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SCREENING OF ELITE SORGHUM GENOTYPES FOR RESISTANCE AGAINST SHOOT FLY AND PINK STEM BORER

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SUMMARY

One hundred and five sorghum genotypes were evaluated against shoot fly, *Atherigona soccata* Rondani and stem borer, *Chilo partellus* (Swinhoe) during *Kharif*, 2020. Screening was done on the basis of per cent dead heart at 28 and 45 days after emergence against shoot fly and stem borer respectively. The results revealed that some genotypes were highly resistant against shoot fly and stem bore excluding the resistant checks. Genotypes, SPV 2768, SPV 2669, SPV 2587, SPV 2593, SPV 2584, SPV 2704, CSV 21F, SPV 2809, SPV 2800, SPV 2808, SPV 2790, SPV 2604 and SPV 2529 have shown multiple resistance against shoot fly and stem borer.

Key words : *Atherigona soccata, chilo partelus,* dead heart, screening

Sorghum [*Sorghum bicolor* (L.) Moench] serve as the primary source of food and fodder for the world's poorest and most food-insecure people, especially in the semi-arid tropics. (Rao *et al.,* 2010). It is primarily cultivated for fodder in Haryana (Satpal *et al*., 2016). The sorghum plant is attacked by over 150 insect species from sowing to harvest, (Verma and Singh, 2000) of which stem borer, *Chilo partellus* (Swinhoe) (Lepidoptera: Pyralidae) and sorghum shoot fly, *Atherigona soccata* (Rondani) (Diptera: Muscidae) are serious pest, having huge penalty from the sorghum crop in terms of quality and quantity. *A. soccata* attack the sorghum crops during the early stage (5-30 days after emergence), particularly in late-sown crop (Nwanze *et al.,* 1990). The larvae of shoot fly cut the growing tip resulting in dead heart formation, and the infestation can reach up to 80 per cent, resulting in yield losses of 80-90 percent for grain and 68 per cent for fodder (Balikaji and Bhagwat., 2009; Jotwani., 1983, Kahate *et al*., 2014). The Larvae of stem borer feed in the leaf whorl resulting into shot holes. The third instar larvae bore into the shoot and feed the growing point lead into the production of a typical "dead heart". The losses caused by *C. partellus* in maize and sorghum ranged from 18-25 per cent in Asia (Dhaliwal *et al.,* 2015). Though both these pests can be effectively controlled by using insecticides but it is not computable with environment and cattle. Host plant resistance (HPR) offers an economic, stable and ecologically sound approach and does not involve any extra cost of cultivation for the successful management of several insect pests in sorghum (Huang, *et al.,* 2013). Therefore, the present study was undertaken to screen sorghum genotypes for resistance against *A. soccata* and *C. partellus*, under All India Coordinated Research Project (AICRP) trials during *Kharif,* 2020 under natural field conditions.

MATERIALS AND METHODS

The experiment was conducted at the Forage Section Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar, during *Kharif,* 2020.. One hundred and five genotypes of IVHT-MC, AVHT-SC, IVHT-SC and IAVHT- SS including Resistant and susceptible were sown in 2nd week of July, 2020 under natural conditions.

The trial was sown in Randomized Blok Design with three replication having 2 row of 2 meter length for each genotype with 45 cm × 25 cm spacing. Per cent dead heart were recorded at 28 and 45 DAE against Shoot fly and Stem borer respectively.

RESULTS AND DISCUSSION

One hundred and five sorghum genotypes were screened against the infestation of shoot fly and stem borer under natural field conditions.

Dead heart formation by Shoot flies and stem borer

The per cent dead hearts were differed statistically among the Sorghum genotypes, when observed at 28 DAE and 45 DAE. IAVHT- MC (multi cut) trial, mean per cent dead hearts at 28 DAE caused by shoot fly varied from 12.4 to 56.9 per cent in different genotypes. the genotypes *viz*. SPV 2768 and SPV 2669 have shows resistance agnist shoot fly and performed well in terms of lowest shoot fly infestation of 15.5 and 31.7 % dead heart, respectively, which is at par with resistance check IS 2312 (RC), IS 18551 (RC), IS 2205(RC) (Table 1). (Ritu *et.al*., 2022; Khandare *et.al.*, 2013).

Genotype namely SPH 1966, SPV 2669, SPV 2768, SPV 2766 and SPH 1933 were found resistant against stem borer having dead heart 10.4, 10.8, 11.7, 12.4 and 13.2 per cent respectively at par with IS 2205 (7.9%), IS 18551 (8.2%), and IS 2312 (11.4%) resistant check. Swarna and DJ 6514 recorded 22.7 and 22.0 per cent dead heart and both shows highly susceptible to stem borer (Table 1). (Bajrang *et al., 2021* and Anil *et al.,* 2021). Genotypes *viz*. SPV 2768 and SPV 2669 shows multiple resistance against the both the pests.

