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Vulnerability of some chickpea and lentil varieties to *Callosobruchus maculatus* infestation

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ABSTRACT

Legumes such as chickpea and lentil play an important role as rich food for many people since it constitutes 20-30% protein and 58% carbohydrate. The susceptibility of four chickpea and three lentil varieties to *Callosobruchus maculatus* (F.) infestations were evaluated in the laboratory at 28±1°C, and 65-75% R.H. Many insect biological parameters were studied as eggs number, mean developmental period (MDP), adult progeny, susceptibility index (SI), seed damage percentage, weight loss percentage and germination percentage. Chickpea and lentil varieties showed non-significant differences for MDP and SI to insect infestation. All chickpea seed varieties were susceptible more than lentil seed varieties. Giza 1 variety was the least susceptible in chickpea varieties while Giza 29 was least susceptible one in lentil varieties. Our results showed that insect infestation for chickpea varieties were more than lentil seed varieties infestation. Chemical analysis of the main seed components of the tested different varieties suggest that the susceptibility of these varieties to *C. maculatus* infestation may be attributed to the high content of carbohydrate and low content of crude fiber in chickpea varieties more than lentil varieties compared to resistance varieties.

Keywords: Vulnerability, Chickpea, Lentils, *C. maculates,* Insect infestation, chemical analysis

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is a pulse crops, widely grown in India and plays an important role in the nutritional security of many millions of people. It is a good source of protein, energy, minerals, vitamins, and fibers. During 2020-2021, a total of 1.238 tons of chickpea was produced in Egypt from an area of 768 feddens (Economic Affairs Sector, Egypt, 2020/2021). Although it is known that chickpea yield has been steadily increasing globally taking the benefits of more higher yielding varieties characterized by improved insect resistance and adaptation to environment, the total harvest and postharvest losses in chickpea in India were estimated at 8.41% including 1.18% in storage alone which is mainly caused by insect pests (Swamy *et al.,* 2020). The lentil crop second place in the group of legumes after beans in of nutritional importance, as its consumption is widespread among most of the population of Egypt. In addition, it is considered one of the crops most suitable for current environmental conditions due to its low water and fertilizer needs compared to other crops (Mohammed and Hanna, 2023). Lentil is one of the most nutritious leguminous crops due to relatively higher protein content (22-35%), carbohydrates, fibers, and calories than other legumes; it is a rich source of iron, phosphorus, calcium, zinc, carotene. vitamin B, lysine and tryptophan (Sharma and Muniappan 2021; Padhy *et al.,* 2025).

Primary post-harvest insects of concern which develop as a results of moisture content and time stored grains are an ideal food source for stored product insect pests, providing the essential elements required for continued growth and development for insect pests (Maier *et al.,* 1997). The levels of carbohydrate, proteins, lipids and vitamins required varies with species concerned (Mason *et al.*, 1997). In addition, (Batta *et al*., 2007) suggests that resistance of wheat varieties can be attributed to the low protein and high in carbohydrates compared to susceptible varieties. Among the insects of seed legumes during storage or after harvest *Callosobruchus* spp. (Chrysomelidae: Bruchinae: Coleoptera) which a very serious pest both in the field and in storage and causes huge economic losses in stored chickpeas (Swamy *et al.,* 2020), reached about 100% and render the grain unsuitable as food or seed within 4-6 months (Chaithanya *et al.,* 2023). There are many accessions which exhibit range of physical and chemical components such as texture, seed color, seed size, hardness and chemical constituents. These defenses are the result of long-term natural selection and morphological features either produce physical stimuli or inhibit insect activity, (Faizan *et al.,* 2023). Hardness has been determined as a primary factor responsible for resistance in seeds against different types of storage insect. Infestation stored grain by *Sitophilus zemaize*s during storage have reduced nutritional values, low percent germination, reduced weight and market value (Demissie *et al.,* 2008). The present study was to evaluate the vulnerability of four chickpea varieties and three lentil varieties to infestation by *C. maculates* under laboratory conditions

MATERIAL AND METHODS

1. Test insect:

The tested insect, *C. maculatus* was reared on commercial chickpea seeds at 28°C and 65- 75% RH within incubator at the Stored Grain Insect Pests Department, Plant Protection Research Institute (PPRI), ARC, Egypt. Adult beetles were reared in large glass jars half-filled with seeds and covered with double cloth layer and firmly tightened with rubber bands to prevent the beetles escape. Jars were kept at the previous conditions for adult mating and oviposition. Adult parents were removed after seven days. The newly emerged adults started to emerge after three weeks and were used for the experimental purposes.

