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SCREENING OF FINGER MILLET (*Eleusine coracana*) GENOTYPES AGAINST PINK STEM BORER

M. LOKESWARIDEVI*, K.V. HARI PRASAD, G.S. PANDURANGA, L. MADHAVI LATHA AND T.M. HEMA LATHA

Department of Entomology, S.V. Agricultural College, ANGRAU, Tirupati-517 502.

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ABSTRACT

A field trial was conducted at Agricultural Research Station, Perumalapalle, Tirupati District, Andhra Pradesh, India for evaluating 100 finger millet genotypes along with four varieties as check entries (Vakula, Tirumala, Indravati, GPU-67 for identification as a source of resistance against pink stem borer, during *kharif* 2021 and late *rabi* 2021-22. During *kharif*, 83 genotypes were placed under highly resistant category with <10 per cent dead heart incidence, 12 genotypes under moderately susceptible (10.1 - 40%) and five genotypes under highly susceptible category (>40%) to pink stem borer infestation. During late *rabi* 2021-22, 80 genotypes were placed under highly resistant category with <10 per cent dead heart incidence, 15 genotypes under moderately susceptible (10.1 to 40.0%) and five genotypes under highly susceptible (>40%) to pink stem borer.

KEYWORDS: Finger millet, pink stem borer, resistance, per cent dead heart.

INTRODUCTION

Finger millet, *Eleusine coracana* Gaertn, popularly known as ragi is popular among small millets (Finger millet, kodo millet, foxtail millet, barnyard millet, proso millet and little millet). It is a highly nutritive crop which can be cultivated in varying climatic conditions with minimum care and management. Its high fiber content, quality protein, mineral compositions are its distinctive nutritional properties that contribute significantly to its nutritional security. Finger millet is a hardy crop and has a quick rejuvenating capacity to various biotic and abiotic stresses and needs very little irrigation, has short crop cycle and is well suited for cultivation under adverse climatic conditions.

The dietary fiber, vitamins and polyphenols available in finger millet have several health benefits. The crop is gaining importance in recent years because of a rise in health awareness among diabetic and obese Indian population. Regulation of glucose homoeostasis and prevention in accumulation of high cholesterol can be achieved by regular intake of finger millet.

The crop is grown in India, Sri Lanka, Nepal, parts of Africa, Madagascar, Malaysia, Uganda, Japan etc., and 85 per cent of the world's production is contributed from India. In India, finger millet is grown in an area of 1.19 m. ha with a production of 1.98 million tonnes giving an average productivity of 1661 kg per ha. Karnataka accounts for 56.21 and 59.52 per cent of area and production of finger millet followed by Tamil Nadu (9.94% and 18.27%), Uttarakhand (9.40% and 7.76%) and Maharashtra (10.56% and 7.16%), respectively.

In Andhra Pradesh, it was grown over an area of 34 thousand hectares with a production of 44,880 tonnes with an average productivity of 1320 kg/ha in 2019-20 (indiastat.com, 2021). Major finger millet growing districts of Andhra Pradesh are Visakhapatnam. Vijayanagaram, Chittoor and Anantapur. Being a subsistence crop, finger millet does not attract the attention of synthetic insecticides and as such development of resistant varieties for insect pests and diseases is a cost effective and viable option that is environmentally friendly.

The potential for development of varieties with insect and disease resistance is enormous and is the need of the hour Efforts should be intensified to identify and improve germplasm or accessions or genotypes having in built resistance to biotic and abiotic stresses that can be effectively utilized in to breeding programmes for varietal improvement. In view of the importance and lack of related information on insect pest in finger millet particularly the ragi pink stem borer, the present investigations on "Studies on plant resistance in finger millet (*Elesine coracana*) to insect pest complex" was taken up with the following.

*Corresponding author, E-mail: suryagangalokeswari@gmail.com

Experimental Material

The experimental material utilized for the present study comprised of 100 indigenous finger millet genotypes that were collected from various states of India for which the seed material was collected from IIMR -Indian Institute of Millet Research, Hyderabad. The details of procurement of seed material the genotypes were presented in Table 1.