In AVHT –SC trial The entries, ; SPV 2587 (10.7% , SPV 2593(14.2%), SPV 2704 (19.5%), CSV 21F (19.9%), CSV 35 F (21.0%) and SPV 2584 (22.5%) were recorded lowest per cent dead hearts which is statistically at par with IS 18551 (10.6%) resistance check against shoot fly. In case of stem borer per cent dead heart the entries SPV 2584 (10.6%), SPV 2587 (10.7%), SPH 1961 (12.1%), SPV 2593 (12.9%) and CSV 21F (13.4%) were recorded, those were found at par with IS 2205 (8.2%) resistant check (Table 2).

TABLE 1
Screening of genotypes for insect pest resistance under IAVHT-MC during *Kharif* 2020

S. No.	Entry	Shoot fly dead hearts (%) at 28 DAE (peak)	Stem borer dead hearts (%) at 45 DAE
1.	SPH1904	47.3	21.5
2.	SPH1905	35.8	14.1
3.	SPH1932	46.7	14.9
4.	SPH1933	43.9	13.2
5.	SPH1934	39.8	14.9
6.	SPH1935	44.4	17.5
7.	SPH1966	36.7	10.4
8.	SPH1967	48.4	17.9
9.	SPH1968	38.6	14.4
10.	SPH1969	45.7	15.8
11.	SPH1970	56.9	21.3
12.	SPH1971	39.9	18.9
13.	SPV2669	31.7	10.8
14.	SPV2670	33.6	16.5
15.	SPV2764	53.1	16.5
16.	SPV2765	48.2	18.2
17.	SPV2766	42.1	12.4
18.	SPV2767	43.7	15.0
19.	SPV2768	15.5	11.7
20.	CSH 24MF	32.9	15.5
21.	CSV 33MF	33.2	15.4
22.	Local Check	29.1	16.4
23.	IS 2312(RC)	12.4	11.4
24.	IS 18551(RC)	13.5	8.2
25.	IS 2205(RC)	20.2	7.9
26.	Swarna(SC)	50.6	22.7
27.	DJ 6514(SC)	51.5	22.0
	Mean	38.3	15.4
	C.D. (5%)	13.29	5.68
	C.V. (%)	21.15	22.54

TABLE 2
Screening of genotypes for insect pest resistance under AVHT-SC during *Kharif* 2020

S. No.	Entry	Shoot fly dead hearts (%) at 28 DAE (peak)	Stem borer dead hearts (%) at 45 DAE
1.	SPH1958	34.0	16.6
2.	SPH1961	31.4	12.1
3.	SPV2584	22.5	10.6
4.	SPV2587	10.7	10.7
5.	SPV2593	14.2	12.9
6.	SPV2704	19.5	14.6
7.	SPV2705	22.8	16.4
8.	CSH 13	36.7	16.5
9.	CSV 30F	25.7	14.2
10.	CSV 35F	21.0	14.7
11.	CSH 40F	31.8	17.5
12.	CSV 21F	19.9	13.4
13.	Local Check	24.9	15.0
14.	IS 2312(RC)	12.5	8.2
15.	IS 18551(RC)	10.6	9.6
16.	IS 2205(RC)	12.8	10.1
17.	Swarna(SC)	50.6	21.4
18.	DJ 6514(SC)	49.5	21.1
	Mean	25.1	14.2
	C.D. (5%)	16.85	6.61
	C.V. (%)	40.52	23.06

Genotypes SPV 2587, SPV 2593, SPV 2584, SPV 2704 and CSV 21F shows multiple resistances against shoot fly and stem borer.

The genotypes *viz*. SPV 2809, SP 2804, SPV 2800 and SPV 2808 in IVHT single cut sorghum having 11.8, 14.9, 19.1 and 21.9 per cent dead heart respectively by shoot fly, and found at par with IS 18551 (12.8% dead heart) resistance check. Likewise, the entries SPV 2809, SPV 2800, SPH 1989, SPV 2797, SPV 2808 and CSV 35F were shows resistance against stem borer. The per cent dead heart of these entries were 10.2, 11.4, 11.7, 12.6, 12.9 and 13.1 respectively, at par with IS 2205 (8.0 %) resistant check (Table 3).The genotypes *viz*. SPV 2809,SPV 2800 and SPV 2808 shows resistance against shoot fly and stem borer.

