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BIORESIDUAL ACTIVITY OF CERTAIN OILS ON THE COWPEA BEETLE *Callosobruchus maculatus* (F.) IN RELATION WITH QUALITY OF MUNGBEAN SEEDS AND DEVELOPMENT OF THE BEETLE ON SOME MUNGBEAN VARIETIES

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ABSTRACT

This study was conducted in 2005 and 2006 seasons at the Economic Entomology Department, Faculty of Agriculture, Kafr El-Sheikh University to find materials that effectively protects stored produce that are readily available, affordable, relatively less poisonous and less detrimental to the environment.

Seeds of the four mungbean *Vigna radiata* Wilczek varieties (seeds), UTT, Giza-1, Kawmy-1, KPS2 were tested as hosts of bruchid beetle, *Callosobruchus maculatus* (F) in the laboratory under controlling conditions of 28 $\pm$ 2 C and 65 $\pm$ 5% R.H. The obtained results revealed that mungbean seeds Giza-1 variety were more sensitive to be attacked by *C. maculatus* than Kawmy-1, UTT and KPS2 varieties, the tested mungbean varieties had a significant effect on the developmental period and total individuals production per female, it was 28.7, 30.61, 35.11 and 37.26 days for developmental period and total individuals production per female 48.0, 42.3, 37.4 and 30.0 individuals for Giza-1, UTT, KPS2 and Kawmy-1, respectively.

Bioresidual activity of the five oils (cotton, castor, soybean, corn and apricot kernel) was evaluated against *C. maculatus* the major stored produce insects in relation to seeds viability under laboratory conditions at 28ºC $\pm$ 2 and 65% $\pm$ 5 R.H.

When infested seeds were treated with oils, it was found that oils were effectively only in case of seeds having the earlier stages of eggs.

Significantly lower numbers of progeny were observed in all treatments when compared with control. There was high significant reduction in weight loss caused by *C. maculatus* in mungbean seeds in control when compared with oils at all levels in all treatments.

Generally, it could be stated that oils used gave moderately protection to the mungbean seeds at 6 months after-treatment.

Seed weight losses and seed infestations were positively correlated with the number of progeny at all times of study.

Germination of mungbean seed was significantly decreased by all tested oils in the initial and at the end of storage period, oils with various concentrations had significant effect on germination speed and mean germination time indices. Generally, increasing oil concentration delayed seed germination and increased the time required for complete seed germination.

Radical and shoot length and seedling dry weight of tested seeds was significantly varied among protectants on the different applied concentrations of tested oils.

So, it could be stated that the applied rates of the used protectants, plant oils could be recommended especially if these seeds would be used also for human. However, it is suggested to resume more tests on the safe recommended dose of the used materials to get healthy seeds and apricot (*Prunus armeniaca* L.) kernels could be used as a source of oils as protectants against *C. maculatus*.

INTRODUCTION

The mungbean is an important pull crop in Egypt. In storage, the seeds are liable to attack by several insect pests, the most important of which is the Cowpea beetle, *Callosobrichus maculatus* (F.). These seeds are rich in protein content and are considered source of protein for human and animal nutrition (Ahmad, 1999, Abbass, 2000 and Ujalir and Chaudhary, 2000).

Genus *Callosobruchus* involves the largest number of pest species which cause the greatest damage to many economically important legume seeds. *C. maculatus* is considered cosmopolitan pest which attacks pulses in stores and cause serious damage (Yang *et al.,* 1995; Weigen, 1999 and Youssef and Kassab, 2002).

In recent years, attention has been given to the control of storage pests by the use of different oils as protectants, including vegetable oils, (Mookherjee, 1971; Su *et al.,* 1972; Hill, 1978; Schoonhoven, 1978; Singh *et al.,* 1978 and Golob and Welbley, 1980).

The present study aimed to evaluate the ability of the bruchid beetles to infest and develop on the seeds of some mungbean varieties in order to find out the most favorable host seeds and study the initial efficiency of oils as seed protectants as well as their residual effects after different storage periods as well as their effects on germination ratio, seedling vigour and the possible utilization of apricot kernels as a source of oils as seed protectants against *C. maculatus*.

MATERIAL AND METHODS

This study was carried out in the Economic Entomology Department, Faculty of Agriculture, Kafr El-Sheikh university, during 2005 and 2006 seasons..