Crop raising

All the agronomic practices were adopted as per the recommendations of ANGRAU in raising the crop expect management practices during the experiment period. The experiment on screening of genotypes for insect resistance was carried out under field conditions by raising 100 Finger millet genotypes along with four check varieties *i.e.,* Vakula. Tirumala, Indravati, GPU-67 during *kharif* 2021 and late *rabi* 2021-22. Nursery was raised as per the recommended package of practices at ARS, Perumalapalle. Tirupati for field experiments. The nursery beds were well prepared by ploughing 4 or 5 times until fine tilth was achieved. The main field was ploughed thoroughly thrice with a tractor drawn cultivator and levelled after removing all the stubbles and weeds. The experiment was laid out in randomized block design (RBD) with 100 genotypes along with four check varieties. Each entry was replicated twice. In each replication the genotypes were sown in 2 rows of 3 meters length with a spacing of 22.5 cm between rows and 10 cm between the plants within the row. The fertilizers *i.e.,* 60 kg N, 30 kg P_2O_5, and 20 kg K_2O hectare^{-1} in the form of urea, single super phosphate and murate of potash, respectively were applied as basal dose as per recommendation. Irrigation and weeding operations were taken during crop growth period to raise good crop

Method of Observations

During the period of study, major insect that was observed was ragi pink stem borer and hence data was regarding per cent dead heart incidence due to pink stem borer is presented here. The incidence of ragi pink stem borer on different genotypes was recorded at weekly intervals. The data on the pest incidence *i.e.,* dead hearts in each genotype and in each replication was recorded.

The data on per cent pest incidence was calculated by using the following formula:

Perst incidence (%) =

$$\frac{\text{Number of infested plants by pink stem borer}}{\text{Total number of plants (healthy + infested)}} \times 100$$

Grouping of Genotypes Based on Per cent Dead Heart Incidence

Resistance or susceptibility of genotypes was categorized based on per cent dead heart incidence, following a three-point (1-3) rating scale given by Sekhar *et al.* (2016) (Table 2).

Statistical Analysis

The data on pest incidence in terms of per cent dead heart was subjected to angular transformations and analysed for getting Analysis of Variance (ANOVA) prescribed for randomized block design with the help of SPSS statistical package (SPSS, 2020).

RESULTS AND DISCUSSION

Response of Finger Millet Genotypes to pink stem borer incidence *kharif* 2021

Mean per cent dead heart incidence at weekly intervals *kharif* 2021

Number of dead hearts on different finger millet genotypes were recorded from 28 to 77 days after sowing at weekly intervals during *kharif*, 2021 (Table 3). The highest incidence of dead hearts by pink stem borer was observed at 63 DAS (36th meteorological week observation) in highly susceptible genotype EN 70 hence per cent dead hearts at 63 DAS was taken as a criteria for scoring of genotypes under different categories.

The reaction of 104 (100 test entries + four checks) finger millet genotypes against pink stem borer incidence was expressed as per cent dead hearts incidence. The per cent dead heart incidence in test genotypes was ranged from 8.13 to 67.3 with an average incidence of 15.52 per cent dead heart incidence during *kharif*, 2021 (Table 3). The genotypes were grouped into different resistance categories based on the per cent dead heart incidence at 63 DAS as given by Sekhar *et al.* (2016) (Table 2). 83 genotypes were placed under highly resistant category with <10 per cent dead heart incidence, 12 genotypes under moderately susceptible (10.1-40%) and five genotypes under highly susceptible category (>40%) to pink stem borer infestation. Four entries IC 00618624, IC 00618651, E 318 and E 326 were highly susceptible to blast and could not survive for getting data on dead heart incidence (Table 3).

The genotypes showing no dead hearts or <10 per cent incidence are *viz.,* IC 0476623, IC 0476587, IC0476095, IC 0475407, IC 0475125, IC 0474816, IC 0475386, IC 0473882, IC 0007953, IC 0007954, IC