TABLE 3
Screening of genotypes for insect pest resistance under IVHT-SC during *Kharif* 2020

S. No.	Entry	Shoot fly dead hearts (%) at 28 DAE	Stem borer dead hearts (%) at 45 DAE
1.	SPH1984	40.5	20.2
2.	SPH1985	38.7	14.6
3.	SPH1986	42.0	16.0
4.	SPH1987	42.1	14.7
5.	SPH1988	34.4	18.2
6.	SPH1989	34.3	11.7
7.	SPV2796	37.6	18.1
8.	SPV2797	44.0	12.6
9.	SPV2798	56.9	15.8
10.	SPV2799	28.5	14.5
11.	SPV2800	19.1	11.4
12.	SPV2801	25.1	14.2
13.	SPV2802	23.6	18.5
14.	SPV2803	25.0	19.5
15.	SPV2804	14.9	14.8
16.	SPV2805	41.1	14.3
17.	SPV2806	69.9	15.2
18.	SPV2807	46.7	20.5
19.	SPV2808	21.9	12.9
20.	SPV2809	11.8	10.2
21.	CSV 30F	27.6	13.8
22.	CSV 35F	37.5	13.1
23.	CSH 40F	42.8	17.7
24.	CSV 21F	47.1	13.7
25.	Local Check	30.6	13.4
26.	IS 2312(RC)	15.0	9.3
27.	IS 18551(RC)	12.8	9.5
28.	IS 2205(RC)	14.3	8.0
29.	Swarna(SC)	58.5	18.5
30.	DJ 6514(SC)	45.4	18.9
	Loc. Mean	34.3	14.8
	C.D. (5%)	9.55	5.1
	C.V. (%)	17.04	21.09

In IAVHT-SS (Sweat Sorghum) trial, per cent damage showed by the entries *viz*. SPV 2792(10.6%), SPV 2790(11.3%), SPV 2693 (14.8%), SPV 2529 (15.2%), SPV 2791(16.6%) and SPV 2604 (21.2%) were recorded statistically at par with IS 18551 (12.3%) resistance check against shoot fly per cent dead hearts at 28 days After Emergence (Table 4).

Stem borer per cent dead hearts varied from 7.5 % to 19.7 % in IS 18551 and SPH 1981 respectively. The genotypes *viz*. SPV 2790, SPV 2604, SPV 2529, SPV 2596, SPV 2595 and SPH 1982 having 9.8, 10.3, 11.1,11.1, 11.2 and 13.1 per cent dead heart infestation of stem borer which is at par with IS 18551 (7.5 percent dead heart) resistance check. SPV 2790, SPV 2604 and SPV 2529 were shows multiple resistances against shoot fly and stem borer (Prasad *et al*., 2015).

TABLE 4
Screening of genotypes for insect pest resistance under IAVHT-SS during *Kharif* 2020.

S. No.	Entry	Shoot fly dead hearts (%) at 28 DAE	Stem borer dead hearts (%) at 45 DAE
1.	SPH1981	29.0	19.7
2.	SPH1982	22.6	13.1
3.	SPH1983	24.9	17.4
4.	SPV2529	15.2	11.1
5.	SPV2600	36.3	17.2
6.	SPV2604	21.2	10.3
7.	SPV2693	14.8	14.4
8.	SPV2695	26.9	11.2
9.	SPV2696	28.1	11.1
10.	SPV2697	30.1	14.8
11.	SPV2700	32.3	13.7
12.	SPV2788	52.4	13.9
13.	SPV2789	57.3	16.3
14.	SPV2790	11.3	9.8
15.	SPV2791	16.6	15.8
16.	SPV2792	10.6	13.9
17.	SPV2793	25.5	13.3
18.	SPV2794	46.3	16.9
19.	SPV2795	42.6	13.7
20.	CSH 22 SS	52.2	14.4
21.	CSV 19 SS	21.5	14.8
22.	CSV 24SS	34.3	16.6
23.	IS 2312 (RC)	13.3	12.6
24.	IS 18551(RC)	12.3	7.5
25.	IS 2205(RC)	15.8	11.0
26.	Swarna(SC)	53.2	18.8
27.	DJ 6514(SC)	52.8	17.7
	Mean	29.2	14.1
	C.D. (5%)	9.61	5.6
	C.V. (%)	20.07	24.22

CONCLUSION

Screening of 105 different genotypes was done on the basis of per cent dead heart at 28 DAE and 45 DAE against Shoot fly and stem borer respectively. The results revealed that some genotypes were highly resistant against shoot fly and stem bore excluding the resistant checks. Genotype *viz*. SPV 2768, SPV 2669, SPV 2587, SPV 2593, SPV 2584, SPV 2704, CSV 21F, SPV 2809, SPV 2800, SPV 2808, SPV 2790, SPV 2604 and SPV 2529 were shows multiple resistances to both the pests.

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