



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(5): 2072-2074

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Received: 15-07-2018

Accepted: 20-08-2018

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International Journal of Chemical Studies

Assessment of the reaction of *Rabi* sorghum lines against shoot fly, stem borer and aphid in Marathwada condition

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Abstract

Sorghum [*Sorghum bicolor* (L.) Moench] is an important cereal crop in India popularly known as 'Jawar' or 'Great millet'. In Maharashtra about 18 important insect pests have been recorded on sorghum crop. In sorghum major incidence of shootfly, stem borer and sorghum aphid are observed. In screening programme in all thirty two sorghum genotypes including three checks were replicated twice under Randomized Block Design for resistance to mention insect pest. The ovipositional preference by shoot fly depends on particular trait. Non preference for shoot fly egg laying skip the crop from the damage by shoot fly. In addition resistant checks IS-18551 and IS-2205, the test entries Sargaon L., IS-31420, PVR-660, PVP-657, IS-24308, IS-17666, IS-26998, Pop sorg.19, IS-13721, IS-40838, IS-30970 and IS-5150 had less preference for egg laying by shoot fly along with resistant characters, test lines Sargaon L., IS-31420, PVR-660, PVP-657, IS-24308, IS-17666 and IS-26998 can tolerate shoot fly damage. Glossy seedlings are having low seedling score and vigorous seedling having low seedling vigour score and seedling vigour score was significantly and positively associated with shoot fly egg and shoot fly incidence. Hence, the lines with glossy and vigorous behavior can be incorporated in breeding programme for developing shoot fly resistant material and can be advised to farmers for growing in shoot fly hot spots.

Keywords: Assess the reaction- different lines- major insect pest- sorghum

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is an important cereal crop in India popularly known as 'Jawar' or 'Great millet'. It is probably originated in East Central Africa and it was introduced in India from East Africa in the year 1500 BC. This crop grows as both *Kharif* and *Rabi* sorghum. This crop mostly used for food as well as fodder purpose.

Maharashtra is foremost sorghum growing state in the country with an area, production, productivity of *Rabi* jowar was 20.21 lakh ha, 17.40 lakh tonnes and 861kg ha⁻¹, respectively (Anonymous 2016-17).

In sorghum major incidence of shootfly, stem borer and sorghum aphids observed. Pest control by different method like physical chemical biological cultural but one of the best methods is host plant resistance mechanism. This method is very safe and low cost input method. The two mechanisms antixenosis and antibiosis are present in host plant which is responsible for resistance to pest.

Material and Methods

Field research trial was carried out on the field of Sorghum Research Unit, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, during *Rabi* 2016-17 with a view to assess the reaction of sorghum lines to major pest. The different morphological traits associated with sorghum and important resistance contributing parameters for major pest reaction.

Material like different sorghum lines, agricultural implements, bullock pair, marker, rope, measuring tape, manures and fertilizers, labels, pegs, brown paper bags etc. were used while conducting field experiment. For biochemical observation used hand refractometer, spadometer used for determination for chlorophyll content.

In screening programme in all thirty two sorghum genotypes including three checks were replicated twice under Randomized Block Design for resistance to shoot fly, stem borer and aphid. The observation were recorded on the number of eggs per five plants at 7, 14, 21 days after emergence (DAE), dead hearts caused by shoot fly at 14, 21 and 28 DAE, to assess the

reaction of sorghum genotypes to shoot fly. The observations of aphids were calculated on scale basis 1 to 9. The dead hearts caused by stem borer were recorded on 45th day after emergence in each plot. Per cent dead hearts were computed by the following formula:

$$\text{Deadhearts (\%)} = \frac{\text{No. of plants with deadhearts in a plot}}{\text{Total no. of plants in the plot}} \times 100.$$

The data obtained from the field and laboratory experiments were converted to appropriate transformations and were subjected to statistical analysis to test the level of significance.

Result and Discussion

Shoot fly, the significantly minimum eggs per five plants 7 DAE were observed on resistant check IS-18551 (1.0) and IS-2205 (1.0), which was at par followed by test entries Sargaon L., IS-31420, PVR-660, PVP-657 and IS-24308, whereas the maximum eggs were noticed on susceptible check DJ-6514 (7.0) (table no. 1). Likewise at 14 DAE the minimum eggs were recorded on resistant checks IS-18551 (2.30) and IS-2205 (2.40). Whereas, maximum eggs were noticed on

susceptible check DJ-6514, test entry IS-26752 and IS-27028 at 14 DAE. Similarly, the resistant checks IS-18551 (1.20) and IS-2205 (1.27) indicates least oviposition preference, followed in test entries IS-13721 (1.25), PVR-660 (1.30), IS-17666 (1.32), IS-24308 (1.36) 21 DAE (Table no.1). Maximum oviposition preference was recorded on susceptible check DJ-6514 which was at par with IS-27028 (5.5) and IS-26752 (5.0). The entries like resistant check IS-18551 and IS-2205, IS-13721, IS-17666, PVR-660, IS-24308 recorded minimum deadhearts percentage at 14, 21 and 28 DAE. Whereas, maximum deadhearts incidence was noticed on susceptible check DJ-6514 and test entry IS-27028 and IS-26752 (Table no.2).

