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Field Screening of Some Long Duration Pigeonpea [*Cajanus cajan* (L.) Millsp.] Genotypes Against the Infestation of Pod bug, *Clavigralla gibbosa* (Spinola) and Gram Pod Borer, *Helicoverpa armigera* (Hubner)

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Twenty-five long duration pigeonpea genotypes were screened for the reaction against pod bug and gram pod borer during *Kharif* season of 2014-15 at the Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. The first incidence of pod bug, *Clavigralla gibbosa* (Spinola) was observed in 4th standard week and continued to 12th standard week in all genotypes The population of pod bug was found to be highest in genotype Bahar (check) and ICP 7035-1 in 11th standard week with population of 10.3 bugs/plant and 10.2 bugs/plant, respectively. The mean population of pod bug was recorded highest in genotypes Bahar (check) and ICP 7035-1 i.e. (6.8 bugs /plant) and lowest in genotype ICP 13212-1 (3.0 bugs/plant). The first incidence of pod borer, *Helicoverpa armigera* (Hubner) larvae was observed in 4th standard week in fifteen genotypes out of the total twenty-five genotypes. The mean population of pod borer was recorded highest in genotype ICP 13198-1 i.e. (1.1 larvae/plant) followed by Bahar (check), ICPL 97253 and ICPHaRL 4985-4 (1.0 larvae/plant) and no incidence of pod borer was recorded in genotype ICPHaRL 4985-10 and ICPL 20062. The highest per cent pod damage caused by *Clavigralla gibbosa* (Spinola) was found in ICP 7035-1 (26.0 per cent), followed by ICPHaRL 4985-11 (21.5 per cent) and ICPL 88039-1 (21.0 per cent). The per cent pod damage inflicted by *Helicoverpa armigera* (Hübner) ranged from nil in genotypes ICPHaRL 4985-10 and ICPL 20062 to 5.5 per cent in genotype ICP 13198-1. The genotype ICP 13198-1 (5.5 per cent) showed higher per cent pod damage as compared to check, Bahar (5.0 per cent). Whereas, all other genotypes showed lower per cent pod damage as compared to Bahar (5.5 per cent). The genotype ICPHaRL 4985-4 showed 5.5 per cent of pod damage similar to the check (Bahar). The per cent grain damage caused by Pod bug on different genotypes ranged from 1.96 per cent in genotype ICP 13212-1 to 16.97 per cent in genotype Bahar (check cultivar). The per cent grain damage due to lepidopterous pod borer on different genotypes varied from nil in genotypes ICPHaRL 4985-10 and ICPL 20062 to 3.03 per cent in genotype ICPHaRL 4989-7. Due to the adverse weather conditions that prevailed during the crop season, a very low grain yields were recorded. The grain yield of different genotypes differed significantly and ranged from 105.6 kg/ha in the genotype ICPL 85063 to 338.9 kg/ha in ICP 7035-1.

Keywords: Pigeonpea, population, pod damage, grain damage, yield, pod bug, pod borer.

Pigeonpea [*Cajanus cajan* (L.) Millsp.] cultivated on almost 4.8 million hectares worldwide is one of the most important legume crop of tropical and subtropical environment. It is grown for pulse grain, fodder, fuel and wood. Pigeonpea being an erect, woody, perennial shrub is commonly grown as an annual crop. It is important in semi-arid cropping systems due to its efficient nitrogen-fixing ability, tolerance to drought and contribution to soil organic matter. Pigeonpea contains high amount of quality dietary protein and and thus is an important source of nutrition to vegetarian population. Devi, (2005) claimed that pigeonpea (*Cajanus cajan*) is an important pulse crop and pests are major

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constraints. Among the various pests, lepidopterous -borers, and pod bug often assumes significance. These pests cause damage to an extent of 80% of the pods and 40 to 60% of the grains (Ahmad, 1938). Sachan *et al.,* (1994) have reported that pigeonpea is attacked by nearly 250 species of insects worldwide belonging to 8 orders and 61 families though relatively few, cause serious yield losses out of which pod bug and pod borer are some of the important pests in pigeonpea cropping system. The important pests of long duration pigeonpea include tur pod bug, *Clavigralla gibbosa* (Spinola), gram pod borer, *Helicoverpa armigera* (Hübner) and tur pod fly, *Melanagromyza obtusa* (Malloch). Others such as legume pod borer, *Maruca vitrata* (Fabricius), Blue butterfly, *Lampides boeticus* (L.) and Plume moth, *Exelastis atomosa* (Walsingham) are also some potential pests that cause significant yield losses in pigeonpea. Therefore keeping in view the above facts, the present investigation entitled 'Field screening of some long duration pigeonpea [*Cajanus cajan* (L.) Millsp.] genotypes against the infestation of pod bug, *Clavigralla gibbosa* (Spinola) and gram pod borer, *Helicoverpa armigera* (Hübner)' was carried out in *kharif* 2014-15.

