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EVALUATION OF DIFFERENT CHICKPEA GENOTYPES AGAINST *HELICOVERPA ARMIGERA* (HUBNER) UNDER UNPROTECTED AND PROTECTED CONDITION

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ABSTRACT

The present investigation on “Evaluation of different chickpea genotypes against *Helicoverpa armigera* (Hubner) under unprotected and protected condition” was conducted in the experimental field of Livestock Farm, Adhartal, JNKVV, Jabalpur (M.P.) during *rabi* season 2010-11. Results revealed that, on the basis of larval population and pod damage, genotype RSG-963, ICCL-86111 and DCP-92-3 were identified as less susceptible against the pest which were at par with the resistant check ICC-37. Genotype CSJ-479, DCP-92-3 and GPF-2 recorded significantly higher grain yields *i.e.*, 1923.67, 1372.68 and 1356.47 kg/ha, respectively. Yield loss due to *H. armigera* ranged from 3.06 (ICC-3137) to 71.38 (PBG-5). Mean loss in grain yield due to damage across genotypes was 29.62%. As per the ‘maximin-minimax’ method five genotypes namely GPF-2, CSJ-479, ICC-37, DCP-92-3 and ICC-3137 were rated as susceptible high yielding *i.e.* tolerant to *H. armigera* and rest of the genotypes were rated as susceptible low yielding.

INTRODUCTION

Gram pod borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is one of the most serious insect pest of various crop in general and pulses in particular. *H. armigera* is known to be key pest due to high reproduction rates, a fast generation on turn over and wide genetic diversity occurs location (Kumar and Singh, 2014). In Madhya Pradesh, it is important pest of chickpea (*Cicer arietinum* Linn.) causing colossal losses every year to the chickpea producing farmers. Heavy dependence on chemical for the control of the pest has created lot of problems. Alternate crop protection methods are gaining interest in order to have a sustainable IPM package against *H. armigera* on chickpea. *H. armigera* is the most serious pest from November to March on chickpea crop. *H. armigera* causes high economic losses to the chickpea crop (Singh and Yadav, 2006; Sarwar *et al.*, 2009). Chickpea is the most preferred host of this species which suffers losses to the tune of 25-70% (Sharma, 2005).

The use of chemical insecticides has traditionally been the primary management option for *H. armigera* control on chickpea (Lateef, 1985). In recent years, however, the development of insecticide resistance in *H. armigera* and renewed emphasis on sustainable, environment friendly crop protection practices has highlighted the need to develop alternative pest management strategies.

The use of resistant genotypes is considered as simple, easy, cheap and ideal method of combating pest problem, from farmer’s point of view, this can be a most acceptable form of pest control technique. In the past, several workers and the scientists have made efforts to screen germplasm/genotypes to find resistant varieties. A common limitation is that most of the pest resistant varieties are not high yielding. Several chickpea genotypes with less susceptibility to *H. armigera* or the genotypes that have the capability to recover from its damage have been identified in the past (Dua *et al.*, 2005). Looking to the situation a field trial was carried out at Jabalpur with the objective to evaluate resistant/susceptible chickpea genotype/s against *H. armigera* for development of varieties in breeding programme under natural pest pressure condition

MATERIALS AND METHODS

The study was conducted in the experimental field of Livestock Farm, Adhartal, JNKVV, Jabalpur (M.P.) during *rabi* season 2010-11. Ten different chickpea genotypes were sown in two sets of experiment, one under unprotected and another under protected condition in a RBD with three replications. The test genotypes were L-550 (susceptible check), ICC-3137, DCP-92-3, ICC-37 (resistant check), ICCL-86111, CSJ-479, RSG-963, GPF-2, PBG-5 and CRIL-2-82. The row to row distance was kept at 60 cm and plot size maintained at 4 x 1.80m. Three sprayings of chlorpyrifos 20 EC @ 250g a.i./ha at vegetative, flowering and pod formation stages of crop were given in protected set of the experiment. Number of larvae were counted at vegetative, flowering and pod formation stages on 9 plants at random from each plot (3 plants/row/plot). Observations on total number of pods and damaged pod were recorded from 9 plants of each plot at harvest. Grain yields

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from each plot were recorded from both protected and unprotected plots and analyzed the data by 'maximin-minimax' method (Odulaja and Nokoe, 1993).