Table 1. List of Finger millet genotypes used for screening of experiment

S. No.	Genotype	S. No.	Genotype	S. No	Genotype
1.	IC 0476623	36.	IC 00622073	71.	IC 0627147
2.	IC 0476587	37.	IC 00600278	72.	SEA 72
3.	IC 0476095	38.	IC 00622084	73.	IC 0627175
4.	IC 0475407	39.	IC 00622089	74.	ER 37
5.	IC 0475125	40.	IC 00622112	75.	ER 41
6.	IC 0474816	41.	IC 00622139	76.	IC 0627178
7.	IC 0475386	42.	IC 00621996	77.	IC 0627179
8.	IC 0473882	43.	IC 00622007	78.	IC 0627180
9.	IC 0007953	44.	IC 00622010	79.	ER 53
10.	IC 0007954	45.	IC 00622031	80.	ER 55
11.	IC 0066140	46.	IC 00622036	81.	ER 61
12.	IC 0478686	47.	IC 00322041	82.	ER 62
13.	IC 0478746	48.	IC 00622046	83.	ER 64
14.	IC 0478792	49.	IC 00622053	84.	ER 67
15.	IC 0478444	50.	IC 0624939	85.	ER 73
16.	IC 0478819	51.	IC 0624940	86.	ER 75
17.	IC 0478832	52.	IC 0624941	87.	ER 76
18.	IC 0478442	53.	IC 0624997	88.	ER 81
19.	IC 0478656	54.	IC 0628917	89.	ER 83
20.	IC 0478693	55.	IC 0628944	90.	ER 99
21.	IC 0478710	56.	IC 0628956	91.	E 318
22.	IC 0478766	57.	SEJ 137	92.	E 326
23.	IC 0478821	58.	EN 8	93.	EN 70
24.	IC 0478862	59.	EN 22	94.	EN 95
25.	IC 0478935	60.	EN 38	95.	EN 96
26.	IC 0478181	61.	EN 46	96.	EN 98
27.	IC 0478319	62.	EN 52	97.	EN 99
28.	IC 0478543	63.	E 265	98.	EN 112
29.	IC 0478640	64.	SEA 7	99.	MLT 10
30.	IC 00618624	65.	SEA 11	100.	MLT 11
31.	IC 00618651	66.	IC 0627123	101.	VAKULA
32.	IC 00622057	67.	SEA 23	102.	TIRUMALA
33.	IC 00622063	68.	IC 0627127	103.	INDRAVATI
34.	IC 00622068	69.	SEA 38	104.	GPU- 67
35.	IC 00622069	70.	IC 0627139		

Table 2. Pest rating scale based on per cent dead heart incidence

Pest Rating score	Per cent Dead Heart Incidence	Pest Reaction
1	Less than <10%	Highly Resistant
2	10.1 – 40.0	Moderately susceptible
3	More than 40.0%	Highly susceptible

0066140, IC 0478686, IC 0478746, IC 0478792, IC 0478444, IC 0478819, IC 0478832, IC 0478442, IC 0478656, IC 0478693, IC 0478710, IC 0478766, IC 0478821, IC 0478862, IC 0478935, IC 0478319, IC 0478543, IC 0478640, IC 00622063, IC 00622068, IC 00622069, IC 00622073, IC 00622084, IC 00622089, IC 00622112, IC 00621996, IC 00622007, IC 00622010, IC 00622031, IC 00622036, IC 00622046, IC 00622053, IC 0624939, IC 0624940, IC 0624941, IC 0628917, IC 0628944, IC 0628956, SEJ 137, EN 8, EN 22, EN 38, EN 52, E 265, SEA 7, SEA 11, IC 0627123, SEA 23, IC 0627127, SEA 38, IC 0627139, IC 0627147, SEA 72, IC 0627175, IC 627179, IC 0627180, ER 53, ER 55, ER 61, ER 62, ER 64, ER 67, ER 76, ER 81, ER 83, ER 99, EN 95, EN 96, EN 98, EN 99, EN 112, MLT- 11 and Indravati and these genotypes were given the score of 1.

The genotypes IC 0478181 (28.1%), IC 00600278 (31.32%), IC 00622139 (34.485%), IC 00322041 (25.50%), EN 46 (23.71%), IC 0627178 (18.89%), ER 73 (36.8%), ER 75 (37.06%), MLT-10 (31.03%), Vakula (34.87%), Tirumala (23.35%) and GPU-67 (16.13%) recorded per cent incidence from 10.1 to 40% were given pest score of two were classified as moderately susceptible category.

The genotypes which recorded per cent dead hearts incidence from 41.04 to 67.3 per cent were given pest scoring of three and were classified as highly susceptible *viz.,* EN 70 (67.3%), IC 00622057 (50.74%), IC 0624997 (46.25%), ER 37 (42.41%) and ER 41 (40.04%).

Late *rabi,* 2021-22

Number of dead hearts on different finger millet genotypes during late *rabi,* 2021-22 was recorded from 28 to 77 days after sowing at weekly intervals (Table 3). The highest incidence of dead hearts by pink stem borer was observed at 56 DAS (12th meteorological week observation) in highly susceptible genotype EN 70 hence per cent dead heart at 56 DAS was taken as a criteria for scoring of genotypes under different categories.