The seeds of mungbean, were obtained from Agriculture Research Center at Giza. Seeds were frozen at -20ºC for 48 hrs to kill previous infestations then kept under laboratory conditions for 3 weeks in order to reduce their moisture content to the normal rate. *C. maculatus* was reared in the laboratory for several generations on mungbean seeds (Kawmy-1, KPS2, UTT and Giza-1 varieties) under laboratory, conditions of 28 + 2ºC and 65 ± 5% relative humidity.

1. Effect of tested seeds on the development of the beetle:

Evaluation of infestation with *C. maculatus* was conducted by putting 30 gr. seeds/petri-dish (replication) of each variety of mungbean seed (four times) and five pairs of newly emerged adults were released in each dish, then kept under experimental conditions. After 7 days when the majority of eggs were laid, seeds were examined and the number of eggs laid was counted. Hatched eggs, penetrated larvae, duration of development from egg oviposition to adult emergence, number of emerged adults, weight of adults and sex ratio were estimated. The percentage of adult emergence and percentage of adult survival were calculated using the following equations (Giga *et al.,* 1993).

$$\% \text{ Adult emergence} = \frac{\text{Number of emerged adults}}{\text{Total number of eggs laid}} x100$$

$$\% \text{ Adult survival} = \frac{\text{Number of emerged adults}}{\text{Total number of hatched eggs}} x100$$

2. Effect of the oil treatments on the immature stages of the insect:

The tested insects of *C. maculatus* were taken from laboratory cultures reared on mungbean seed, variety Giza-1 at 28±2ºC and 65 ± 5% R.H.

Oils used were cotton, castor, soybean, corn (all obtained from local cooking oil refineries) and apricot kernel oil (was obtained from ARC, Giza). Dosages used were 5.0, 10.0 and 15.0 ml/kg seeds. All experiments were conducted under constant conditions of 28 ± 2ºC and 65 ± 5% R.H.

Samples of 50 gr. of sound mungbean seeds in small glass jars were infested each with 10 pairs of newly emerged adults. Twenty four hours later the insects were removed and the seeds with eggs on them were left for the required time to obtain 3-days-old eggs and 1-week old larvae. The infested seeds having the mentioned immature stages were treated with the oils and incubated till the emergence of the new adults, which were recorded. Each test and the control was replicated 4 times.

3. Effect of the oil treatments on the emergence of adult, infestation and seed loss:

Samples each of 50 gm from seeds treated by the previous method were placed into glass jar for periods of storage reached 0, 2, 4 and 6 months post-treatment. Each treatment was replicated 4 times.

Ten adults from *C. maculatus* were transferred to each jar. The infested jars were then covered with muslin. Adults were allowed to oviposite for 7 days and then removed, the seeds were kept for development of insects. The emergence adults were counted and removed, seeds which showed exit holes of insects were separated from the samples and counted to estimate the percentage of infestation according to the following equation:

$$\% \text{ infestation} = \frac{\text{Number of infested seeds}}{\text{Number of total seeds (sound and infested)}} \text{ x } 100$$

For determination of loss, samples were sieved and then weighted. Loss in weight in each sample was assessed according to the following equation:

$$\% \text{weight loss} = \frac{\text{Dry weight of sound seeds - dry weight of infestd seeds}}{\text{Dry weight of sound seeds}} \text{ x } 100$$

4. Viability tests:

Effect of oil treatments on seed germination was examined mungbean seeds, treated with oils, were kept under laboratory conditions.

However, two sets of germination tests were done, the first was after 24 hours of treatment and the second after 6 months of the treatment date. Samples of twenty seeds were taken randomly from every treatment and were placed each into sand in a glass container, soaked with water. Each treatment was replicated 4 times. The following measurements were recorded:

1. Number of germinated seeds were counted daily till the completion of germination and expressed as germination percentage. Germination speed (Maguire, 1962) and mean germination time indices were computed as the following formula:

Germination speed index = $\sum(n/t)$

Mean germination time index = $\sum(nt)/\sum n$

Where:

n = Number of seeds newly germinating at time,

t = Days from sowing.

