SCREENING OF DIFFERENT GENOTYPES/CULTIVARS AGAINST PINK STEM BORER *Sesamia inferens* INFESTING *durum* WHEAT

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ABSTRACT

A field experiment was carried out at Agricultural Research Station, Anand Agricultural University, Arnej during November 2017 to February 2018 to know the susceptibility of different genotypes/cultivars against pink stem borer infesting durum wheat. The experiment was laid out in Randomized Block Design (RBD) in three replications. The genotypes/cultivars A 206 (3.26%) and GW 1346 (3.58%) were found resistant by recording lower dead heart per cent, which reflected on yield. DR 15-17 (3.74%), GADW 3 (4.12%) and GW 1350 (4.43%) were found moderately resistant. GW 1344 (5.12%), AR 16-09 (5.45%), DR 15-15 (5.70%) and DR 16-01 (5.95%) were found moderately susceptible. The genotypes/cultivars GW 1 (7.12%) and AR 14-04 (7.62%) proved as susceptible against pink stem borer.

KEY WORDS: durum, pink stem borer, Resistant, Sesamia inferens, Susceptible, Wherat

INTRODUCTION

Wheat (*Triticum* spp.) is a crop of global significance. It is grown in diversified environment. It is a staple food of millions of people. Wheat is one of the most important food crops and is cultivated extensively in almost all the countries. The major wheat producing countries are China, India, Russian Federation, USA, France, Australia, Canada, Pakistan, Ukraine, Germany (Anon., 2019). The major insect pests damaging the crop are aphid ,*Aphis nerii* (Boyer de Fonscolombe), *Ghujhia* weevil *Tanymecus indicus* Faust, Pink borer *Sesamia inferens* (Walker), Termite *Microtermes obesi* (Holmgren) and *Odontotermes obesus* (Rambur), Armyworm *Mythimna separate* (Walker), and Gram pod borer: *Helicoverpa armigera* (Hubner) (Atwal and Dhaliwal, 2015). The wheat stem borer is locally known as "*Gulabi gaabhmarani eyal*" in Gujarat (Patel and Patel, 1970). Wheat pink stem borer, *S. inferens* is one of the serious pests of almost all the cereals by attacking the crops at various stages and causing severe damage with yield losses. It is one of the major pests of wheat causes more than 11.01 per cent

damage to the crop (Godhani, 1987). It occasionally caused heavy losses in restricted areas, with infestation ranging from 5.7 to 11.1 per cent in Rajasthan (Singh, 1986). The damage caused by the over-wintering first generation larvae and it varies from 6.17 to 9.83 per cent in different parts of China (Lina *et al.,* 2012). Symptoms of its damage in wheat are similar to those recorded in rice on which it was originally a pest. Damage caused by larvae is expressed as "dead hearts" at seedling stage and "white ears" at ear head stage (Deol, 2002). This is being an internal borer; it is difficult to control with the single method of pest control practices. Cultural control including resistant varieties is one of the best methods for managing any pest as it does not cause problem of pesticidal resistance, pest resurgence and residues on crop produce. Resistant varieties play an important role to save the crop from such notorious pest and to minimize the use of insecticides.

MATERIALS AND METHODS

The study was carried out at Agricultural Research Station, AAU, Arnej during November 2017 to February 2018 to study the susceptibility of wheat genotypes/cultivars against pink stem borer. Eleven genotypes/cultivars of *durum* wheat were grown in the plot of 6 m x 0.9 m. Experiment was laid out in Randomized Block Design (RBD) in three replications. Experimental plot was kept free from insecticidal spray and all the agronomical practices were followed. Observations were recorded at weekly interval during morning hours starting from 15 days after sowing till the maturity of the crop. The number of healthy and infested tillers was recorded from each genotype/cultivar per one meter row length from three different spots. The data, thus, obtained were subjected to statistical analysis for susceptibility test of different genotypes/cultivars against this pest.

In order to differentiate the pink stem borer infestation on different genotypes/cultivars, an attempt was made to splinter genotypes/cultivars in different categories. Patel *et al*. (2002) categorized castor varieties against semi looper in to four group *viz.,* highly resistant (HR), resistant (R), susceptible (S) and highly susceptible (HS) which were modify to fit into wheat genotypes/cultivars for screening against pink stem borer. Different wheat genotypes/cultivars were grouped in to six categories of resistant to pink stem borer *viz.,* highly resistant (HR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS) based on dead heart per cent (Table 1). For the purpose, mean value of individual variety (X_i) was compared with mean value of all cultivars/genotypes (X) and standard deviation (SD). The retransformed data were used for computation of X, X_i and SD in case of this parameter.

