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# Screening of Pigeonpea Genotypes against *Helicoverpa armigera* (Hubner) under Field Condition

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**ABSTRACT**

Twenty pigeonpea genotypes were screened under field conditions at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh during *kharif*, 2018-2019. Among the genotypes screened against *Helicoverpa.armigera* for resistance/tolerance, based on per cent pod damage and seed damage, eight genotypes *viz.,* RKPV 527-01, GJP 1606, JKM 189, BDN 711, ICPL 87119, RVSA 16-4, IPA 15-05, LRG 467 were grouped under resistant category as they recorded the pest suspectibility rating ranging from 1 to 5. The average number of larvae per plant ranged from 0.18 (RVSA 16-4) to 5.59 (ICPL 8863) with a mean of 2.18 larvae per plant.

**key words:** *genotypes, pigeonpea, gram pod borer.*

Pulses are referred as poor man's meat since they provide a concentrated source of valuable, digestible and high quality vegetarian protein. They are well known as cheap source of dietary proteins of food, feed and fodder for animals. Pulses are grown in semi-arid regions under a wide variety of agro climatic conditions.

India is the major pulse growing country in the world of which pigeonpea *Cajanus cajan* (L.) ranks second in area and production and contributes about 90% in the world's pulse production. In Andhra Pradesh, it is cultivated in an area of 2.76 lakhs per hectare with 1.39 lakh tonnes of production and with productivity of 504 kg $ha^{-1}$ (AICRP on pigeonpea, project co-ordinators report, 2018-19).The production of pigeonpea is very low even in the era of green revolution. In the recent years, there has been significant decline in the pigeonpea production in India, leading to price increase and reduction in per capita availability.

The relatively low crop yields may be attributed to non-availability of improved cultivars, poor crop husbandry and exposure to a number of biotic and abiotic stresses in pigeonpea growing regions. Among the various constraints, insect pests are one of the major and important ones affecting the productivity of pigeonpea apart from ecological and biological constraints. It is attacked by more than 300 species of insects of which the pod borers *viz*., gram pod borer, *Helicoverpa armigera* (Hubner) the most important pest causing heavy loss (Sachan *et al.,* 1994).

Pod borer, *Helicoverpa armigera* (Hubner) is one of the major insect pests of pulses. It attacks at early stage and become severe during maturity stage of the crop. The pest accounts for 90-95% of total damage. A single larva of *H.armigera* can damage 25-30 pods of gram in its life time.It feeds on tender shoots and young seeds. It make holes on pods and inserts its half body inside the pod to eat developing seeds (Ojha *et al.*, 2017). The yield loss due to *H. armigera* was estimated to be more than 60 % (Vishakantaiah and Babu, 1980).

Out of several approaches available for the management, idenitification and use of resistant varieties is a viable and cost effective option.

## MATERIAL AND METHODS

Twenty genotypes were sown during *kharif*, 2018-2019 to evaluate the resistance/tolerance levels against *H.armigera* in field under unprotected conditions in Randomized Block Design (RBD) with three replications. Each germplasm accession was accommodated in two rows each of 4m length. Out of twenty genotypes, LRG 52(Amaravathi) was considered as locak check it was the most popular variety grown in Andhra pradesh**.** The larval counts of *H.armigera* from flowering to pod maturation stage at ten days interval on five randomly tagged plants was recorded. The pods damaged by gram pod borer have characteristic big circular holes.

To assess the degree of infestation caused by *H.armigera*, two hundred pods were picked out from each replication at the time of harvest and per cent pod damage was calculated.

$$\text{Per cent pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

At the time of harvest, two hundred pods per replication were collected at random and were split open to count healthy and damaged seeds and the per cent seed damage was calculated.

$$\text{Per cent seed damage} = \frac{\text{Number of damaged seeds}}{\text{Total number of seeds}} \times 100$$

**Grouping of genotypes based on pest susceptibility**

In order to group the genotypes, the pest susceptibility was calculated using the following formula and then converted to 1 to 9 rating scale as given by Abbott (1925).

$$\text{Pest susceptibility (\%)} = \frac{\text{P.D. of check} - \text{P.D. of test entry}}{\text{P.D. of check}} \times 100$$

Where,

P.D. = mean of per cent pods or seeds damaged

| Pest Susceptibility rating | Pest Susceptibility (%) | Remarks |
|---|---|---|
| 1 | 100 | A rating of scale 1-5 was considered as resistant, 6 was equal to check and from 7-9 as susceptible. |
| 2 | 75 to 99.9 | |
| 3 | 50 to 74.9 | |
| 4 | 25 to 49.9 | |
| 5 | 10 to 24.9 | |
| 6 | -10 to 9.9 | |
| 7 | -25 to -9.9 | |
| 8 | -50 to -24.9 | |
| 9 | -50 or less | |

## RESULTS AND DISCUSSION

The observations made on larval population of *H.armigera* revealed that there existed a significant difference among genotypes (Table 1**).** The average number of larvae per plant ranged from 0.18 (RVSA 16-4) to 5.59 (ICPL 8863) with a mean of 2.18 larvae per plant. These findings were in conformity with Khorasiya *et al.*(2014) who observed larval incidence of 2.17 plant $^{-1}$ in BDN 2.

