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Evaluation of Different Chickpea Genotypes for Resistance against Pod Borer, *Helicoverpa armiger* (Hub.) (Lepdoptera: Noctuidae) under Field Conditions, Sudan

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***Abstract* – Field trial was conducted at Hudeiba Research Station Farm, River Nile State, Sudan during the winter season 2013/014, to evaluate eighteen chickpea genotypes, including the eight released varieties and ten advanced genotypes provided by ICARDA, for resistance against pod borer (PB), *Helicoverpa armigera* and chickpea yield. Genotypes Atmore and Flip03-139c were recorded higher resistant against PB, than the Mattama, Hawata, Selwa, Wad Hamed, Jabel Marra, Flip03-127c and Flip04-9c, which were showed moderate resistant to pod borer. The cultivar Hawata gave the highest seed yield (1482 kg/ha) followed by Atmore (1276 kg/ha) and Shandi (1246 kg/ha).**

***Keywords* – Chickpea Genotypes, *Cicer Arietinum*, Pod Borer, Plant Resistant, *Helicoverpa armigera* (Hub).**

I. Introduction

Chickpea, *Cicer arietinum* L., is one of the major cool season food legumes grown in the Sudan [1]. It is valued for its nutritive seeds, with high, 25.3% -28.9% protein content [7]. According to [6] the world production was about 9, 313, 43 ton under area 11, 671 and 587 ha respectively. In Sudan the main production area is the Northern region, although, an expansion towards Central regions (Gezira) is taking place since the last few years and reach 60000 feddans in season 2005/06. The pod borer is reported as the main insect pest attacking chickpea in the Sudan, which its larvae feed on leaves and developing seeds [1].Estimate of yield losses by individual insect pests, diseases or weeds in tropical regions range between 50 and 100% [12]. Economics losses from direct yield reduction, cost of chemical application and scouting required for decision to control this pest are considerable [2]. PB has developed resistance against conventional insecticides as a result of their heavy use [3] and [8]. Development of resistance cultivars to this pest could provides an effective approach in integrated pest management (IPM) to minimize the yield losses [11]. Studies have been conducted by many workers on screening of chickpea varieties for resistance and tolerance [4]; [5]; [9]; and [10]. The objective of this study was to evaluate different chickpea genotypes against pod borer under field conditions.

II. Materials and Methods

The experiment was conducted at Hudeiba Research Station farm, River Nile State, Sudan during season 2013/014. Ten advanced chickpea genotypes provided by ICARDA of and eight released varieties (Table 1) were tested for resistance against pod borer (PB). The experiment was laid out in a randomized complete block design with three replicates. Seeds were sown on 20 November with a distance of 60 cm and 10 cm between rows and plants was maintained respectively. Each experimental plot consisted of four rows, each of 5 m length. All cultural practices as recommended by ARC were adopted under pesticides–free conditions. Weekly observations on pod borer larvae counts were recorded on randomly selected plants of one meter length from each row. At the harvest of the crop, pod damage was recorded in each plot after counting the total number of pods and pods damage by the pest from five randomly selected plants. Damage caused by CPB was calculated and converted into percent damage by using the following equation.

$$\text{Percent pod damage} = \frac{\text{Number of damaged pods}}{\text{Total number of pods}} \times 100$$

The crop was harvested, threshed and seed yield measured for plot, and then calculated as kg/ha. The data collected were statistically analyzed using analysis of variance (ANOVA) technique MSTAT-C software program and separation was done by Duncan's multiple range test (DMRT).

III. Results and Discussion

The tested genotypes of chickpea differed significantly ($P \leq 0.05$) in the number of larvae, percentage pod damage and seed yield (Table 1 and 2). High infestation with PB (number of larvae) on plants per meter row length before flowering stage was (1.8) on Flip03-110c and the lowest (0.8) on Flip04-10c. At flowering stage, larval population ranged from 0.7 to 1.4 larvae per meter row length on all genotypes tested. During the pod setting, at that time most of the pods were mature and PB larvae have non-significant effect on pod damage. Here it clear that none of the tested genotypes was completely resistant to pod borer infestation. In the general performance indicate that the

high larval infestation was recorded on Flip04-30c (1.5 larvae per meter row length) and the lowest (0.9 larvae per meter row length) on Flip04-1c and Wad Hamed. The high percentage of pod damage was recorded on Flip03-104c (7.o %) Followed by Flip04-30c (6.8%), Flip03-110c (6.3%), Flip04-10c (6.1%) and Flip03-102c (5.9%), and slightly lower damage on Mattama, (3.0%) followed by Hawata (3.1%), Selwa (3.1%), Wad Hamed (3.2%), Jabel Marra (3.3%), Flip03-127c (3.6%) and Flip04-9c(3.6%).Whereas, the lowest percentage of pod damage was recorded on Atmore (2.1%) followed by Flip03-139c (2.6%). Hawata gave the highest seed yield (1482 kg/ha) followed by Atmore (1276 kg/ha) and Shandi (1246 kg/ha), while the lowest yield was recorded with genotypes, Flip04-30c (22 kg/ha) followed by Flip03-107c (114.3 kg/ha), Flip03-110c (186.o kg/ha), Flip03-104 (213 kg/ha) and Flip03-102c (339.4 kg/ha).

