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Evaluation of the Fungicidal and Insecticidal Activity of three Seed Oil Extracts against Some Phytopathogenic Fungi and Tomato Insects

Sabbour, M. M.[1], Sahab, A. F.[2], Hussein, M. M.[3]

[1]Plant Pathology Department, Pests and Plant Prot.

[2]Department and water and irrigation Relationship

[3]Department National Research Centre, Cairo Egypt

Abstract: ***This study was conducted to determine the antifungal and insecticidal activities of three seed extracts of jatropha nut, jojopa and castor oil. Seeds of jojoba, jatropha and castor bean were infected with fungi with an average of 52.70%, 48.13% and 84.43% on PDA, rose bengal and malt extract agar media, respectively. Number of fungi was ranged between 8.3 and 216.7 cfu/100 seeds for jojoba, 188.3 and 350.0 cfu/100 seeds for jatropha and between 66.7 and 283.3 cfu/100 seeds for castor bean. Results detected a total of 13 species of fungi belonging to 6 genera were isolated and identified. A. niger (28.68%) and Fusarium spp. (19.85%) were the abundant common fungi associated with jojoba seeds and A. niger (41.49%) was detected in jatropha seeds, while in castor oil seeds, the common associated fungi was A. niger (48.57%). Ethanolic seed extracts of jojoba and jatropha were found to be effective against seed borne pathogenic fungi, while castor oil showed minimum activity. Moreover, the majority of the fungi were not sensitive to the water extract concentrations of 250 and 500 ppm unlike at higher concentrations of 1000 and 2000 ppm. The ethanolic extract of jojoba showed highest insecticidal activity against two insect of tomato, as the means number of eggs deposited /female were significantly decreased. When Tuta absoluta treated with seed extracts of all different treatment at concentrations, 0.5, 2, and 3%, the eggs laid per female showed a significant decrease compared to control. The study also showed that the aqueous extract of castor bean was weaker in its effect on the Tuta absoluta insect compared to the other treatments. The ethanolic extract of jatropha showed highest activity on Phthorimaea operculella as the means number of eggs deposited /female were significantly decreased. Field application trails also indicated that water and ethanolic seed extracts of jojoba, jatropha and castor oil were more effective in increasing tomato yield in the two tested regions of Ismailia and Al-Gabal Alasfar.***

Keywords: Jatropha, jojoba, castor bean and water extracts, antifungal, insecticidal activities.

1. Introduction

Jatropha (*Jatropha curcas* L.), jojoba (*Simmondsia chinensis* (Link) Schneid) and castor bean (*Racinus communis* L.) a promising crops is being extensively studied for antimicrobial and pesticide activity. Due to diminishing petroleum reserves and the environmental consequences, biodiesel became an alternative energy fuel (Zurina, 2009). Some of the seed borne fungi were found to be very destructive caused seed rot or even change the quality during storage, thus making the seeds unfit or for oil properties (Elarosi, 1993 and Dharmaputra *et al.*, 2009). However, recently due to the expansion of biodiesel plants in several countries throughout the plant pathogens may be spreads through infected seeds.

It has been known that parts of *J. curcas* can be used for a wide range of purposes. Extracts from various parts such as seeds have shown molluscicidal, insecticidal and fungicidal properties (Meshram *et al.*, 1996; Nwosn and Okafor, 1995; Rug and Ruppel, 2000 and Sahab *et al.*, 2011). Neves *et al.* (2009) evaluated the presence of *Fusarium, Rhizoctonia* and *Alternaria* spp. associated with the seeds of Jatropha through blotter test and germination in trays. Also, Jayaraman *et al.*(2011) reported the occurrence of different species of *Aspergillus, Penicillium* and *Mucor* species associated with jatropha seeds during storage. Srivastava *et al.,* (2011) identified sixteen fungal species from physic nut seeds during one year of storage including : *Alternaria altrnata*, *A. flavus, A fumigatus, A. niger, A. terreus, Cephalosporium irregularis, Chaetomium globosum, Cladosporium cladosporoides, Curvularia lunata, Fusarium moniliforme, F. roseum, Penicillium citrinum, P. rubrum and Rhizopus stolonifer.*

