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# Field screening of medium duration pigeonpea cultivars against pod borers

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**Abstract**
Among different germplasm lines screened, none of the genotype showed resistance to *H. armigera*. The genotypes, LRG 120, LRG 119, LRG 116, LRG 86, LRG 61 and LRG 52 showed moderate resistance with pod damage ranging from 16.8 to 21.4% to *M. vitrata*. Similarly, the genotypes, LRG 121, LRG 108, LRG 104, LRG 61 and LRG 52 showed moderate resistance with pod damage ranging from 16.9 to 21.2% to *M. obtusa*. Overall, the two entries *viz*., LRG 61 and LRG 52 were moderately resistant to both *Maruca* and *Melanagromyza*. However, LRG 104, LRG 52 and LRG 41 with 1570, 1500 and 1500 kg/ha, respectively were highly productive. Similarly, under advanced varietal trial, the genotypes, LRG 52 (4.5%), WRG 181 (5.3%) and RVSA 34 (5.5%) were categorized as moderately susceptible to gram pod borer, *Helicoverpa armigera* with pest susceptibility rating (PSR) of 5 and 6; and the genotypes, SKNP 224 (14.4%), WRG 79 (14.8%) and SKNP 207 (15.2%) were categorized as moderately resistant to spotted pod borer, *Maruca vitrata* with PSR of 4. The pod damage due to pod fly, *Melanagromyza obtusa* ranges from 11.8% (SKNP 207) to 35.5% (RVSA 81) and were categorized from moderately susceptible to highly susceptible with PSR ranging from 5 to 9. The local check, LRG 41 has recorded highest yield (1611.0 kg/ha), followed by WRG 181 (1556.0 kg/ha).

**Keywords:** Genotypes, gram pod borer, *Helicoverpa armigera, Maruca vitrata, Melanagromyza obtusa,* pigeonpea and pod fly and spotted 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 pod fly (*Melanagromyza obtusa*) (Malloch) are of great significance and cause considerable yield losses [1]. 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 [2, 3, 4]. However, information on relative resistance or susceptibility of certain newly developed entries was lacking. Hence, the present studies were conducted.

## Materials and Methods
Two experiments were conducted in *Kharif* 2012 at Regional Agricultural Research Station, Lam, Guntur with eighteen and twenty pigeonpea genotypes under preliminary varietal trial and advanced varietal trial respectively were sown by adopting a spacing of 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. Observations on pod damage due to different pod borers were recorded on pods collected from 5 randomly selected tagged plants per replication. The per cent damage was estimated by counting both damaged and total number of pods (Equation 1), while assessment was also made on the damage due to individual species of pod borer complex by considering the damaged pods based on feeding and hole emergence pattern *i.e.*, large round and regular holes for *H. armigera*, the irregular scrapping and holes on the pods for *M. vitrata* and the pin head size holes at the peripheral end for *M. obtusa*.

$$\text{Per cent pod damage} = \frac{\text{Number of pods damaged}}{\text{Total number of pods in the sample}} \times 100 \quad \text{.......Equation 1}$$

In order to group the genotypes, the pest susceptibility (%) was calculated using the formula given by Abbott (1925) [5] 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.

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

Where, P.D = mean of per cent pods damaged

Pest susceptibility rating (PSR). Seed yield per plot was recorded and converted to kg per ha at the time of harvest.

| 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 *H. armigera*, *M. vitrata* and *M. obtusa* and pod yield. Under preliminary varietal trial, the pod damage due to *Helicoverpa* ranged between 9.4% (LRG 104) to 22.2% (LRG 115). None of the genotypes screened were found resistant (PSR 4 and <4). Thus, the genotypes screened were categorized under susceptible, moderately susceptible and highly susceptible with PSR ranging from 5 to 9. Low incidence of *M. vitrata* was recorded in LRG 61(16.8%), followed by LRG 116 (18.4), LRG 86 (18.6), LRG 119 (20.4), LRG 120 (21.4) and LRG 52 (21.4) and categorized as moderately resistant with PSR of 4. Highest incidence (42.2%) was recorded in LRG 104. The rest of the lines were grouped under susceptible category. Similarly, the genotypes showed wide variation ranging from 16.9 to 29.9% (LRG 103) against *M. obtusa* incidence. Low incidence of *M. obtusa* was recorded in LRG 104 (16.9%), followed by LRG 61 (18.3), LRG 108 (20.1), LRG 121 (20.6) and LRG 52 (21.2) and categorized as moderately resistant with PSR of 4. The rest of the lines were grouped under susceptible category. Overall, among the eighteen germplasm lines screened, LRG 61 and LRG 52 were moderately resistant to both *M. vitrata* and *M. obtusa*. Further, the genotypes showed wide variation in their yields ranging from 931 to 1570 kg/ha. However, the genotypes, LRG 104, LRG 52 and LRG 41 with 1570, 1500 and 1500 kg/ha, respectively were highly productive (Table 1).