RESULTS AND DISCUSSION

The data presented in Table 1 on larval population of *H. armigera* recorded on different chickpea genotypes at vegetative, flowering and pod formation stages under unprotected condition revealed that no significant difference in larval population at vegetative and flowering stages *i.e.* 0.00 larvae/plant (DCP-92-3) to 0.18 larvae/plant (L-550) and 0.04 larvae/plant (ICCC/37) to 0.18 larvae/plant (L-550). The infestation was at par in all the genotypes at both the stages. Larval population at pod formation stage varied from 0.07 larvae/plant to 0.73 larvae/plant. Genotype RSG-963 recorded significantly the least larval population (0.07 larvae/plant) with genotypes ICCL-86111, DCP-92-3, ICC-37 and L-550 *i.e.* 0.18, 0.22, 0.33 and 0.37 larvae/plant, followed by genotypes CRIL-2-82 (0.44 larvae/plant) and ICC-3137 (0.48 larvae/plant). While maximum larval population observed in genotypes PBG-5, GPF-2 and CSJ-479 *i.e.* 0.51, 0.70 and 0.73 larvae/plant, which were at par with each other.

On the basis of overall mean larval populations recorded at three different stages of the crop, a significantly lowest larval population (0.08 larvae/plant) was observed in genotype RSG-963 followed by ICCL-86111, DCP-92-3 and ICC-37 *i.e.*

0.10, 0.11, 0.14 larvae/plant. While maximum larval population (0.22 to 0.29 larvae/plant) was recorded in genotypes PBG-5, L-550, ICC-3137, CRIL-2-82, GPF-2 and CSJ-479 which were at par with each other (Table 1).

Pod damage was higher in unprotected condition (5.23 per cent in DCP-92-3 to 22.45 % in CRIL-2-82) as compared to protected condition (0.91 % in ICCL-86111 to 6.26 % in L-550).

Under unprotected condition least pod damage was recorded in DCP-92-3, RSG-963, ICCL-86111 and GPF-2 *i.e.* 5.23, 7.68, 9.88 and 10.37 per cent, respectively, which were at par with the resistant check ICC-37 (11.43 per cent), and maximum pod damage recorded in ICC-3137, PBG-5, L-550, CSJ-479 and CRIL-2-82, *i.e.* 14.28, 17.53, 19.61, 21.90 and 22.45 per cent, respectively and they were at par with each other. In case of protected condition least pod damage was recorded in ICCL-86111, DCP-92-3, CSJ-479 and GPF-2 *i.e.* 0.91, 1.17, 1.57 and 1.62 per cent, respectively which were at par with resistant check ICC-37 (1.87 %). Maximum pod damage was recorded in RSG-963 and L-550 (4.80 & 6.26 %, respectively) (Table 2).

Under unprotected condition genotype CSJ-479, DCP-92-3 and GPF-2 recorded significantly higher grain yield *i.e.* 1923.67, 1372.68 and 1356.47 kg/ha, respectively which were at par followed by ICC-3137 (1097.23 kg/ha). While significantly lower yield was recorded from RSG-963, PBG-5, CRIL-2-82, L-550 and ICC-37 *i.e.* 192.29, 196.75, 238.88, 289.35 and 761.57 kg/ha, respectively and at par with each

Table 1: Screening of chickpea genotypes against *H. armigera* under unprotected condition

Genotypes	Larval population/plant at			Mean
	Vegetative stage	Flowering stage	Pod formation stage	
L-550 (SC)	0.18(0.83)	0.18(0.83)	0.37(0.93)	0.24(0.86)
ICC-3137	0.11(0.78)	0.15(0.80)	0.48(0.98)	0.24(0.86)
DCP-92-3	0.00(0.71)	0.15(0.80)	0.22(0.85)	0.11(0.78)
ICCC-37 (RC)	0.07(0.76)	0.04(0.73)	0.33(0.91)	0.14(0.80)
ICCL-86111	0.04(0.73)	0.11(0.78)	0.18(0.82)	0.10(0.77)
CSJ-479	0.07(0.75)	0.07(0.76)	0.73(1.11)	0.29(0.88)
RSG-963	0.07(0.76)	0.11(0.78)	0.07(0.76)	0.08(0.76)
GPF-2	0.11(0.78)	0.07(0.76)	0.70(1.09)	0.28(0.88)
PBG-5	0.07(0.76)	0.11(0.78)	0.51(1.01)	0.22(0.85)
CRIL-2-82	0.15(0.80)	0.15(0.80)	0.44(0.97)	0.24(0.85)
SEm +	0.03	0.04	0.06	0.02
CD at 5%	NS	NS	0.17	0.08

Figures in parentheses are square root transformed values, SC = Susceptible check, RC = Resistant check.

