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EVALUATION OF CHICKPEA (*CICER ARIETINUM* L.) GENOTYPES FOR RESISTANCE AGAINST GRAM POD BORER, *HELICOVERPA ARMIGERA* AND ITS POPULATION DYNAMICS

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SUMMARY

Twenty-four genotypes of chickpea were screened for resistance against *Helicoverpa amigera*. Population dynamics study revealed that larval population of *H. armigera* remained on the crop from 45 to 165 days after sowing with peak at 150 DAS (10.99 larvae/mrl) followed by 135 DAS (10.52 larvae/mrl). Genotype, H 10-22 harboured maximum number of larvae (4.39 larvae/mrl), whereas, genotype, H 16-17 showed minimum number (3.85 larvae/mrl). Minimum and maximum pod damage was recorded in genotype, H 19-36 (25.7%) and DCP 92-3 (41.7%), respectively. Maximum yield was obtained from genotype, H 16-04 (2159.72 kg/ha) followed by H 13-03 (1933.33 kg/ha). Weather parameters *viz.* temperature (maximum and minimum) and relative humidity (morning and evening) exhibited significant positive and significant negative correlation with larval population of *H. armigera*, respectively. Sunshine hours showed non-significant positive, while wind speed and rainfall exhibited non significant negative correlation with *H. armigera*.

Key words: *Helicoverpa armigera*, Evaluation, Weather parameters, Genotypes, Population dynamics, Pod damage

Chickpea (*Cicer arietinum* L., Family Fabaceae) is one of the most important *rabi* pulse crop and considered as 'poor man meat' as it contains protein (21.5%), carbohydrates (64.5%), fat (4.5%) (Ahlawat and Omprakash, 1996), vitamin B and minerals (potassium and phosphorus). In India, it is cultivated in an area of 10.47 m ha with production and productivity of 12.27 mt and 1172 kg/ha, respectively (Anonymous 2024). In Haryana this crop occupies and area of 29.00 thousand ha with total production and productivity of 26.00 thousand tonnes and 911 kg/ ha, respectively (Anonymous 2024). Globally India is the largest producer of chickpea, but the productivity is less as compared to other countries. Biotic stress (insect-pests) is the major limiting factor for low productivity of this crop. About 60 insect species found feeding on this crop worldwide (Reed *et al.*,1987) among which *Helicoverpa armigera* is considered as the most important insect-pest causing yield losses ranging from 70 to 95 per cent (Prakash *et al.*, 2007). An estimated loss of US$325 million in chickpea and over US$5 billion on different crops worldwide, despite application of insecticides costing over US$2 billion annually due to *Helicoverpa* spp. has been reported (Sharma, 2005). *H. armigera* is the most damaging pest of chickpea crop causing damage from seedling to crop maturity stage with significant reduction in crop yield. Under favourable condition pod damage of about 90 to 95 per cent has been reported due to *H. armigera* (Sehgal and Ujagir, 1990; Sachan and Katti, 1994). Management strategies *viz.* use of resistant/tolerant varieties (ICCL 86111), biocontrol agents, cultural practices, spray of botanicals, biopesticides and insecticides (spinosad 45 SC @100 g a. i/ ha, indoxacarb 15.8 EC @ 75 g a.i./ ha: Mishra *et al.*, 2014) etc. are effective against *H. armigera*. Indiscriminate use of pesticides leads to adverse effects like environmental pollution, resurgence of pests, insect resistance to insecticides, health hazards etc. An idea about population dynamics in chickpea crop plays an important role to develop better management strategy. Keeping in view the importance of chickpea crop the present studies was undertaken to study the population dynamics of *H. armigera* in different genotypes of chickpea and to screen different genotypes against *H. armigera*.

MATERIALS AND METHODS

Twenty-four genotypes of chickpea were sown on 13 November, 2021 at Research Farm of Pulse Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar. Crop was sown in randomized block design (RBD) with plot size of 2 rows of 4 m length with three replications of each genotype. Row to row and plant to plant distance was kept 30 x 10 cm, respectively. All the recommended agronomic package of practice was followed to raise the good crop except the spray of insecticides. Weekly meteorological data of entire cropping period was statistically analyzed to determine the correlation coefficient (r) values between the larval populations of *H. armigera* and meteorological factors. Larval population of *H. armigera* was recorded at 15 days interval initiating 15 days after sowing (DAS) from three-meter row length (mrl) in each replication. Pod damage (%) by *H. armigera*, pest susceptibility rating (PSR : keeping DCP 92-3 as check) were recorded according to formulae