MATERIALS AND METHODS

The present investigation was carried out at Agricultural Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during *kharif*, 2014–15. Twenty five pigeonpea genotypes/varieties were grown each in plots of 3 rows of 4 m length (total no. of plots, 50) following row to row and plant to plant spacing of 75 cm and 30 cm respectively. The crop was grown following the normal agronomic practices in "Randomized Block Design (RBD)" with two replications. The crop was shown on 5th August 2014 (31st Standard Week) and harvested during 27thApril 2015 (17th Standard Week). The experimental field was manifested to natural infestation and no insecticide applications were conducted. For recording the population of insect pest, five plants were randomly selected from each genotype and each unit plot and the immature as well as the mature stage of major insect pests present on them were counted at weekly intervals, from 24th January to 21st march during 2015. The observation related to pods feeding insect-pest i.e. pod bug, *Clavigralla gibbosa* (Spinola) and gram pod borer, *Helicoverpa armigera* (Hübner) were recorded. The number of insect count recorded from the two replications for all the genotypes were separately averaged for each genotype on standard week basis. The sampling for pod and seed damage assessment by insect pests was done at 80% maturity stage of the crop. For pod and grain damage assessment five plants from the three central rows in each plot were selected randomly and all the pods from five plants were pooled together and finally 100 pods were picked up and observations were recorded. Later, the percent pod and grain damage was worked out using the formula.

$$\text{Per cent pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods taken for observation}} \times 100 \quad ...(1)$$

$$\text{Per cent grain damage} = \frac{\text{Number of damaged grains}}{\text{Total number of grains taken for observation}} \times 100 \quad ...(2)$$

The grain yield was also recorded for each plot after excluding the border rows on the two sides of the plot. The grain yield data for each plot was converted to grain yield in kg/ha.The insect pest resistance/susceptibility rating was done on 1-9 scale as given below-

$$\text{Pest resistance percentage} = \frac{\text{P. D. of Check} - \text{P. D. of test genotype}}{\text{P. D. of Check}} \times 100$$

Where P.D. = Mean per cent of pod damaged.

Statistical analysis

All the data recorded were subjected to statistical analysis as per the Randomized Block Design procedure and insect population data were transformed with square root transformed $\sqrt{x+0.5}$

The insect pest resistance/susceptibility rating was done on 1-9 scale as given by Lateef and Sachan (1990)

Pest resistance percentage	Relative resistance/susceptibility rating	
100%	1	↑
75 to 99%	2	↑
50 to 75%	3	Increasing resistance
25 to 50%	4	↑
10 to 25%	5	↑
-10 to 10%	6	Equal of check
-25 to -10%	7	↓
-50 to -25%	8	Increasing susceptibility
-50% or less	9	↓

method and the per cent pod and grain damage data were angular transformed. The significance in yield difference has been judged by using Duncan Multiple Range Test (SPSS).

RESULTS AND DISCUSSION

Incidence and population dynamics of pod bug and pod borer on pigeonpea

The twenty-five genotypes namely ICP 7035-1, ICPHaRL 4985-11, T 21, ICPHaRL 4989-7, ICPHaRL 4985-10, ICPHaRL 4985-4, ICPL 20036-1, ICPHaRL 4979-2, ICPHaRL 4985-1, ICPL 88039-1, ICPL 98008, ICP 13212-1, ICPL 87119, ICPL 84060-1, ICPL 332 WR, ICP 13198-1, ICPL 909, ICPL 85063, ICPX 77303, ICPL 20062, PPE 45-2, ICP 10531-1, ICPL 97253, ENT 11, Bahar (check cultivar) were raised for studying the damage assessment in relation to per cent pod and grain damage by pod bug and lepidopterous pod borer (LPB). The relative yield (kg/ha) performance was also recorded at the harvest of crop.

The first incidence of pod bug, *Clavigralla gibbosa* was observed in 4th standard week in 2014-15 in all genotypes. The peak of population of pod bug was recorded during 11th standard week in almost all genotypes (Table 1.1). The results are in agreement with Kumar and Nath (2003) reported that the activity of pod bug (*Clavigralla gibbosa*) infestation was observed from 23rd January and peaked on 7th February and remained until 24th March. Kumar and Nath (2005) conducted a study during 1994-96 and observed the average population of *Clavigralla gibbosa* to be 1.67 per five plants.

