Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(6): 700-703

Received: 09-09-2017
Accepted: 12-10-2017

Naveen AS
Student, Department of Agricultural Entomology, UAHS, Navile, Shivamogga, Karnataka, India

Jayalaxmi Narayan Hegde
Associate Professor, Department of Agricultural Entomology, UAHS, Navile, Shivamogga, Karnataka, India

Shivanna BK
Professor and Head, Department of Agricultural Entomology, UAHS, Navile, Shivamogga, Karnataka, India

Sharanabasappa
Assistant Professor, Department of Agricultural Entomology, UAHS, Navile, Shivamogga, Karnataka, India

Chaitanya HS
Scientist (Horticulture), Krishi Vigyan Kendra, Udupi, UAHS, Shivamogga, Karnataka, India

Correspondence
Naveen AS
Student, Department of Agricultural Entomology, UAHS, Navile, Shivamogga, Karnataka, India

Field reactions of cowpea genotypes against pod borers in cowpea, *Vigna unguiculata* L

Naveen AS, Jayalaxmi Narayan Hegde, Shivanna BK, Sharanabasappa and Chaitanya HS

Abstract
Out of the six genotypes screened for their resistance against spotted pod borer, *Maruca vitrata*, C-152 proved resistance with lowest mean larval population per five plants (3.21), With respect to the Gram pod borer, *Helicoverpa armigera*, C-152 proved resistance in recording lowest mean larval population (0.94), followed by IT 38596 (1.50), KBC-2 (1.63), DC-47-1 (1.88), South pearl (2.38) and North border (3.19) which were on par with each other. For African pea moth, *Cydia ptychora*, C-152 proved resistance in recording lowest mean larval population (1.31), followed by IT 38596 (1.75), KBC-2 (1.75), DC-47-1 (1.94), South pearl (2.25) and North border (2.88) which were on par with each other. In case of blue butterfly, *Lampides boeticus*, C-152 proved resistance in recording lowest mean larval population (1.05), followed by KBC-2 (1.33), IT 38596 (1.56), DC-47-1 (1.77), South pearl (2.10) and North border (2.39) which were on par with each other. With respect to the pod damage due to borer complex, the least per cent pod damage was noticed in C-152 (14.80) which was on par with KBC-2 (17.38). IT 38596 (18.77) and DC-47-1 (20.32) which were on par with each other. Based on the damage score, the genotypes *viz*., C-152 (14.80), KBC-2 (17.38) and IT 38596 (18.77) were found to be highly resistant, while DC-47-1 (20.32), South pearl (21.97) and North border (24.25) were categorized as moderately resistant. When the yield data were compared among the genotypes, the genotype C-152 recorded the highest yield of 17.32 q/ha. The genotype KBC-2 registered yield of 15.96 q/ha which was on par with C-152 (17.32 q/ha) and IT 38596 (14.85 q/ha).

Keywords: Cowpea, Pod borer complex, *Maruca vitrata*, *Helicoverpa armigera*, *Cydia ptychora*, *Lampides boeticus*, mean larval population, pod damage, damage score, screening, resistant

1. Introduction
Cowpea (*Vigna unguiculata* Linnaeus) is an important grain legume in the tropics and subtropics. It is native to central Africa and belongs to the family Fabaceae, and is eaten in the form of grain, green pods and leaves. Cowpea is considered to be the most important source of protein food in tropical and sub-tropical countries where diets in general are deficient in protein. They also provide substantial quantities of minerals and vitamins to the diet. Cowpea is known as vegetable meat due to the high amount of protein in the grain with better biological value on dry weight basis. The grain contains 26.61 per cent protein, 3.99 per cent lipid, 56.24 per cent carbohydrates, 8.60 per cent moisture, 3.84 per cent ash, 1.38 per cent crude fibre, 1.51 per cent gross energy and 54.85 per cent nitrogen free extract [7]. In Karnataka, cowpea is cultivated over an area of 68029 hectares with the production of 35114 tonnes and the productivity of 543 kg/ha during 2011-12 [1]. Several insect pests are recorded to attack the cowpea crop at different stages of growth, out of these, borers *viz*., spotted pod borer, *Maruca vitrata* Geyer, gram pod borer, *Helicoverpa armigera* Hubner, African pea moth, *Cydia ptychora* Meyrick and Lycaenid Blue butterfly, *Lampides boeticus* Linnaeus are the major constraints in increasing its production and cause severe yield loss up to 60 per cent [8]. Out of the pod borers, the spotted pod borer is a serious pest of grain legumes in the tropics and subtropics because of its extensive host range, distribution and destructiveness. Out of the pod borers, the spotted pod borer is a serious pest of grain legumes in the tropics and subtropics because of its extensive host range, distribution and destructiveness. The larvae of legume pod borer attack on vegetative as well as reproductive parts of the plant. The larvae web the leaves, buds, flowers and pods together and feed inside. This typical feeding habit protects the larvae from natural enemies and other adverse factors and is responsible for retarded growth of the crop.