RESULTS AND DISCUSSION

Dead heart (%) in different genotypes/cultivars

The data on pooled over ten periods on incidence of pink stem borer on wheat genotypes/cultivars are presented in Table 2 and depicted in Figure 1. The data on pooled over periods of dead heart (%) from various genotypes/cultivars differed significantly from each other. The lowest dead heart was recorded in genotype/ cultivar A 206 (3.26%) and it was at par with GW 1346 (3.58%), DR 15-17 (3.74%). Further, GW 1346 (3.58%) found at par with DR 15-17 (3.74%) and GADW 3 (4.12%). On other side, GADW 3 (4.12%) was found at par with GW 1350 (4.43%). Genotype/cultivar GW 1344 (5.12%) was at par with genotypes/cultivars AR 16-09 (5.45%) and DR 15-15 (5.70%). Again, AR-16-09 (5.45%) was at par with DR 15-15 (5.70%) and DR 16-01 (5.95%). GW 1 (7.12%) and

AR 14-04 (7.62%) exhibited the highest dead heart per cent and was at par with each other. Genotype/ cultivar AR 14-04 (7.62%) recorded significantly higher infestation than all the tested genotypes/cultivars.

Categorization of wheat genotypes/cultivars

The categorization of different wheat genotypes/cultivars based on dead heart (%) is summarized in Table 3. Genotypes/cultivars A 206 (3.26%) and GW 1346 (3.58%) recorded dead heart per cent in range of 2.23 to 3.66 and was emerged as resistant genotypes. The genotypes/cultivars DR 15-17 (3.74), GADW 3 (4.12) and GW 1350 (4.43) registered less than 5.10 and more than 3.66 per cent dead heart and proved to be moderately resistant. The category moderately susceptible included genotypes/cultivars GW 1344 (5.12%), AR 16-09 (5.45%), DR 15-15 (5.70%) and DR 16-01 (5.95%), whereas GW 1 (7.12%) and AR 14-04 (7.62%) noticed less than 7.97 but more than 6.53 dead heart per cent and proved to be susceptible.

Yield (kg/ha)

The data on grain yield (kg/ha) of wheat are presented in Table 2. The highest grain yield of wheat was recorded from the cultivar A 206 (1565 kg/ha) followed by genotype GW 1346 (1518 kg/ha), DR 15-17 (1491 kg/ha), GADW 3 (1453 kg/ha), GW 1350 (1394 kg/ha) and they all were remained at par with each other. The genotype/cultivar GW 1344 (1155 kg/ha) was at par with AR 16-09 (1138 kg/ha) and DR 15-15 (1117 kg/ha). On other side, DR 15-15 (1117 kg/ha) found at par with DR 16-01 (1064 kg/ha). Further, DR 16-01 (1064 kg/ha) was found at par with GW 1 (910 kg/ha). Again, GW 1 (910 kg/ha) was at par with AR 14-04 (825 kg/ha). Significantly the lowest grain yield of the wheat was noticed in genotype/cultivar AR 14-04 (825 kg/ha) and it was at par with GW 1 (910 kg/ha).

The highest straw yield of wheat was recorded from the genotype/cultivar A 206 (2270 kg/ha) followed by genotype/ cultivar GW 1346 (2201 kg/ha), DR 15-17 (2162 kg/ha), GADW 3 (2107 kg/ha), GW 1350 (2022 kg/ha) and they all were remained at par with each other. The genotype/cultivar GW 1344 (1732 kg/ha) was at par with AR 16-09 (1709 kg/ha), DR 15-15 (1675 kg/ha) and DR 16-01 (1596 kg/ha). On other side, DR 16-01 (1596 kg/ha) was found at par with GW 1 (1352 kg/ha). Further, GW 1 (1352 kg/ha) was found at par with AR 14-04 (1248 kg/ha). Significantly the lowest straw yield of the wheat was noticed in genotype/cultivar AR 14-04 (1248 kg/ha) and it was at par with GW 1 (1352 kg/ha).