2. Shoot and root lengths (cm) of seedlings were measured after complation of germination.

3. After shoot and root lengths measurement, the seedlings were oven dried to constant weight for 24 hours at 70^{o}C to determine dry weight (mg/seedling).

Duncan's multiple range test was used to compare the treatment means (Duncan, 1955).

RESULTS AND DISCUSSION

1. Effect of tested seeds on the development of the beetle:

As shown in Table (1), the cowpea beetle *C. maculatus* laid relatively more eggs on Giza-1 (65.6) and fewer number of eggs on Kawmy (59.2), while moderate number on both UTT (63.4) and KPS2 (60.8).

Table (1):Some biological aspects of *C. maculatus* on four mungbean varieties under laboratory conditions.

Parameters		Varieties			
		Giza-1	**UTT**	**KPS2**	**Kawmy-1**
Mean No. of eggs		65.60 c	63.40 b	60.80 a	59.20 a
Hatched eggs		60.00 c	55.00 b	53.20 b	50.10 a
% rate of hatchability		91.46 c	86.75 b	87.50 b	84.62 a
No. of penetrated larvae		51.30 c	51.00 c	48.30 b	40.90 a
% rate of penetration		85.50 b	92.72 d	90.78 c	81.63 a
External mortality		8.70 b	4.00 a	4.90 a	9.20 c
Emerged adults		48.00 d	42.3 c	37.4 b	30.30 a
% adult emergence		73.17 d	66.71 c	61.51 b	51.18 a
Survival rate		80.00 d	76.90 c	70.30 b	60.47 a
Internal mortality		3.30 a	8.70 b	10.90 c	10.60 c
Developmental period (in days)		28.70 a	30.61 b	35.11 c	37.26 d
Mean weight of one emerged adult (mg)	Male	3.56 a	3.33 a	3.40 a	3.20 a
	Female	4.55 b	4.22 b	3.96 a	3.78 a
Sex ratio	Male	11.50 d	8.00 b	9.50 c	7.10 a
	Female	14.20 d	11.20 c	10.30 b	8.30 a

Means followed by same letter in the same rows are not significantly different, at 5% level according to Duncan's multiple range test.

Egg hatchability was 84.62% on Kawmy-1, 87.5% on KPS2 but it was 86.75% on UTT and 91.46% on Giza-1, *C. maculatus* larvae showed a high rate of penetration on UTT and KPS2 seeds with external mortality of 4.0 and 4.9, respectively, While reached 8.7 on Giza-1 and 9.2 on Kawmy-1. This may be due to the legument characters or to the size, the structure and chemical composition (Youssef and Kassab, 2002).

The insect rate of reproduction measured a mean number of adults emerged per female was significantly affected by mungbean variety. Total beetle production per female 48.0, 42.3, 37.4 and 30.3 individuals per female for Giza-1, UTT, KPS2 and Kawmy-1, respectively. The percentage of emerged adults was 73.17, 66.71, 61.51 and 51.18 on Giza-1, UTT, KPS2 and Kawmy-1, respectively. Survival rate was 76.9%, 80.0% and 60.47% on UTT, Giza-1 and Kawmy-1, respectively, and 70.3% on KPS2 with internal mortality of 3.30, 8.70, 10.90 and 10.60 on Giza-1, UTT, KPS2 and Kawmy-1, respectively. Developmental period was 28.7, 30.61 days on Giza-1 and UTT and increased on KPS2 to 35.11 days and on Kawmy-1 to 37.26 days.

The adults emerged from the different seed varieties was significantly affected in weight. The female adults produced from Giza-1 variety showed the highest weight (4.55 mg) followed by those produced from UTT, KPS2 and Kawmy-1, respectively.

Sex ratio differed significantly from one variety to another, the highest number of females was produced from Giza-1 and UTT variety whereas the lowest number of females was produced from Kawmy-1.