Considering the above factors, the present study was conducted to determine resistance of cowpea varieties against pod borer complex under field conditions.

2. Material and Methods

The experiment was conducted at Zonal Agriculture and Horticulture Research Station (ZAHRS), Navile, Shivamogga during *Kharif* 2016. Six genotypes *viz.*, DC-47-1, North border, South pearl, IT 38596, C-152 and KBC-2 were screened for their reaction to different pod borers of cowpea. Each genotype was sown in two rows of three meter length with spacing of 45 cm x 10 cm. The experimental design was Randomized Complete Block Design (RCBD) with four replications. The genotypes were sown during the third week of July 2016. The crop was raised following all recommended agronomic practices *viz*., fertilizer application, irrigation, inter- cultivation and disease management except pest management practices. The observations were recorded on five randomly selected plants at fifteen days intervals commencing from flowering till harvest. The resistance or susceptibility of cowpea genotypes was studied by counting the number of larvae per plant, number of damaged pods per plant and per cent pod damage. Damaged pods were cut open and the presence of different species of larvae was confirmed based on the species of larvae and per cent pod damage by species.

2.1 Pod damage

The observation on pod damage was recorded by counting total number of pods harvested from five plants and number of pods damaged by the pod borers. Later, the per cent damage was worked out using the following formula [10.]

Per cent pod damage= Number of damaged pods per plant to the total number of pods per plan

2.2 Resistance score

Based on the per cent pod damage, the damage score for each genotype was calculated and was given the resistance rating score of 1-5 as suggested by Jackai (1982).

Pod damage (%)	Score	Resistance rating
0-20	1	Highly resistant
21-40	2	Moderately resistant
41-60	3	Intermediate
61-80	4	Susceptible
81-100	5	Highly susceptible

3. Results and Discussions

Incidence of pod borers started at the time of flowering and continued up to the harvesting stage of the crop. Peak incidence appeared at poding stage of the crop. Towards maturity of the crop, population reduced which might be due to the reduction of tenderness in the pods. The results revealed that among six genotypes presented (Table 1 and Fig. 1), none was found free from infestation of the borers.

Spotted pod borer, *Maruca vitrata*

The mean of *Maruca vitrata* population ranged from 3.21 to 6.04 larvae/plant on different cowpea genotypes. Among the six genotypes, C-152 was found the least susceptible (3.21 larvae/plant) followed by KBC-2 (4.24) which was on par with each other. The genotype IT 38596 (4.98), DC-47-1 (5.50) and South pearl (5.72) which were on par with each other, followed by North border (6.04) which were on par with IT 38956, DC-47-1 and South pearl. [4] reported that out of the varieties screened for resistance against *M. vitrata*, the larval population on different varieties ranged from 4.00 to 17.00 per five plants [9] reported that larval population of spotted pod borer, *M. vitrata* ranged from 0.67 (Pusa Phalguni) to 2.83 (GC-8949) per plant in cowpea.

Gram pod borer, *Helicoverpa armigera*

In case of *H. armigera* (Table 1), among the six genotypes C-152 was found the least susceptible (0.94 larvae/plant) followed by IT 38596 (1.50) which was on par with each other. The genotypes, KBC-2 and DC-47-1 with the mean larval population of 1.63 and 1.88, respectively were on par with each other. South pearl which recorded mean larval population of 2.38 per five plants was on par with DC-47-1. [6] reported lowest larval population of *H. armigera* on chickpea cultivar, ICC- 506 (0.22/plant).