As per the earlier reports, Godhani (1987) reported that wheat variety Lok 1 showed lowest pink stem borer infestation and J 24 was more susceptible to this pest at Junagadh (Gujarat). Ahad *et al*. (2002) noted that BAW 743 and BAW 769 were promising to tolerate pink stem borer infestation under field condition at Dinajpur (Bangladesh). Chaudhary *et al.* (2018) reported that GDW 1255 showed significantly less dead heart per cent and found resistant to pink stem borer at Sardarkrushinagar (Gujarat). The genotypes/cultivars screened during present investigations had not been screened by earlier workers. Hence, it could not be possible to compare these genotypes/cultivars with earlier findings.

CONCLUSION

Overall, among the 11 genotypes/ cultivars of *durum* wheat screened against pink stem borer in the field, genotypes/cultivars A 206 (3.26 %) and GW 1346 (3.58 %) had low incidence of pink stem borer which reflected on yield and found resistant to pink stem borer. The genotypes/cultivars DR 15-17 (3.74%), GADW 3 (4.12%) and GW 1350 (4.43%) were found moderately resistant and

registered comparatively low yield. The category of moderately susceptible genotypes/cultivars included GW 1344 (5.12%), AR 16-09 (5.45%), DR 15-15 (5.70 %) and DR 16-01 (5.95 %), whereas GW 1 (7.12%) and AR 14-04 (7.62%) proved to be susceptible genotypes/cultivars against pink stem borer.

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Table 1: Scale for categorization of genotypes/cultivars for resistance

Category of Resistance	Scale for Resistance
Highly Resistant (HR)	$\bar{X}_i < (\bar{X} - 2SD)$
Resistant (R)	$\bar{X}_i > (\bar{X} - 2SD) < (\bar{X} - SD)$
Moderately Resistant (MR)	$\bar{X}_i > (\bar{X} - SD) < \bar{X}$
Moderately Susceptible (MS)	$\bar{X}_i > \bar{X} < (\bar{X} + SD)$
Susceptible (S)	$\bar{X}_i > (\bar{X} + SD) < (\bar{X} + 2SD)$
Highly Susceptible (HS)	$\bar{X}_i > (\bar{X} + 2SD)$

Table 2: Incidence of pink stem borer in different genotypes/cultivars of wheat and its effect on yield

Sr. No.	Genotypes/Cultivars	Dead Heart (%)*	Yield (kg/ha)	
			Seed	Straw
1	AR 14-04	2.85a (7.62)	825d	1248e
2	AR 16-09	2.44bc (5.45)	1138b	1709bc
3	DR 15-15	2.49bc (5.70)	1117bc	1675c
4	DR 15-17	2.06ef (3.74)	1491a	2162a
5	DR 16-01	2.54b (5.95)	1064bc	1596cd
6	GW 1344	2.37c (5.12)	1155b	1732bc
7	GW 1346	2.02ef (3.58)	1518a	2201a
8	GW 1350	2.22d (4.43)	1394a	2021ab
9	GW 1	2.76a (7.12)	910cd	1352de
10	A 206	1.94f (3.26)	1565a	2270a
11	GADW 3	2.15de (4.12)	1453a	2107a
S. Em. ±	Treatment (T)	0.042	65.17	98.06
	Period (P)	0.040	-	-
	P x T	0.132	-	-
CV%		9.77	9.11	9.31

Notes: *1. *Pooled of ten periods*
2. Figures in parentheses are retransformed values and those outside are $\sqrt{X + 0.5}$ transformed values
3. Treatment means with letter(s) in common are not significant by Duncan's New Multiple Range Test (DNMRT) at 5 % level of significance

Table 3: Categorization of different genotypes/cultivars of *durum* wheat for their susceptibility to pink stem borer, *S. inferens* during *rabi*, 2017-18

Category of resistance	Scale	Genotypes/cultivars
Based on dead heart (%)	**X = 5.10**	**SD = 1.43**
Highly Resistant (HR)	$\bar{X}_i$<(2.23)	-
Resistant (R)	$\bar{X}_i$> (2.23) < (3.66)	A 206 (3.26)
		GW 1346 (3.58)
Moderately Resistant (MR)	$\bar{X}_i$> (3.66) < (5.10)	DR 15-17 (3.74)
		GADW 3 (4.12)
		GW 1350 (4.43)
Moderately Susceptible (MS)	$\bar{X}_i$> (5.10) < (6.53)	GW 1344 (5.12)
		AR 16-09 (5.45)
		DR 15-15 (5.70)
		DR 16-01 (5.95)
Susceptible (S)	$\bar{X}_i$> (6.53) <(7.97)	GW 1 (7.12)
		AR 14-04 (7.62)
Highly Susceptible (HS)	$\bar{X}_i$> 7.97	-

