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Original Research Article

Evaluation of Different Chickpea Genotypes against Pod Borer, *Helicoverpa armigera* (Hubner)

S. R. Sadar[1], S. D. Bantewad[2] and N. E. Jayewar[3*]

[1]Department of Agricultural Entomology, College of Agriculture, Badnapur, Maharashtra, India
[2]Department of Agricultural Entomology Agricultural Research Station, Badnapur, Maharashtra, India
[3]Department of Agricultural Entomology, College of Agriculture, Parbhani, Maharashtra, India
**Corresponding author*

A B S T R A C T

The experiments were conducted to screen different chickpea genotypes for their resistance against. *Helicoverpa armigera* at farm of Agricultural Research Station Badnapur during 2016-17, design in Randomized Block Design (RBD) with three replications. All the genotypes under varietal screening indicated significant variation regarding eggs and larval population, per cent pod damage, *H. armigera* larval parasitization and grain yield. The mean number of eggs per plant of *H. armigera* was observed in the range of 0.15 to 0.68 eggs per plant on the different genotypes under study. Significantly least eggs population was observed on BDNG-2013-1 (0.15 eggs/plant) and which was at par with Phule G 12403 (0.21 eggs/plant). The mean population of *H.armigera* was observed in the range of 0.27 to 1.18 larvae / plant on the genotypes under study. The lowest larval population was reported on genotypes BDNG 2013-1 (0.27 larvae/plant) and which was at par with Phule G 12403 (0.34 larvae/plant), ICCL 86111 (0.37 larvae/plant), AKG 13033 (0.37 larvae/plant), Vijay (0.39 larvae/plant), BDNG 9-3 (0.41 larvae/plant), ICCV 97105 (0.48 larvae/plant) and ICCV 07306 (0.49 larvae/plant), respectively.

Keywords

Chickpea, *Helicoverpa armigera*, and Genotypes

Introduction

Chickpea (*Cicer arietinum*) was first grown in Turkey around 7500 B. C. The important chickpea growing countries in the world are India, Turkey, Pakistan, Iran, Mexico, Russia and Australia. The most important chickpea growing states in the India are Maharashtra, Gujarat and Madhya Pradesh. It is an important pulse crop in India and it accounts for 47.3 per cent of total pulse production. India is largest producer of chickpea in world sharing 65.25 per cent in area and 65.49 per cent in production (Anonymous, 2001).

H. armigera is known to be the key pest and most important limiting factor in the successful cultivation of chickpea (Lateef, 1985 and Reed *et al.*, 1987) due to high reproduction rates, a fast generation on turn over, wide genetic diversity occurs location and an ability to withstand, metabolize and avoid toxic chemicals. This pest starts infesting the shoot/tips few weeks after crop emergence and feed on buds, flowers and pods till harvesting, causing heavy yield losses. Larvae of *H. armigera* are voracious foliar feeder as early instars and later shift to

the developing seeds and fruits leading to drastic reduction in yield Reed. The pod borer *H. armigera*, is the most serious pest which cause high economic losses to the chickpea crop (Sarwar *et al.,* 2009).

Pod borer *H. armigera* has developed resistance to several pesticides, especially synthetic pyrethroids, organophosphates, carbamates and organochlorine insecticides, leading to excessive use of more chemicals, which also lead to environmental pollution. Use of insecticides also increases cost of cultivation for the small scale farmers, since they are not affordable and are increasingly become less feasible. Thus, Host Plant Resistance (HPR) along with natural enemies and the cultural practices remains the backbone of pest management system favorable to most agro ecosystems (Sharma, 2007). Despite the importance of HPR in IPM, breeding for plant resistance to insect pest has not been in rapid development considering *H. armigera* resistance to insecticide in chickpea. There is an urgent need to develop chickpea cultivars with resistance to the pest. The wider host range, multiple generations, migratory behavior and high fecundity of gram pod borer as well as its ability to develop resistance against insecticides makes it difficult to manage. Thus, keeping these in view the present investigation on "Evaluation of different chickpea genotypes against pod borer, *Helicoverpa armigera* (Hubner)" was carried out with the following objectives to screen chickpea genotypes for source of resistance against *Helicoverpa armigera* under field condition.