Maji and Imolehin (2010) showed that *A. niger*, *A.flavus*, *F. moniliforme* and *Penicillium* spp. were the most abundant fungi associated with castor bean seeds. Sharma and Champawat (2000) found that five fungal species (*A. flavus, A. nidulans, A. niger, F. pallidoroseum and Rhizopus* spp.) were isolated from jojopa seeds. Application of synthetic pesticides during the past few decades, to control pests has been a standard practice. However, with growing evidence that many conventional pesticides can adversely affect the environmental requirements for safer means of pest management have become crucial (Rozman *et al.*, 2007). Jojoba seeds are containing of some unique glucoside compounds that can cause food intake inhibition and repellency effect for the stored products pests (Bellirou *et al.*, 2005). Tomato is one of the most important Solanaceous vegetable crops in Egypt. The tomato plants are currently infested with many serious pests. The most destructive pests are the potato tuber *Phthorimaea operculella* moth and Tuta *absoluta*. Larvae cause severe damage to vegetable crops of family Solanaceae (Sarhan, 2004; Soliman *et al*., 2008; Abul-Nasr *et al*., 1971and Sabbour and Ismail, 2002).

Therefore, the importance and the aim of this study were to investigate the antifungal and insecticidal activity of jatropha, jojoba and castor oil seeds collected from two regions in Egypt against some selected phytopathogenic fungi and against Phthorimaea *operculella* and *Tuta absolua.* of tomato insect.

2. Materials and Methods

Isolation and Identification of associated fungi: pod lots of jatropha nut, jojoba and castor bean plants were collected from environmental farm at Ismailia and Al-Gabal Alasfar (region at) Giza, Governorates. One hundred seeds of each pod were surface disinfected by soaking in 2% sodium hypochlorite for 3 min, followed by 70% ethanol for 2 min. and then thoroughly washed in sterile water. Drain excess water, dried between two layer of sterilized filter papers. The seeds were platted on PDA, rose bengal and malt extract agar media at rate of 4 seeds/dish. The plates were incubated at 27±2˚Cfor 7 days. Fungi growing from the seeds were isolated, purified and identified according to Barnett and Hnter (2000), Domsch *et al*. (2007) and Samson *et al*.(2010).

2.1 Natural seed infection and total fungal counts

The percentage of natural infection, total fungal counts as colony forming unite (cfu/100seeds) and the frequency occurrence of different fungi associated with seeds were determined.

2.2 Plant Extracts

a) **Aqueous Extract:** seeds of jatropha nut, jojoba and castor bean plants were collected in clean polyethylene bags from Ismalia Governorate and El Gabal Alasfar region in Giza Governorate, Egypt. The seeds were washed with distilled water and grounded into powder then air-dried. 10 g of the ground seeds was measured into a conical flask and 40ml of sterile distilled water was added and left properly on the shaker at 100 rpm for 24 hrs after which the extract was filtered and squeezed through three layer of muslin cloth. The filtrate was then centrifuged at 2000 rpm for 5 minutes after which it was decanted and the supernatant was sterilized by using the membrane filtration unit. The filtrate obtained was stored in sterile bottles and kept at 4˚C for antifungal and insecticidal activities (Arekemase *et al.,* 2011).

b) **Ethanolic Extract:** A 10g of powdered seed materials were soaked in 40ml of 95% ethanol for 5 days at room temperature and filtered as mentioned before. The filtrate was dried using a rotary evaporator at 60˚C. (Khalil and Dababneh, 2007).