Pod damage (%) = (Number of damaged pods/total number of pods) ×100

PSR= (C-T)/C × (100), where C = Check genotype, T= Treatment genotype

RESULTS AND DISCUSSION

Larval population of *H. armigera* showed significant differences among different genotypes of chickpea during the period of observation except at 165 days (Table 1). *H. armigera* commenced at 45 DAS with minimum and maximum population on H 19-16 (1.56 larvae/mrl) and HC 6 (3.11 larvae/mrl), respectively. Genotype, H 19-16 showed lowest population of *H. armigera* and was at par with H 12-22, H 10-22, H 17-16, H 19-21, H 19-36, HC 7, DCP 92-3 (Ch.) and GNG 1958. At 60 DAS, larval population decline in all genotypes (except H 10-22 and H 12-22) with maximum and minimum on H 09-90 (2.22 larvae/mrl) and H 12-63 and H 19-21 (0.89 larvae/mrl). At 75 DAS there was decline in larval population of *H. armigera* in all genotypes and population ranged from 0.11 larvae per mrl (H 09-90, H 16-05, H 16-21, H 17-16, H 18-08, H 19-21, HC 5, HC 6, HC 7, GNG 2171) to 0.56 larvae per mrl (H 05-24). Slight increase in population of *H. armigera* was observed at 90 DAS in all genotypes (except H 13-36 and H 18-08) showing maximum on H 19-36 (1.56 larvae/mrl) and minimum in H 18-08 (0.11 larvae/mrl), respectively. At 105 to 120 DAS, increase in larval population was observed in all genotypes and it ranged from 1.56 (H 17-16 and HC 7) to 3.00 (H 19-16) and 3.56 (H 19-16) to 5.67 larvae per mrl (GNG 1971). Sharp increase in larval population of *H. armigera* was observed at 135 DAS being maximum on genotype, H 13-03 (11.78 larvae/mrl) and minimum on H 12-22 (9.11 larvae/mrl) which was at par with H 05-24, H 07-120, H 12-22, H 16-17, H 16-21, H 17-16, H 19-16, H 19-21, HC 5, HC 6 and DCP 92-3. Increase in population was observed at 150 DAS in all genotypes (except H 09-90, H 10-22, H 13-36, H 16-05, H 16-17, H 16-21, H 17-16 and H 19-36) being maximum on HC 7 (12.67 larvae/mrl) and minimum on H 16-17, H 16-21 (9.33 larvae/mrl), respectively. However, larval population of *H. armigera* showed non-significant difference among different genotypes at 165 DAS and population ranged from 3.56 (H 07-120, H 12-63) to 5.11 larvae per mrl (H 13-36 and H 16-21). The present findings are in accordance with those of Rekha *et al.* (2025) who reported the occurrence of *H. armigera* on chickpea from 50th Standard Meteorological Weeks (SMWs), to 19th SMW with peaks in 14th (HC 1) and 16th SMW (HK 1).

On the basis of overall mean of different period observations significant differences were observed among different genotypes. Maximum number of larvae was recorded on genotype, H 10-22 (4.39 larvae/mrl). Minimum population of *H. armigera* larvae was recorded on genotype, H 16-17 (3.85 larvae/mrl) and it was at par with H 19-21, H 17-16, H 19-16, H 07-120, H 05-24, H 16-21, H 18-08, H 19-12, DCP 92-3, GNG 1958 and H 16-04. However, peak population of *H. armigera* was recorded at 150 DAS (10.99 larvae/mrl) followed by 135 DAS (10.52 larvae/mrl) and 120 DAS (4.51 larvae/mrl). The present findings are more or less in confirmation with those of Singh and Yadav (2016), Jeewesh Kumar *et al.* (2013), Patange *et al.* (2015) and Deepak *et al.* (2018) who reported minimum number of larvae of *H. armigera* in DCP-92-3 (15.59 larvae/5 plants), C 235 (0.5 larvae/10 plants), PKV Kabuli-2 (0.68 larvae/5 plants) and BG 372 (1.54 larvae/ mrl) respectively.