The results indicated that per cent pod damage by *H.armigera* on different pigeonpea genotypes differed significantly and was in range of 3.33 (RVSA 16-4) to 18.67 (ICPL 8863) with a mean of 9.80% (Table 2 and Fig 1)

Out of 20 genotypes screened for resistance/ tolerance against *H.armigera*, based on per cent pod damage, eight genotypes *viz.,* RVSA 16-4 (3.33), JKM 189 (4.67), GJP 1606 (5.33), BDN 711 (5.33), LRG 467 (5.33), IPA 15-05 (5.33), ICPL 87119 (6.00) and RKPV 527-01(6.00) were grouped under resistant category as it was recorded that the pest suspectibility rating ranged from 1 to 5; and eleven genotypes *viz.,* WRP 1 (10.00), BDN 716 (10.67), TJT 501 (12.00), GRG 152 (12.00), LRG 463 (13.33), BDN 2 (13.33), LRG 460 (14.00), LRG 466 (15.33), LRG 464 (16.00) and ICPL 8863 (18.67) were grouped under susceptible category as their pest suspectibility rating ranged from 7 to 9 (Table 2 and Fig 1).

The present findings were in agreement with Chauhan and Dahiya (1993) who reported that the pod damage due to pod borers was in the range of 5.00 to 26.3% among different genotypes.

The results indicated that per cent seed damage by *H.armigera* in different pigeonpea genotypes differed significantly and was in the range of 1.59 (RVSA 16-4) to 10.65 (ICPL 8863) with a mean of 5.00% (Table 3 and Fig 1).

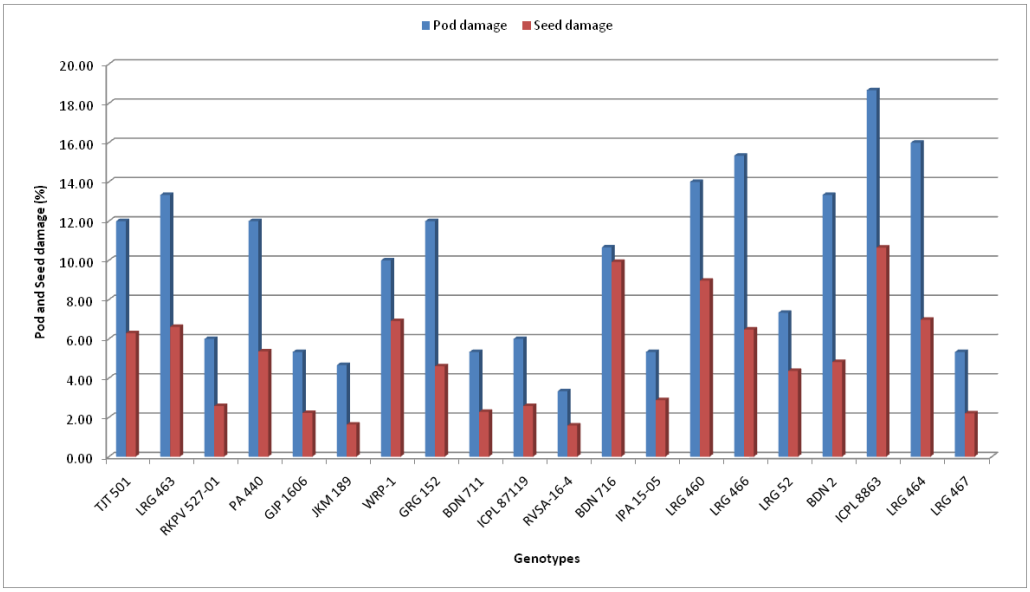


**Fig. 1. Response of pigeonpea genotypes in terms of per cent pod and seed damage due to *H.armigera* during k*harif*, 2018-2019**