During late *rabi*, 2022, the per cent dead heart incidence in test genotypes ranged from 8.13 to 64.64 with an average 14.08 per cent dead heart incidence during late *rabi*, 2022. Out of 104 genotypes screened for resistance to dead heart incidence, 80 genotypes were placed under highly resistant category with <10 per cent dead heart incidence, 15 genotypes under moderately susceptible (10.1 to 40.0%) and five genotypes under highly susceptible (>40%) to pink stem borer. Four entries IC 00618624, IC 00618651, E 318 and E 326 were highly susceptible to blast and hence we couldn't get any panicles out of it Table 3.

The genotypes showing no dead hearts or <10 per cent incidence *viz.,* IC 0476587, IC 0476095, IC 0475407, IC 0475125, IC 0475386, IC 0473882, IC 0007953, IC 0007954, IC 0066140, IC 0478686, IC 0478746, IC 0478792, IC 0478444, IC 0478181, IC 0478819, IC 0478832, IC 0478442, IC 0478656, IC 0478693, IC 0478766, IC 0478821, IC 0478862, IC 0478935, IC 0478319, IC 0478543, IC 0478640, IC 00622063, IC 00622068, IC 00622069, IC 00622073, IC 00622084, IC 00622089, IC 00622112, IC 00621996, IC 00622007, IC 00622010, IC 00622031, IC 00622036, IC 00622046, IC 00622053, IC 0624939, IC 0624940, IC 0624941, IC 0628917, IC 0628944, IC 0628956, SEJ 137, EN 8, EN 22, EN 38, EN 52, E 265, SEA 7, SEA 11, IC 0627123, SEA 23, IC 0627127, SEA 38, IC 0627139, IC 0627147, SEA 72, IC 0627175, IC 0627179, IC 0627180, ER 53, ER 55, ER 61, ER 62, ER 64, ER 67, ER 76, ER 81, ER 83, ER 99, EN 95, EN 96, EN 98, EN 99, EN 112, MLT- 11 and Indravati, these genotypes were given the score of one.

The genotypes IC 0476623 (10.44%), IC 0474816 (10.17%), IC 0478710 (18.16%), IC 00600278 (30.42%), IC 00622139 (33.485%), IC 00322041 (24.50%), EN 46 (23.32%), IC 0627178 (20.25%), ER 73 (32.88%), ER 75 (35.26%), MLT-10 (30.85%), Vakula (34.76%), Tirumala (23.57%) and GPU-67 (13.71%) which recorded per cent incidence score from 10.1 to 40% were classified under moderately susceptible category with

Table 3. Mean per cent dead heart incidence at highest per cent incidence of *Sesamia inferens kharif,* 2021 and late *rabi,* 2021-22