Pod damage (%) by *H. armigera* showed significant differences among different genotypes. Significantly lower pod damage was recorded in genotype, H 19-36 (25.7%) and it was found at par with all other genotypes except DCP 92-3 (41.7%). Present findings are more or less in accordance with studies conducted by various workers who reported minimum pod damage by *H. armigera* in genotype, ICPL-3201 (Banu *et al*., 2007), Punjab-2008 and Balkasar-2000 (Rehman *et al*., 2017), ICCV 09103, HC 1, NBeG 1004, GLW 48, GL 25016 and ICCV 92944 (Reddy and Agnihotri, 2018). Minimum yield was recorded in genotype, H 17-16 (1022.22 kg/ha), however, yield was maximum in genotype, H 16-04

TABLE 1

Larval population of *H. armigera*, pod damage (%), pest susceptible rating and yield (kg/ha) of different genotypes of chickpea

Genotype	Larvae of *H. armigera* /mrl at										Pod damage (%)*	Yield (kg/ha)
	45 DAS	60 DAS	75 DAS	90 DAS	105 DAS	120 DAS	135 DAS	150 DAS	165 DAS	Av.		
H 05-24	2.67 (1.91)	1.56 (1.59)	0.56 (1.24)	0.67 (1.29)	2.00 (1.73)	4.33 (2.31)	9.44 (3.23)	11.11 (3.48)	4.22 (2.28)	4.06 (2.25)	27.2 (31.40)	1505.56
H 07-120	2.56 (1.88)	1.56 (1.59)	0.00 (1.00)	0.78 (1.33)	2.00 (1.73)	4.44 (2.33)	10.00 (3.32)	11.44 (3.52)	3.56 (2.13)	4.04 (2.24)	26.9 (31.24)	1619.44
H 09-90	2.33 (1.82)	2.22 (1.79)	0.11 (1.05)	1.00 (1.40)	2.00 (1.73)	4.89 (2.42)	11.67 (3.56)	9.78 (3.28)	4.33 (2.31)	4.26 (2.29)	25.8 (30.50)	1733.33
H 10-22	2.00 (1.73)	2.11 (1.75)	0.22 (1.10)	0.89 (1.37)	2.67 (1.91)	5.00 (2.45)	11.33 (3.51)	10.78 (3.43)	4.56 (2.35)	4.39 (2.32)	32.7 (34.87)	1197.22
H 12-22	1.78 (1.67)	2.11 (1.75)	0.00 (1.00)	0.67 (1.29)	2.11 (1.76)	5.56 (2.56)	9.11 (3.18)	12.44 (3.66)	4.67 (2.38)	4.27 (2.30)	31.8 (34.32)	1480.56
H 12-63	2.78 (1.94)	0.89 (1.36)	0.00 (1.00)	0.67 (1.29)	2.67 (1.91)	4.44 (2.33)	11.22 (3.49)	12.00 (3.60)	3.56 (2.13)	4.25 (2.29)	31.6 (34.15)	1477.78
H 13-03	2.33 (1.82)	1.44 (1.56)	0.00 (1.00)	1.00 (1.39)	2.22 (1.79)	3.89 (2.21)	11.78 (3.57)	11.78 (3.57)	3.89 (2.21)	4.26 (2.29)	26.7 (31.06)	1933.33
H 13-36	2.89 (1.97)	1.89 (1.70)	0.33 (1.15)	0.22 (1.10)	1.67 (1.63)	4.00 (2.23)	11.44 (3.53)	10.78 (3.43)	5.11 (2.47)	4.26 (2.29)	31.4 (34.08)	1500.00
H 16-04	2.89 (1.97)	1.00 (1.41)	0.22 (1.10)	0.67 (1.29)	2.22 (1.78)	4.22 (2.28)	10.78 (3.43)	11.22 (3.49)	4.33 (2.31)	4.17 (2.27)	26.5 (30.93)	2159.72
H 16-05	2.78 (1.94)	1.78 (1.66)	0.11 (1.05)	0.56 (1.23)	2.11 (1.76)	5.22 (2.49)	10.89 (3.45)	10.44 (3.38)	4.11 (2.26)	4.22 (2.28)	31.6 (34.22)	1422.22