Notes: *$\bar{X}$ = Mean value of all genotypes/cultivars*
$\bar{X}_i$ = Mean value of individual genotype/cultivar
SD = Standard Deviation

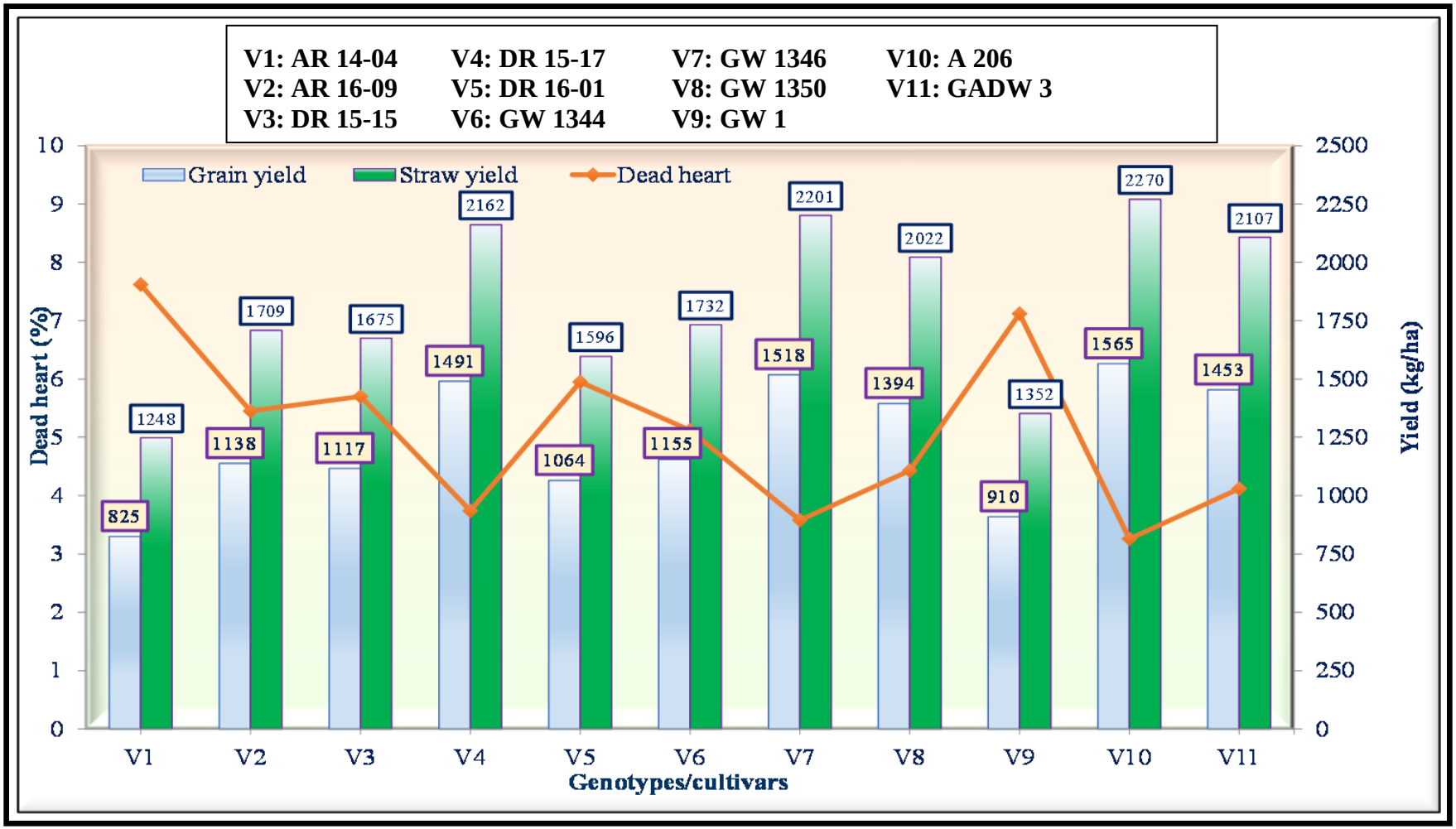

Fig. 1: Performance of different genotypes/cultivars of durum wheat against S. inferens and yield

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