S. No	Genotype	*kharif* 2021	*rabi 2022*	S. No	Genotype	*kharif* 2021	*rabi 2022*
		63 DAS	56 DAS			63 DAS	56 DAS
1	IC 0476623	1 (8.127)	9.98 (10.447)	53.	IC 0624997	36.08 (46.252)	36.72 (47.699)
2	IC 0476587	1 (8.127)	1 (8.127)	54.	IC 0628917	1 (8.127)	1 (8.127)
3	IC 0476095	1 (8.127)	1 (8.127)	55.	IC 0628944	1 (8.127)	1 (8.127)
4	IC 0475407	1 (8.127)	1 (8.127)	56.	IC 0628956	1 (8.127)	1 (8.127)
5	IC 0475125	1 (8.127)	1 (8.127)	57.	SEJ 137	1 (8.127)	1 (8.127)
6	IC 0474816	1 (8.127)	9.74 (18.18)	58.	EN 8	1 (8.127)	1 (8.127)
7	IC 0475386	1 (8.127)	1 (8.127)	59.	EN 22	1 (8.127)	1 (8.127)
8	IC 0473882	1 (8.127)	1 (8.127)	60.	EN 38	1 (8.127)	1 (8.127)
9	IC 0007953	1 (8.127)	1 (8.127)	61.	EN 46	18.14 (23.714)	18.25 (23.326)
10	IC 0007954	1 (8.127)	1 (8.127)	62.	EN 52	1 (8.127)	1 (8.127)
11	IC 0066140	1 (8.127)	1 (8.127)	63.	E 265	1 (8.127)	1 (8.127)
12	IC 0478686	1 (8.127)	1 (8.127)	64.	SEA 7	16.52 (22.12)	1 (8.127)
13	IC 0478746	1 (8.127)	1 (8.127)	65.	SEA 11	1 (8.127)	1 (8.127)
14	IC 0478792	1 (8.127)	1 (8.127)	66.	IC 0627123	1 (8.127)	1 (8.127)
15	IC 0478444	1 (8.127)	1 (8.127)	67.	SEA 23	1 (8.127)	1 (8.127)
16	IC 0478819	1 (8.127)	1 (8.127)	68.	IC 0627127	13.25 (18.90)	1 (8.127)
17	IC 0478832	1 (8.127)	1 (8.127)	69.	SEA 38	1 (8.127)	1 (8.127)
18	IC 0478442	1 (8.127)	1 (8.127)	70.	IC 0627139	1 (8.127)	1 (8.127)
19	IC 0478656	1 (8.127)	1 (8.127)	71.	IC 0627147	1 (8.127)	1 (8.127)
20	IC 0478693	1 (8.127)	1 (8.127)	72.	SEA 72	1 (8.127)	1 (8.127)
21	IC 0478710	1 (8.127)	14.19 (22.12)	73.	IC 0627175	1 (8.127)	1 (8.127)
22	IC 0478766	1 (8.127)	1 (8.127)	74.	ER 37	35.32 (42.413)	34.32 (41.186)
23	IC 0478821	1 (8.127)	1 (8.127)	75.	ER 41	35.73 (40.040)	33.84 (40.24)
24	IC 0478862	1 (8.127)	1 (8.127)	76.	IC 0627178	13.24 (18.890)	15.89 (20.247)
25	IC 0478935	1 (8.127)	1 (8.127)	77.	IC 0627179	1 (8.127)	1 (8.127)
26	IC 0478181	13.12 (28.105)	8.9 (17.35)	78.	IC 0627180	1 (8.127)	1 (8.127)
27	IC 0478319	1 (8.127)	1 (8.127)	79.	ER 53	1 (8.127)	1 (8.127)
28	IC 0478543	1 (8.127)	1 (8.127)	80.	ER 55	1 (8.127)	1 (8.127)
29	IC 0478640	1 (8.127)	1 (8.127)	81.	ER 61	1 (8.127)	1 (8.127)
30	IC 00618624	0.000	0.000	82.	ER 62	1 (8.127)	1 (8.127)
31	IC 00618651	0.000	0.000	83.	ER 64	1 (8.127)	1 (8.127)
32	IC 00622057	39.64 (50.746)	37.64 (48.746)	84.	ER 67	1 (8.127)	1 (8.127)
33	IC 00622063	1 (8.127)	1 (8.127)	85.	ER 73	18.5 (36.848)	17.9 (32.884)
34	IC 00622068	1 (8.127)	1 (8.127)	86.	ER 75	19.18 (37.060)	18.2 (35.263)
35	IC 00622069	1 (8.127)	1 (8.127)	87.	ER 76	1 (8.127)	1 (8.127)
36	IC 00622073	1 (8.127)	1 (8.127)	88.	ER 81	1 (8.127)	1 (8.127)
37	IC 00600278	17.52 (31.320)	17.02 (30.42)	89.	ER 83	1 (8.127)	1 (8.127)
38	IC 00622084	1 (8.127)	1 (8.127)	90.	ER 99	1 (8.127)	1 (8.127)
39	IC 00622089	1 (8.127)	1 (8.127)	91.	E 318	0.000	0.000
40	IC 00622112	1 (8.127)	1 (8.127)	92.	E 326	0.000	0.000
41	IC 00622139	26.04 (34.485)	25.94 (33.485)	93.	EN 70	42.035 (67.300)	41.85 (64.643)
42	IC 00621996	1 (8.127)	1 (8.127)	94.	EN 95	1 (8.127)	1 (8.127)
43	IC 00622007	1 (8.127)	1 (8.127)	95.	EN 96	1 (8.127)	1 (8.127)
44	IC 00622010	1 (8.127)	1 (8.127)	96.	EN 98	1 (8.127)	1 (8.127)
45	IC 00622031	1 (8.127)	1 (8.127)	97.	EN 99	1 (8.127)	1 (8.127)
46	IC 00622036	1 (8.127)	1 (8.127)	98.	EN 112	1 (8.127)	1 (8.127)
47	IC 00322041	19.28 (25.501)	19.07 (24.5)	99.	MLT 10	23.55 (31.029)	23.01 (30.859)
48	IC 00622046	1 (8.127)	1 (8.127)	100.	MLT 11	1 (8.127)	1 (8.127)
49	IC 00622053	1 (8.127)	1 (8.127)	101.	VAKULA	25.25 (34.867)	25.1 (34.768)
50	IC 0624939	1 (8.127)	1 (8.127)	102.	TIRUMALA	18.85 (23.357)	18.85 (23.57)
51	IC 0624940	1 (8.127)	1 (8.127)	103.	INDRAVATI	1 (8.127)	1 (8.127)
52	IC 0624941	1 (8.127)	1 (8.127)	104.	GPU- 67	11.29 (16.127)	10.59 (13.71)
					F test	**Sig.**	**Sig.**
					SEm	**6.82**	**6.51**
					CD	**11.12**	**11.01**