2. Source of chickpea and lentil varieties:

Total four chickpea seed varieties (Giza 1, Giza 3, Giza 4 and Giza 531) and three lentil varieties (Giza 9, Giza 51 and Giza 29) were obtained from the Field Crops Research Institute, (ARC). Seeds of each variety were washed with tape water and dried under a shade for a week, at room conditions and were sterilized by freezing at -20°C for two weeks for eliminating any hidden insects.

3. Susceptibility of selected varieties to *C. maculatus:*

Five replicates of each chickpea and lentil variety were made. Each contained twenty- five grams as weigh of chickpea seeds, while, in case of lentil seeds, ten grams of seeds put in a small glass jar of 7×3 cm diameter. Each replicate was infested with two pairs of newly emerged adults of *C. maculatus* and the jars were incubated at 28±1˚C, 65-75% RH. The adults were left to oviposit for three days only, and then removed. The chickpea and lentil were examined for oviposition by counting the total egg numbers. The replicates left a further three weeks and inspected for recording of the first adult emergence, progeny number, weight loss percentage and calculate the susceptibility index (SI). The latter was calculated according to (Dobie, 1974) as follows:-

$$SI = \frac{\text{Log } F_1}{D} \times 100$$

Whereas: F_1 = Total number of emerged adults and D = mean developmental period for eggs, larvae and pupae. The obtained values of susceptibility index (SI) were ranked into five ranks according to (Mensah, 1986) as follows:

A: The values between 0.0– 2.5 were considered resistant (R).
B: Those between 2.6– 5.0 were considered moderately resistant (MR).
C: The SI values between 5.1– 7.5 were considered moderately susceptible (MS).
D: The values between (7.6– 10.0) were susceptible (S).
E: Those > 10.0 were considered highly susceptible (HS).

The percent seed damaged was obtained by dividing number of damage seeds on the total number of seeds.

Seeds damaged percentage was calculated according to the method of (Odeyemi and Daramola, 2000) as follows equations:

$$\text{Seeds damage (\%)} = \frac{\text{Number of bored seeds}}{\text{Total seed number}} \times 100$$

Weight loss percentage was also calculated described by **(Bains *et al.,* 1976)** as follow:-

$$\text{Weight loss (\%)} = \frac{\text{Initial weight- final weight}}{\text{Initial weight}} \times 100$$

4. Physical characteristics of the tested chickpea and lentil seed varieties:

4.1. Seed Colour:

The color of the different seed varieties was determined by visual examination of mature intact seeds as described by (Khare and Johari, 1984).

4.2. Texture:

The external surface of the tested seeds was examined, whether it is smooth, rough, or wrinkled as described by (Khare and Johari, 1984).

4.3. Hundred seeds weight (gm):

Three replicates of one hundred seeds of each variety were weighed on an analytical digital balance. The mean grain weight (g) of each variety was calculated.

4.4. Seed size:

The seed size was also obtained by dividing the total weight of ten randomly selected seeds by ten.

4.5. Seed diameter:

Seed diameter calculated as the mean of measurements taken from three positions (the middle and two different ends of the seed) using a venire caliper.

5. Chemical components of the tested chickpea and lentil seeds:

The main chemical components of chickpea and lentil seeds were investigated using common analytical methods, at Biochemistry Departmental in Faculty of Agriculture, AL-Azhar University. The percentages of protein, fat, carbohydrate, moisture content, fiber and ash in untreated seeds were estimated according to (Nira, 2013). The previous chemical components were measured and analyzes in the 750-2500nm wavelength rang using a near-infrared (NIR) spectroscope (model DA1650-FOSS Corporation – Denmark.

6. Seed germination percentage:

Seeds germination of chickpea and lentil seeds were tested at the end of the experiment. Four replicates, each replicate contain twenty- five of seeds selected of each varieties. The seeds were planted in 9-cm diameter Petri dishes on moistened cotton pads under laboratory conditions. A control of chickpea and lentil seeds were also done for comparison. After one week, number of the germinated seeds was recorded and the germination percentage was calculated as (Ileke *et al.,* 2013):

$$\text{Seed germination (\%)} = \frac{\text{No. of the germinated seeds}}{\text{Total seed number}} \times 100$$

7. Data analysis:

Data obtained from this experiment were subjected to one way analysis of variance (ANOVA) and significant differences between means were separated by the least significant difference LSD at 5% level of probability (Gomez and Gomez, 1984).

