SUSCEPTIBILITY OF SORGHUM CULTIVARS TO STEM BORER, *Chilo partellus* SWINHOE

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ABSTRACT

Field screening of 12 genotypes of sorghum against major insect pest during *rabi* 2006-07 and 2007-08 showed that among 12 genotypes Nizergoti, BP 53 and GJ 38 were less susceptible compared to other genotypes. Yield of different varieties did not directly increase or decrease according to degree of damage caused by pest. Among different plant characters non significant correlation of plant height, breadth of leaf, length of internodes, peduncle length, length of leaf and number of internodes with dead heart produced by stem borer was found.

Key words: Sorghum, stem borer, *Chilo partellus*, genotypes, physical plant characters, Susceptibility

INTRODUCTION

Sorghum stem borer, *Chilo partellus* Swinhoe act as limiting factors in the successful cultivation of sorghum crop in India. Host-plant resistance plays an important role in the insect-pest management either alone or in combination with other control methods. A number of sorghum genotypes showing varying levels of resistance to spotted stem borer, *Chilo partellus* Swinhoe. Therefore, an attempt was made to establish a possible correlation between physical plant characters and resistance to this pest.

MATERIALS AND METHODS

These studies were carried out at Agricultural Research Station, Navsari Agricultural University, Tanchha, Dis-Bharuch. The experiment was laid out in a randomized block design and replicated thrice at Agricultural Research Station, N.A.U., Tanchha during *rabi* 2006-07 and 2007-08 under rain fed condition. Twelve varieties of sorghum viz., SR 655-1, SR 713-1, SR 833-22, SR 1030, SR 1115-1, SR 1638, SR 1657, SR 1665, BP 53, Nizergoti, GJ 36, GJ 38 were sown in October (*Rabi*) in a plot of 4 rows of 4.0 meter length with 60

cm x 10 cm spacing in *rabi*. The treatments were replicated thrice. All the post sowing recommended agronomical practices were followed. Experimental area was kept free from insecticidal spray throughout the season in order to record the incidence of insect pests. Observation on the number of dead heart formation due to damage of stem borer larvae and total number of plants in net plot per replication were counted and recorded at weekly interval. Per cent dead heart formation was calculated from the data and it was statistically analyzed. The data were analyzed statistically using appropriate transformation. Grain yield was recorded of each variety in all replication. To determine the resistance attributing physical characters of sorghum against insect pests following observation were recorded.

a. Number of leaves per plant at maturity stage

Total number of leaves per plant was counted from five randomly selected plants from each net plot and mean number of leaves per plant worked out.

b. Plant height at maturity stage

The plant height from soil surface to tip of ear head was measured from 5 plants selected randomly from each net plots and mean plant height was worked out.

c. Leaf size at maturity stage

To measure the length of leaf fourth leaf from base was selected. The length of leaf from the base to the tip along the midrib was measured and means length was calculated. The breadth of leaf approximately at the middle of leaf was measured.

d. Number of internodes per plant at maturity stage

Total number of internodes per plant was counted from five plants randomly selected from each net plot and mean number of internodes per plant was worked out.

e. Length of internodes at maturity stage

For this purpose five plants were randomly selected from each net plot. Mean length of internodes was calculated by dividing stem length with total number of internodes per plant.

f. Panicle Length at maturity stage

For this purpose five plants were randomly selected from each net plot. Panicle length was measured from the base of panicle up to the top of the ear head. Simple correlations between the above plant characters and insect resistance in sorghum as revealed by dead heart formed was worked out.