In general, *C. maculatus* was able to develop on all tested mungbean seed varieties according to the evaluation parameters for the tested mungbean variety, Giza-1 seeds were more favourable for infestation followed by Kawmy-1, UTT and KPS2, respectively. The same results indicate that seeds of Giza-1 was more sensitive to be attacked by *C. maculatus* beetles than those of Kawmy-1, it provides shorter development periods which in turn indicate greater suitability for insect development. Several investigations have been reported to clarify the relation between seed susceptibility to attack and the insect reproductive aspects. For example Giga *et al.* (1993), Youssef and Kassab (2002) reported that generally short periods of insect development were found on susceptible varieties of seeds than bruchid-resistant ones. Rashed *et al.* (1996) found that seeds of mungbean variety Giza-1 are more sensitive to be attacked by *C. chinensis* than those of Kawmy-1, it provides shorter developmental period. Youssef (2007) reported that Kawmy-1 and KPS2 were less susceptible mungbean varieties for *Liriomiza trifolii* (Burgess) infestation.

In general, these results are in agreement with the findings of (Roy, 1994 and El-Talbanty, 2003) they found that the mungbean was preferred for the larval and pupal development of *C. maculatus*.

2. Effect of the oil treatments on the immature stages:

When oil treatments were applied 1, 3 and 10 days after oviposition (Table 2), a significant differences of reduction in adult emergence were noted as follows:

Table (2): Effect of the oil treatments on the immature stages of *C. maculatus.*

Oil treatment	Dose ml/kg	% of emerged adult		
		Eggs		Larvae
		One-day old	3-days old	One week old
Cotton	5	8.9 h	38.6 L	68.7 n
	10	4.9 e	26.2 j	62.9 m
	15	0.0 a	10.0 f	35.4 h
Castor	5	7.6 g	28.9 k	58.0 L
	10	3.4 d	18.6 h	48.8 k
	15	0.0 a	9.5 e	28.6 f
Soybean	5	4.9 e	6.2 d	35.6 h
	10	1.3 c	1.8 b	26.8 d
	15	0.0 a	0.0 a	18.9 b
Corn	5	5.9 f	21.0 i	41.3 j
	10	4.6 e	12.3 g	38.2 i
	15	0.0 a	0.0 a	27.6 e
Apricot kernel	5	0.4 b	4.3 c	30.3 g
	10	0.0 a	0.0 a	25.2 c
	15	0.0 a	0.0 a	10.6 a
Control	**0**	**75.3 i**	**73.2 m**	**74.3 o**

Means followed by same letter in the same column are not significantly different, at 5% level according to Duncan's multiple range test.

Treatment of seeds having one day old eggs at the rate of 15 ml/kg of all tested oils, showed complete protection. Meanwhile, treatment of seeds having 3 days old eggs showed the same level of protection in case of corn, soybean and apricot kernel oils.

Treatment of seeds having the larval stage showed that all tested oils, even at the highest dose (15 ml/kg), failed to prevent adult emergence.

From the results presented in this paper and those of other workers (Shoonhoven, 1978 and Sing *et al.,* 1978 and Ramzan *et al.,* 1990), it is clear that many vegetable oils exhibit ovicidal activity, these oils interfere with normal respiration of eggs, resulting in hilling embryos by suffocation and the insecticidal effectiveness of vegetable oils was determined by the triglyceride component, while of the fatty acids tested, oleic acid was effective. Apricot kernel oil contained mainly oleic and linoleic acids (93.15% of the total fatty acids) (Own and Kassab, 2001).

Yearly, large quantities of apricot kernels are discarded after processing of apricot fruits. This is not wastes a potentially valuable resource, but also aggravates an already serious disposal problem. These seeds could be used as a source of oils (Ismael and Badawy, 1990).

3. Effect of the oil treatments on emergence:

The average number of adults that had emerged at all times after treatment ranged from 0 to 59.7 in different treatments. (Table 3).

Table (3): Effect of the oil treatments on the emergence of adult *C. maculates*.

Oil treatment	Dose ml/kg	Number of progeny			
		Storage period (months)			
		0	2	4	6
Cotton	5	8.6 h	20.3 k	27.6 L	48.7 m
	10	2.3 d	7.6 f	15.3 h	19.2 i
	15	0.0 a	2.3 c	2.6 c	4.3 b
Castor	5	5.3 g	17.3 j	19.4 k	35.8 L
	10	2.4 d	8.1 h	17.6 j	19.3 i
	15	0.0 a	2.2 c	2.5 c	6.3 d
Soybean	5	2.9 f	10.2 h	15.3 h	23.6 j
	10	0.0 a	5.3 e	11.1 f	16.2 h
	15	0.0 a	1.2 b	2.6 c	5.1 c
Corn	5	2.6 e	11.4 i	16.8 i	28.9 k
	10	1.3 b	7.3 f	11.9 g	19.3 i
	15	0.0 a	5.2 e	9.8 e	11.2 g
Apricot kernel	5	1.7 c	2.3 c	5.3 d	10.5 f
	10	0.0 a	0.0 a	0.0 a	1.3 a
	15	0.0 a	0.0 a	0.0 a	1.3 a
Control		**47.3 i**	**48.5 L**	**49.8 m**	**55.7 n**

Means followed by same letter in the same column are not significantly different, at 5% level according to Duncan's multiple range test.