The first incidence of pod borer,

Table 1. Comparative performance showing per cent pod damage of some promising pigeonpea genotypes against major insect pests during *Kharif* 2014-15

S. No	Genotypes	Days to 50 % flowering	% Pod damage by pod bug	R/S Rating	% Pod damage by LPB	R/S Rating
1.	ICP 7035-1	106	26 (30.64)	4	0.5 (2.88)	2
2.	ICPHaRL-4985-11	93	21.5 (27.58)	3	1 (5.74)	2
3.	T-21	108	14.5 (22.13)	3	1 (4.06)	2
4.	ICPHaRL-4989-7	103	8.5 (16.88)	2	3.5 (10.75)	4
5.	ICPHaRL-4985-10	94	10 (18.41)	2	0 (0.00)	1
6.	ICPHaRL-4985-4	105	15 (22.77)	3	5 (12.85)	6
7.	ICPL-20036-1	101	13 (21.11)	3	1 (5.74)	2
8.	ICPHaRL-4979-2	102	11.5 (19.81)	3	0.5 (2.87)	2
9.	ICPHaRL-4985-1	104	8.5 (16.77)	2	3 (9.83)	4
10.	ICPL-88039-1	100	21 (27.16)	3	2 (8.13)	3
11.	ICPL-98008	102	13.5 (21.27)	3	1.5 (6.93)	3
12.	ICP-13212-1	108	6.5 (14.67)	2	0.5 (2.87)	2
13.	ICPL-87119	110	8.5 (16.94)	2	1.5 (6.93)	3
14.	ICPL-84060-1	107	14 (21.85)	3	2.5 (9.05)	4
15.	ICPL-332 WR	109	10.5 (18.90)	2	0.5 (2.87)	2
16.	ICP-13198-1	112	9 (17.43)	2	5.5 (13.54)	6
17.	ICPL-909	105	19.5 (25.65)	3	2 (7.85)	3
18.	ICPL-85063	103	17 (24.34)	3	1 (4.06)	2
19.	ICPX-77303	108	12.5 (20.69)	3	1 (5.74)	2
20.	ICPL-20062	105	20 (25.81)	3	0 (0.00)	1
21.	PPE-45-2	107	14.5 (22.35)	3	2.5 (9.05)	4
22.	ICP-10531-1	108	14.5 (22.37)	3	1.5 (6.93)	3
23.	ICPL-97253	103	18 (25.10)	3	4.5 (12.22)	6
24.	ENT-11	109	13 (21.11)	3	1.5 (6.93)	3
25.	Bahar (Check)	92	43 (40.96)	-	5 (12.85)	-
	SEm±		2.57		1.76	
	C.D at =0.05%		7.55		5.18	

Figure in parentheses are arc-sin transformed values LPB= Lepidopterous pod borers, R-Resistance, S-Susceptible

Helicoverpa armigera larvae was observed in 4th standard week in only among fifteen genotypes out of the twenty-five genotypes under trial. The peak population of pod borer recorded between 8th to 11th standard weeks in several genotypes in 2014-15 except in the genotypes ICPHaRL 4985-10 and ICPL 20062, where there were no incidence throughout the reproductive phase of the crop (Table 1.2). These findings are in close agreement with Kumar and Nath (2003) recorded that the activity of pod borer (*Helicoverpa armigera*) on 23 January, continued until 8 April and peaked on 24 March.

The genotype Bahar (check cultivar) and ICP 7035-1 were most susceptible to pod bug and showed higher incidence of 6.8 mean pod bug population per plant. The genotype ICP 13212-1 was almost resistant with mean pod bug population per plant as 3.0. The mean larval population of gram pod borer was recorded highest in genotype ICP 13198-1 i.e. (1.1 larvae/plant) and lowest in genotype i.e. genotype ICPHaRL 4985-10 and ICPL 20062 with no incidence of pod borer at all and thus can be told to be highly resistant to pod borer.

Extent of damage caused by pod bug and pod borer in various long duration pigeonpea genotypes

Pod damage

In case of damage by pod bug, the genotype ICP 13212-1 showed least pod damage of 6.5 per cent, hence we can decipher that it is highly resistant against pod bug damage with an insect pest resistance/ susceptibility rating of 2. The highest per cent pod damage was found in the check (Bahar) with 43.0 per cent pod damage. Thus all the other genotypes proved to be better in terms of pod damage by showing equal or less susceptibility to pod bug damage.

