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Varietal screening of chickpea, *Cicer arietinum* (L.) against gram pod borer, *Helicoverpa armigera* (Hüb.)

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Abstract
Fifteen chickpea varieties/genotypes (JG 11, ICCV2, KAK 2, Pusa 391, JGK 1, GJG 3, JG 315, JG 218, JG 63, ICCV 10, Vishal, RSG 888, RSG 44, JAKI 9218 and KPG 59) were screened for resistance to gram pod borer, *Helicoverpa armigera* in T.C.A., Dholi, Muzaffarpur (Bihar). The population of *Helicoverpa armigera* was observed on chickpea genotypes from 51 to 114 days after sowing. The overall lowest mean larval population was recorded on Pusa 391 closely followed by RSG 888 during crop season 2017-18. The overall highest mean larval population (4.46) was recorded on JGK 1 which was at par with GJG 3, JAKI 9218, JG 315, JG 63 and JG 218.The maximum per cent pod damage (15.52%) was observed on JGK 1 genotype and minimum per cent pod damage (2.77%) in Pusa 391.

Keywords: Varietal screening, chickpea, *H. armigera*

Introduction
Chickpea (*Cicer arietinum* L.) is one of the most important leguminous crop and is extensively cultivated in dry and rain-fed areas of the world. India is the largest producer of chickpea with 67 per cent of global production. It occupies nearly 31 per cent of the total pulse area in the country and contributes over 37 per cent to the national pulse production [6]. It is a *Rabi* season crop cultivated throughout the India, particularly in the states of Madhya Pradesh, Uttar Pradesh, Rajasthan, Bihar, Haryana, Maharashtra and Punjab. In Bihar, chickpea occupies 0.06 million hectares area with an annual production of 0.066 million tonnes with productivity 1098 kg ha^{-1} [1].

Chickpea being a rich source of nutrients i.e. protein (17-21%), carbohydrate (61-63%) and fat (4-5%) and also calcium, iron, niacin, vitamin B and Vitamin C provides the valuable protein supplement to the diet of the predominately vegetarian human population, besides it contributes to the national income. It is also considered to have medicinal value for blood purification and is beneficial for diabetic patients [4].

Amongst the several constraints affecting the yield, the insect pests, particularly the gram pod borer, *Helicoverpa armigera* (Hüb.), is recognized as the most important which cause high economic losses to the chickpea crop [11] and [9]. A single larva can consume 30-40 pods in its life time [12]. Yield losses due to gram pod borer in chickpea may range from 70 to 95 per cent [8]. Most of the cultivated varieties are highly susceptible to *H. armigera.* The development of crop cultivar resistant or tolerant to *H. armigera* has a major potential for integrated management [10] particularly under subsistence farming in developing countries. Development of resistant or tolerant cultivars to *H. armigera* has received the major attention in recent past [7, 8, 10]. Chickpea is the most preferred host of *H. armigera*, which suffers losses to the tune of 25.0 to 75.0 per cent [13]. The present study was aimed at to evaluate the chickpea varieties/genotypes against *H. armigera* under the natural high pest pressure condition of Dholi, Bihar and utilize the information in the effective management of pest through an integrated approach.

Materials and Methods
The experiment was laid out in a Randomized Block Design (RBD) with fifteen varieties/genotypes *viz*. JG 11, ICCV2, KAK 2, Pusa 391, JGK 1, GJG 3, JG 315, JG 218, JG 63, ICCV 10, Vishal, RSG 888, RSG 44, JAKI 9218 and KPG 59 (check) with three replications. The plot size was of 3 rows of 2m while the row to row and plant to plant distance was maintained as 30 cm and 10 cm, respectively.

The crop was sown in the second week of December, 2017. Population of *H. armigera* (Hüb.) was recorded at weekly intervals on chickpea crop during morning hours between 8.00 A.M. to 10.00 A.M. without disturbing the pest. The observations were recorded on five randomly selected tagged plants in each plot by counting the larval population. The varieties/genotypes were allowed to have a natural infestation. The observations on the larval population of the gram pod borer were recorded soon after the appearance of the pod borer till harvesting of the crop. An observation on grain yield was also recorded at harvest. In all ten observations, the first starting from 1st February to last on April 4, 2018 at weekly intervals was recorded.

Results and Discussion

Initial observations on a larval population of *H. armigera* was recorded from the time of buildup of the insect population i.e. 51 DAS till the maturity i.e. 114 DAS (Table 1). At 51 DAS the maximum mean number of larvae (2.0 larvae/5plant) was observed on variety RSG 888 and minimum mean number (0.66 larvae/5plant) on Pusa 391 and JG 11, GJG 3 and JG 315 as against 1.33 larvae/5plant in check variety, KPG 59. No significant difference between varieties and their check occurred among test varieties.

The mean larval population of *H. armigera* ranged from 2.60 in variety Pusa 391 to 4.46 five plants^{-1} in JGK 1 (Table 2) registering them as least and highly susceptible varieties, respectively. The variety RSG-888 with next lowest larval population (2.90 five plants^{-1}) was least susceptible. However, both Pusa 391 and RSG-888 varieties were significantly superior over all of the remaining varieties except KPG 59 (2.16 five plants^{-1}). Of the remaining varieties, ICCV 2, KAK 2, JG 11, ICCV 10 and Vishal were significantly at par to each other. The maximum population (4.46 larvae five plants-1) was recorded on variety JGK 1followed by GJG 3 (4.33 five plants^{-1}). The order of susceptibility in chickpea varieties/ genotypes against gram pod borer was RSG 44 < JG 218 < JG 63 < JAKI 9218 < JG 315.

