Screening of Pigeonpea Genotypes Against Pod Borer Complex

R. M. Jalondhara, D. R. Patel* and Alok Shrivastava

Dept. of Entomology, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujrat (396 450), India

Corresponding Author

D. R. Patel
e-mail: patel.devendra2829@yahoo.com

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Abstract

Field screening of 15 genotypes and cultivars against pod borer and pod fly showed that among 15 genotypes and cultivars, BDN-2, GT-1 and GAUT-93-17 were less infested by pod borer and pod fly and gave higher yield. No correlation was observed between morphological plant characters of pigeonpea and pod borer and pod fly infestation.

Keywords: Genotypes, *Helicoverpa armigera, Melanagromyza obtusa*, morphological characters, pigeonpea

1. Introduction

The pigeonpea [*Cajanus cajan* (L.) Millsp.] is one of the important pulse crops of India. In India has largest acreage under pigeonpea (3.90 M ha) with a total production and productivity of 3.17 mt and 1230 kg ha^{-1}, respectively (DAC, 2014). Generally, it is grown all over the country, but extensively cultivated in Maharashtra, Karnataka, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Odisha, Bihar, Tamil Nadu, and Gujarat. Among the factors responsible for low yield, the damage caused by insect pests is one of the major factors in pigeonpea. It is attacked by several insect pests from seedling stage till harvesting. The pod borer complex comprises of *Helicoverpa armigera*, *Grapholita critica*, *Maruca testulalis*, *Exelastis atomosa* and *Melanagromyza obtusa*. Among them, *Helicoverpa armigera* and *Melanagromyza obtusa* are the key pest cause heavy loss. The pesticides is expensive and numerous application may be required this is often beyond the reach of most of farmers. In many areas, insecticides and spraying equipment are either not available or farmer lack of proper knowledge of their use. Under such circumstances use of resistant or less susceptible cultivars is one of the most important methods of keeping insect population below economics threshold level. Host plant resistance does not involves any cost or application skill in pest control techniques, It is most useful when carefully utilized with other components of pest management. Therefore, evaluation of varieties or genotype against major pests was studied for their resistance.

2. Materials and Methods

The investigation was carried out at the College Farm, N. M. College of Agriculture, N. A. U., Navsari during *Kharif* 2014-15. The experiment was laid out in a randomized block design and replicated twice and 15 genotypes or cultivars were sown during second fortnight of July. Each cultivar was grown in two rows of 4.0 meters length with 90cm x 20cm spacing. All the recommended agronomical practices were adopted for raising the crop. The experimental site was kept free from pest management practices.

2.1. Pod and seed damage

For recording observations on pod borer and pod fly, five plants were randomly selected from each plot and the pods of these plants were plucked separately at the time of maturity of crop. Pod damage due to lepidopteran pod borer (*Helicoverpa armigera*) was recorded at harvest by observing randomly plucked 250 pods from 5 plants from each cultivar. The pod damage due to these lepidopteran larvae was detected by the presence of hole(s) on pod wall. Treatment wise total number of damaged pods was recorded and % infestation was calculated. For recording grain damage due to podfly (*Melanagromyza obtusa)* 50 pod were collected separately for each selected five plants and from these 250 pods healthy and damage grain were counted separately for podfly damage (%). The yield data was recorded at the time of harvesting. The pod borer (%) and podfly infestation (%) was subject to arc sin transformation prior to statistical analysis.

2.2. Morphological component

The present study was carried out to know the relationship of pod borer complex with different plant characters like days to 50% flowering, plant height, pods $plant^{-1}$, pod length, seeds pod^{-1}, days to maturity of pigeonpea cultivars were also

recorded for pest preference under field conditions. Data on morphological parameters like; days to 50% flowering, plant height, pods plant^{-1}, pod length, seeds pod^{-1}, days to maturity were correlated with pod borer infesting various pigeonpea cultivars.

3. Results and Discussion

3.1. Pod borer infestation

The results presented in Table 1 showed that the pigeonpea genotypes differed significantly with respect to their reaction to pod borer, *Helicoverpa armigera* infestation. The result on mean pod damage (%) caused by *Helicoverpa armigera* varied from 2.8 to 12.8 % with an average of 7.6 %. Among different genotypes or cultivars BDN-2 recorded the significant lowest pod damage (2.8 %), followed by GT-1 (4.8 %), GAUT-93-17 (5.8 %) and BP-10-21 (6.4 %) and they were at par with each other. The genotype BP-06-33 recorded significant higher pod damage (12.8 %) and which was at par with BP-08-06 (10.4 %).