Table 2. Comparative performance showing per cent grain damage of some promising pigeonpea genotypes against major insect pests during *Kharif* 2014-15

S. No.	Genotypes	% Grain damage by pod bug	R/S Rating	% Grain damage by LPB	R/S Rating
1.	ICP 7035-1	7.08 (15.38)	3	0.11 (1.85)	2
2.	ICPHaRL-4985-11	6.89 (15.17)	3	0.14 (2.14)	2
3.	T-21	4.51 (12.16)	3	0.28 (3.03)	2
4.	ICPHaRL-4989-7	3.29 (10.41)	2	3.03 (9.91)	9
5.	ICPHaRL-4985-10	3.06 (9.83)	2	0.00 (0.00)	1
6.	ICPHaRL-4985-4	5.80 (13.90)	3	1.83 (7.77)	7
7.	ICPL-20036-1	4.49 (12.23)	3	0.44 (3.73)	3
8.	ICPHaRL-4979-2	4.60 (12.35)	3	0.14 (1.52)	2
9.	ICPHaRL-4985-1	2.79 (9.48)	2	0.94 (5.46)	4
10.	ICPL-88039-1	7.69 (15.93)	3	0.55 (4.23)	3
11.	ICPL-98008	5.32 (13.18)	3	0.42 (3.63)	3
12.	ICP-13212-1	1.96 (7.97)	2	0.15 (1.54)	2
13.	ICPL-87119	2.20 (8.52)	2	0.43 (3.69)	3
14.	ICPL-84060-1	3.98 (11.42)	2	0.83 (5.23)	4
15.	ICPL-332 WR	3.47 (10.71)	2	0.16 (1.60)	2
16.	ICP-13198-1	2.39 (8.90)	2	2.49 (9.07)	9
17.	ICPL-909	7.94 (16.33)	3	0.73 (4.87)	3
18.	ICPL-85063	5.74 (13.85)	3	0.70 (3.83)	3
19.	ICPX-77303	5.70 (13.78)	3	0.30 (3.14)	2
20.	ICPL-20062	6.76 (14.40)	3	0.00 (0.00)	1
21.	PPE-45-2	5.41 (13.36)	3	0.75 (4.94)	3
22.	ICP-10531-1	5.60 (13.66)	3	0.54 (4.08)	3
23.	ICPL-97253	6.20 (14.40)	3	1.54 (7.11)	6
24.	ENT-11	3.90 (11.36)	2	0.56 (4.27)	3
25.	Bahar (Check)	16.97 (24.31)	-	1.65 (7.37)	-
	SEm±	1.53		0.96	
	C.D at =0.05%	4.49		2.82	

Figure in parentheses are arc-sin transformed values LPB= Lepidopterous pod borers, R-Resistance, S-Susceptible

The pod damage caused by lepidopterous pod borer ranged from 0.0 per cent in genotypes ICPHaRL 4985-10 and ICPL 20062 to 5.5 per cent in genotype ICP 13198-1. Thus, the genotypes ICPHaRL 4985-10 and ICPL 20062 were found to be highly resistant against lepidopterous pod borer among all the genotypes screened. The genotype ICP 13198-1 (5.5 per cent) showed higher per cent pod damage against check, Bahar (5.0 per cent) but, was found to have an insect pest resistance/ susceptibility rating of 6 i.e. this genotype was similar to that of check (Table 2.1). Mishra *et al.,* (1998) screened some late maturing pigeonpea germplasm against major insect pests at the North-Eastern Ghat zone of Orissa, India and the genotype ICPL 332 was found to be the least susceptible (20.43% pod damage) to insect pest damage followed by PPE 45-2 and ICPL 87088 (25.75 and 29.57%, respectively). Srivastava and Mohapatra (2002) reported that the extent of pod damage inflicted by LPBs and pod fly varied from 1.0 to 6.3% and 15.1 to 33.1%, respectively. Banu *et at.,* (2007) conducted an experiment to screen fifteen germplasm lines for their resistance/tolerance to pod borer under natural infestation in pesticide-free open field and concluded that on the basis of mean infestation, ICP 13201 showed the lowest (25%) pod damage and showed lowest susceptibility among the genotypes studied. It was followed by ICP 13208 and ICP 11964 that showed lower pod damage. Sunitha *et al.,* (2008) screened the six promising short duration pigeonpea genotypes for their reaction against lepidopterous pod borer under field, greenhouse and laboratory conditions in Andhra Pradesh, India. Field and greenhouse experiments showed significantly lower pod damage by lepidopterous pod borer in ICPL 98003 and ICPL 98008 compared to the susceptible genotype ICPL 88034.