It was found that treated seeds with, soybean and apricot kernel oils at levels of 10 and 15 ml/kg, cotton, castor and corn oils at level of 15 ml/kg seeds completely prevented any emergence of adults at 0 time post-treatment cotton oil and castor oil at level of 5 ml/kg seeds were found to give the lowest effect at all times post-treatment, where the average number of adults ranged in between 5.3 to 35.8 and 8.6 to 48.7 for castor and cotton oils, respectively. generally, cotton oil at level of 5 ml/kg was found to be the least effective at all times post-treatment. Data also showed that as the levels of tested oils increased, the emergence of progeny adults decreased. Youssef and Kassab (2002) found that increasing the time of storage decrease the developmental period of *C. maculatus,* this means increase of insect population and degree of infestation. The data, also cleared that while the time after treatment was increasing the effects of tested materials clearly decreased. These results are in agreement with the findings of Golob and Webley (1980) and Begum and Quinione (1991).

4. Effect on infestation and seed loss:

At all times in post-treatment there was a significant difference between the average percent damage of treatments and control. At 6 months after treatment there were significant variations at different levels of oils and the average percentage loss in seed weight ranged from 0 to 1.2% in the different treatments at (0 time) after treatment (Table 4).

Table (4):Effect of the oil treatments on the infestation rate and seeds loss of *C. maculatus*.

Oil treatment	Dose ml/kg	Storage period (months) 0	2	4	6
		Seed infestation (%)			
Cotton	5	3.8 f	8.7 j	9.9 k	22.1 m
	10	0.5 d	2.7 f	4.1 f	7.9 h
	15	0.0 a	0.5 b	0.8 b	2.5 e
Castor	5	0.7 e	7.6 i	8.2 j	15.0 L
	10	0.3 c	2.8 f	6.3 h	6.6 g
	15	0.0 a	0.7 c	1.6 c	2.0 d
Soybean	5	0.5 d	3.6 g	5.3 g	10.4 j
	10	0.0 a	2.0 e	4.0 f	7.4 h
	15	0.0 a	0.5 b	0.9 b	1.5 c
Corn	5	0.3 c	4.8 h	6.9 i	12.6 k
	10	0.1 ab	2.0 e	4.0 f	8.0 i
	15	0.0 a	1.0 d	3.0 e	4.0 f
Apricot kernel	5	0.2 b	0.9 d	2.2 d	4.0 f
	10	0.0 a	0.0 a	0.0 a	0.6 b
	15	0.0 a	0.0 a	0.0 a	0.3 a
Control		**22.0 g**	**23.4 k**	**24.1 L**	**25.3 n**
		Seed loss (%)			
Cotton	5	1.2 d	3.0 k	3.8 h	12.7 j
	10	0.1 a	0.8 f	1.3 e	2.1 e
	15	0.0 a	0.1 b	0.3 b	0.6 b
Castor	5	0.5 c	2.6 j	3.8 h	10.2 i
	10	0.1 a	1.9 i	2.0 f	2.9 f
	15	0.0 a	0.5 d	0.8 c	1.4 d
Soybean	5	0.3 b	1.2 h	2.1 f	3.6 g
	10	0.0 a	0.8 f	1.3 e	2.3 e
	15	0.0 a	0.1 b	0.3 b	0.8 c
Corn	5	0.05 a	0.9 g	2.8 g	4.5 h
	10	0.09 a	0.6 e	1.3 e	2.8 f
	15	0.0 a	0.4 c	0.9 d	1.2 cd
Apricot kernel	5	0.01 a	0.4 c	1.3 e	2.1 e
	10	0.0 a	0.0 a	0.0 a	0.3 b
	15	0.0 a	0.0 a	0.0 a	0.1 a
Control		**10.5 e**	**11.8 L**	**12.3 i**	**13.6 k**

Means followed by same letter in the same column are not significantly different, at 5% level according to Duncan's multiple range test.