RESULTS

The results showed that all tested chickpea varieties were susceptible to *C. maculatus* infestation (Table 1). Significant differences were obtained among the varieties in respect to total mean deposited eggs number, adult progeny, seed damage (percentage) and weight loss (percentage). The highest eggs number was on Giza 3 variety (106.0 eggs) while the lowest (66.0 eggs) on Giza1 variety. Progeny number of *C. maculatus* was low in Giza1variety (41.0 adults) compared to the highest progeny (84.0) adults in Giza 3 variety. All tested varieties were susceptible to the infestation with without significant differences. Seed damage percentage in Giza 1 variety reached 52.3 %; while on Giza3variety increased to 68.9%. Weight loss percentage was 23.1% in Giza 1 variety, while it was 37.3% in Giza 3 variety.

Table 1. Growth and damage of *C. maculatus* on chickpea seed varieties**.**

Test varieties	Mean eggs No.±SE	Progeny (No) ± SE	MDP (days)± SE	Susceptibility Index (SI)± SE	Seed damage (%)± SE	Weight loss (%) ± SE
Giza 1	66.0±16.8b	41.0 ± 9.0b	21.0 ±0.6	7.6 ± 0.6 (S)	52.3±1.5b	23.1±1.7b
Giza 3	106.0±11.0a	84.0± 15.1a	21.3± 0.4	9.0±0.6 (S)	68.9± 2.9a	37.3±2.4a
Giza 4	72.0±3.6ab	62.0±6.9ab	22.0±0.0	8.1± 0.2 (S)	63.4±1.6a	29.0±2.9b
Giza 531	80.0± 9.5ab	64.0± 9.7ab	21.5±0.3	8.4 ± 0.4 (S)	62.7±5.1a	26.3±1.7b
F	2.69	3.49	1.04	1.45	5.14	7.04
LSD (0.05)	33.2	30.3	1.3	1.4	9.4	7.4
P value	0.01	0.05	0.41	0.28	0.02	0.01

SE= Standard error, MDP= mean developmental period (days) for eggs, larvae and pupae, S = susceptible, Different letters at each column were significantly different

Data in (Table 2) data concerning the studied biological parameters of *C. maculatus* such as egg numbers, mean developmental period, emerged adults, susceptibility index, seed damages and weight loss on three lentil seed varieties. The obtained results showed significant differences between the tested varieties in the progeny number and weight loss percentage. Mean eggs number on all lentil varieties ranged between 38.0 – 54.0 eggs. The lowest progeny number (8.0 adults) was in Giza29, while the highest progeny number was (21.0 adults) the in Giza 51 variety. The MDP values (days) was similar in all varieties it ranged between 28 to 31 days. The SI values were 3.0, 4.7 and 3.9 for Giza 29, Giza 51 and Giza 9, respectively. The highest percentage of weight loss was 14.4 % in Giza 51 and the lowest value (3.0%) was obtained in Giza 29 variety

Table 2. Growth and damage of *C. maculatus* on lentil seed varieties.

Test varieties	Mean eggs No.±SE	Progeny (No) ± SE	MDP (days)± SE	Susceptibility Index (SI)± SE	Seed damage (%)± SE	Weight loss (%) ± SE
Giza 9	53.0±17.1	14.0± 2.6ab	29.0± 2.4	3.9± 0.7 (MR)	12.4± 0.5	13.5± 0.8a
Giza 51	38.0±4.1	21.0±2.4a	28.0±1.3	4.7± 0.6 (MR)	16.9 ±1.2	14.4±0.8a
Giza 29	54.0±12.4	8.0±0.8b	31.0±1.3	3.0± 0. 9 (MR	9.3±2.9	9.9 ± 0.0b
F	73.0	4.33	0.80	1.53	3.60	7.62
P value	0.51	0.05	0.47	0.27	0.12	0.03
LSD (0.05)	37.6	9.9	4.4	2.0	10.1	2.9

MDP = mean developmental period (days), MR=moderately resistant, Different letters at each column were significantly different.

Data in (Table 3) revealed that the highest mean weight of 100-seeds (g) of chickpea varieties 25.7 (g) was obtained in Giza 531, while, the lowest weight was observed in Giza 3 seed variety. No significant differences were found between chickpea varieties in seed size (mm) and seed diameter. In the case of lentil varieties stated that there are significant differences between mean weight of 100-seed and seed size while showed seed diameter non- significant between tested lentil varieties.

Table 3. Mean number of physical characters of different chickpea and lentil seed varieties.