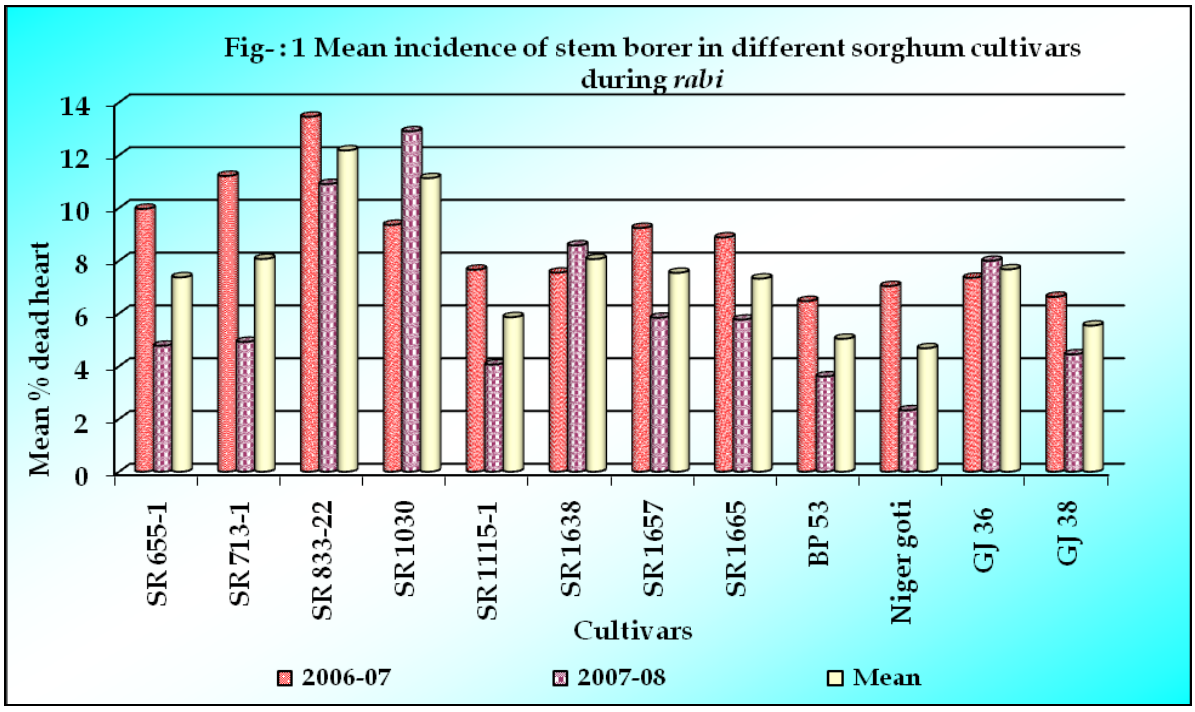
RESULTS AND DISCUSSION

The results on mean percentage of dead heart caused by stem borer during *rabi* 2006-07 revealed that stem borer infestation in terms of dead heart ranged between 6.47% to 13.45% with an average of 8.73% (Table 1). Lower dead heart

percentage was recorded in BP 53 (6.47%) and it was at par with GJ 38 (6.63%), Nizergoti (7.03%), GJ 36 (7.35%), SR 1638 (7.54%), SR 1115-1 (7.65%), SR 1665 (8.88%), and SR 1657 (9.24%), The highest mean dead heart was recorded in SR 833-22 (13.45%), followed by SR 713-1 (11.21%).

During the year 2007-08 the lowest mean dead heart was recorded in Nizergoti (2.32%) and it was at par with BP 53 (3.61%), SR 1115-1 (4.06%) and GJ 38 (4.45%). The genotype SR 1030 recorded highest per cent dead heart (12.90%), followed by SR 833-22 (10.90%).

The pooled mean over two season however revealed non significant difference among different genotypes, Nizergoti recorded numerically lower dead heart (4.68%) and it was followed by BP 53 (5.04%) and GJ 38 (5.54%), while SR 833-22 recorded higher per cent dead heart (12.18%) followed by SR 1030 (11.13%). Thus Nizergoti, BP 53 and GJ 38 were less susceptible compared to other genotypes. Similar report by Anonymous (1962) regarding variety BP 53.



The statistical analysis of yield data (Table 2) showed that the genotype SR 1115-1 gave the highest yield (2653 kg ha^{-1}) which was significantly higher than all other varieties except GJ 36 which was at par with it in 2006-07. Variety SR 1115-1 though showed lower incidence of stem borer (7.65% DH) yielded better (2653 kg ha^{-1}) than the variety Nizergoti, which showed minimum incidence (7.03% SB DH) in 2006-07. This indicated that the yield of different varieties did not directly increase or decrease according to degree of damage caused by pest but the varietal characters like differential yielding ability

couple with ability to recover the damage caused by the pest may possibly be responsible for differences in yield of different varieties under present investigation.

While in 2007-08 BP 53 gave the highest grain yield (1842 kg ha^{-1}), which was significantly higher than all other varieties except GJ 38, Nizergoti, GJ 36, SR 1030, SR 1657 and SR 713-1, which were at par. The variety SR 655-1 gave lowest yield (979 kg ha^{-1}). The variety BP 53 showed lower stem borer (3.61% DH) yielded better. This also indicated that the yield of different varieties did not directly increase or decrease according to degree of damage caused by pest but the varietal characters like differential yielding ability couple with ability to recover the damage caused by the pest may possibly be responsible for differences in yield of different varieties under present investigation.