It was found out that the seeds treated with cotton oil and castor oil at level of 5 ml/kg gave the least protection to the seeds in all times after treatment where, the average percentage loss in seed weight ranged from 1.2 to 12.7% and 0.5% to 10.2% for cotton and castor oil, respectively. Generally, it could be stated that soybean, corn and apricot kernel gave the highest protection to mungbean if compared with oils of cotton and castor. The lowest effect treatments were recorded appeared at 6 months post-treatment. However, there was always a significant difference between treatments and control at 6 months post-treatment.

Data indicated that the weight losses in seeds were proportional the level of infestation damage, seeds weight loss and seeds infestation were positively correlated with the number of emerged adult at all times of study where, r = 0.94, 0.99, 0.95 and 0.96 for seed weight losses. These results are in agreement with the findings of Ramzan *et al.* (1990), Kumari *et al.* (1990), Youssef and Kassab (2002).

5. Viability and vigour of seeds:

Results obtained in the course of the present investigations indicates that the effect of applied oils affected the germination percentage, speed and mean germination time indices and seedling vigour (radical, shoot length and dry weight) as shown in Table (5).

In general, data indicates that, the germination percentage of mungbean seeds was significantly decreased by oils that were tested after 24 hours or 6 months of treatment start and that result was more clear especially with high rates. Accordingly the germination percentage decreased on the checks from 95.7% (untreated seeds) to (94.2 – 86.2 %) on the average after 24 hours of treatment. Moreover, the percentage of germination after the indicated period (6 months) was found to decrease from 90.60% (untreated seeds) to (88.6 – 82.1%) in the case of seeds treated with different protectants and become with recommended level of germination percentage (85%) which was recommended by Ministry of Agricultural for legume seeds.

The results indicated a clear reduction in the germination percentage at the initial and at the end of storage period as the result of using different oils if compared with untreated seeds (Singh *et al.* 1978 and Schoonhoven, 1978). Oils significantly decreased germination speed index of all concentrations. The greatest germination speed index resulted from application of 5 m/k, while the lowest one resulted from application of the 15 m/kg concentration. Increasing oils concentration significantly increased the mean germination time index compared with the control.

Seedling vigour results indicated that radical, shoot length and dry weight of the tested seeds significantly varied among the applied protectants at different concentrations of used oils.

The various rates of decrease in the development of seedling after 24 hours of treatment and at the end of storage period agrees with the occurred decrease on the germination percentage. However, the various stimulating influences occurred on treated seeds could be attributed to chemical influences of the effect of storage time used protectants on the biochemical constituents of the seeds which might show up more clearly on seed which posses relatively lower viability.

These results are in agreement with the Youssef and Kassab (2002), they found that storage time caused decreasing in moisture and carbohydrate content of stored peanut seeds while fat and ash contents were increased with increasing the time of storage and decreasing quality of legume seeds. This means decreasing germination and seedling vigour seeds.

Table (5): Effect of the oil treatments on viability and seedling vigour of mungbean seeds.