African pea moth, *Cydia ptychora*

In case of *Cydia ptychora* (Table 1), among the six genotypes C-152 was found the least susceptible (1.31 larvae/plant) which was on par with IT 38596 (1.75) and KBC-2 (1.75) followed by DC-47-1 (1.94) which was on par with KBC-2, IT 38596 and South pearl. South pearl and North border which recorded mean larval population of 2.25 and 2.88, respectively were on par with each other [4]. reported that larval population of *C. Ptychora* on different varieties ranged from0.30 to 3.00 per five plants [2]. reported the lowest mean larval population of *C. ptychora* per plant on cowpea in genotypes *viz.*, JCP-22 (1.28), GC-3 (1.32), JCP-28 (1.34), JCP-55 (1.39) and ACS-9 (1.47).

Blue butterfly, *Lampides boeticus*

In case of *Lampides boeticus* (Table 1), among the six genotypes C-152 was found the least susceptible (1.05 larvae/plant) followed by KBC-2 (1.33) which was on par with each other. The next best genotype was IT 38596 (1.56) followed by genotype DC-47-1 (1.77) and South pearl (2.10) which were on par with each other [4]. who reported that larval population of *L. boeticus* on different varieties ranged from 1.00 to 14.0 per five plants.

The data presented in Table 2 revealed that none of the genotype was found free from incidence of pod borer damage. The data on the overall mean per cent pod damage revealed that the least per cent pod damage was noticed in C-152 (14.80). KBC-2 (17.38), followed by IT 38596 (18.77), DC-47-1 (20.32) and South pearl (21.97) which were on par with each other [5] reported that cowpea varieties *viz.*, 52-38, PI-339, P-869 and MS-90-82/2 recorded less percentage of pod damage of 25.67, 18.66, 26.33 and 19.33 per cent, respectively (Fig.2).

Based on the damage score presented in Table 3, it is revealed that the genotypes *viz*., C-152 (14.80), KBC-2 (17.38) and IT 38596 (18.77) were categorized as highly resistant, However, DC-47-1 (20.32), South pearl (21.97) and North border (24.25) were categorized as moderately resistant.

Cowpea yield (q/ha.)

The mean yield data is presented in Table 3.The genotype C-152 recorded the highest yield of 17.32 q/ha. The genotype KBC-2 registered yield of 15.96 q/ha which was on par with C-152 (17.32 q/ha) and IT 38596 (14.85 q/ha). DC-47-1 (13.23 q/ha), South pearl (12.85 q/ha) and North border (11.32 q/ha) which were on par with each other with respect to mean yield. North border recorded the lowest yield out of the genotypes evaluated.

Table 1: Mean larval population of *M.* vitrata, *H. armigera, C. ptychora* and *L. boeticus* on different genotypes of cowpea

S. No	Genotypes	Mean no. of larvae/plant *M. vitrata*	Mean no. of larvae/plant *H. armigera*	Mean no. of larvae/plant *C. ptychora*	Mean no. of larvae/plant *L. boeticus*
1	DC-47-1	5.50 (2.45)^{ab}	1.88 (1.53)^{bc}	1.94 (1.56)^{b}	1.77 (1.51)^{bc}
2	North border	6.04 (2.56)^{a}	3.19 (1.92)^{a}	2.88 (1.83)^{a}	2.39 (1.70)^{a}
3	South pearl	5.72 (2.49)^{ab}	2.38 (1.69)^{b}	2.25 (1.65)^{ab}	2.10 (1.61)^{ab}
4	IT 38596	4.98 (2.34)^{ab}	1.50 (1.40)^{cd}	1.75 (1.50)^{bc}	1.56 (1.23)^{c}
5	C-152	3.21 (1.87)^{c}	0.94 (1.19)^{d}	1.31 (1.34)^{c}	1.05 (1.23)^{d}
6	KBC-2	4.24 (2.17)^{bc}	1.63 (1.46)^{c}	1.75 (1.49)^{bc}	1.33 (1.35)^{cd}
	S. Em. ±	0.11	0.07	0.06	0.05
	C.D.(P=0.05)	0.34	0.22	0.18	0.16
	C.V. %	10.03	9.89	7.86	7.63

Note: Figures in the parentheses are√ x+0.5 transformed values, Means followed by same letters do not differ significantly by DMRT (P=0.05)

Table 2: Mean per cent pod damage by pod borers on different genotypes of cowpea

Sr. No.	Genotypes	Mean per cent pod damage /five plants
1	DC-47-1	20.32 (28.64)^{ab}
2	North border	24.25 (29.80)^{a}
3	South pearl	21.97 (27.23)^{ab}
4	IT38596	18.77 (24.97)^{b}
5	C- 152	14.80 (21.15)^{c}
6	KBC-152	17.38 (24.72)^{b}
	S. Em. ±	0.17
	C.D.(P=0.05)	3.26
	C.V. %	8.40