The results of percent pod damage in chickpea (Table 1) revealed significant differences among the genotypes under investigation, ranging from 2.77 to 15.52 per cent. The minimum pod damage was observed in genotype Pusa 391 where as maximum pod damage was in genotype JGK 1 closely followed by GJG 3, JG 315 and JG 63.

Table 1: Mean larval population and per cent pod damage by *H. armigera* (Hüb.) on chickpea varieties/genotypes during *Rabi* 2017-18

Sl. No.	Varieties/Genotypes	Mean larval population/5plants	Total no. of pods/5 plants	Mean no. of pods infested/ 5 plants	Pod damage (%)
1	JG 11	3.23	66	3.4	5.69
2	ICCV 2	3.16	61	3.23	5.26
3	KAK 2	3.19	66	3.47	5.58
4	Pusa 391	2.60	55	1.40	2.77
5	JGK 1	4.46	54	8.40	15.52
6	GJG 3	4.33	75	9.93	13.25
7	JG 315	3.99	70	7.01	12.44
8	JG 218	3.72	56	6.41	11.45
9	JG 63	3.91	81	9.80	12.10
10	ICCV 10	3.66	68	5.33	8.25
11	Vishal	3.56	59	6.03	10.22
12	RSG 888	2.99	61	2.43	4.74
13	RSG 44	3.69	59	4.47	8.21
14	JAKI 9218	3.99	64	4.23	6.68
15	KPG 59	2.16	62	4.57	6.73
SEm±		0.26	3.87	0.15	0.25
CD at 5%		0.78	11.29	0.45	0.74

Table 2: Larval population of *Helicoverpa armigera* on different chickpea genotypes during crop season 2017-18

S. No.	Varieties/ Genotypes	Larval population per 5 plants (days after sowing)										Mean larval population
		51 day (05)	58 day (06)	65 day (07)	72 day (08)	79 day (09)	86 day (10)	93 day (11)	100 day (12)	107 day (13)	114 day (14)	
1.	JG 11	1.00	1.00	2.33	3.00	3.67	4.00	6.67	5.33	3.67	1.67	3.23
2.	ICCV 2	1.33	1.00	1.67	2.33	3.00	3.67	5.67	5.00	4.33	3.33	3.16
3.	KAK 2	1.33	3.00	2.00	2.67	3.00	3.33	5.33	5.00	4.33	2.00	3.19
4.	Pusa 391	0.66	0.66	1.33	2.00	3.00	3.33	4.00	5.00	4.67	1.33	2.60
5.	JGK 1	1.33	2.67	3.67	4.33	5.00	5.67	7.33	6.00	5.00	3.67	4.46
6.	GJG 3	1.00	2.00	4.33	4.00	4.33	4.67	8.00	7.67	6.33	2.00	4.33
7.	JG 315	1.00	1.66	3.00	3.33	4.33	5.00	7.00	6.33	5.00	3.33	3.99
8.	JG 218	1.33	1.69	2.15	3.00	3.63	4.15	8.33	7.33	3.33	2.33	3.72
9.	JG 63	1.33	2.33	3.00	3.33	4.00	5.33	6.33	5.33	4.67	3.00	3.91
10.	ICCV 10	1.33	2.00	3.33	4.00	4.33	5.00	6.33	4.67	3.67	2.00	3.66
11.	Vishal	1.33	2.00	3.00	3.33	4.00	4.67	5.33	5.00	4.00	2.67	3.56
12.	RSG 888	2.00	1.67	1.66	2.00	3.00	4.33	5.00	4.00	4.00	2.33	2.99
13.	RSG 44	1.33	1.66	2.00	2.67	3.00	3.66	7.00	6.66	5.00	4.00	3.67
14.	JAKI 9218	1.00	1.66	3.00	3.33	4.33	5.00	7.00	6.33	5.00	3.33	3.99
15.	KPG 59 (Check)	1.33	2.33	1.33	2.00	2.33	2.00	3.33	3.00	3.00	1.00	2.16
	SEm±	0.04	0.13	0.19	0.31	0.54	0.89	0.73	0.98	0.63	0.21	0.26
	CD at 5%	0.12	0.39	0.57	0.93	0.16	0.26	0.21	0.29	0.18	0.63	0.78

Similar results have been reported by [5] who screened fifteen genotypes of chickpea against *H. armigera* and found that BG-372, HC-1, SAKI-9516, Vijay and Avrodhi were comparatively less susceptible as they harboured lower larval population (1.07 to 1.32 larvae/plant). These genotypes had lower pod damage (11.41 to14.16%) with higher grain yield (1375 kg/ha to 1187 kg/ha) than remaining cultivars. The present findings are also in agreement with the work of [3] who screened a total of 119 genotypes of chickpea against gram pod borer and found that the mean incidence of pod borer on the promising genotypes- IC 269317, IC 268855, IC 269218 and IC 269347 ranged from 11.24 to 14.23 per cent as compared to 21.36, 21.53, 23.94 and 35.4 per cent on the check varieties PBG 1, L 550, GPF 2 and the Infester, respectively. Similar results were also reported by [2] who screened the genotype 5282 and found that lowest larval population (3.56 larvae/5 plants) was statistically on par with genotypes ICCL 86111, RSG 963 and GL 25016 with the larval population of 3.91, 3.88 and 3.94 larvae per 5 plants, respectively

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