Oil treatment	Dose ml/kg	Germination %	Germination speed index	Mean germination time index	Seedling vigour: Shoot length (cm)	Seedling vigour: Radical length (cm)	Seedling vigour: Seedling dry weight (mg)
	After 24 hours of treatment						
Cotton	5	93.6 h	1.5 e	8.7 bc	11.7 h	9.5 c	43.6 f
	10	89.6 d	1.4 d	8.9 c	10.5 d	8.5 bc	38.5 b
	15	86.2 a	1.2 b	9.1 d	10.6 e	7.7 ab	37.5 a
Castor	5	94.2 i	1.6 f	8.2 a	10.3 c	8.1 b	43.6 f
	10	89.1 c	1.5 e	8.7 bc	10.6 de	8.6 bc	40.5 d
	15	87.4 b	1.2 b	9.2 e	8.6 a	7.3 a	38.4 b
Soybean	5	92.1 g	1.7 g	8.5 b	13.1 j	10.7 d	47.7 j
	10	90.0 de	1.5 e	8.9 c	12.6 i	9.3 c	46.8 i
	15	89.3 c	1.2 b	9.3 f	11.1 f	8.1 b	44.5 g
Corn	5	91.4 f	1.4 d	8.3 ab	13.2 j	10.6 d	46.3 hi
	10	90.1 e	1.3 c	8.6 bc	12.6 i	8.1 b	45.8 h
	15	89.4 c	1.1 a	9.2 e	11.8 h	7.3 a	43.6 f
Apricot kernel	5	91.0 f	1.6 f	8.2 a	11.7 gh	9.4 c	41.8 e
	10	90.0 de	1.6 f	8.7 bc	11.6 g	8.2 b	39.6 c
	15	89.5 cd	1.5 e	8.9 c	10.2 b	7.7 ab	38.2 b
Control		**95.7 j**	**1.8 h**	**8.3 ab**	**13.1 j**	**11.7 e**	**49.3 k**
	After 6 months of treatment						
Cotton	5	84.1 e	1.2 d	9.5 f	10.3 e	8.8 h	42.8 j
	10	82.6 b	1.1 c	9.6 g	11.3 gh	8.0 e	42.4 i
	15	82.3 ab	1.0 b	8.7 a	11.4 h	7.7 c	39.0 g
Castor	5	88.6 h	1.1 c	9.0 c	10.5 f	9.5 j	45.8 m
	10	88.0 g	0.9 ab	9.2 de	10.2 e	8.6 g	45.0 L
	15	82.9 c	0.9 ab	9.5 f	8.5 b	8.2 f	39.1 g
Soybean	5	82.6 bc	1.2 d	9.1 d	10.6 f	9.2 i	44.1 k
	10	82.3 ab	0.9 ab	8.9 b	10.2 e	7.9 d	40.3 h
	15	82.1 a	0.8 a	9.9 j	9.6 d	6.1 a	38.2 f
Corn	5	88.0 g	1.2 d	9.6 g	11.2 g	9.8 j	33.2 d
	10	83.2 d	1.0 b	9.8 i	10.3 e	8.9 h	30.7 c
	15	82.3 ab	0.9 ab	10.1 L	8.3 a	7.9 d	29.3 b
Apricot kernel	5	87.4 f	1.1 c	9.3 e	11.0 f	9.8 j	38.0 e
	10	83.2 d	0.9 ab	9.7 h	9.5 d	9.3 i	30.7 c
	15	82.1 a	0.8 a	10.0 k	9.1 c	6.6 b	29.0 a
Control		**90.6 i**	**1.3 e**	**9.6 g**	**12.4 i**	**10.3 k**	**46.3 n**

Means followed by same letter in the same column are not significantly different, at 5% level according to Duncan's multiple range test.

Results in the present investigation indicates a clear effect of decrease of *C. maculates* when using oils. On the other hand, germination of seeds was found to be safely affected. So, it could be stated that the applied rates of the used protection (oils) could be recommended especially if these seeds would be used also for human. However, more tests to get healthy seeds is suggested. However, it is essential to find out the residual effects of the final products of these oils during storage that should be taken into consideration.

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التأثير الحيوى لمتبقى بعض الزيوت على حشرة خنفساء اللوبيا وعلاقتها بجودة بذور فول المانج وتطور الخنفساء على بذور بعض أصناف فول المانج

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أجريت هذه الدراسة فى كلية الزراعة ـ جامعة كفرالشيخ خلال موسمى ٢٠٠٥ ، ٢٠٠٦ بهدف الحصول على مواد ذات تأثير فعال فى وقاية البذور المخزونة تكون متاحة وسهل الحصول عليها وقليلة السمية نسبيا وأقل ضررا للبيئة حيث أصبحت الحاجة اليها ضرورة ملحة ولذلك تم تقييم مدى حساسية أربعة أصناف من فول المانج وهم: جيزه-١ ، قومى-١ ، UTT ، KPS2 للإصابة بحشرة خنفساء اللوبيا تحت ظروف المعمل عند درجة حرارة ٢٨°م ± ٢ ، رطوبة نسبية ٦٥ ± ٥%. وأيضا دراسة التأثير الإبادى لخمسة أنواع من الزيوت (بذرة القطن ، نوى المشمس ، فول الصويا ، الذرة ، الخروع بمعدل: ٥، ١٠، ١٥ ملى/ كجم بذور) على حشرة خنفساء اللوبيا وعلاقة ذلك بحيوية وجودة بذور فول المانج.