IV. Conclusion

Based on the obtained results it can be concluded that the infestation by the PB and the percentage of pod damage were higher on genotypes, Flip03-104c, Flip04-30c, Flip03-110c, Flip04-10c and Flip03-102c than the slightly lower pod damage on Mattama, Hawata, Selwa, Wad Hamed, Jabel Marra, Flip03-127c and Flip04-9c and the lowest damage was recorded on Atmore and Flip03-139c. High and moderate resistant had shown by genotypes in our study represent a valuable source of resistance to the PB. Therefore, it is suggested that those genotypes could be exploited by development of resistant germplasms by using them in hybridization.

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Table 1: Mean number of Pod borer larvae and general performance on different chickpea genotypes at Hudeiba, Sudan, season 2013/014.

Genotype	Pod borer larval population			General performance
	Before flowering	At flowering	At pod set	
Flip03-139c	0.9 (0.3) ab	(1.0) abcd	1.1 (1.0)	(1.0) ab
Flip04-30c	1.7 (2.3) cd	(1.4) d	1.5 (1.8)	(1.5) c
Flip03-102c	1.1 (0.7) abc	(1.2) bcd	1.5 (1.8)	(1.3) bc
Flip03-127c	1.3 (1.3) abcd	(1.3) cd	1.2 (1.0)	(1.3) bc
Flip04-9c	1.0 (0.5) ab	(0.9) abc	1.4 (1.5)	(1.1) ab
Flip03-104c	1.2 (1.0) abcd	(1.4) d	1.4 (1.5)	(1.3) bc
Flip03-107c	1.3 (1.2) abcd	(1.1) bcd	1.1 (0.8)	(1.2) abc
Flip03-110c	1.8 (3.0) d	(0.7) a	1.1 (0.8)	(1.3) bc
Flip04-1c	1.0 (0.5) ab	(1.2) bcd	1.1 (0.8)	(0.9) a
Flip04-10c	0.8 (0.3) a	(1.1) abcd	1.3 (1.3)	(1.1) ab
Atmore	1.3 (1.5) abcd	(1.3) cd	1.3 (1.3)	(1.2) abc
Shandi	0.9 (0.5) ab	(1.3) cd	1.1 (0.8)	(1.1) ab
Jabel Marra	1.2 (0.8) abc	(0.9) abc	1.1 (0.8)	(1.1) ab
Hawata	1.2 (0.8) abc	(0.9) abc	1.4 (1.5)	(1.2) abc
Burgaig	1.5 (1.8) bcd	(0.8) ab	0.9 (0.3)	(1.1) ab
Mattama	1.3 (1.3) abcd	(1.0) abcd	1.1 (0.8)	(1.1) ab
Salwa	1.2 (1.0) abcd	(0.8) ab	1.0 (0.5)	(1.0) ab
Wad Hamed	0.9 (0.3) ab	(0.9) abc	1.0 (0.5)	(0.9) a
SE±	0.1786*	0.1234**	0.179 n.s	0.115*
C.V%	25.9	20.2	25.9	17.3

Actual data between bracts
Transformed data √x+0.5
Means followed by the same letter are not significantly different at 5%and 1% level respectively.
n.s = not significant.

Table 2: Percentage of pods damage and seed yield on different chickpea genotypes at Hudeiba, Sudan, season 2013/014

Genotype	% pods damage	Seed yield (kg/ha)
Flip03-139c	2.6 a	508.5 de
Flip04-30c	6.8 e	22.6 h
Flip03-102c	5.9 de	339.4 efg
Flip03-127c	3.6 ab	696.4 cd
Flip04-9c	3.6 ab	738.2 c
Flip03-104c	7.0 e	213.7 fgh
Flip03-107c	5.6 cde	114.3 h
Flip03-110c	6.3 de	186.0 gh
Flip04-1c	4.8 bcd	356.8 efg
Flip04-10c	6.1 de	397.2 ef
Atmore	2.1 a	1276.0 b
Shandi	5.5 cde	1246.0 b
Jabel Marra	3.3 ab	780.1 c
Hawata	3.1 ab	1482.0 a
Burgaig	4.0 abc	867.1 c
Mattama	3.0 ab	824.5 c
Salwa	3.1 ab	381.1 efg
Wad Hamed	3.2 ab	516.8 de
SE±	0.987**	64.19**
C.V%	22.5	18.3

Means followed by the same letter are not significantly different at 1% level