The statistical analysis of pooled data showed that the yield difference was found to be non significant among different genotypes. The genotype SR 1115-1 gave numerically higher grain yield (2043 kg ha^{-1}) than all genotypes (Table 2). The genotype SR 1115-1 though showed medium incidence of stem borer (5.86% DH) yielded higher than the variety Nizergoti, which showed minimum incidence of stem borer (4.68%). This further indicated that the yield of different varieties did not directly increase or decrease according to degree of damage caused by pest but the varietals characters like differential yielding ability couple with ability to recover the damage caused by the pest may possibly be responsible for differences in yield of different varieties under present investigation.

Influence of physical characters of sorghum plants on incidence of sorghum pest

The different plant characters (physical) of 12 sorghum genotypes were correlated with incidence of stem borer during *rabi* season and results obtained are presented in Table 3 and 4. The pooled data of two year i.e., 2006-07 and 2007-08 revealed that the negative but non significant correlation of plant height, breadth of leaf and length of internodes with dead heart produced by stem borer was found, while positive but non significant correlation found between peduncle length, length of leaf, number of internodes and stem borer dead heart (Table 3). The study indicated that variety Nizergoti proved less susceptible against stem borer (4.68 % DH) and recorded 146.46 cm plant height, 5.02 cm breadth of leaf and 19.43 cm length of internodes against the susceptible variety SR 833-22 (12.18 % DH) which recorded 122.13 cm plant height, 5.32 cm breadth of leaf and 18.07 cm length of internodes (Table 4). Thus stem borer incidence was not influenced by any of the physical parameters of sorghum genotypes included in the experiment. Earlier Khurana and Verma (1985) reported that plant height, number of leaves, length of leaves are negatively correlated with dead heart. Variation in present findings regarding

resistance may be due to the mechanism of non preference and /or antibiosis involved in particular varieties.

SUMMARY

Among different plant characters negative but nonsignificant correlation of plant height, breadth of leaf and length of internodes with dead heart produced by stem borer was found while, positive but nonsignificant correlation found between peduncle length, length of leaf, number of internodes and stem borer dead heart. Thus stem borer incidence was not influenced by any of the physical parameters of sorghum genotypes included in the experiment.

R E F E R E N C E S

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Table:-1 Mean dead heart formation by stem borer, *C. partellus* in different sorghum genotypes in *rabi* season.

Sr. No.	Name of genotype	Mean per cent dead heart		
		2006-07	2007-08	pooled
1	**SR 655-1**	18.36 (9.96)	12.58 (4.77)	15.47 (7.37)
2	**SR 713-1**	19.55 (11.21)	12.77 (4.92)	16.16 (8.06)
3	**SR 833-22**	21.42 (13.45)	19.23 (10.90)	20.33 (12.18)
4	**SR 1030**	17.69 (9.35)	20.87 (12.90)	19.28 (11.13)
5	**SR 1115-1**	16.01 (7.65)	11.57 (4.06)	13.79 (5.86)
6	**SR 1638**	15.76 (7.54)	16.98 (8.58)	16.37 (8.06)
7	**SR 1657**	17.53 (9.24)	13.95 (5.84)	15.74 (7.54)
8	**SR 1665**	17.27 (8.88)	13.58 (5.76)	15.42 (7.32)
9	**BP 53**	14.62 (6.47)	10.79 (3.61)	12.71 (5.04)
10	**Nizergoti**	15.32 (7.03)	8.75 (2.32)	12.03 (4.68)
11	**GJ 36**	15.67 (7.35)	16.40 (7.99)	16.04 (7.67)
12	**GJ 38**	14.90 (6.63)	11.69 (4.45)	13.29 (5.54)
Mean		**8.73**	**6.34**	**7.54**
S.Em ±		**1.14**	**1.29**	**1.57**
CD @ 5%		**3.36**	**3.79**	**NS**
CV %		**11.69**	**15.87**	**13.61**

**** Figure in parenthesis is retransformed values while those outside are arcsine transformation values.***

Table:-2 Grain yield in different sorghum genotypes in *rabi* season.