The minimum stem borer dead hearts was recorded in resistant check IS-18551 (6.07) and IS-2205 (6.77), which was at par line Sargaon L. (7.48%). Whereas, the maximum stem borer dead hearts percentage observed in susceptible check DJ-6514. Which was at par line SPV-1411, IS-17757, IS-5150, Pop.sorgh-220, IS-27028 and IS-29364 (table no. 3). The minimum aphid damage score was noticed in test entries PVP-657, Pop sorg.158, IS-13721, IS-40838 and Pbn ent.5, while resistant checks IS-18551 and IS-2205. The maximum aphid damage score was recorded in susceptible check DJ-6514 (8.0) (table no. 3).

Table 1: Oviposition Preference by shoot fly on different sorghum lines in Rabi 2016.

Sr. No.	Sorghum genotypes	Shoot fly eggs per five plant		
		7 DAE	14 DAE	21 DAE
1	IS 26752	6 (2.64)	12(3.59)	5(3.59)
2	IS 27028	6.4 (2.72)	11.5(3.52)	5.5(3.52)
3	Pop sorg. 138	5.3(2.51)	9.5(3.24)	4(3.24)
4	IS 29364	5.6(2.47)	9.5(3.23)	4(3.23)
5	SPV 1411	3.3(2.04)	4(2.22)	2(2.22)
6	IS 17771	4.22(2.28)	7(2.82)	3(2.82)
7	IS 17757	4.6(2.36)	7.5(2.91)	2(2.91)
8	Tandur-2	4.72(2.34)	7.5(2.91)	3(2.91)
9	IS 26998	2(1.73)	5(2.44)	2.3(2.44)
10	Sargaon L.	1.5(1.57)	3(2.00)	1.5(1.98)
11	IS 17666	1.5(1.58)	2.48(1.86)	1.32(1.86)
12	IS 31420	1.5(1.57)	2.6(1.89)	1.5(1.89)
13	PVR 660	1.5(1.57)	2.5(1.87)	1.3(1.86)
14	Pop sorg. 19	2(1.73)	4.5(2.32)	2.4(2.32)
15	IS 13721	2(1.73)	2.75(1.93)	1.25(1.93)
16	PVP 657	1.5(1.57)	4.75(2.39)	1.5(2.39)
17	IS 40838	2(1.73)	3.5(2.12)	2.5(2.12)
18	IS 5221	3.46(2.11)	5(2.44)	2.6(2.44)
19	Pop scr 158	4.8(2.40)	3.5(2.12)	4.3(2.30)
20	IS 24308	1.5(1.57)	2.6(1.89)	1.36(1.89)
21	IS 30970	2.4(1.84)	3.6(2.14)	2.7(2.14)
22	IS 5150	2.5(1.86)	3(2.00)	1.2(2.00)
23	IS 31123	4.96(2.43)	6.75(2.78)	4.4(2.71)
24	Pop.sorgh 220	2.6(1.89)	3.2(2.04)	1.46(2.04)
25	Pbn ent.1	2.7(1.92)	2.5(1.87)	1.48(1.87)
26	Pbn ent.2	2.74(1.93)	2.7(1.92)	2.5(1.92)
27	Pbn ent.3	2.86(1.96)	2.5(1.87)	2.75(1.87)
28	Pbn ent.4	2.92(1.98)	3.75(2.17)	2(2.17)
29	Pbn ent.5	3.72(2.17)	4.8(2.40)	2.8(2.40)
30	IS 2205 (R)	1(1.41)	2.4(1.84)	1.27(1.84)
31	IS 18551 (R)	1(1.41)	2.3(1.81)	1.2(1.81)
32	DJ 6514 (S)	7(2.84)	12(3.60)	6(3.60)
C.D		0.47	0.30	0.45
SE (m)		0.162	0.10	0.15
C.V		11.47	6.14	9.40