3.2. Pod fly infestation

The data pertaining to the incidence of pod fly, *Melanagromyza obtusa* on seeds are presented in Table 1. The seed damage (%) due to pod fly range between 5.6 to 18.8% with an average of 11.7%. The cultivar BDN-2 recorded significantly lowest seed damage (5.6%) and it was remained at par with GT-1 (8.0 %), GAUT-93-17 (8.8%), BP-11-13 (9.2%) and BP-10-13 (9.2 %). The highest percentage seed damage was recorded in BP-06-33 (18.8 %), followed by BP-08-06 (16.4 %). From the overall result, it can be in inferred that out of 15 genotypes screened BP-11-13, BP-10-13. BP-10-11, BP-10-21, GAUT-93-17, GT-1 and BDN-2 proved promising against pod borer and pod fly and they recorded less than 7.6% and 11.7% pod and seed infestation by pod borer and pod fly, respectively. Earlier to this Kalariya et al. (1998) reported that GT-1 and BDN-2 observed resistant against the pod borer viz., *Heliothis armigera* and *Melanagromyza obtusa.* Patel et al. (2012) observed lower pod damage due to pod borer in GT-1, which is in corroboration with the present finding.

Table 1: Screening of different genotype against *H. armigera* and pod fly

Sr. No.	Genotype	% Pod borer infestation	% Pod fly infestation	Grain yield (kg ha^{-1})
1.	BP-06-33	21.79 (12.8)	26.4 (18.8)	790
2.	BP-08-06	19.72 (10.4)	24.63 (16.4)	914
3.	BP-10-03	17.84 (8.4)	22.43 (13.6)	1149
4.	BP-10-07	17.82 (8.4)	21.77 (12.8)	1175
5.	BP-10-08	17.84 (8.4)	22.11 (13.2)	1243
6.	BP-10-09	17.01 (7.6)	21.10 (12.0)	1262
7.	BP-11-13	16.17 (6.8)	18.57(9.2)	1293
8.	BP-10-13	16.17 (6.8)	18.57 (9.2)	1319
9.	BP-10-11	16.20 (6.8)	20.75 (11.6)	1281
10.	BP-10-21	15.74 (6.4)	19.69 (10.4)	1290
11.	SKNP-224	18.23 (8.8)	22.11 (13.2)	1207
12.	GAUT-93-17	14.99 (5.8)	18.19 (8.8)	1413
13.	GT-1	13.86 (4.8)	17.39 (8.0)	1443
14.	VAISHALI	18.23 (8.8)	21.77 (12.8)	1113
15.	BDN-2	11.1 (2.8)	14.78 (5.6)	1446
	GM	7.6	11.7	1222.5
	SEm±	1.24	1.46	85.82
	CD (*p*=0.05)	3.75	4.44	248.62
	CV (%)	10.38	10.01	12.15

Figures outside parentheses are arcsine transformed value

3.3. Grain yield

The statically analysis of yield data (Table 1) showed that the cultivar BDN-2 gave the highest grain yield (1446 kg ha^{-1}), which was significantly higher than all other genotypes. While, genotype GAUT-93-17, SKNP-224, BP-10-21, BP-10-11, BP-10-13, BP-10-09 and BP-10-08 remained at par with BDN-2. From the overall result it can be inferred that out of 15 genotype or cultivars screened a cultivar BDN-2 gave higher grain yield and lower incidence of *Helicoverpa* and pod fly, this genotype was remain at par with GT-1, GAUT-93-17 with respect to pod borer and pod fly infestation and yield. Thus this genotype can be utilize for further breeding programme.

3.4. Influence of morphological characters of pigeonpea on incidence of pod borer and pod fly

The different plant characters of 15 genotypes were correlated with incidence of pod borer and pod fly and result obtained are presented in Table 2. The data pertaining to simple correlation of different plant characters of pigeonpea genotypes revealed that pod borer had non-significant positive correlation with days to 50 % flowering, pods plant^{-1}, pod length and seeds pod^{-1}, while, non-significant negative correlation with plant height and days to maturity.The data Table 2 also revealed that pod fly infestation had non-significant positive correlation with days to flowering, pods plant^{-1}, pod length, seeds pod^{-1} and days to maturity, while negative correlation with plant height.

Table 2: Correlation between different morphological parameters of pigeonpea genotypes and incidence of pigeonpea pod borer and pod fly

IOP	DF	PH	PP	PL	SP	DM
PBI	0.503	-0.135	0.108	0.283	0.070	-0.053
PFI	0.450	-0.128	0.0424	0.226	0.074	0.009

IOP: Insect or pest; DF: Days to 50% Flowering; PH: Plant Height (cm); PP: Pods Plant-1; PL: Pod Length (cm); SP: Seeds Pod-1; DM: Days to Maturity; PBI: % pod borer infestation; PFI: % pod fly infestation

4. Conclusion

Field screening of 15 genotypes or cultivars against pod borer and pod fly showed that among 15 genotypes or cultivars, BDN-2, GT-1 and GAUT-93-17 were less infested by pod borer and pod fly and gave higher yield. No correlation was observed between morphological plant characters of pigeonpea and pod borer and pod fly infestation.

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