Table 3. Yield of pigeonpea genotypes during *Kharif* 2014-15

S. no	Genotypes	Mean Grain Yield (Kg/ha)
1.	ICP 7035-1	338.9 a
2.	ICPHaRL-4985-11	233.3 defgh
3.	T-21	150.0 efgh
4.	ICPHaRL-4989-7	227.8 cdef
5.	ICPHaRL-4985-10	166.7 defgh
6.	ICPHaRL-4985-4	333.3 ab
7.	ICPL-20036-1	244.4 bcde
8.	ICPHaRL-4979-2	177.8 defgh
9.	ICPHaRL-4985-1	261.1 abcd
10.	ICPL-88039-1	111.1 gh
11.	ICPL-98008	236.1 cdef
12.	ICP-13212-1	161.1 efgh
13.	ICPL-87119	180.6 defgh
14.	ICPL-84060-1	122.2 gh
15.	ICPL-332 WR	222.2 cdef
16.	ICP-13198-1	186.1 defgh
17.	ICPL-909	166.7 defgh
18.	ICPL-85063	105.6 h
19.	ICPX-77303	155.6 efgh
20.	ICPL-20062	172.2 defgh
21.	PPE-45-2	162.2 efgh
22.	ICP-10531-1	206.7 cdefg
23.	ICPL-97253	138.9 fgh
24.	ENT-11	177.8 defgh
25.	BAHAR (Check)	300.0 abc
	SEm±	1.09
	C.D at 5%	3.19

Grain damage

The per cent grain damage by pod bug in the genotypes screened were evaluated and found that all the genotypes are showing some resistance when compared with the check cultivar (Bahar). The genotypes ICPHaRL 4985-10, ICPHaRL 4985-1, ICPHaRL 4989-7, ICPL 87119, ICPL 84060-1, ICPL 332-WR, ICP 13212-1, ICP 13198-1 and ENT 11 showed a rating of 2 as compared to susceptible check, Bahar and thus were showing high resistance to the pod bug infestation. All the other genotypes showed a rating of 3 i.e. they had shown some resistance when compared with the check (Bahar).

The per cent grain damage by lepidopterous pod borer in the genotypes screened was found as follows: the genotype ICPL 97253 gave a rating of 6 and was found equally susceptible to the local check, Bahar. The genotype ICPHaRL 4985-4 showed a rating of 7 and was found to be more susceptible against lepidopterous pod borer than local check cultivar, Bahar. The genotypes ICPHaRL 4989-7 and ICP 13198-1 gave a rating of 9 depicting that they have become highly susceptible when compared with Bahar (check). The genotypes ICPHaRL 4985-10 and ICPL 20062 gave a rating of 1 on the scale and were found to be highly resistant against lepidopterous pod borer when compared with local check, Bahar. The genotypes ICPHaRL 4985-1 and ICPL 84060-1 gave a rating of 4 on the rating scale

Table 4. Pod bug (*Clavigrella gibbosa* Spinola) population on certain long duration pigeonpea genotypes during 2014-15