Materials and Methods

The experiment was conducted at experimental farm of Entomology section at Agriculture Research Station, Badnapur during *rabi* -2016-17 with twenty genotypes, as BDNG-797, BDNG-9-3,BDNG-2013-1, BDNG-798, Vijay, Digvijay, Virat Vishal, Phule Krupa, Phule-G-12403, PKV Kabuli-2, PKV Kabuli-4, JG-11, Jaki-9218, ICCL-86111, ICC-3137, BDNG-807, ICCV-07306, ICCV-97105 and AKG-13033 in Randomized Block Design (RBD) with Three Replication with Gross plot size 1.80 m x 2.0 m and Net plot size 0.90 m x 1.60 m and spacing of 45 × 10 cm, crop was sown in 2nd fortnight of October 2016.

Method of recording observations

The observations on eggs and larval population were recorded on five randomly selected plants from each test genotype and from each replication at weekly interval and the pod damage was recorded from pod initiation up to harvest of the crop. No. of eggs and larvae of pod borer was recorded during vegetative, flowering and pod formation stage of different genotypes of chickpea crop.

At maturity, the total number of healthy and damaged pods was counted and the per cent of pod damage was worked out by using the formula (Kumar *et al.,* 2013).

$$\text{Pod damage (\%)} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

The pod damage caused by *H. armigera* were asartained on the basis of infestation pattern specified by Bindra and Jokhmola (1967). The crop was harvested when leaves started senescence and shedding. The plants were harvested at the base by manual labour, using sickle. After harvest, the crop was allowed to dry in the sun for a few days. Threshing was done by beating the plants with sticks and grain yield (gm) per plot was recorded and yield data was converted to kg per ha.

The data obtained on the screening of genotypes against *H. armigera*, and per cent pod damage was subjected to statistical analysis after suitable transformations for interpretation of results.

Results and Discussion

The results obtained in the present investigation are reported as under.

The mean number of eggs per plant of *H. armigera* was observed in the range of 0.15 to 0.68 eggs per plant on the different genotypes under study. The least egg laying was reported on genotypes BDNG-2013-1 (0.15 eggs/plant) which was at par with Phule G 12403 (0.21 eggs/plant), ICCL 86111(0.21 eggs/plant) Vijay (0.22 eggs/plant), BDNG 9-3 (0.25 eggs/plant), AKG 13033 (0.25 eggs/plant) and ICCV 07306 (0.35 eggs/plant). The highest numbers of *H. armigera* eggs were recorded on ICC 3137 (0.68 eggs/plant).

The mean population of *H.armigera* was observed in the range of 0.27 to 1.18 larvae / plant on the genotypes under study. The least larval population was reported on genotypes BDNG 2013-1 (0.27 larvae/plant) and which was at par with Phule G 12403 (0.34 larvae/plant), ICCL 86111 (0.37 larvae/plant), AKG 13033 (0.37 larvae/ plant), Vijay (0.39 larvae/plant), BDNG 9-3 (0.41 larvae/plant), ICCV97105 (0.48 larvae/plant) and ICCV 07306 (0.49 larvae/plant), respectively.

The mean pod damage due to pod borer was observed to range from 2.49 to 7.73 per cent on different genotypes under study. The least pod damage was recorded on genotype, BDNG 2013-1 i.e. 2.49 per cent and which was at par with genotypes, AKG 13033 (2.96 per cent) followed by ICCV 97105 (3.30 per cent), BDNG 9-3 (3.33 per cent), ICCL 86111 (3.50 per cent), ICCV 07306 (3.72 per cent) and Vijay (3.89 larvae/plant) respectively.