Seed varieties		Mean weight of 100-seed(g)± SE	Seed size (mm)± SE	Seed diameter± SE	Seed texture	Seed Color
Chickpea	**Giza1**	21.8±0.1b	1.6±0.2	6.77± 0.0	smooth	Light brown
	Giza3	24.7±0.8a	1.5± 0.0	7.04±0.1	smooth	Light brown
	Giza4	23.5±0.7ab	1.6±0.1	6.59±0.3	smooth	Light brown
	Giza 531	25.7±1.2a	1.1± 0.1	6.04±0.4	smooth	Light brown
	F	7.1	2.01	2.49	-	-
	P value	0.01	0.17	0.13	-	-
	LSD (0.05)	2.3	0.57	0.86	-	-
Lentil	**Giza9**	2.2±0.1b	0.4±0.0a	2.67±0.4	smooth	Brown
	Giza51	2.4±0.0a	0.3±0.0ab	2.09±0.0	smooth	Brown
	Giza 29	1.8±0.0c	0.2±0.1b	2.19±0.1	smooth	Brown
	F	19.17	9.58	1.24	-	-
	P value	0.001	0.01	0.35	-	-
	LSD (0.05)	0.2	0.1	0.95		-

Different letters at each column were significantly different.

Data obtained in the (Table 4) showed that, no clear results was found between chemical characteristic and susceptibility of different varieties of chickpea to test insect, thus, on the basis of susceptibility index. The results showed that the highest total protein percent recorded in Giza 4 variety (23.3 %) and the lowest was 21.9 % in Giza 1 variety with significant differences. Fat percent, moisture content percent and crude fiber percent no significant differences in the tested chickpea varieties. Whereas, the total carbohydrates percent showed a significant difference in the tested chickpea varieties, the highest recorded in Giza 1 variety (59.4%) and the lowest amounts in Giza 4 to 58.1%.

In case of lentil, the data showed significant differences between varieties in all chemical components except moisture content percent and crude fiber percent. The results showed that the highest total protein percentage was 25.5 and 25.1 % in Giza 9 variety and Giza 29 variety, respectively. Fat percent was highly in Giza 51 variety (1.6%) and reached to 0.7% in Giza 29 variety. Whereas, the total carbohydrates percent showed a significant difference in the tested lentil varieties the highest recorded in Giza 29 variety (56.1 %) and reduced in Giza 9 and Giza 51 to 53.7 and 53.5%, respectively. In general, each varieties had its own effect on egg laying where, total carbohydrate, total protein, total lipids and moisture content as chemical characters did not provide change or reduce ovipositional.

Table 4. Chemical components of chickpea and lentil seed varieties.

Seed varieties		Total Proteins (%) ± SE	Fat (%) ± SE	Moisture Content (%)± SE	Total carbohydrates (%) ± SE	Crude Fiber (%) ± SE	Ash (%) ± SE
Chickpea	**Giza1**	0.3c±21.8	4.9±0.4	9.2±0.1	59.4±0.5a	0.0±2.7	1.6±0.1b
	Giza3	0.6b±22.4	4.7±0.0	9.4±0.1	59.1±0.1b	2.5±0.4	1.7±0.2b
	Giza4	23.2 ±1.2a	4.5±0.1	8.9±0.2	58.7±1.6b	2.8±0.1	1.4±0.0b
	Giza 531	22.7 ±1.4b	4.9±0.7	8.6±1.2	58.1±0.3c	2.6± 0.2	2.9±0.1a
	F	21.03	3.67	4.82	48.67	0.73	36.8
	P value	0.001	0.12	0.08	0.001	0.44	0.002
	LSD (0.05)	0.500	0.39	0.51	0.3	0.76	0.3
Lentil	**Giza9**	25.5±1.6a	0.9±0.1b	9.7±1.2	53.7±4.6b	4.9±0.2	5.7±07a
	Giza51	23.3±1.2b	1.6±1.2a	9.6±1.5	53.5 ±5.9b	5.5±1.3	4.2±1.1b
	Giza 29	25.1±0.6a	0.7±0.3b	9.4±1.1	56.1±9.4a	4.6±0.6	3.8±2.2b
	F	27.47	9.93	3.17	104.52	7.88	60.20
	P value	0.01	0.04	0.18	0.01	0.06	0.001
	LSD (0.05)	1.1	0.6	0.63	0.64	0.73	0.58

Data of (Table 5) showed the seed germination percent of the chickpea and lentil varieties after artificial infestation by *C. maculatus*. Chickpea germination percent was 68.5% in Giza 531 variety after one month of infestation compared to the control (90.0 %), while in Giza 4 variety, it reached to 70.1% with no significant differences among varieties. The germination percent of lentil seed varieties showed an intermediate values and it was higher (65.3%) in Giza 9 variety compared to the control (74.3%), while germination percent in Giza 51 and Giza 29 variety was 50.7 and 52.2, respectively.