Table 2: Performance of chickpea genotypes against *H. armigera* under unprotected and protected condition.

Genotypes	Per cent pod damage		Grain yield (kg/ha)	
	Unprotected	Protected	Unprotected	Protected
L-550	19.61(26.21)	6.26(14.49)	289.35	456.01
ICC-3137	14.28(22.02)	3.48(10.77)	1097.23	1131.94
DCP-92-3	5.23(13.20)	1.17(6.09)	1372.68	1891.20
ICCC-37	11.43(19.40)	1.87(7.83)	761.57	1259.71
CCL-86111	9.88(17.95)	0.91(5.39)	372.68	638.88
CSJ-479	21.90(27.67)	1.57(7.21)	1923.67	2048.61
RSG-963	7.68(16.10)	4.80(12.65)	192.29	354.16
GPF-2	10.37(18.78)	1.62(7.58)	1356.47	1798.61
PBG-5	17.53(24.72)	2.85(9.66)	196.75	687.50
CRIL-2-82	22.45(28.06)	4.01(11.71)	238.88	372.68
SEm +	2.29	0.85	195.20	65.93
CD at 5%	6.79	2.52	579.96	196.73

Figures in parentheses are arc sin transformed values.

Table 3: Grain yield and yield loss in chickpea genotypes due to *H. armigera*.

Genotypes	Grain yield (kg/ha)		Yield loss(%)	Relative yield(%)	Relative yield loss(%)	Category
	Unprotected	Protected				
L-550	289.35	456.01	36.54	36.19	55.87	S-LY
ICC-3137	1097.23	1131.94	3.066	89.85	4.68	S-HY
DCP-92-3	1372.68	1891.20	27.41	150.12	41.91	S-HY
ICCC-37	761.57	1259.71	3.95	100	6.03	S-HY
I CCL-86111	372.68	638.88	41.66	50.71	63.60	S-LY
CSJ-479	1923.67	2048.61	6.09	162.62	9.31	S-HY
RSG-963	192.29	354.16	45.70	28.11	69.87	S-LY
GPF-2	1356.47	1798.61	24.58	142.77	37.58	S-HY
PBG-5	196.75	687.50	71.38	54.57	109.14	S-LY
CRIL-2-82	238.88	372.68	35.90	29.58	54.89	S-LY

S-HY = Susceptible high yielding, S-LY = Susceptible low yielding

other. In case of protected condition genotype CSJ-479 and DCP-92-3 recorded significantly higher grain yield (2048.61 and 1891.20 kg/ha), respectively followed by GPF-2 recording 1798.61 kg/ha. While, significantly lower grain yield was recorded from RSG-963, CRIL-2-82 and L-550 (354.16, 372.68 and 456.01 kg/ha, respectively) they were at par (Table 2).

The study revealed that yield loss due to *H. armigera* ranged from 3.06 (ICC-3137) to 71.38 (PBG-5). Mean loss in grain yield due to damage across genotypes was 29.62 %. As per the 'maximin-minimax' method five genotypes viz., GPF-2, CSJ-479, ICC-37, DCP-92-3 and ICC-3137 were rated as susceptible high yielding i.e. tolerant to pest and rest of the genotypes were rated as susceptible low yielding (Table 3). Lakshmi Narayanamma *et al.*, (2007) reported that 'maximin-minimax' approach involves a vital yield component and the entire insect-pest complex, to classify the genotypes into resistant groups. It was possible to identify genotypes with resistance/tolerance to a location specific pest complex and good yield potential.

Cultivars with tolerance mechanism of resistance have a great value in pest management as such cultivars prevent the evolution of new insect biotypes capable of feeding on resistant cultivars (Tingey, 1981). Lateef & Sachan (1990) suggested that some of the chickpea lines suffered considerably less borer damage than others due to tolerance to pod borer. This has necessitated that need for selecting genotypes with greater ability to tolerate or recover from the pod borer damage (Lateef, 1985).

The genotypes identified tolerant to *H. armigera* in the present study may be further utilized for development of varieties in breeding programme.

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