It is of great interest to consider the performance of different genotypes in respect of different quantitative characters of economic importance particularly flower colour, days to 50 per cent flowering, days to maturity, number of pods per plant and grain yield. Out of thirteen genotypes showed pink colour and remaining seven genotypes in kabuli group showed white colour. The variation in days to 50 per cent flowering ranged from 41 to 63 days. Genotype JG 11 (41 days) and Phule G 12403 (42 days) took least days while highest days were taken by Phule kripa (63 days).The variation in days to maturity ranged from 98 to 111 days. The genotype PKV kabuli2 matured in least number of days (98) followed by JG 11 (101), PKV Kabuli 4 (102), ICCV 97105 (102), Vishal (102), Vijay (102), Virat (103) and Jaki 9218 (103) and matured very late (111) days in Digvijay. Number of pods per plant ranged from 41.40 to 67.60. The genotype ICCV 97105 recorded lowest (41.40 pods/plant), while AKG 13033 had maximum number of pods per plant (67.60 pods/plant) (Table 2).

The data on average grain yield of chickpea genotypes under study is presented in Table 2. The grain yield of genotypes under study ranged from 1578 to 2368 kg/ha. The maximum grain yield was recorded by genotypes AKG 13033 (2368 kg/ha) which was at par with the genotypes BDNG 2013-1 (2294 kg/ha) followed by Phule G 12403 (2285 kg/ha), JG 11 (2252 kg/ha), Vijay (2228 kg/ha) and Jaki 9218 (2207 kg/ha), this was followed by genotypes, BDNG 798, BDNG 9-3, Virat, Phule kripa and Digvijay which recorded the grain yield of 2048, 2038, 1958, 1945 and 1926 kg/ha,

respectively. The lowest grain yield among the genotypes tested were recorded by ICC 3137 (1578 kg/ha), followed by ICCV 97105 (1613 kg/ha) and ICCV 07306 (1648 kg/ha), respectively.

Larval count

The findings in relation to larval population of *H. armigera* infesting chickpea are pursuant to the observations recorded by Bhatt and Patel (2001) conducted experiment on screening of chickpea cultivars for their resistance to gram pod borer, *H. armigera* at C.P. college of Agriculture, Gujarat Agricultural University, S.K. Nagar. It was revealed that out of 11 genotypes evaluated, lowest larval population (Larvae per 5 plants) was recorded in Chaffa (14.32) and ICCV 10 (17.31), GNG 465(23.61) and BG 391(23.31). Similarly, Pratap *et al.,* (2002) who observed that pod borer infestation was more severe under late sown conditions as was evidenced by higher grand men of 40.22 and 17.49% in Env. 2 and 4, respectively as compared to 35.29 and 11.06% in early sown crop. Erect type genotype E405 was highly resistant in all the four environments, whereas genotypes, ICCV 88102, ICCV 88202, ICCV 90201, ICCV 88506 and ICCV 910257 have shown resistance to pod borer in two or three environments. The earliest maturing genotype, ICCV 2 was highly resistant under early sown conditions and moderately resistant under late sown conditions (Table 1 and Fig. 1).

Percent pod damage

The data on per cent pod damage due to *H. armigera* are in accordance with the observations recorded by Jadhav *et al.*, (2012) who reported that the pod damage within twenty genotypes tested varied between 8.48 to 33.06 per cent. The genotype, Phule G-105-14-1 recorded lowest mean per cent pod damage of 8.48 and second highest yield of 40.47 q/ha. The genotype, Phule-G-7104 exhibited mean per cent pod damage of 9.61 and registered highest yield of 41.39 q/ha. The genotype Phule G-06302 and local Kabuli recorded maximum per cent pod damage of 30.04 and 33.04 respectively. Similarly, Kumar *et al.*, (2013) reported that identify chickpea genotype for resistance to pod borer. 100 chickpea genotypes were screened and out of them 39 genotypes recorded less than found with more than 10 per cent damage, 42 between 10 to 320 per cent damage and 19 genotypes were found with more than 20 per cent and above pod damage caused by the pod borer *H.armigera* (Hub.).