Genotypes	Population per plant									
	4th SW	5th SW	6th SW	7th SW	8th SW	9th SW	10th SW	11th SW	12th SW	Over all mean
ICP 7035-1	1.1 (1.44)	2.2 (1.8)	4.6 (2.36)	6.5 (2.74)	7.8 (2.97)	9.2 (3.2)	9.7 (3.27)	10.2 (3.35)	9.5 (3.23)	6.8 (2.71)
ICPHaRL4985-11	1 (1.41)	2.1 (1.77)	4.5 (2.34)	6.4 (2.72)	7.7 (2.91)	9.1 (3.18)	9.6 (3.25)	10.1 (3.34)	9.4 (3.22)	6.7 (2.69)
T 21	0.3 (1.14)	0.9 (1.37)	2.2 (1.78)	4.3 (2.30)	5.5 (2.55)	8.2 (3.03)	7.6 (2.94)	8.3 (3.05)	7.2 (2.87)	4.9 (2.34)
ICPHaRL4989-7	0.2 (1.09)	0.5 (1.21)	0.7 (1.31)	1.2 (1.48)	2.3 (1.82)	4.1 (2.27)	5.6 (2.57)	7.3 (2.88)	6.3 (2.71)	3.1 (1.93)
ICPHaRL4985-10	0.2 (1.09)	0.5 (1.24)	0.8 (1.33)	2.2 (1.78)	3.3 (2.08)	5.6 (2.56)	5.9 (2.63)	7.5 (2.91)	6.5 (2.73)	3.6 (2.04)
ICPHaRL4985-4	0.4 (1.18)	1.1 (1.45)	2.9 (1.98)	5.0 (2.44)	6.3 (2.70)	8.9 (3.15)	8.2 (3.04)	8.9 (3.15)	8 (3)	5.5 (2.45)
ICPL 20036-1	0.2 (1.11)	0.7 (1.32)	1.2 (1.49)	3.1 (2.02)	4.7 (2.38)	7 (2.83)	6.8 (2.78)	7.8 (2.96)	6.7 (2.78)	4.2 (2.18)
ICPHaRL4979-2	0.2 (1.1)	0.7 (1.29)	0.9 (1.39)	2.7 (1.93)	4.0 (2.25)	6.4 (2.72)	6.3 (2.70)	7.6 (2.93)	6.5 (2.74)	3.9 (2.12)
ICPHaRL4985-1	0.2 (1.09)	0.5 (1.22)	0.7 (1.32)	1.4 (1.55)	2.6 (1.91)	4.5 (2.35)	5.6 (2.58)	7.4 (2.89)	6.3 (2.71)	3.2 (1.95)
ICPL 88039-1	0.9 (1.37)	2 (1.72)	4.3 (2.30)	6.3 (2.70)	7.5 (2.92)	9 (3.16)	9.3 (3.21)	10.0 (3.32)	9.2 (3.2)	6.5 (2.66)
ICPL 98008	0.3 (1.12)	0.8 (1.34)	1.8 (1.66)	3.6 (2.15)	5.1 (2.47)	7.7 (2.96)	7.2 (2.86)	7.9 (2.99)	6.9 (2.81)	4.6 (2.26)
ICP 13212-1	0.2 (1.08)	0.5 (1.21)	0.7 (1.31)	1.0 (1.42)	2.1 (1.76)	3.8 (2.19)	5.5 (2.56)	7.3 (2.88)	6.3 (2.7)	3.0 (1.90)
ICPL 87119	0.2 (1.09)	0.5 (1.22)	0.7 (1.32)	1.6 (1.63)	2.9 (1.99)	4.9 (2.42)	5.7 (2.6)	7.4 (2.89)	6.4 (2.72)	3.4 (1.98)
ICPL 84060-1	0.3 (1.13)	0.8 (1.36)	2 (1.72)	4.0 (2.24)	5.3 (2.52)	7.9 (2.98)	7.4 (2.9)	8.1 (3.02)	7 (2.84)	4.8 (2.3)
ICPL 332 WR	0.2 (1.09)	0.6 (1.27)	0.9 (1.36)	2.4 (1.85)	3.8 (2.19)	6.2 (2.68)	6.1 (2.67)	7.5 (2.92)	6.5 (2.74)	3.8 (2.09)
ICP 13198-1	0.2 (1.09)	0.5 (1.24)	0.7 (1.32)	1.9 (1.70)	3.1 (2.04)	5.1 (2.48)	5.8 (2.61)	7.4 (2.9)	6.4 (2.72)	3.5 (2.02)
ICPL909	0.7 (1.29)	1.5 (1.59)	3.6 (2.13)	5.7 (2.58)	7.1 (2.85)	8.6 (3.10)	9 (3.16)	9.7 (3.27)	8.9 (3.15)	6.1 (2.57)
ICPL 85063	0.5 (1.21)	1.2 (1.47)	3.1 (2.01)	5.2 (2.48)	6.5 (2.74)	9.1 (3.17)	8.4 (3.07)	9.1 (3.17)	8.2 (3.03)	5.7 (2.49)
ICPX 77303	0.2 (1.1)	0.7 (1.3)	1 (1.41)	3.0 (1.99)	4.2 (2.28)	6.8 (2.78)	6.5 (2.74)	7.7 (2.94)	6.6 (2.76)	4.1 (2.15)
ICPL 20062	0.8 (1.32)	1.8 (1.66)	4 (2.23)	6.2 (2.67)	7.3 (2.88)	8.8 (3.13)	9.2 (3.19)	9.9 (3.3)	9 (3.17)	6.3 (2.62)
PPE 45-2	0.3 (1.15)	0.9 (1.38)	2.5 (1.86)	4.5 (2.34)	5.9 (2.62)	8.4 (3.06)	7.8 (2.97)	8.5 (3.08)	7.4 (2.9)	5.1 (2.38)
ICP 10531-1	0.4 (1.17)	1 (1.42)	2.7 (1.92)	4.7 (2.39)	6.1 (2.66)	8.7 (3.11)	8 .0(3.00)	8.7 (3.12)	7.8 (2.96)	5.3 (2.42)
ICPL 97253	0.6 (1.25)	1.3 (1.52)	3.2 (2.06)	5.5 (2.54)	6.9 (2.81)	8.4 (3.07)	8.7 (3.12)	9.4 (3.23)	8.5 (3.08)	5.8 (2.52)
ENT 11	0.2 (1.11)	0.8 (1.33)	1.5 (1.6)	3.5 (2.11)	4.9 (2.43)	7.3 (2.88)	6.9 (2.81)	7.9 (2.98)	6.8 (2.79)	4.4 (3.23)
BAHAR	1.1 (1.45)	2.4 (1.83)	4.7 (2.38)	6.6 (2.76)	7.9 (2.99)	9.3 (3.21)	9.7 (3.28)	10.3 (3.37)	9.5 (.25)	6.8 (2.72)
SEm±	0.005	0.013	0.009	0.023	0.015	0.008	0.008	0.004	0.007	0.043
CD at 5%	0.014	0.039	0.026	0.068	0.045	0.025	0.023	0.012	0.02	0.121