2.3 Antifungal Activity

The ethanolic and water extracts were calculated against linear growth of some plant pathogenic fungi (*Alternaria alternata, Aspergillus flavus, A. niger, Fusarium oxysporum* and *F. solani).* Petri dishes containing sterile PDA cooled to 60˚C were mixed well with various concentrations of crude extract (0, 250, 500, 1000 and 2000 mg/L). The agar was inoculated by a 5mm disc of 7 day- old phytopathogenic fungi and then incubated at 27˚C until it fully grow of control plates. Diameter of fungal colonies of treatments was measured and percentage inhibition (PI %) was calculated according to formula of Vincent (1947):

$$\text{Percent inhibition} = \frac{\text{Growth in control} - \text{growth in treatment}}{\text{Growth in control}} \times 100$$

2.4 Insecticidal Activity

2.4.1Rearing Insect Pests

2.4.1 a) *T. absoluta*: the tomato pinworm were reared on tomato leaves under laboratory conditions at 22±2Co and RH 60-70%.*T. absoluta* used in the trials was obtained from laboratory culture of pests and plant prot. Dept. NRC, Egypt.

$$\text{Percent inhibition} = \frac{\text{Growth in control} - \text{growth in treatment}}{\text{Growth in control}} \times 100$$

2.4.1 b) *Phthorimaea operculella*: standard laboratory colony of the potato tuber moth *P. operculella* was reared on potato tubers of *Solanum tuberosum* as a natural host plant under controlled conditions (26±2°C and 70±5% R.H). Eggs were obtained from the stock culture and kept in Petri-dishes till larval hatch. The rearing technique by El-Sherif (1966) was adopted. Pupae were individually kept in specimen tubes (1×3cm) till adult emergence. Adult moth were kept in oviposition cages that consist of chimney glass (8cm in diameter and 16cm height), the lower rim of which rested on the bottom of a Petri-dish lined with a disk of filter paper (Watman, No-1) and the upper rim covered with muslin. Each cage was provided with a small piece of cotton soaked in 5% honey solution as food supply. The deposited eggs were collected and kept in Petri-dishes till larval hatching. Groups of newly hatched larvae were transferred into Petri-dishes containing fresh pieces of potato. Larval development was allowed to continue until the adult emergence. The percentages of mortality were calculated after seven days and corrected according to Abbott, (1925), while LC50 was calculated through probity analysis according to Finney (1964).

Field Trials: field trials were carried out at Ismalia Governorate and El-Gabal Alasfer region (Giza Governorate), Egypt to study the effectiveness of the tested water and ethanolic extract on *T. aabsoluta* and *P.operculella*. Tomato (variety Biofly 2) was cultivated by end of May in an area of about 1200 m^2, divided into 12 plots of 100 m^2 each. Four plots were assigned for each pathogen, while 4 plots were treated with water and used as controls and water and ethanolic seed extract applied at 5% concentration and 5L / plot. Treatments were performed in a randomized plot designate the sunset with a five liter sprayer. Three applications were made at one week interval at the commencement of the experiment, and then 20 samples of plants were randomly collected at certain time intervals from each plot and transferred to laboratory for examination. Average number of each of the tested pests / sample / plot / treatment was calculated after 20, 50, 90 and 120 days post 1st application. The infestations of target pests were then estimated in each case. The experiment was replicated 4 times. After harvest, yield of each treatment was weighed as kg/feddan. Yield loss was calculated according to the following equation:

Yield loss = potential yield- actual yield x 100

Where the potential yield was that treatment which gave the best results among the tested treatments, and was taken as a base for comparing with the other treatments.

Statistical analysis: the collected data were statistically computed using the software Mstate-c for Windows. Least significant differences values at P≤0.05 were used to separate treatment means when ANOVA indicated a significant F value according to the methods described by Snedecor and Cochran (1990).

3. Results and Discussion

3.1 Percentage of natural infection

It is clear from the data of Table (1) that seeds of jojopa, jatropha and castor oil were contaminated with fungi with an average of 52.70%, 48.13% and 84.43% on PDA, rose bengal and malt extract agar media, respectively.

Table 1: Percentage of fungal infection and total fungal count (cfu/100 seeds) of Jojoba, jatropha and castor oil seeds on PDA, rose bengal and malt extract agar media.

