibility, fifteen genotypes viz., Co 0238, CoH 167, Co 0237, CoH 160, Co 0118, CoH 56, CoH 92, CoJ 64, CoH 110, CoS 767, CoH 119, Co 1148, CoH 150, CoH 99 and Co 5011 were categorized as least susceptible and dead heart formation ranged from 0 to 15 per cent. The four genotypes viz. Co 5009, CoS 8436, Co 7717 and CoPb 91 recorded mean cumulative per cent dead heart formation by *C. infuscatellus* between 15.1 to 30 per cent and were categorized as moderately susceptible. None of the genotype was recorded as highly susceptible.

Among the eight early maturing sugarcane genotypes (Co 0238, CoH 160, Co 0118, CoJ 64, Co 0237, Co 5009, CoH 56 and CoH 92), seven genotypes viz., Co 0238, CoH 160, Co 0118, CoJ 64, Co 0237, CoH 56 and CoH 92 were categorized as least susceptible and only one genotype (Co 5009) was categorized as moderately susceptible. There were significant differences in percent tinestation of dead heart among the seven mid maturing genotypes (Co 7717, CoPb 91, CoH 167, CoH 119, CoS 8436, CoH 99 and Co 5011). The four genotypes viz., CoH 167, CoH 119, CoH 99 and Co 5011 were categorized as least susceptible and three genotypes viz., Co 7717 (18.4%), CoPb 91 (15.8%) and CoS 8436 (16.4) were categorized as moderately susceptible. All the four late maturing genotypes (CoH 110, CoS 767, Co 1148 and CoH 150) were categorized as least susceptible and mean cumulative dead heart formation ranged from 5.4 to 9.3 percent. Minimum number of bored plants/ha (4310) were observed in genotype Co 0238 and maximum number of bored plants/ha (18419) were observed in genotype Co 7717 (Table 2).

Evaluation of sugarcane germplasms against *C. infuscatellus* has been reported by different workers. Mahla *et al.* (2002) screened 131 genotypes of sugarcane against *C. infuscatellus*. Based on the incidence, 30 genotypes were categorized as tolerant, 48 genotypes were categorized as moderately tolerant, 52 genotypes were categorized as susceptible and one genotype (CoH 98) was categorized as highly susceptible. The highest incidence of *C. infuscatellus* was recorded in genotypes S-90-337 (15.9%), CoS 90269 (18.7%) and CoH 98 (32.09%) and the lowest incidence was observed in genotypes CoH 77 (1.00%), S-89-246 (3.90%) and CoS 91-128 (1.43%), which were less preferred by the shoot borer. Jhansi (2009) observed that the mean cumulative incidence of dead hearts by *C. infuscatellus* ranged from 14.64 to 51.52 percent. Genotype 98 V 140 was categorized as least susceptible. Fifteen genotypes were categorized as moderately susceptible. Twelve genotypes recorded mean cumulative incidence of *C. infuscatellus* above 30 per cent and were categorized as highly susceptible. Kalariya and Radadia (2013) reported that lowest dead heart formation was observed in Co 0323 (11.07%) and it was followed by Co 2002 N 666 (13.35%) and CoM 0265 (13.37%). These three genotypes were categorized as least susceptible. The highest mean cumulative incidence of dead heart was observed in Co 62175 (34.72%) and categorized as highly susceptible. Vemuri *et al.* (2013) recorded that genotypes Co 0110 (8.49%), 98 A 165 (9.85%), Co6806 (9.57%) and 98 A 125 (8.01%) were least susceptible; genotypes 97 A 85 (22.48%), 2000 A 105 (24.28%), 99 A 5 (24.23%) and C0 62175 (26.31%) were moderately susceptible; whereas, genotypes 93A 11 (31.85%), 99A 33 (37.53%), 94 A 124 (34.98%) and Co M 9902 (41.82%) were highly susceptible. Muhammad *et al.*

Table 1. Reaction of sugarcane genotypes against early shoot borer, *C. infuscatellus*

Sr. No.	Genotypes	Maturity	Dead heart formation (%)	Total no. of bored plants/ha	Grade of infestation
1	Co 0238	Early	4.1(11.64)*	4310	Least Susceptible
2	CoH 160	Early	8.1(16.51)	8462	Least Susceptible
3	Co 0118	Early	7.6(15.99)	7985	Least Susceptible
4	CoJ 64	Early	4.6(12.37)	4840	Least Susceptible
5	Co 0237	Early	10.4(18.80)	10480	Least Susceptible
6	Co 5009	Early	16.3(23.80)	15916	Moderately Susceptible
7	CoH 56	Early	13.8(21.80)	12220	Least Susceptible
8	CoH 92	Early	12.6(20.77)	11190	Least Susceptible
9	Co 7717	Mid	18.4(25.39)	18419	Moderately Susceptible
10	CoPb 91	Mid	15.8(23.41)	14658	Moderately Susceptible
11	CoH 167	Mid	8.2(16.63)	8520	Least Susceptible
12	CoH 119	Mid	14.2(22.13)	13890	Least Susceptible
13	CoS 8436	Mid	16.4(23.88)	16590	Moderately Susceptible
14	CoH 99	Mid	10.2(18.61)	10220	Least Susceptible
15	Co 5011	Mid	12.6(20.77)	13119	Least Susceptible
16	CoH 110	Late	9.2(17.65)	9465	Least Susceptible
17	CoS 767	Late	5.4(13.42)	5578	Least Susceptible
18	Co 1148	Late	9.3(17.74)	9685	Least Susceptible
19	CoH 150	Late	6.4(14.64)	6217	Least Susceptible
CD(p=0.05)			(5.17)		
C.V.(%)			(8.75)		

*Figure in parentheses are angular transformed values

Table 2. Categorization of sugarcane genotypes against early shoot borer, *C. infuscatellus*

Maturity groups	Germplasm	Infestation (%)	Category	No. of Genotypes
Early	Co 0238, Co 0237, CoH 160, Co 0118, CoH 56, CoH 92 and CoJ 64	1.0-15.0	Least Susceptible	7
Mid	CoH 167, CoH 119, CoH 99 and Co 5011	1.0-15.0	Least Susceptible	4
Late	CoH 110, CoS 767, Co 1148 and CoH 150	1.0-15.0	Least Susceptible	4
Early	Co 5009	15.1-30.0	Moderately Susceptible	1
Mid	CoS 8436, Co 7717 and CoPb 91	15.1-30.0	Moderately Susceptible	3

(2014) observed that minimum mean borer infestation (9.62%) was observed in late maturing variety Disco (B-43/60); whereas, early maturing and high sucrose content variety SPSG-26 showed the maximum infestation (23.7%). The variations in incidence of *C. infuscatellus* as reported by different workers to that of present investigations may be due to different biochemical constituents in different genotypes tested and meteorological factors prevailing at time of experimentation.

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