Values in the parenthesis are Angular transformed values; Sig. Significant at 0.05 per cent level of significance
NS : Non significant; DAS : Days After Sowing

pest incidence score of two.

The genotypes which recorded per cent dead hearts incidence 40.24 to 64.64 per cent were classified as highly susceptible with pest incidence score of three *viz.,* EN 70 (64.64%), IC 00622057 (48.74%), IC 0624997 (47.69%), ER 37 (41.186%) and ER 41 (40.24%).

Similar to the present findings, several workers have grouped test genotypes into different categories based on per cent dead heart incidence. Basavaraj and Biradar (2017) reported that among 123 genotypes of pearl millet screened for stem borer *Chilo partellus* incidence, 80 genotypes showed highly tolerant reaction (0-20% dead heart), 31 genotypes exhibited tolerant reaction (21-40% dead heart), 12 genotypes were found to be moderately tolerant. Genotypes *viz.,* CPBLT-123, TPBLT-110, TPBLT-116, TPBLT-117 and TPBLT-118 among B lines, CPRT-104, CPRT-109, CPRT-125 and LPRT-125 among R lines showed less than 5 per cent dead heart incidence were classified as resistant to pearl millet stem borer.

Vishvendra *et al.* (2017) reported low percentage of dead heart incidence by *Chilo partellus* in PMH-117 (5.33) which is a resistant variety and maximum in Hybrid Madhuri (45.92) which is a susceptible variety after 45 days of maize sowing. Swami and Bajpai (2006) screened eight selected maize varieties against maize stem borer *Chilo partellus* and found that only PARBHAT and MAHI DHAWAL were found relatively resistant against this pest with mean dead hearts in the range of 19.97 and 26.26 per cent.

Sasmal *et al.* (2018) reported per cent dead heart incidence in sorghum by *Sesamia inferens* in the range of 6.4-29.5 and 9.5-27.2 per cent during *rabi* 2012-13, 2013-14 respectively. The pooled mean of two season data indicated that the finger millet genotypes: PRM 9002, KOPN 933, OEB 28, RAU 8 and Champabati recorded less than 10 per cent dead hearts (DH). Among these genotypes, OEB 28 recorded lowest dead hearts (8.4% DH) PRM 9002 (8.6%DH) which showed resistance against *S. inferens*. The genotypes GPU 75, VL 352, BR 4, BBM 11, VL 352, GPU 79, OEB 87, OEB 303, OEB 265, Godavari, Dibyasinha, Nilachala, Subhra, Chilika, OEB532, VL 149, OEB 22, Bhairabi, AKP 2, OEB 312 had dead heart incidence within 10-20% which showed moderate resistance against *S. inferens*. Remaining finger millet genotypes: OEB 225, OEB 311, OEB 52 and OEB 526 recorded more than 20% DH incidence which showed susceptible against *S. inferens* in the experiment. Similarly, Patel *et al.* (2021) conducted screening experiments with sorghum varieties against stem borer, *C. partellus* and observed that lesser than 69.47 per cent dead hearts were found in the varieties of AFS-28 and SSG-59-3 showing resistance. While, more than 69.47 but less than 83.0 per cent dead hearts were observed in the varieties of AFS-26, AFS-30 and AFS-36 recording moderate resistance.

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