



Screening of some promising pigeonpea (*Cajanus cajan* (L.) millsp.) genotypes against major insect pests

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Abstract

A field experiment was conducted during *Kharif*, 2012 to screen twenty genotypes for their resistance or susceptible to different pod borers in pigeonpea. Among the genotypes screened, CO 6, TRG 38, BRG 2, BRG 10-4 and CRG 2010-01 with 2.8, 3.9, 4.8, 5.0 and 5.0% pod damage due to *Helicoverpa armigera* were categorized as moderately resistant with pest susceptibility rating (PSR) of 3 and 4; the genotypes PT 04-423, WRG 173, BRG 10-4, BRG 2, TDRG 4, AKTM 10-07, RVKT 268, and LRG 41 respectively with 8.3, 9.6, 10.0, 10.3, 11.3, 12.4, 13.4 and 13.9% pod damage due to *M. vitrata* were categorized as moderately resistant with PSR of 3 and 4; and the genotypes PT 04-423, GRG 811, RVSA 7-21, WRG 173, BRG 2, GJP 1113 and LRG 41 respectively with 4.1, 11.1, 15.7, 15.9, 16.2, 16.4 and 17.5% pod damage due to *Melanagromyza obtusa* were categorized as moderately resistant with PSR of 2, 3 and 4. Ultimately, the genotypes, PT 04-423 (16.7%) and BRG-2 (31.3%) showed significantly low pod borer complex damage; BRG 10-4 (15.0%) showed significantly low pod damage due to *H. armigera* and *M. vitrata*; and WRG 173 (25.5%) and LRG 41 (31.4%) showed significantly low pod damage by *M. vitrata* and *M. obtusa* and were categorized as moderately resistant.

Keywords: genotypes, *helicoverpa armigera*, *maruca vitrata*, *melanagromyza obtusa*, pigeonpea, pod borer

Introduction

Pigeonpea (*Cajanus cajan* (L.) Millsp.) is an important pulse crop grown in Andhra Pradesh, India. A large number of insects infest pigeonpea crop at its various growth stages of which that attack reproductive structures, including buds, flowers and pods such as gram pod borer (*Helicoverpa armigera*) (Hubner), spotted pod borer (*Maruca vitrata*) (Geyer) and podfly (*Melanagromyza obtusa*) (Malloch) are of great significance and cause considerable yield losses (Lateef and Reed, 1990) [4]. Out of several approaches available for their management, identification and use of resistant varieties is viable and cost effective option as pigeonpea is mostly grown by poor and marginal farmers. Several workers screened different genotypes of pigeonpea for resistance against insect pests (Patel and Patel, 1990; Raut *et al.*, 1993 and Mandal, 2005) [6, 7, 5]. However, information on relative resistance or susceptibility of certain newly developed entries was lacking. Hence, the present study was conducted to screen twenty pigeonpea germplasm lines for their resistance or susceptibility to pod borers during *Kharif*, 2012 at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh.

Materials and Methods

An experiment was conducted in *Kharif* 2012 at Regional Agricultural Research Station, Lam, Guntur with twenty pigeonpea genotypes of which nineteen including two national checks, ICP 8863 and WRP 1; and a zonal check, CO 6 were obtained from different All India Co-ordinated Research Project (AICRP) centers. The local check, LRG -41 was considered as it was the most popular variety grown in Andhra Pradesh, occupying 40% of redgram area. Spacing adopted

was 180 x 20 cm in a randomized block design with three replications. The crop was grown under rainfed conditions following all recommended agronomic practices except plant protection measures. The inflorescence damage due to spotted pod borer was recorded on five twigs per plant and five randomly selected plants per replication at peak flowering stage of the crop. The pods damaged by gram pod borer were identified by the presence of characteristic round large holes on pods. The spotted pod borer infected pods show irregular holes with webbed excreta. Similarly, the podfly infected pods have small holes with gnawed or burrowed shriveled seeds. To assess the degree of infestation by different pod borers, pods from five randomly selected plants per replication were collected at the time of harvest. Based on the number of infested and healthy pods the per cent pod damage due to different insect pests was calculated. In order to group the genotypes, the pest susceptibility (%) was calculated using the formula given by Abbott (1925) [1] and then converted to 1 to 9 pest susceptibility rating (PSR). Seed yield per plot was recorded and converted to kg per ha at the time of harvest. The per cent pod damage and yield were subjected to appropriate statistical package by AGRISTAT.