Table 5. Seed germination percentage of chickpea and lentil varieties when infested by *C. maculatus* after one months.

% germination after month of infestation			
	Varieties	**(Control)**	**Infested varieties**
Chickpea	**Giza1**	90.0±0.0	72.2±4.1
	Giza3	90.0±0.0	70.3±2.0
	Giza4	83.5±2.0	70.1±6.1
	Giza 531	90.0±0.0	68.5± 4.9
	F	1.00	0.06
	P value	0.47	0.97
	LSD (0.05)	12.66	23.55
Lentil	**Giza9**	74.3±2.3	65.3±2.7a
	Giza51	72.1±1.2	50.7±4.1b
	Giza 29	80.8±3.1	52.2±6.2b
	F	0.51	13.2
	P value	0.64	0.03
	LSD (0.05)	28.22	9.9

DISCUSSION

Insect pests infest and destroy about 5 – 15 % of all stored grains and seeds while they are in storage in silos, in warehouse or farms. The losses consist of lowered weight and food value, heating of grains, mould spoilage and low germination of seed. The use of insecticides or fumigants against stored product insects is not promised due to undesirable residues. Therefore, it is necessary to look for varieties that are resistant to insect infestation. Gene based resistance is one of the most satisfactory and sustainable methods of pest control, particularly as a basic element in integrated pest management approach (Nalini *et al.*, 2012). Different authors reported studies on susceptibility or resistance of chickpea and lentil varieties to *C. maculatus* around the world (Gopala, 2019; Jaba *et al.,* 2020; Falke *et al.,* 2021; Kavitha and Maheswari, 2021; Faizan *et al.,* 2023). In our experiments we found considerable variation among the chickpea and lentil varieties. The results showed that insect infestation for chickpea varieties were more than lentil seed varieties infestation, where chickpea varieties produced more progeny than lentil varieties, therefore, it is suitable for the growth of *C. maculatus* than lentil varieties. This due to found physical factors such seed size and seed surface which either smooth and wrinkle or nutritional factors such lipid, total carbohydrates and protein needed for the immature stages to complete its life cycle. The results of chemical analysis of the main seed components of the different varieties explain that the susceptibility of these varieties to *C. maculatus* infestation may be attributed to the high content of carbohydrate and low content of crude fiber in chickpea varieties more than lentil varieties compared to resistance varieties. Likewise, (Mason *et al.*, 1997) note that primary post-harvest insects of concern which develop as a results of moisture content and time stored grains are an ideal food source for stored product insect pests, providing the essential elements required for continued growth and development (Maier *et al.*, 1997).

The levels of carbohydrate, proteins, lipids and vitamins required varies with species concerned. Also, (Batta *et al.,* 2007) suggests that resistance of wheat varieties can be attributed to the low protein and high in carbohydrates compared to susceptible varieties. Our results demonstrated there are no clearly relation between seed characters of chickpea and lentil varieties and biological parameters of *C. maculatus*. The non-free choice oviposition preference and survival of *Callosobruchus* Spp on chickpea are depending on certain physical factors as seed texture seed hardness and size as mentioned by (Samyuktha *et al.,* 2020; Sathish *et al.,* 2020). The rough or wrinkled seeds, hairiness and thick seed coat might be the main factors responsible for the seed resistant once to bruchids insect attack. The varieties of chickpea which smaller seed size are completely resistant or immune to the *C. maculates* under free and non- free choice condition, while these smooth surface and boldness size were more preferred for oviposition (Erler *et al.,* 2009). Several reports indicated that the influence physical characteristics such as size and shape of the seed, seed hardness and seed coat differences associated with different legume seeds influence the level of resistance to bruchids infestation (Eker *et al.*, 2018; Swamy *et al.,* 2020; Falke *et al.,* 2021). The chickpea seeds with smooth, soft, thin seed coat, light color and bigger seed size supported higher emergence of adult beetles (Gopola *et al.,* 2019). The seed characteristics such as seed hardness, small size, absence of essential nutritional factors, and presence of toxic substances, may affect bruchid damage to legume seeds (Jaba *et al.,* 2020).