H 16-17	2.56 (1.88)	1.67 (1.63)	0.00 (1.00)	0.67 (1.29)	1.89 (1.70)	4.78 (2.40)	9.78 (3.28)	9.33 (3.21)	4.00 (2.23)	3.85 (2.20)	32.5 (34.74)	1277.78
H 16-21	2.78 (1.94)	2.00 (1.73)	0.11 (1.05)	0.67 (1.29)	2.33 (1.82)	4.78 (2.40)	10.00 (3.32)	9.33 (3.21)	5.11 (2.47)	4.12 (2.26)	29.7 (33.86)	1540.28
H 17-16	2.00 (1.73)	1.56 (1.59)	0.11 (1.05)	0.22 (1.10)	1.56 (1.59)	4.56 (2.36)	10.44 (3.38)	9.67 (3.27)	4.78 (2.40)	3.88 (2.21)	33.1 (35.09)	1022.22
H 18-08	2.78 (1.94)	1.22 (1.49)	0.11 (1.05)	0.11 (1.05)	2.33 (1.82)	3.89 (2.21)	11.11 (3.48)	11.33 (3.51)	4.33 (2.30)	4.14 (2.27)	31.8 (34.30)	1380.56
H 19-12	2.78 (1.94)	1.33 (1.52)	0.00 (1.00)	1.33 (1.52)	2.11 (1.76)	3.78 (2.18)	10.78 (3.43)	11.11 (3.48)	4.11 (2.25)	4.15 (2.27)	33.0 (35.06)	1233.33
H 19-16	1.56 (1.60)	1.22 (1.48)	0.22 (1.10)	0.78 (1.32)	3.00 (1.99)	3.56 (2.13)	9.78 (3.28)	10.78 (3.43)	4.33 (2.30)	3.91 (2.22)	31.7 (34.23)	1455.56
H 19-21	2.22 (1.79)	0.89 (1.37)	0.11 (1.05)	1.11 (1.45)	2.33 (1.82)	4.44 (2.32)	9.78 (3.28)	9.78 (3.27)	4.11 (2.26)	3.86 (2.20)	29.2 (32.72)	1641.67
H 19-36	2.00 (1.73)	1.33 (1.52)	0.00 (1.00)	1.56 (1.59)	2.67 (1.91)	4.78 (2.40)	10.89 (3.45)	10.56 (3.39)	4.22 (2.28)	4.22 (2.28)	25.7 (30.43)	1869.44
HC 5	2.44 (1.85)	1.78 (1.67)	0.11 (1.05)	0.78 (1.32)	2.89 (1.97)	4.33 (2.31)	9.89 (3.30)	11.56 (3.54)	4.33 (2.31)	4.23 (2.29)	26.4 (30.90)	1352.78
HC 6	3.11 (2.03)	1.78 (1.66)	0.11 (1.05)	0.78 (1.32)	2.89 (1.97)	4.22 (2.28)	9.44 (3.23)	11.00 (3.46)	4.67 (2.38)	4.22 (2.28)	31.7 (34.26)	1466.67
HC 7	2.00 (1.73)	1.78 (1.66)	0.11 (1.05)	0.56 (1.24)	1.56 (1.60)	5.11 (2.47)	10.67 (3.41)	12.67 (3.70)	4.33 (2.31)	4.31 (2.30)	33.3 (35.19)	1402.78
DCP 92-3	2.11 (1.76)	1.33 (1.52)	0.00 (1.00)	0.67 (1.29)	2.67 (1.90)	4.56 (2.36)	10.44 (3.38)	11.00 (3.46)	4.56 (2.36)	4.15 (2.27)	41.7 (40.21)	1130.56
GNG 2171	2.67 (1.91)	1.33 (1.52)	0.11 (1.05)	0.67 (1.29)	2.22 (1.79)	5.67 (2.58)	11.00 (3.46)	11.44 (3.53)	4.00 (2.23)	4.35 (2.31)	32.8 (34.93)	1830.56
GNG 1958	2.22 (1.79)	1.00 (1.40)	0.00 (1.00)	0.89 (1.36)	2.00 (1.73)	3.89 (2.21)	10.78 (3.43)	12.44 (3.66)	4.22 (2.28)	4.16 (2.27)	33.7 (35.47)	1630.56
Mean	2.43	1.53	0.11	0.74	2.25	4.51	10.52	10.99	4.31	-	-	-
C.D. at 5%	(0.20)	(0.26)	(0.12)	(0.19)	(0.24)	(0.23)	(0.22)	(0.28)	(N.S.)	(0.07)	(6.07)	185.69
S.E.m(±)	(0.07)	(0.09)	(0.04)	(0.07)	(0.08)	(0.08)	(0.08)	(0.10)	(0.08)	(0.02)	(2.13)	65.02