Yield and quality parameter

The present findings are in accordance with, Sanap and Jamadagni (2005) who reported that ICC 9854 and ICC 12490 had grain yield of 1391 and 1483 kg/ha, respectively and were superior over ICC 506 EB. Similarly, Deshmukh *et al.,* (2010) found that BG-372, HC-1, SAKI-9516, Vijay and Avrodhi were comparatively less susceptible as these harbored lower larval population (1.07 to 1.32 larvae/plant), also had lower damage to pods (11.14 to 14.16%) and higher grain yield (1187 kg/ha to 1375 kg/ha) than remaining cultivars. Similarly, Patange *et al.,* (2015) reported that the highest grain yield (33.69 q/ha) was produced by Virat in spite of more larval population i.e. 0.92 larva per five plants. It can be concluded that genotype Virat has more resistance against *H. armigera* by virtue of its genetic potentiality.

Above results are also in accordance with, Bhatt and Patel (2001) who reported that the genotypes ICCC 4 had the highest grain yield (1250 kg/ha). The lowest yield (772

kg/ha) was produced by Chaffa due to its smaller grain size and lower yield potential. Similarly, Choudhary *et al.,* (2015) reported that the variety CSJD-884 recorded maximum yield (14.54 q/ha) at par with RSG-931 (14.36 q/ha), while lowest yield was from RSG-44 (11.13 q/ha) and Dinesh and Anusha (2017) reported that the maximum yield was recorded for Vijay (2.12 and 2.02 kg/plot) followed by RSG 888 (1.90 and 1.80 kg/plot). The minimum yield was recorded for Samrat (1.45 and 1.41 kg/plot) and Kabuli (1.18 and 1.08 kg/plot), respectively.

Table.1 Mean eggs larval population and pod damage of *H. armigera* on chickpea

Sr. No.	Genotype	No. of *H. armigera* eggs/plant		No. of *H. armigera* larvae/plant		Pod Damage (%)	
1	BDNG-797	0.57	(1.03)	0.98	(1.21)	6.40	(14.66)
2	BDNG-9-3	0.25	(0.87)	0.41	(0.95)	3.33	(10.51)
3	BDNG-2013-1	0.15	(0.81)	0.27	(0.87)	2.49	(9.09)
4	BDNG-798	0.50	(1.00)	0.84	(1.15)	6.22	(14.44)
5	Vijay	0.22	(0.85)	0.39	(0.94)	3.89	(11.38)
6	Digvijay	0.55	(1.02)	0.83	(1.15)	7.51	(15.90)
7	Virat	0.43	(0.96)	0.70	(1.09)	7.33	(15.71)
8	Vishal	0.46	(0.98)	0.81	(1.14)	5.75	(13.88)
9	Phule Krupa	0.45	(0.97)	0.74	(1.11)	7.73	(16.14)
10	Phule-G-12403	0.21	(0.84)	0.34	(0.91)	5.85	(14.00)
11	PKV Kabuli-2	0.64	(1.07)	1.18	(1.29)	7.44	(15.82)
12	PKV Kabuli-4	0.59	(1.05)	0.99	(1.22)	6.50	(14.78)
13	JG-11	0.49	(0.99)	0.88	(1.17)	5.62	(13.72)
14	Jaki-9218	0.51	(1.00)	0.90	(1.18)	5.66	(13.77)
15	ICCL-86111	0.21	(0.84)	0.37	(0.93)	3.50	(10.78)
16	ICC-3137	0.68	(1.09)	0.91	(1.18)	6.75	(15.05)
17	BDNG-807	0.47	(0.98)	0.72	(1.10)	4.88	(12.77)
18	ICCV-07306	0.35	(0.92)	0.49	(0.99)	3.72	(11.13)
19	ICCV-97105	0.35	(0.92)	0.48	(0.98)	3.30	(10.46)
20	AKG-13033	0.25	(0.86)	0.37	(0.93)	2.96	(9.90)
	SE(m) ±	0.04		0.07		0.94	
	CD at 5%	0.13		0.19		2.67	
	CV %	9.08		10.48		12.33	

Figures of Eggs larval population in parenthesis are √x+0.5.
Figures of percentage in parenthesis are angular transformed values.