**Table 1. Larval incidence of of *H.armigera* on different pigeonpea genotypes during *kharif*, 2018 - 2019**

| S.No. | Name of the genotype | No. of *H.armigera* larvae /plant | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1st count | 2nd count | 3rd count | 4th count | 5th count | Average |
| 1 | TJT 501 | 2.66 (1.90) | 2.93 (1.98) | 3.47 (2.11) | 3.07 (1.90) | 2.00 (1.55) | 2.83 (1.89) |
| 2 | LRG 463 | 2.66 (1.90) | 3.00 (2.00) | 3.33 (2.08) | 3.92 (2.22) | 3.67 (2.16) | 3.32 (2.07) |
| 3 | RKPV 527-01 | 0.66 (1.24) | 0.27 (1.11) | 0.47 (1.20) | 1.33 (1.52) | 0.53 (1.20) | 0.65 (1.26) |
| 4 | PA 440 | 3.33 (2.07) | 2.67 (1.90) | 4.13 (2.27) | 2.80 (1.95) | 1.80 (1.67) | 2.95 (1.97) |
| 5 | GJP 1606 | 0.26 (1.12) | 0.73 (1.30) | 0.67 (1.28) | 0.40 (1.16) | 0.40 (1.16) | 0.49 (1.20) |
| 6 | JKM 189 | 0.33 (1.14) | 0.73 (1.28) | 0.60 (1.22) | 0.33 (1.14) | 0.47 (1.18) | 0.49 (1.19) |
| 7 | WRP 1 | 2.66 (1.90) | 2.80 (1.95) | 3.47 (2.11) | 4.00 (2.24) | 3.33 (2.08) | 3.25 (2.06) |
| 8 | GRG 152 | 3.33 (2.08) | 2.67 (1.91) | 3.13 (2.02) | 2.87 (1.96) | 1.47 (1.57) | 2.69 (1.91) |
| 9 | BDN 711 | 0.66 (1.24) | 0.20 (1.09) | 0.93 (1.38) | 0.33 (1.14) | 0.47 (1.18) | 0.52 (1.21) |
| 10 | ICPL 87119 | 0.26 (1.11) | 0.13 (1.06) | 0.73 (1.26) | 0.60 (1.22) | 0.33 (1.15) | 0.41 (1.16) |
| 11 | RVSA 16-4 | 0.06 (1.03) | 0.07 (1.03) | 0.37 (1.16) | 0.13 (1.06) | 0.27 (1.11) | 0.18 (1.08) |
| 12 | BDN 716 | 3.33 (2.08) | 2.67 (1.91) | 3.67 (2.16) | 2.87 (1.97) | 3.67 (2.16) | 3.24 (2.05) |
| 13 | IPA 15-05 | 0.26 (1.12) | 0.27 (1.12) | 0.73 (1.26) | 0.60 (1.24) | 0.87 (1.34) | 0.55 (1.22) |
| 14 | LRG 460 | 3.33 (2.08) | 2.73 (1.93) | 3.40 (2.10) | 2.87 (1.97) | 3.13 (2.03) | 3.09 (2.02) |
| 15 | LRG 466 | 2.00 (1.73) | 2.80 (1.95) | 3.33 (2.08) | 2.93 (1.88) | 4.00 (2.24) | 3.01 (1.98) |
| 16 | LRG 467 | 0.33 (1.14) | 0.20 (1.09) | 0.53 (1.22) | 0.33 (1.14) | 0.50 (1.44) | 0.38 (1.14) |
| 17 | BDN 2 | 3.33 (2.08) | 2.87 (1.97) | 4.07 (2.25) | 4.13 (2.27) | 4.00 (2.23) | 3.68 (2.16) |
| 18 | ICPL 8863 | 5.33 (2.51) | 4.20 (2.28) | 6.27 (2.70) | 6.47 (2.73) | 5.67 (2.58) | 5.59 (2.56) |

Sig. – Significant Figures in parentheses are square root (n+1) transformed values

**Table 2. Pest susceptibility rating for different pigeonpea genotypes based on per cent pod damage by ` *H.armigera* during *Kharif*, 2018-2019**