**Table 1:** Pest susceptibility rating (PSR) for different pigeonpea genotypes under primary varietal trial by pod borers

| S. No. | Name of the Genotype | Pod damage (%) due to *H. armigera* | PSR* | Inflorescence damage (%) due to *M. vitrata* | Pod damage (%) due to *M. vitrata* | PSR* | Pod damage (%) due to *M. obtusa* | PSR* | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | LRG 121 | 19.6 (26.3) | 9 | 34.4 (35.9) | 23.0 (28.7) | 5 | 20.6 (26.9) | 4 | 1042 |
| 2 | LRG 120 | 16.1 (23.6) | 8 | 29.8 (33.0) | 21.4 (27.5) | 4 | 25.0 (30.0) | 5 | 931 |
| 3 | LRG 119 | 14.1 (22.0) | 7 | 29.2 (32.7) | 20.4 (26.8) | 4 | 25.9 (30.6) | 5 | 1112 |
| 4 | LRG 117 | 10.9 (19.2) | 6 | 32.5 (34.6) | 22.2 (28.1) | 5 | 23.5 (29.0) | 5 | 1375 |
| 5 | LRG 116 | 17.4 (24.6) | 9 | 25.3 (30.1) | 18.4 (25.4) | 4 | 24.7 (29.8) | 5 | 1250 |
| 6 | LRG 115 | 22.2 (28.1) | 9 | 34.0 (35.6) | 27.4 (31.6) | 6 | 28.3 (32.1) | 6 | 1153 |
| 7 | LRG 108 | 16.3 (23.8) | 8 | 32.0 (34.3) | 26.8 (31.1) | 6 | 20.1 (26.6) | 4 | 1042 |
| 8 | LRG 104 | 9.4 (17.9) | 5 | 48.9 (44.4) | 42.2 (40.5) | 8 | 16.9 (24.3) | 4 | 1570 |
| 9 | LRG 103 | 11.8 (20.0) | 6 | 38.3 (38.2) | 27.7 (31.7) | 6 | 29.9 (33.2) | 6 | 1362 |
| 10 | LRG 102 | 21.5 (27.5) | 9 | 35.0 (36.2) | 26.8 (31.2) | 6 | 21.8 (27.8) | 5 | 1278 |
| 11 | LRG 101 | 11.1 (19.4) | 6 | 43.0 (41.0) | 38.3 (38.2) | 8 | 25.9 (30.6) | 5 | 1375 |
| 12 | LRG 98 | 16.0 (23.5) | 8 | 30.5 (33.5) | 22.6 (28.4) | 5 | 28.7 (32.4) | 5 | 1431 |
| 13 | LRG 94 | 13.0 (21.0) | 7 | 36.0 (36.8) | 24.4 (29.5) | 5 | 22.2 (28.1) | 5 | 1375 |
| 14 | LRG 86 | 14.4 (22.2) | 7 | 25.3 (30.1) | 18.6 (25.5) | 4 | 28.4 (32.2) | 6 | 1237 |
| 15 | LRG 61 | 20.8 (27.1) | 9 | 23.4 (28.8) | 16.8 (24.0) | 4 | 18.3 (25.3) | 4 | 1223 |
| 16 | LRG 52 | 11.2 (19.5) | 6 | 28.3 (32.1) | 21.4 (27.5) | 4 | 21.2 (27.4) | 4 | 1500 |
| 17 | ICPL 85063 | 13.5 (21.5) | 7 | 37.2 (37.5) | 28.1 (32.0) | 6 | 23.6 (29.1) | 5 | 1320 |
| 18 | LRG 41(LC) | 11.3 (19.6) | - | 33.0 (35.0) | 28.9 (32.5) | - | 28.8 (32.4) | - | 1500 |
| | C.D (P=0.05) | 5.5 | | 8.5 | 5.8 | | 4.4 | | 338 |
| | CV (%) | 11.5 | | 11.6 | 9.3 | | 7.1 | | 12.5 |
| | SEm± | 1.8 | | 2.9 | 2.0 | | 1.5 | | 113.4 |