Figures in parentheses are √x+0.5 transformed value SW: Standard Week

Table 5. Gram pod borer *(Helicoverpa armigera* Hübner) larval population on certain long duration pigeonpea genotypes during 2014-15

Genotypes	Population per plant									
	4th SW	5th SW	6th SW	7th SW	8th SW	9th SW	10th SW	11th SW	12th SW	Over all mean
ICP 7035-1	0.0 (1.00)	0.0(1.00)	0.1(1.03)	0.3(1.14)	0.5(1.22)	0.6 (1.26)	0.7(1.32)	0.7(1.32)	0.0 (1.00)	0.3(1.14)
ICPHaRL4985-11	0.0 (1.00)	0.0 (1.02)	0.1(1.05)	0.3(1.15)	0.5(1.24)	0.7 (1.29)	0.8(1.33)	0.8(1.33)	0.7 (1.30)	0.4(1.19)
T 21	0.0 (1.00)	0.1 (1.03)	0.1(1.06)	0.4(1.17)	0.6(1.25)	0.7 (1.30)	0.8(1.34)	0.8(1.35)	0.7 (1.30)	0.5(1.20)
ICPHaRL4989-7	0.1 (1.07)	0.3 (1.13)	0.5(1.21)	0.7(1.29)	0.9(1.37)	1.2 (1.49)	1.6(1.61)	1.7(1.65)	1.0 (1.42)	0.9(1.36)
ICPHaRL4985-10	0.0 (1.00)	0.0 (1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0 (1.00)	0.0(1.00)	0.0(1.00)	0.0 (1.00)	0.0(1.00)
ICPHaRL4985-4	0.2 (1.09)	0.5 (1.20)	0.6(1.25)	0.8(1.33)	1.0(1.42)	1.4 (1.55)	1.7(1.65)	1.8(1.68)	1.1 (1.45)	1.0(1.40)
ICPL 20036-1	0.0 (1.00)	0.1 (1.03)	0.2(1.07)	0.4(1.18)	0.6(1.27)	0.7 (1.30)	0.8(1.35)	0.9(1.36)	0.7 (1.31)	0.5(1.21)
ICPHaRL4979-2	0.1 (1.02)	0.0 (1.01)	0.1(1.03)	0.3(1.14)	0.5(1.23)	0.6 (1.27)	0.7(1.32)	0.8(1.32)	0.6 (1.27)	0.4(1.18)
ICPHaRL4985-1	0.1 (1.06)	0.3 (1.12)	0.4(1.20)	0.6(1.28)	0.9(1.36)	1.2 (1.48)	1.5(1.58)	1.6(1.62)	1.0 (1.43)	0.8(1.35)
ICPL 88039-1	0.1 (1.05)	0.2 (1.08)	0.3(1.15)	0.5(1.24)	0.8(1.33)	0.9 (1.37)	1.0(1.41)	1.1(1.45)	0.9 (1.37)	0.6(1.28)
ICPL 98008	0.1 (1.04)	0.1 (1.05)	0.2(1.11)	0.5(1.21)	0.7(1.30)	0.8 (1.34)	0.9(1.38)	0.9(1.39)	0.8 (1.34)	0.6(1.24)
ICP 13212-1	0.0 (1.00)	0.0 (1.01)	0.1(1.03)	0.3(1.15)	0.5(1.23)	0.6 (1.28)	0.7(1.32)	0.8(1.33)	0.6 (1.28)	0.4 1.18)
ICPL 87119	0.1 (1.04)	0.1 (1.05)	0.3(1.12)	0.5(1.22)	0.7 (1.30)	0.8(1.35)	0.9 (1.39)	1.0 (1.40)	0.8 (1.35)	0.6 (1.25)
ICPL 84060-1	0.1 (1.05)	0.2 (1.10)	0.4(1.17)	0.6(1.26)	0.8 (1.34)	1.1(1.45)	1.3 (1.52)	1.5 (1.58)	0.9 (1.39)	0.8 (1.32)
ICPL 332 WR	0.0 (1.00)	0.0 (1.01)	0.1 1.04)	0.3 1.15)	0.5 (1.23)	0.7 1.28)	0.8 (1.32)	0.8 (1.34)	0.7 (1.29)	0.4 (1.19)
ICP 13198-1	0.2 (1.10)	0.5 (1.22)	0.6 1.26)	0.8(1.34)	1.1 (1.45)	1.5(1.58)	1.8 (1.67)	2.0 (1.73)	1.2 (1.47)	1.1 (1.43)
ICPL 909	0.1 (1.05)	0.2 (1.09)	0.3 1.15)	0.6 1.25)	0.8 (1.33)	0.9 1.38)	1.1 (1.45)	1.3 (1.52)	0.9 (1.38)	0.7 (1.29)
ICPL 85063	0.0 (1.00)	0.1 (1.03)	0.2(1.08)	0.4(1.18)	0.6 (1.27)	0.7(1.31)	0.8 (1.36)	0.9 (1.37)	0.7 (1.31)	0.5 (1.21)
ICPX 77303	0.0 (1.00)	0.1 (1.04)	0.2(1.09)	0.4(1.19)	0.6 (1.28)	0.7(1.32)	0.9 (1.36)	0.9 (1.38)	0.8 (1.32)	0.5 (1.22)
ICPL 20062	0.0 (1.00)	0.0 (1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)	0.0(1.00)
PPE 45-2	0.1 (1.05)	0.2 (1.11)	0.4(1.19)	0.6(1.26)	0.8 (1.35)	1.1(1.46)	1.4 (1.55)	1.6 (1.60)	1.0 (1.42)	0.8 (1.33)
ICP 10531-1	0.1 (1.04)	0.1 (1.06)	0.3(1.13)	0.5(1.23)	0.7 (1.31)	0.8(1.36)	1.0 (1.40)	1.0 (1.40)	0.8 (1.36)	0.6 (1.25)
ICPL 97253	0.2 (1.08)	0.4 (1.17)	0.6(1.25)	0.7(1.32)	0.9 (1.39)	1.3(1.52)	1.7 (1.63)	1.8 (1.66)	1.1 (1.44)	1.0 (1.39)
ENT 11	0.1 (1.04)	0.2 (1.07)	0.3(1.14)	0.5(1.23)	0.7 (1.32)	0.9(1.36)	1.0 (1.40)	1.0 (1.41)	0.9 (1.36)	0.6 (1.27)
BAHAR	0.2 (1.09)	0.5 (1.21)	0.6(1.26)	0.8(1.34)	1.0 (1.42)	1.4(1.55)	1.7 (1.65)	1.8 (1.68)	1.1 (1.45)	1.0 (1.41)
SEM±	0.006	0.005	0.002	0.004	0.009	0.010	0.013	0.010	0.022	0.020
CD at 5%	0.018	0.016	0.007	0.012	0.025	0.031	0.026	0.030	0.064	0.055