Note: Figures in parentheses indicate arc sine transformed values. Means followed by same letters do not differ significantly by DMRT (P=0.05)

Table 3: Response of cowpea genotypes to pod borers infestation during 2016

Genotypes	Mean per cent pod damage	Damage score	Resistance rating	Yield (q/ha)
DC-47-1	20.32 (28.64)^{ab}	2	Moderately resistant	13.23^{bcd}
North border	24.25 (29.80)^{a}	2	Moderately resistant	11.32^{d}
South pearl	21.97 (21.97)^{ab}	2	Moderately resistant	12.85^{cd}
IT38596	18.77 (24.97)^{b}	1	Highly resistant	14.85^{abc}
KBC-152	17.38 (21.15)^{c}	1	Highly resistant	15.96^{ab}
C- 152	14.80 (24.72)^{b}	1	Highly resistant	17.32^{a}
S. Em. ±	0.17	-	-	0.12
C.D.(P=0.05)	3.26	-	-	0.38

Note: Figures in parentheses indicate arc sine transformed values. Means followed by same letters do not differ significantly by DMRT (P=0.05)

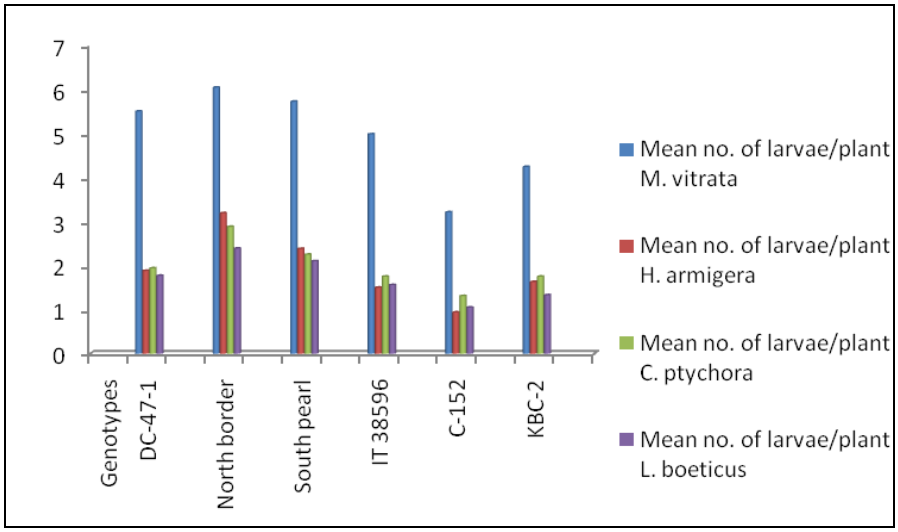

Fig 1: Mean larval population of *M.* vitrata, *H. armigera, C. ptychora* and *L. boeticus* on different genotypes of cowpea