Sr. No.	Name of genotype	Grain yield (Kg/ha)		
		2006-07	2007-08	pooled
1	**SR 655-1**	1403	979	1191
2	**SR 713-1**	1878	1498	1688
3	**SR 833-22**	979	994	987
4	**SR 1030**	1871	1557	1714
5	**SR 1115-1**	2653	1432	2043
6	**SR 1638**	2010	1308	1659
7	**SR 1657**	2024	1505	1765
8	**SR 1665**	2002	1198	1600
9	**BP 53**	1425	1842	1633
10	**Nizergoti**	1929	1586	1758
11	**GJ 36**	2112	1578	1845
12	**GJ 38**	1915	1827	1871
Mean		**1850**	**1442**	**1646**
S.Em ±		**200.82**	**128.73**	**208.18**
CD @ 5%		**589.03**	**377.57**	**NS**
CV %		**18.80**	**15.46**	**17.74**

Table:-3 Simple correlations between different physical parameters of sorghum genotypes and incidence of sorghum stem borer

Sr. No	Plant character	Stem borer		
		2006-07	2007-08	pooled
1	**Plant height**	-0.198	-0.238	-0.207
2	**Peduncle length**	0.071	0.186	0.140
3	**Length of leave**	0.119	0.203	0.206
4	**Breadth of leave**	0.021	-0.220	-0.133
5	**Number of leave**	0.098	-0.245	0.183
6	**Length of internodes**	-0.209	-0.023	-0.188
7	**Number of internodes**	0.033	-0.199	0.016

**** Significant at 5 % level*** **** * Significant at 1 % level***

Table: 4 Mean of different physical character of different cultivars (*rabi*)

Sr no	Cultivar	Plant height (cm)			Peduncle length (cm)			Length of leave (cm)			Breadth of leave (cm)			Number of leaves			Length of internodes (cm)			Number of internodes		
		2006-07	2007-08	pooled	2006-07	2007-08	pooled	2006-07	2007-08	pooled	2006-07	2007-08	pooled	2006-07	2007-08	pooled	2006-07	2007-08	pooled	2006-07	2007-08	pooled
1	**SR 655-1**	91.53	106.80	99.17	22.00	21.13	21.57	60.40	61.16	60.78	5.34	5.57	5.45	7.87	7.20	7.53	11.77	14.22	12.99	7.80	7.53	7.67
2	**SR 713-1**	113.60	137.33	125.47	19.00	17.93	18.47	63.78	63.96	63.87	6.08	6.31	6.19	9.33	7.73	8.53	15.37	18.44	16.90	7.47	7.47	7.47
3	**SR 833-22**	112.53	131.73	122.13	18.60	19.67	19.13	62.49	59.07	60.78	5.27	5.37	5.32	8.73	7.20	7.97	16.76	20.58	18.67	6.73	6.40	6.57
4	**SR 1030**	116.87	110.73	113.80	18.67	18.87	18.77	60.16	61.78	60.97	4.83	4.95	4.89	8.20	7.05	7.63	14.89	15.40	15.14	7.87	7.20	7.53
5	**SR 1115-1**	124.53	111.53	118.03	19.07	20.47	19.77	62.86	59.49	61.18	5.37	5.59	5.48	9.07	7.00	8.03	18.91	17.11	18.01	6.60	6.53	6.57
6	**SR 1638**	124.27	110.53	117.40	20.33	18.80	19.57	60.09	61.29	60.69	4.79	4.85	4.82	7.53	7.13	7.33	15.80	15.25	15.52	7.87	7.27	7.57
7	**SR 1657**	130.60	127.13	128.87	19.47	19.80	19.63	60.93	61.31	61.12	4.78	4.91	4.84	7.73	6.67	7.20	14.87	16.03	15.45	8.80	7.93	8.37
8	**SR 1665**	106.87	111.93	109.40	19.73	21.33	20.53	57.89	59.55	58.72	4.95	4.76	4.85	8.07	7.20	7.63	12.71	14.35	13.53	8.40	7.80	8.10
9	**BP-53**	117.60	119.40	118.50	14.20	12.53	13.37	61.67	59.45	60.56	6.11	5.40	5.75	7.60	6.80	7.20	16.10	17.57	16.84	7.27	6.80	7.03
10	**N Goti**	152.47	140.33	146.40	17.67	14.27	15.97	50.02	49.38	49.70	4.83	5.21	5.02	8.67	8.07	8.37	19.73	19.13	19.43	7.73	7.33	7.53
11	**GJ 36**	103.93	89.93	96.93	22.07	20.33	21.20	59.74	54.71	57.22	6.37	6.12	6.24	7.33	6.27	6.80	17.72	17.80	17.76	5.87	5.07	5.47
12	**GJ 38**	110.60	119.87	115.23	21.07	25.27	23.17	66.96	61.49	64.22	5.25	6.01	5.63	9.00	7.73	8.37	15.05	17.83	16.44	7.40	6.73	7.07

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