Table.2 Quantitative characters of different chickpea genotypes

Sr. No.	Cultivars	Flower colour	Days to 50% flowering	Days to maturity	No of pods/ plant	Grain yield (Kg/ha)
1	BDNG-797	Pink	45	105	44.60	1840
2	BDNG-9-3	Pink	43	105	47.80	2038
3	BDNG-2013-1	Pink	43	106	58.40	2294
4	BDNG-798	White	53	110	64.40	2048
5	Vijay	Pink	51	102	42.80	2228
6	Digvijay	Pink	46	111	52.00	1926
7	Virat	White	60	103	48.00	1958
8	Vishal	Pink	52	102	44.20	1830
9	Phule Krupa	White	63	103	52.80	1945
10	Phule-G-12403	White	42	106	43.40	2285
11	PKV Kabuli-2	White	58	98	51.00	1823
12	PKV Kabuli-4	White	56	102	41.60	1958
13	JG-11	Pink	41	101	45.00	2252
14	Jaki-9218	Pink	55	103	44.40	2207
15	ICCL-86111	Pink	48	109	44.20	1848
16	ICC-3137	Pink	44	105	48.60	**1578**
17	BDNG-807	White	57	107	51.80	1787
18	ICCV-07306	Pink	43	106	43.20	1648
19	ICCV-97105	Pink	47	102	41.40	1613
20	AKG-13033	Pink	48	107	67.60	**2368**
	SE(m) ±	--	--	--	--	63
	CD at 5%	--	--	--	--	180
	CV %	--	--	--	--	11.52