We found that studies on the seed characters no relationship between susceptibility index except seed size, small seed size of lentil may be for resistance and gave fewer progeny its caused of SI was low, while those of chickpea which seeds with larger seed size give more progeny and higher SI. Jaba *et al.,* (2020) reported that many studies especially rough (wrinkled), hairyness and thick seed coat might be responsible for resistance and the varieties with smaller seed size of chickpea are completely resistant or immune to the test *C. chinensis* species under free and non- free choice the other test genotypes. Swamy *et al.,* (2020) the found that the higher oviposition, adult emergence and grain damage were found to have thin seed coat and larger seed size and the weight of the grains showed significant positive correlation to adult emergence and grain damage while seed coat thickness showed the negative correlation. Dobie, (1974) reported that resistance in stored maize to insect attack has been attributed to physical factors such as grain hardness, pericarp surface texture, nutritional factors such as amylase, lipid and protein content. Our results stated that significant reduction in tested seed germination after one month of infestation.

The germination percentage of infestation seed caused by *C. maculatus* were decreased after 30 days of the infestation, where germination percentage in different pulses suffer serious damage of up to 54-77.0% (Kavitha and Maheswari, 2021). The reason for the significant reduction in percent germination after 30 days in chickpea varieties due to the insect infestation. The biochemical analyses showed significant variations in the contents of total carbohydrates, proteins among the tested chickpea varieties.

CONCLUSION

All chickpea seed varieties were susceptible more than lentil seed varieties. Giza1 variety was the least susceptible in chickpea varieties while Giza 29 was least susceptible one in lentil varieties. Considerable variation were found among the chickpea and lentil varieties. The insect infestation of chickpea varieties were more than lentil seed varieties, therefore, the lentil varieties can be stored for longer storage periods than chickpea varieties without *C. maculatus* infestation. Chemical analysis of the main seed components of the tested different varieties showed a high carbohydrate content and low content of crude fiber in chickpea varieties more than lentil varieties.

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قابلية بعض أصناف بذور الحمص والعدس للإصابة الحشرية بحشرة خنفساء اللوبيا

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تلعب البقوليات مثل الحمص والعدس دورا مهما كغذاء غنى للعديد من الأشخاص لاحتوائها على نسبة بروتين مرتفعة (28%) ونسبة كربوهيدرات تصل إلى 58%. تم في هذا البحث دراسة قابلية أربع أصناف من الحمص وثلاث أصناف من العدس للإصابة بحشرة خنفساء اللوبيا *Callosobruchus maculatus* في المعمل عند درجة حرارة 28 ± 1 درجة مئوية ورطوبة نسبية 65- 75%. تم دراسة بعض المتغيرات البيولوجية كعدد البيض الكلى وفترة النمو وعدد الكلى للحشرات الكاملة الخارجة وقيمة دليل الحساسية ونسبة الفاقد في الوزن ونسبة الضرر بجانب حساب نسبة الإنبات بعد انتهاء الإصابة الحشرية لمعرفة تأثير هذه الإصابة على حيوية الجنين مقارنة بالكنترول.

أظهرت نتائج هذا البحث أن المعايير السابق ذكرها زادت بعد شهر من الإصابة وأن جميع أصناف الحمص كانت أكثر حساسية للإصابة بالحشرة عن أصناف العدس التي كانت مقاومة نسبياً مع عدم وجود اختلافات معنوية بين أصناف بذور الحمص والعدس في متوسط فترة النمو ودليل الحساسية للإصابة بالحشرات. كان الصنف جيزة 1 هو الأقل تأثراً في أصناف الحمص بينما كان الصنف جيزة 29 هو الأقل حساسية في أصناف العدس. وهذا ربما بسبب حجم البذرة والعوامل الغذائية مثل البروتين والدهون الكربوهيدرات اللازمة لنمو الأطوار الغير كاملة في الحشرات.

وأظهرت النتائج أيضا أنه لا يوجد علاقة معنوية بين الصفات الفيزيائية للأصناف الحمص والعدس المختبرة وبين بعض المتغيرات البيولوجية لحشرة خنفساء اللوبيا كحجم البذرة مع دليل الحساسية وعدد البيض الكلى وفترة النمو في حين كان الاختلاف معنويا بين حجم البذرة وعدد الحشرات الخارجة ونسبة الفاقد في الوزن.

الكلمات الافتتاحية : قابلية الإصابة ، الحمص ، العدس ، خنفساء اللوبيا ، الإصابة الحشرية ، التحليل الكيماوي