Values in parenthesis are sq. root transformation values, DAS: Days after sowing, *Values in parenthesis are angular transformed values, PSR of all genotypes = 5 (Least susceptible, taking DCP 92-3 as check entry).

TABLE 2

Weather parameter and its correlation with mean larval population of *H. armigera* on different genotypes of chickpea

Days after sowing (DAS)	*H. armigera*	Max. T (°C)	Min. T (°C)	RH (M)	RH (E)	Wind speed (km/h)	Bright sunshine hours	Rainfall (mm)
45	2.43	19.9	5.4	93.2	50.9	2.7	4.6	1.2
60	1.53	18.3	7.5	97.9	64.1	3.6	3.7	40.0
75	0.11	14.3	6.8	96.6	76.5	3.4	1.0	24.0
90	0.74	20.6	6.9	96.6	54.6	3.8	6.4	5.8
105	2.25	24.9	8.3	92.5	47.7	4.1	8.4	0.0
120	4.51	26.4	10.0	93.0	43.9	3.6	7.8	0.0
135	10.52	34.7	16.2	84.7	31.7	3.7	7.8	0.0
150	10.99	40.0	16.6	73.3	26.8	3.3	8.6	0.0
165	4.31	39.7	20.5	68.9	39.3	5.3	8.2	1.5
Correlation with *H. armigera*	0.827**	0.733*	-0.673*	-0.874**	-0.019^{NS}	0.626^{NS}	-0.488^{NS}	

*Significant at 5% level of significance, **Significant at 1% level of significance.

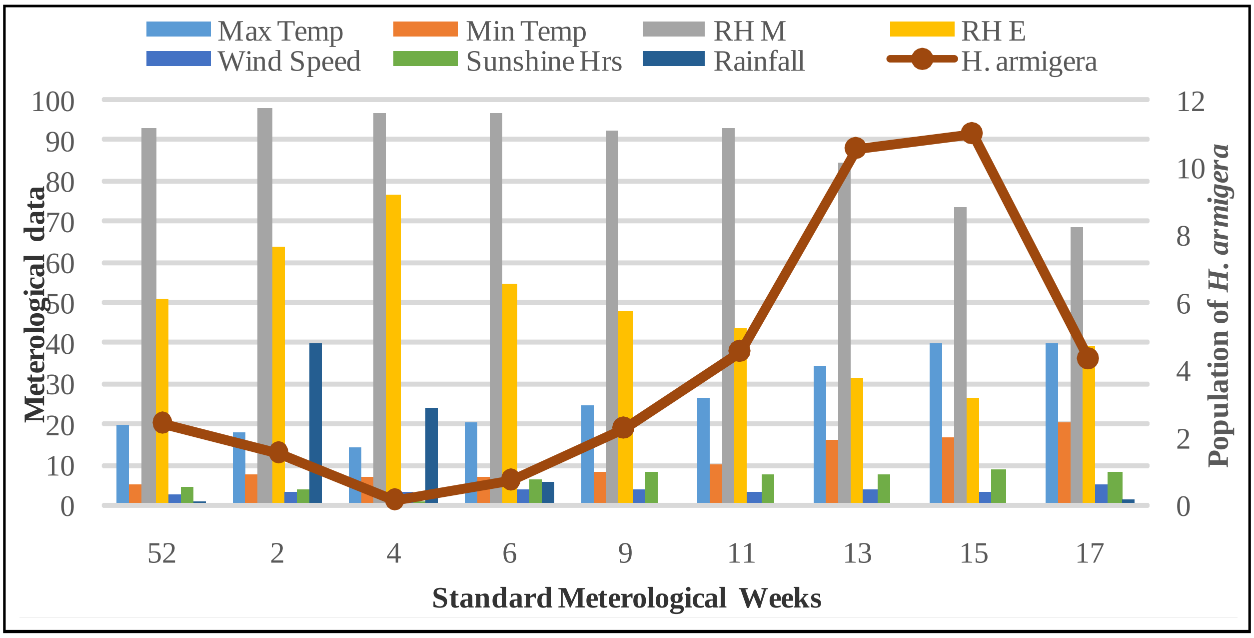

Fig. 1. Mean population of *H. armigera* on chickpea genotypes during *Rabi*, 2021.

(2159.72 kg/ha) followed by H 13-03 (1933.33 kg/ha) which was found at par with H 19-36 (1869.44 kg/ha) and GNG 2171 (1830.56 kg/ha).

Influence of weather parameters on insect pests of chickpea genotypes

Data presented in Table 2 predicted about the correlation of *H. armigera* with weather parameters. Larval population of *H. armigera* exhibited highly significant positive and significant positive correlation with maximum temperature and minimum temperature, respectively. Whereas relative humidity (morning) and relative humidity (evening) showed significant negative and highly significant negative correlation with *H. armigera*. The present findings are in confirmation with Rekha *et al.* (2025) who reported significant positive and significant negative correlation of *H. armigera* with temperature (max. & min.) and relative humidity (morning & evening), respectively. Sunshine hours showed non-significant positive, while wind speed and rainfall exhibited non-significant negative correlation with *H. armigera*.

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