Fig.1 Mean eggs larval population and pod damage of *H. armigera* on chickpea

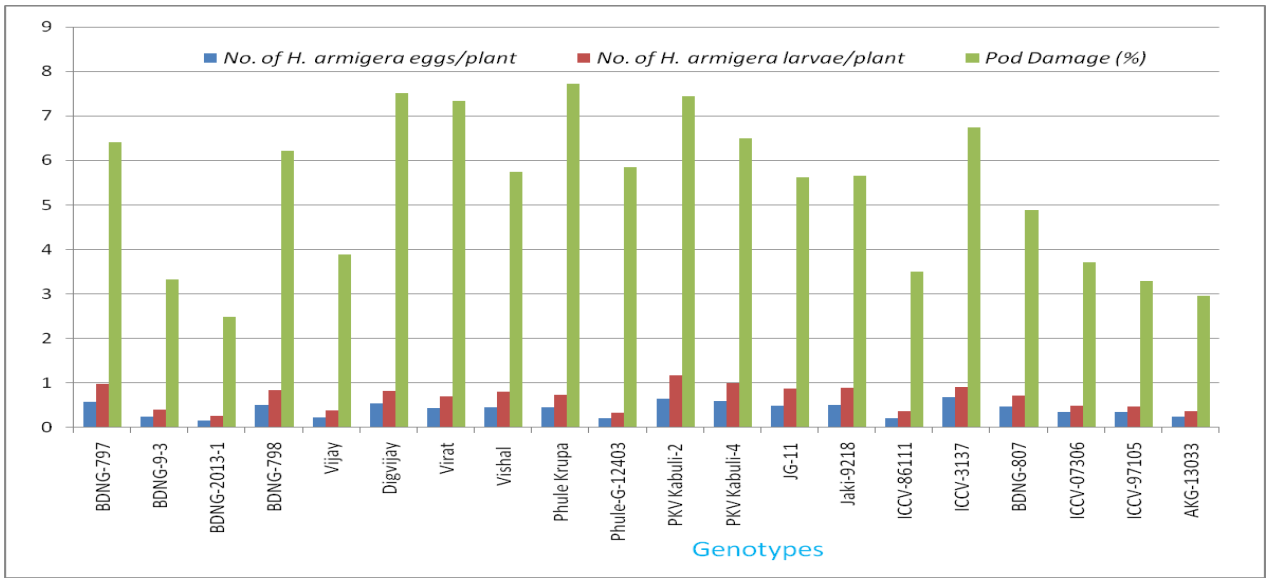

Fig.2 General field view of experiment

References

Anonymous, 2001. FAO bulletin of statistics New Delhi. 2: 46-47.

Bhatt, N.J. and R.K. Patel 2001. Screening of Chickpea cultivars for their resistance to gram Pod borer *H. armigera Indian Journal of Entomology*. 63(3): 277-280.

Bindra S.S.; and Jokhmola S.S 1967. Incidence and losses causes by some pod infesting instar in different varieties of pigeonpea in Madhya Pradesh. *Indian Journal of agriculture Sicence*. 37: 177-186.

Choudhari O.M., Anwala A., Sharma M.M. 2015. Studies varietal screening and data chickpea against *H. armigera.* Journal of Ecofriendly. 10(1): 58-61.

Deshmukh, S.G; B.V. Sureja, D.M. Jethva and V.P. Chatar 2010. Field efficacy of different insecticides against *Helicoverpa armigera* infesting chickpea *Legume Res.* 33(4): 269-273.

Jadhav S.P; R.S. Mule and S.K. Mehendale 2012. Screening of some promising genotypes of chickpea against pod borer, *Helicoverpa armigera. Pestology*. XXXVI(7): 22-24.

Kumar, S.V.S; J.C. Prakash and B.A. Kumar 2013. Identification of chickpea genotypes for resistance to pod borer and Fusarium wilt. BIOINFOLET, 10(2B): 745-749.

Lateef-S.S. 1985. Gram pod borer *Heliothis armigera (Hub)* resistance in Chickpea. *Agricultural Ecosystem and Environment*, 14:95102.

Patange, N.R. D.K. Patil and P.G. Chandile 2015. Field screening of Kabuli genotypes of chickpea against pod borer *Helicoverpa armigera.* Innovative Insect Management Approaches for sustainable Agro Ecosystem held at AC & RI, TNAU, Madurai, India. Pp. 265-266.

Patange, N.R., D.K. Patil, S.B. Sarode and P.G. Chandile 2015. Screening of chickpea genotypes against pod borer *Helicoverpa armigera* for sustainable

crop production. National Seminar on Dryland agriculture in Vidarbha: Priorieties and development issues, at Dr. PDKV, Akola (MS). India.

Pratap, A., Basandrai, D., Mehta P.K. and Basandrai, A.K. 2002. Evaluation of chickpea against pod borer *Helicoverpa armigera. Ind. J. Genet.* 62(2): 131-134.

Reed, W, Cardona C, Sithanantham S, and S.S. Lateef 1987. Chickpea insect pest and their control CAB International wailling food oxam UK. Pp. 283-316.

Sanap, M.M. and B.M. Jamadagni 2005. Screening of chickpea for resistance to pod borer, *H. armigera* (Hubner) at Rahuri, Maharashtra, India. *ICPN,* 12:37-39.

Sarwar, M. Ahmad, N. and Toufiq; M. 2009. Host plant resistance relationships in chickpea (C*icer arietinum* L.) against gram pod borer *Helicoverpa armigera Pakistan. Journal. Bot.* 41(6): 3047-3052.

Sharma H.C. 2007. Host Plant resistance to insect: modern Approaches and Limitations. Indian Journal of Plant. Protection. 35(2): 170-184.