Figures in parentheses are √x+0.5 transformed value SW: Standard Week

and were found to be least susceptible against lepidopterous pod borer when compared to local check, Bahar. The genotypes ICP 10531-1, ENT 11, ICPL 20036-1, ICPL 88039-1, ICPL 98008, ICPL 87119, ICPL 909, ICPL 85063 and PPE 45-2 showed a rating of 3 and thus they depicted to have some resistance when compared with the susceptible check, Bahar. The rest seven genotypes showed a rating of 2 i.e. they had also shown some resistance when compared with the check cultivar. (Table 2.2)

The present findings are in partial agreement with Srivastava and Mohapatra (2002) who conducted an experiment where fifteen medium duration pigeonpea genotypes were examined and the pest susceptible rating (PSR) showed that the genotype ICP 8863 suffered the highest pod damage caused by LPBs, while the lowest was in KM 124 and KM 125.

Yield

Since the crop was badly affected by the adverse weather conditions, hence very low grain yields were recorded. In general the grain yield of different genotypes differed significantly and ranged from 105.6 kg/ha to 338.9 kg/ha in 2014-15 in different pigeonpea genotypes. The genotypes ICP 7035-1 and ICPHaRL 4985-4 gave the highest yield of 338.9 kg/ha and 333.3 kg/ha respectively above the check cultivar (Bahar). The present findings are in partial agreement with Ekshinge *et al.,* (1996) conducted a trial on the short duration pigeonpea cultivars and found that ICPL-87 was the highest yielding cultivar and had the lowest level of pest infestation. (Table 3)

CONCLUSION

On the basis of the above investigation it may be concluded that host plant resistance plays a very important part in governing the pest infestation level in pigeonpea and screening is an appropriate method to identify resistant genotypes. The incidence of insect-pests increases with the advancement of crop age and the actual damage to the economic produce take place after flowering of the crop. The pod bug, *Clavigralla gibbosa* (Spinola) and gram pod borer, *Helicoverpa armigera* (Hübner) are cardinal insect pest in long duration pigeonpea in this zone. Among the twenty-five genotypes screened, ICP 7035-1 is found to be most resistant against insect pest damage and also gave the highest yield and hence it can be recommended as a source of resistance to insect pests.

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