وقد أظهرت النتائج:

أن بذور فول المانج صنف جيزه-١ كانت أكثر حساسية للإصابة بالحشرة عن باقى الأصناف المختبرة. أيضا وجود تأثير معنوى للأصناف المختبرة على فترة النمو وإنتاج عدد من الأفراد لهذه الحشرة حيث كانت فترة النمو: ٢٨,٧ ، ٣٠,٦١ ، ٣٥,١١ ، ٣٧,٢٦ يوم وكانت عدد الأفراد الناتجة: ٤٨,٠ ، ٤٢,٣ ، ٣٧,٤ ، ٣٠,٣ فرد لكل من جيزه ١ ، UTT ، KPS2 ، قومى-١ على التوالى.

أيضا أظهرت النتائج أن معاملة بذور فول المانج عليها بيض عمر(١ يوم) بالزيوت بمعدل: ١٥ ملى/كجم بذور تقى البذور من الإصابة بالحشرة. عند معاملة البذور عليها بيض عمر (٣ يوم) بمعدل ١٥

ملى/كجم منع خروج الحشرات الكاملة ماعدا زيت القطن والخروع. أما معاملة البذور (بها يرقات عمر أسبوع) بالزيوت والمعدلات المستخدمة لم تمنع خروج الحشرات الكاملة.

بزيادة التركيزات المستخدمة من الزيوت يقل عدد الحشرات الكاملة الخارجة من البذور المعاملة وكان زيت القطن أقل تأثيرا عن باقى الزيوت المستخدمة وزيت نوى المشمس أكثر فاعلية بين الزيوت المستخدمة عند جميع المستويات والأوقات المختلفة حتى ٦ شهور بعد المعاملة. وكانت الفروق معنوية فى معدل الانخفاض فى الوزن الذى يحدث نتيجة الإصابة فى البذور المعاملة بالزيوت فى جميع المعاملات وذلك مقارنة بالكنترول. وقد وجد ارتباط معنوى موجب بين عدد الحشرات الكاملة الخارجة ونسبة الإصابة والضرر فى البذور .

انخفضت معنوياً نسبة الإنبات للحبوب بعد المعاملة بالزيوت بعد ٢٤ ساعة ، ٦ شهور من المعاملة. حيث انخفضت نسبة الإنبات من ٩٥,٧% فى الحبوب الغير معاملة إلى (٩٤,٢ – ٨٦,٢ %) بعد المعاملة بـ ٢٤ ساعة. بينما انخفضت نسبة الإنبات بعد ٦ شهور من ٩٠,٦% فى الحبوب الغير معاملة لتصبح (٦.٨٨ - ٨٢,١%) وهى تتفق مع نسبة الإنبات الموصى بها من وزارة الزراعة (٨٥%). أدت التركيزات المختلفة من الزيوت الى اختلافات معنوية فى كل من دليل سرعة الإنبات ودليل متوسط وقت الإنبات. حيث أدت زيادة التركيز الى نقص دليل سرعة الإنبات وعلى العكس أدى الى زيادة دليل متوسط وقت الإنبات للبذور المعاملة. وعلى ذلك فان زيادة تركيز الزيوت قد أدى الى تأخير إنبات البذور واطاله الوقت اللازم لاكتمال إنباتها. اختلف معنوياً كل من طول الجذير والريشة والوزن الجاف للبادرات فى الحبوب المعاملة بالمواد المختلفة مقارنة بالحبوب الغير معاملة.

يتضح من الدراسة ان الصنف قومى-١ اقل قابلية للإصابة عن باقى الأصناف المختبرة وإمكانية استخدام بعض الزيوت النباتية فى حماية بذور فول المانج من الإصابة بحشرة خنفساء اللوبيا ونقترح المزيد من الاختبارات للحصول على حبوب آمنة صحيا مع إمكانية استخدام نوى المشمس كمادة خام مهملة للحصول على زيت يستخدم فى مكافحة الحشرة دون استخدام المبيدات الضارة بصحة الإنسان والبيئة.