Pest susceptibility (%) =

$$\frac{\text{P.D of check} - \text{P.D of test entry}}{\text{P.D of check}} \times 100$$

Where,

P.D = mean of per cent pods damaged

Table 1

Pest Susceptibility Rating (PSR)	Pest Susceptibility (%)	Category
1	100	Highly resistant
2	75 to 99.9	Resistant
3	50 to 74.9	Moderately Resistant
4	25 to 49.9	Moderately Resistant
5	10 to 24.9	Moderately Susceptible
6	-10 to 9.9	Moderately Susceptible
7	-25 to -9.9	Susceptible
8	-50 to -24.9	Highly Susceptible
9	-50 or less	Highly Susceptible

Results and Discussion

The pigeonpea genotypes showed wide variation in the extent of infestation by gram pod borer (*H. armigera*), spotted pod borer (*M. vitrata*), podfly (*M. obtusa*) and pod yield (Table 2). Among the genotypes screened, only five entries viz., CO 6, TRG 38, PT 04-423 BRG-2, BRG 10-4 and CRG 2010-01 with 2.8, 3.9, 4.3, 4.8, 5.0 and 5.0 % pod damage respectively were categorized as moderately resistant with PSR of 3 and 4; and rest of the entries with pod damage ranging from 5.6 to 11.5% were categorized under moderately susceptible to highly susceptible with PSR ranging from 5-9 to *H. armigera*. The moderate resistance of the genotypes may be due the presence of high trichome density and trichome length on pods; and presence of high phenol and low protein and sugar content. Singh *et al.* (1993) [8] reported that medium duration cultivars had more damage due to *H. armigera* (Table 2). The incidence of *M. vitrata* was low in PT 04-423 (8.3%),

WRG 173 (9.6%), BRG 10-4 (10.0%), BRG-2(10.3%), TDRG 4(11.3%), AKTM 10-07 (12.4%), RVKT 268 (13.4%) and LRG 41 (13.9%) and were categorized as moderately resistant with PSR of 3 and 4. The rest of the entries screened were categorized under moderately susceptible to highly susceptible category with PSR ranging from 5 to 9 (Table 2).

The genotypes showed wide variation in per cent pod damage ranging from 4.1 and 33.0 against *M. obtusa*. The genotype, PT 04-423 with 2.1% pod damage was categorized as resistant with PSR of 2. The genotypes viz., GRG 811, RVSA 07-21, WRG 173, BRG 2, GJP 1113 and LRG 41 with 11.1, 15.7, 15.9, 16.2, 16.4 and 17.5 per cent pod damage respectively were categorized as moderately resistant with PSR of 3 and 4 and rest of the genotypes fall under moderately susceptible to highly susceptible category against *M. obtusa* with PSR of 5 to 8 (Table 2).

Dua *et al.* (2005) [3] reported existence of all the four mechanisms of resistance viz., non-preference, antibiosis, tolerance and avoidance in pigeonpea. These resistance mechanism govern the damage levels by a particular insect and hence the variability. The crop yields were more in the genotypes BRG-2 (1410 kg/ha), followed by LRG 41 (1385 kg/ha), BDN 2010-1 (1368 kg/ha) and RVSA 7-21 (1339 kg/ha). Some genotypes have recorded higher grain yield even though they had high infestation of insect pests. It was in conformity with Chandraka *et al.* (1981) [2] and Patel and Patel (1990) [6] who observed higher response to grain yield by some pigeonpea selections in spite of heavy incidence of pod borers.