Table 2: Shoot fly dead hearts in various sorghum lines during *Rabi* 2016

Sr. No.	Sorghum genotypes	Percent dead hearts due to shoot fly		
		14 DAE	21 DAE	28 DAE
1	IS 26752	18(25.10)	29.00(32.58)	32(34.45)
2	IS 27028	30(33.21)	42.84(40.88)	45.42(42.36)
3	Pop sorg. 138	17.5(24.73)	23.26(28.84)	25.74(30.47)
4	IS 29364	22(27.97)	33.21(35.19)	34.92(36.61)
5	SPV 1411	14.5(22.38)	21.67(27.74)	22.11(28.05)
6	IS 17771	32(34.45)	43.41(41.21)	45.95(42.66)
7	IS 17757	32(34.45)	46.60(43.05)	48.37(44.05)
8	Tandur-2	21(27.27)	31.43(34.10)	32.44(34.70)
9	IS 26998	33(35.06)	48.54(44.16)	50.28(45.14)
10	Surgaon L.	8.5(16.95)	11.41(19.74)	12.37(20.59)
11	IS 17666	11(19.37)	14.72(22.56)	16.73(24.14)
12	IS 31420	12(20.27)	16.79(24.19)	18.30(25.13)
13	PVR 660	12.5(20.70)	13.18(21.22)	14.18(21.69)
14	Pop sorg. 19	9(17.46)	16.28(23.80)	22.29(28.17)
15	IS 13721	9.5(17.95)	16.25(23.70)	18.2(25.25)
16	PVP 657	9(17.46)	16.26(23.78)	17.40(24.53)
17	IS 40838	12.5(20.70)	13.43(21.49)	14.6(22.39)
18	IS 5221	18(25.10)	22.24(28.14)	27.5(31.63)
19	Pop scr 158	12.5(20.70)	13.35(21.41)	15.9(23.49)
20	IS 24308	7(15.34)	12.76(20.92)	14.3(22.20)
21	IS 30970	29(32.58)	40.96(39.79)	43.05(40.98)
22	IS 5150	31.5(34.14)	44.25(41.70)	45.18(42.23)
23	IS 31123	32(34.45)	45.13(42.21)	46.76(43.14)
24	Pop.sorgh 220	31(33.83)	46.54(43.01)	48.4(44.06)
25	Pbn ent.1	14(21.97)	22.76(28.50)	23.72(29.15)
26	Pbn ent.2	11(19.37)	20.39(26.84)	22.7(28.44)
27	Pbn ent.3	14(21.97)	22.55(28.35)	24.95(29.97)
28	Pbn ent.4	18(25.10)	35.93(36.83)	36.5(37.14)
29	Pbn ent.5	9(17.46)	16.40(23.89)	18.2(25.24)
30	IS 2205 (R)	6.6(14.89)	10.21(18.63)	12(20.27)
31	IS 18551 (R)	6(14.18)	9.10(17.56)	11.2(19.55)
32	DJ 6514 (S)	35.6(36.63)	48.75(44.28)	50.3(45.17)
C.D		3.78	3.56	5.19
SE (m)		1.31	1.23	1.79
C.V		7.56	5.74	8.01

Table 3: percent stem borer dead hearts and aphid damage score

Sr. No.	Sorghum genotypes	Stem borer dead hearts (45 DAE)	Aphid damage score (75 DAE)
1	IS 26752	10.57(18.97)	6.5(2.74)
2	IS 27028	12.42(20.63)	6(2.65)
3	Pop sorg. 138	10.15(18.57)	6.5(2.74)
4	IS 29364	11.73(20.02)	7(2.83)
5	SPV 1411	12.83(20.98)	6.25(2.69)
6	IS 17771	11.95(20.20)	6.75(2.78)
7	IS 17757	12.82(20.97)	8(3.0)
8	Tandur-2	9.58(18.00)	6.5(2.74)
9	IS 26998	12.17(20.41)	7(2.82)
10	Surgaon L.	7.48(15.87)	7.25(2.87)
11	IS 17666	8.93(17.38)	7(2.82)
12	IS 31420	9.77(18.20)	6(2.65)
13	PVR 660	8.43(16.87)	6(2.65)
14	Pop sorg. 19	7.93(16.34)	7.5(2.91)
15	IS 13721	12.07(20.32)	5(2.45)
16	PVP 657	7.62(16.02)	4.5(2.35)
17	IS 40838	8.10(16.53)	5(2.45)
18	IS 5221	9.47(17.92)	6.5(2.74)
19	Pop scr 158	8.06(16.48)	4.5(2.35)
20	IS 24308	8.43(16.87)	6(2.64)
21	IS 30970	11.47(19.78)	6.75(2.78)
22	IS 5150	12.73(20.90)	7(2.83)
23	IS 31123	12.42(20.63)	6(2.65)
24	Pop.sorgh 220	12.60(20.78)	6(2.65)
25	Pbn ent.1	10.07(18.49)	5.75(2.59)
26	Pbn ent.2	9.37(17.82)	5.5(2.55)
27	Pbn ent.3	10.10(18.52)	6(2.65)
28	Pbn ent.4	12.10(20.34)	6.75(2.78)
29	Pbn ent.5	10.87(19.24)	5(2.45)
30	IS 2205 (R)	6.77(15.08)	4.5(2.35)
31	IS 18551 (R)	6.07(14.26)	4(2.24)
32	DJ 6514 (S)	13.40(21.46)	8(3.02)
C.D		1.61	0.341
SE (m)		0.54	0.118
C.V		6.14	6.243

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