* PSR (Pest Susceptibility Rating) based on pod damage; LC: Local check
Figures in ( ) indicate arc sin percentage transformed values

Under advanced varietal trial, results showed vide variation ranging from 4.5% (LRG 52) to 17.7% (Guliyal red) against pod damage due to *H. armigera* among different genotypes. The genotypes, LRG 52 (4.5%), WRG 181 (5.3%) and RVSA

34 (5.5%) were moderately susceptible (PSR of 5 and 6) and all others were categorized under susceptible to highly susceptible (PSR of 7 to 9) to *H. armigera* damage. The results were in conformity with the findings of Singh *et al.* (1993) [6] who reported that medium maturing cultivars had more pod damage due to *H. armigera*. The genotypes, SKNP 224, WRG 79 and SKNP 207 with 14.4, 14.8 and 15.2% pod damage respectively were categorized moderately resistant with PSR of 4. The genotypes exhibited a great deal of variation ranging from 11.8% (SKNP 207) to 35.5% (RVSA 81) against pod damage due to *M. obtusa*. However, none of the genotypes was found resistant. The grain yield was more in the local check, LRG 41 (1611.0 kg/ha), followed by WRG 181(1556.0 kg/ha) and LRG 52 (1542 kg/ha) (Table 2).

**Table 2:** Pest susceptibility rating (PSR) for different pigeonpea genotypes under advanced varietal trial to pod borers

| S. No. | Name of the Genotype | Pod damage (%) by *H. armigera* | PSR* | Inflorescence damage (%) by *M. vitrata* | Pod damage (%) by *M. vitrata* | PSR* | Pod damage (%) by *M. obtusa* | PSR* | Yield (kg/ha) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rajeev Lochan | 9.0 (17.4) | 9 | 32.2 (34.5) | 29.6 (32.9) | 8 | 14.2 (21.8) | 6 | 1264 |
| 2 | RVSA 81 | 9.4 (17.5) | 9 | 33.3 (35.2) | 21.4 (27.5) | 6 | 35.5 (36.6) | 9 | 1195 |
| 3 | RVSA 68 | 11.2 (19.5) | 9 | 36.0 (36.9) | 32.5 (34.7) | 8 | 21.6 (27.7) | 8 | 945 |
| 4 | LRG 52 | 4.5 (12.2) | 5 | 38.7 (38.5) | 36.1 (37.0) | 9 | 21.0 (27.2) | 8 | 1542 |
| 5 | RVKT 261 | 6.2 (14.3) | 7 | 30.6 (33.6) | 23.1 (28.5) | 6 | 19.4 (25.8) | 7 | 1153 |
| 6 | RVSA 64 | 16.5 (23.9) | 9 | 41.1 (39.8) | 35.4 (36.5) | 9 | 22.0 (27.9) | 8 | 1000 |
| 7 | RVKT 260 | 7.8 (16.0) | 8 | 44.2 (41.6) | 37.0 (37.4) | 9 | 12.1 (20.2) | 5 | 806 |
| 8 | RVSA 34 | 5.5 (13.5) | 6 | 30.2 (33.3) | 20.2 (26.3) | 6 | 26.6 (31.0) | 9 | 1139 |
| 9 | ENT 11 | 7.3 (15.6) | 8 | 38.5 (38.4) | 35.1 (36.3) | 9 | 18.2 (25.1) | 7 | 1278 |
| 10 | WRG 157 | 7.3 (15.5) | 8 | 29.1 (32.7) | 25.1 (30.1) | 7 | 29.6 (32.9) | 9 | 1431 |
| 11 | ICP 332 WR | 7.7 (16.0) | 8 | 37.4 (37.7) | 34.6 (36.0) | 9 | 19.8 (26.4) | 8 | 1334 |
| 12 | WRG 79 | 8.2 (16.6) | 8 | 22.1 (27.9) | 14.8 (22.4) | 4 | 15.3 (22.8) | 6 | 1459 |
| 13 | Guliyal Red | 17.7 (24.8) | 9 | 40.7 (39.6) | 36.3 (37.0) | 9 | 14.2 (21.7) | 6 | 848 |
| 14 | WRG 181 | 5.3 (13.2) | 6 | 32.7 (34.8) | 23.2 (28.8) | 6 | 25.7 (29.9) | 9 | 1556 |
| 15 | SKNP 224 | 9.9 (18.2) | 9 | 19.0 (25.8) | 14.4 (21.6) | 4 | 27.0 (31.3) | 9 | 1084 |
| 16 | WRG 98 | 6.3 (14.4) | 7 | 31.6 (34.1) | 23.2 (28.8) | 6 | 21.1 (26.5) | 8 | 1167 |
| 17 | SKNP 207 | 14.1 (22.1) | 9 | 19.4 (26.1) | 15.2 (22.6) | 4 | 11.8 (19.9) | 5 | 1375 |
| 18 | WRG 65 | 6.8 (14.9) | 7 | 36.0 (36.9) | 24.7 (29.8) | 7 | 15.6 (22.8) | 6 | 1487 |
| 19 | LRG 41 (LC) | 6.2 (14.2) | 7 | 29.7 (33.0) | 19.4 (26.0) | 5 | 16.2 (23.5) | 6 | 1611 |
| 20 | BSMR 853 (NC) | 5.5 (13.1) | - | 26.0 (30.7) | 22.4 (27.9) | - | 15.6 (23.1) | - | 1431 |
| | C.D (P=0.05) | 4.7 | - | 6.8 | 9.4 | - | 8.1 | - | 225 |
| | CV (%) | 13.5 | - | 9.5 | 14.8 | - | 14.8 | - | 8.6 |
| | SEm± | 1.6 | - | 2.3 | 3.2 | - | 2.8 | - | 76.13 |