| S.No. | Name of the genotype | Pod damage (%) | Pest susceptibility (%) | Susceptibility rating | Remarks |
|---|---|---|---|---|---|
| 1 | TJT 501 | 12.00 (20.26) | -63.71 | 9 | S |
| 2 | LRG 463 | 13.33 (21.14) | -81.85 | 9 | S |
| 3 | RKPV 527-01 | 6.00 (13.83) | 18.14 | 5 | R |
| 4 | PA 440 | 12.00 (20.26) | -63.71 | 9 | S |
| 5 | GJP 1606 | 5.33 (13.16) | 27.28 | 4 | R |
| 6 | JKM 189 | 4.67 (12.16) | 36.28 | 4 | R |
| 7 | WRP 1 | 10.00 (18.43) | -36.42 | 8 | S |
| 8 | GRG 152 | 12.00 (20.22) | -63.71 | 9 | S |
| 9 | BDN 711 | 5.33 (13.16) | 27.28 | 4 | R |
| 10 | ICPL 87119 | 6.00 (13.83) | 18.14 | 5 | R |
| 11 | RVSA 16-4 | 3.33 (6.14) | 54.57 | 3 | R |
| 12 | BDN 716 | 10.67 (18.98) | -45.56 | 8 | S |
| 13 | IPA 15-05 | 5.33 (13.16) | 27.28 | 4 | R |
| 14 | LRG 460 | 14.00 (21.85) | -90.99 | 9 | S |
| 15 | LRG 466 | 15.33 (22.85) | -109.14 | 9 | S |
| 16 | LRG 467 | 5.33 (7.86)) | 27.28 | 4 | R |
| 17 | BDN 2 | 13.33 (21.19) | -81.85 | 9 | S |
| 18 | ICPL 8863 | 18.67 (25.38) | -154.7 | 9 | S |

Pest Susceptibility rating:
1 to 5 –Resistant,
6- Equal to check,
7 to 9 – Susceptible
R —Resistant
S—Susceptible;
Sig. – Significant Figures in parentheses are arc sine transformed values

**Table 3. Pest susceptibility rating for different pigeonpea genotypes based on per cent seed damage by *H.armigera* during *Kharif* 2018-2019**

| S.No. | Name of the genotype | Seed damage (%) | Pest susceptibility (%) | Susceptibility rating | Remarks |
|---|---|---|---|---|---|
| 1 | TJT 501 | 6.29 (14.51) | -43.93 | 8 | S |
| 2 | LRG 463 | 6.61 (14.83) | -51.25 | 9 | S |
| 3 | RKPV 527-01 | 2.58 (7.36) | 40.04 | 4 | R |
| 4 | PA 440 | 5.36 (13.38) | -22.65 | 7 | S |
| 5 | GJP 1606 | 2.23 (8.58) | 48.97 | 4 | R |
| S | JKM 189 | 1.64 (6.01) | 62.47 | 3 | R |
| 7 | WRP 1 | 6.91 (15.10) | -58.12 | 9 | S |
| 8 | GRG 152 | 4.61 (9.79) | -5.49 | 6 | Equal to check |
| 9 | BDN 711 | 2.29 (6.97) | 47.59 | 4 | R |
| 10 | ICPL 87119 | 2.58 (7.36) | 40.96 | 4 | R |
| 11 | RVSA 16-4 | 1.59 (4.20) | 63.61 | 3 | R |
| 12 | BDN 716 | 9.92 (18.33) | -127.00 | 9 | S |
| 13 | IPA 15-05 | 2.88 (9.71) | 34.09 | 4 | R |
| 14 | LRG 460 | 8.97 (17.26) | -105.26 | 9 | S |
| 15 | LRG 466 | 6.48 (14.16) | -48.28 | 8 | S |
| 16 | LRG 467 | 2.20 (4.96) | 49.65 | 4 | R |
| 17 | BDN 2 | 4.82 (12.59) | -10.29 | 7 | S |
| 18 | ICPL 8863 | 10.65 (19.04) | -143.70 | 9 | S |

Pest Susceptibility rating:
1 to 5 –Resistant,
6- Equal to check,
7 to 9 – Susceptible
R —Resistant
S—Susceptible;
Sig. – Significant Figures in parentheses are arc sine transformed values

Out of 20 genotypes screened for resistance/ tolerance against *H.armigera* based on per cent seed damage, eight genotypes *viz.,* RVSA 16-4(1.59), JKM 189(1.64), LRG 467 (2.20), GJP 1606(2.23), BDN 711(2.29), RKPV 527-01(2.58), ICPL 87119(2.58) and IPA 15-05(2.88) were designated as resistant category as the pest suspectibility rating of them ranged from 1 to 5; and ten genotypes *viz.,* BDN 2(4.82), PA 440(5.36), TJT 501(6.29), LRG 466(6.48), LRG 463(6.61), WRP 1(6.91), LRG 464(6.97), LRG 460(8.97), BDN 716(9.92), and ICPL 8863(10.65) were grouped under susceptible category as they recorded the pest suspectibility rating ranging from 7 to 9. The genotype GRG 152 (4.61%), with pest susceptibility rating of 6 was equal in performance to check genotype LRG 52 (4.37%) (Table 3 sand Fig 1).

## CONCLUSION

The genotypes RKPV 527-01, GJP 1606, JKM 189, BDN 711, ICPL 87119, RVSA 16-4, IPA 15-05 and LRG 467 were found resistant to *H.armigera* based on n.o of larvae/plant, per cent pod and seed damage with pest susceptibility rating of 1 to 5.

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