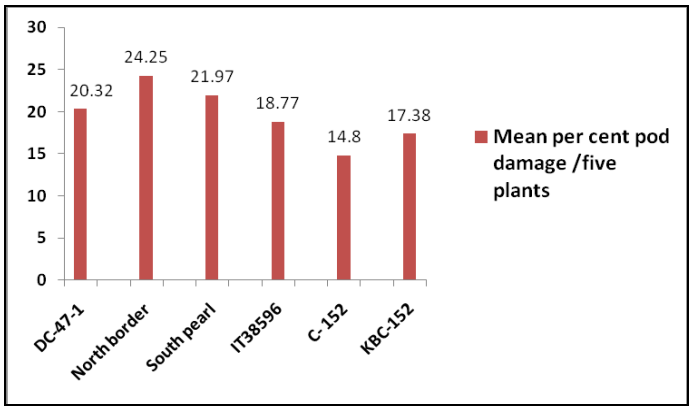

Fig 2: Mean per cent pod damage by pod borers on different genotypes of cowpea

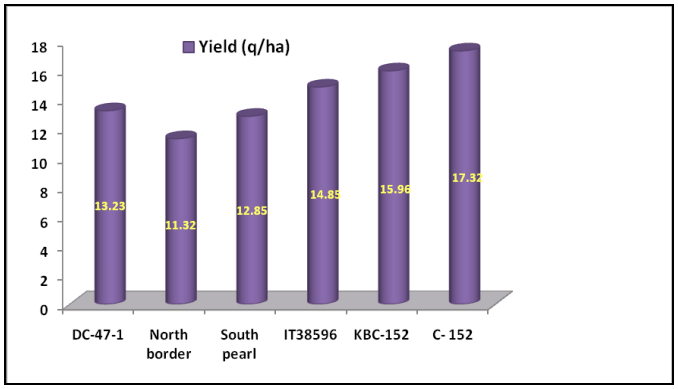

Fig 3: Yield performance of the Cowpea genotypes for the pod borers damage

4. Conclusion

Out of the six genotypes screened for their resistance against borer complex viz., spotted pod borer, *Maruca vitrata* and Gram pod borer, *Helicoverpa armigera*, African pea moth, *Cydia ptychora* of blue butterfly, *Lampides boeticus*, C-152 proved resistance with lowest mean larval population per five plants, followed by KBC-2, IT 38596, DC-47-1, South pearl and North border which were on par with each other. With respect to the pod damage due to the borer complex, the least per cent pod damage was noticed in C-152 which was on par with KBC-2. IT 38596 and DC-47-1 which were on par with each other followed by South pearl which were on par with each other. The highest mean per cent pod damage was observed in North border. Based on the damage score, the genotypes *viz*., C-152, KBC-2 and IT 38596 were found to be highly resistant, while DC-47-1, South pearl and North border were categorized as moderately resistant. When the yield data was compared among the genotypes, the genotype C-152 recorded highest yield, followed by KBC-2 and IT 38596 which were on par with each other. Hence, it was concluded that C-152 which is the locally grown cowpea genotype, which was found best out of all the varieties screened with respect to their resistance to borer complex and yield, can be adopted by the growers for better yield.

5. Acknowledgement

Special thanks to Department of Entomology, University of Agricultural and Horticultural Sciences, Shivamogga for the necessary facilities that were made available to carry out the research work.

6. References

1. Anonymous. Annual Report, Directorate of Economics and Statistics, Government of India, New Delhi, 2013,
2. Hutke SS, Virani VR, Jethva DM, Kalasariya RL. Field screening of cowpea germplasms against pod borer complex. Pestology. 2014; 38(8):40-42.
3. Jackai LEN. A field screening technique for resistance of cowpea (*Vigna unguiculata*) to the pod borer *Maruca testulalis* (Geyer) (Lepidoptera: Pyralidae). Bulletin of Entomological Research. 1982; 72(2):145-156.
4. Jagginavar SB. Studies on the pod borer complex of cowpea (*Vigna unguiculata* (L.) Walp.) With special reference to the biology and control of *Lampides boeticus* Linnaeus (Lepidoptera: Lycaenidae). M. Sc. (Agri) Thesis, University of Agricultural Sciences, Dharwad. 1988.
5. Lalasangi MS. Bionomics, loss estimation and control of the pod borer, *Maruca testulalis* (Geyer) (Lepidoptera: Pyralidae) on cowpea (*Vigna unguiculata* W.). M. Sc. (Agri) Thesis, University of agricultural sciences, Bangalore, 1984.
6. Ogenga NW, Latigo JE, Obuo, Orolon P. Infestation and pod damage by *Helicoverpa armigera* (Hubner) on chickpea. International Journal pest Management. 1994; 40(3):245-248.
7. Oyewale RO, Bamaiyi LJ. Management of cowpea insect pests**.** Scholar of Academic Journal Biosciences. 2013; 1(5):217-226.
8. Pandey SN, Singh R, Sharma VK, Kanwat PW. Losses due to insect pests in some *Kharif* pulses. Indian Journal of Entomology. 1991; 53(4):629-631.
9. Prajapati DA, Dodia DA, Tikka SBS. Relative susceptibility of cowpea genotypes against spotted pod borer, *Maruca vitrata* Fabricius (Lepidoptera: Pyralidae). Journal of Arid Legumes. 2008; 5(2):136-137.
10. Sravani D, Mahalakshmi MS, Rani CS, Kumari VP. Seasonal incidence of spotted pod borer, *Maruca vitrata* (Fabricius) (Lepidoptera: Crambidae) on green gram under unsprayed conditions. International Journal Pure Applied Biosciences. 2015; 3(5):152-158.