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

The pests have better survival on susceptible than resistant genotypes due to some antibiosis and antixenosis resistance mechanisms. Dua *et al.* (2005) [7] reported the existence of all the four mechanisms of resistance *viz.*, non preference, antibiosis, tolerance and avoidance in pigeonpea. These resistance mechanisms govern the damage levels by a particular insect and hence the variability. 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) [8] and Patel and Patel (1990) [9] who observed higher response to grain yield by some pigeonpea selections in spite of heavy incidence of pod borers.

## Conclusion
From the present studies, it was evident that none of the genotypes was free from pod borer infestation. Further, none of the genotypes were resistant to most dreadful insect, *H. armigera*. However, the two entries *viz.*, LRG 61 and LRG 52 were moderately resistant to *Maruca* whereas, the entries, SKNP 224 and RVKT 260 showed moderate resistance to both *Maruca* and *Melanagromyza*.

## References

1. Lateef SS, Reed W. Insects Pests of Tropical Food Legumes. New York, USA: John Willey and Sons. 193-29Abbott, W.S. 1925. A method of computing the effectiveness of an insecticide. Journal of economic entomology. 1990; 18:265:267.
2. Patel PS, Patel JR. Screening of pigeonpea genotypes to pod borers and pod fly. Legume Research. 1990; 13(2):91-94.
3. Raut SB, Nawele RN, Mote UN. Field screening of pigeonpea germplasm against pod borer complex. Agriculture Science Digest. 1993; 13(1):17-19.
4. Mandal SMA. Response of some pigeonpea genotypes to pod borers. Environmental Ecology. 2005; 23:373-374.
5. Abbott WS. A method of computing the effectiveness of an insecticide. Journal of Economic Entomology. 1925; 18:265-267.
6. Singh RN, Sekhar JC, Singh KM, Singh Y. Response of different cultivars of pigeonpea against the pod damaging insects. Indian Journal of Entomology. 1993; 55(3):252-255.
7. Dua RP, Gowda CLL, Shiv Kumar Saxena, KB, Govil JN, Singh BB, Singh AK, Singh RP, Singh UP, Kranthi S. Breeding for resistance to *Heliothis / Helicoverpa*: Effectiveness and limitations. In: *Heliothis/Helicoverpa* management: Emerging trends and strategies for future research (ed., Hari C.Sharma) Oxford and OBH publications. New Delhi, 2005, 223-242.
8. Chandraka MK, Katiyar OP, Chitale MW, Deole JY, Kitur SU, Patidar GL. Incidence of major insect pests on pigeonpea selections at Raipur. International Pigeonpea News Letter. 1981; 1:34-35.