Table 2: Pest susceptibility rating (PSR) for different pigeonpea genotypes by pod borers

S. No	Name of the Genotype	Pod damage (%) by <i>H. armigera</i>	PSR*	Inflorescence damage (%) by <i>M. vitrata</i>	Pod damage (%) by <i>M. vitrata</i>	PSR*	Pod damage (%) by <i>M. obtusa</i>	PSR*	Yield (kg/ha)
1	PT 04-423	4.3 (12.0)	4	15.3 (23.0)	8.3 (16.2)	3	4.1 (11.2)	2	1242
2	RVKT 268	9.5 (18.0)	8	21.5 (27.5)	13.4 (21.3)	4	29.5 (32.9)	8	1195
3	TDRG 4	10.5 (19.0)	9	17.2 (24.4)	11.3 (19.4)	4	20.6 (26.8)	5	1082
4	AKTM 10-07	11.5 (19.8)	9	20.6 (26.9)	12.4 (20.4)	4	24.2 (29.4)	6	1206
5	GJP 1110	9.4 (17.8)	8	30.8 (33.6)	23.0 (28.6)	7	23.0 (28.5)	6	1150
6	WRG 173	7.0 (15.4)	6	20.9 (27.2)	9.6 (18.0)	3	15.9 (23.4)	4	1240
7	RVSA 07-21	6.2 (14.4)	5	29.2 (32.6)	20.5 (26.9)	6	15.7 (23.0)	4	1339
8	BRG 10-4	5.0 (12.9)	4	18.5 (25.4)	10.0 (18.3)	3	21.9 (27.7)	6	971
9	TRG 38	3.9 (11.2)	4	40.7 (39.6)	29.9 (38.9)	8	26.4 (30.9)	7	1175
10	BDN 2010-1	7.7 (16.0)	7	30.4 (33.4)	23.7 (29.1)	7	22.7 (28.3)	6	1368
11	GJP 1113	9.5 (18.0)	8	34.3 (35.8)	23.7 (29.1)	7	16.4 (23.8)	4	1188
12	GRG 811	7.7 (16.1)	7	35.4 (36.5)	24.0 (29.3)	7	11.1 (14.5)	3	778
13	SKNP 10-39	9.0 (17.5)	8	45.1 (42.2)	33.2 (34.9)	9	33.0 (35.0)	8	501
14	SKNP 10-35	6.5 (14.8)	6	30.4 (33.4)	19.6 (26.1)	6	19.1 (25.8)	5	1050
15	CRG 2010-01	5.0 (12.8)	4	33.9 (35.6)	23.0 (28.7)	7	20.3 (26.8)	5	1165
16	BRG-2	4.8 (12.6)	4	18.9 (25.6)	10.3 (18.4)	3	16.2 (23.4)	4	1410
17	LRG 41(LC)	7.4 (15.8)	6	23.6 (29.0)	13.9 (21.1)	4	17.5 (24.6)	4	1385
18	CO 6 (ZC)	2.8 (9.6)	3	35.1 (36.3)	24.7 (29.8)	7	28.1 (32.0)	7	1153
19	WRP-1 (NC)	5.6 (13.7)	5	26.9 (31.2)	17.3 (24.3)	5	28.2 (32.0)	7	760
20	ICP 8863 (NC)	6.9 (15.2)	-	29.7 (33.0)	20.9 (26.9)	-	23.5 (28.8)	-	1161
	C.D (P=0.05)	3.2		7.3	8.6		7.8		201.9
	CV (%)	10.2		11.1	16.3		14.1		8.6

- PSR (Pest Susceptibility Rating) based on pod damage;
- Figures in () indicate arc sin percentage transformed values
- LC: Local check; NC: National Check; ZC: Zonal Check.

Conclusions

From the present study, it was evident that the genotypes, PT 04-423 and BRG 2 have shown low pod damage due to pod borer complex viz., *H. armigera*, *M. vitrata* and *M. obtusa*. Further, the genotype, BRG 10-4 with low incidence of *H. armigera* and *M. vitrata*; and the genotypes WRG 173 and LRG 41 with incidence of *M. vitrata* and *M. obtusa* were categorized as moderately resistant.

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