Seeds of	PDA		Rose bengal		Malt extract		Mean	
	% infection	Count (cfu/100 seeds)	% infection	Count (cfu/100 seeds)	% infection	Count (cfu/100 seeds))	% infection	Count (cfu/100 seeds)
Jojoba	35.0	136.4	11.1	8.3	70.0	216.7	38.7	120.5
Jatropha	83.3	188.3	100.0	250.0	100.0	350.0	94.4	262.8
Castor oil	40.0	140.0	33.3	66.7	83.3	283.3	52.2	163.3
Average	52.7	154.9	48.13	108.3	84.43	283.3	61.8	182.2

*Tests were rune in quadruplicate
* Counts represent the number of fungi /100 seeds incubated at 28±2ºC for 7 days.

The percentage of fungal infection was higher in seeds of jatropha than in seeds of jojoba and castor oil, as the mean % infection were 94.4, 38.7 and 52.2% in seeds of jatropha, jojoba and castor oil respectively. On the other hand, jojoba seeds showed the lowest densities of contamination than the other two seeds on the three tested media.

It is also clear from Table (1) that the number of fungi was ranged between 8.3 and 216.7 cfu/100 seeds for jojoba, 188.3 and 350.0 cfu/100 seeds for jatropha and between 66.7 and 283.3 cfu/100 seeds for castor bean. Moreover, seeds of jojoba showed low fungal densities on the three tested media than the corresponding figures of jatropha and castor bean seeds. Also, the fungal counts were low on rose bengal agar medium than figures in the other two media. As, the average numbers of cfu/100 seeds were 108.3 154.9 and 283.3 on rose bengal, PDA and malt extracts agar media respectively. Almost similar results were obtained by earlier finding by Worang (2008), Neves *et al.* (2009) and Sahab *et al.* (2011).

3.2 Frequency Occurrence of Fungi

The data of all samples per fungal genera or species given in Table (2) indicate that the fungal contamination occurred within intact seeds. Great variation in type and in numbers of propagations among samples was noted and many fungal isolates which found in seed type may be absent in the other two seed samples.

Table 2: Frequency occurrence of fungi isolated from seeds of jatropha, jojoba and castor oil on PDA medium.

Fungi	jojoba		jatropha		Castor bean	
	Number	%	Number	%	Number	%
Alternaria alternata	13	9.56	14	7.45	11	7.86
Alt. tenues	4	2.94	0	0.00	9	6.43
Aspergillus flavus	10	7.35	14	7.45	0	0.00
A. niger	39	28.68	78	41.49	68	48.57
A.nidulans	0	0.00	6	3.19	0	0.00
A. sydowi	0	0.00	2	1.06	0	0.00
A. sulphoreus	6	4.41	0	0.00	0	0.00
A. tamarii	0	0.00	6	3.19	0	0.00
A. terreus	14	10.29	8	4.26	30	21.13
Fusarium spp.	27	19.85	16	8.51	0	0.00
Mucor spp.	6	4.41	17	9.04	0	0.00
Rhizopus nigricans	4	2.94	13	6.91	0	0.00
Penicillium spp.	13	9.56	14	7.45	22	15.71
Total	136		188		140	

In all cases, a total of 13 species of fungi belonging to 6 genera were isolated and identified. Depending upon the frequent occurrence of the genera and species were grouped as major and minor component. As, *A. niger* (28.68%) and *Fusarium* spp. (19.85%) were the abundant common fungi associated with jojoba seeds and *A. niger* (41.49%) was detected in jatropha seeds, while in castor oil seeds, the common associated fungi was *A. niger* (48.57%). Some genera or species fungi also were appeared in low densities or occur sporadically and to constitute small numbers of the fungi associated seeds of the three types including, *Alt. tenues* and *R. nigricans* (2.94%) and *Mucor* spp. (4.41%0 in jatropha seeds while, *A. sydowi* (1.06%), *A. tamarii* (3.19%) and *A. terreus* (4.26%) were less common in jatropha seeds.

A. niger was the most prevalent fungi in seeds of jojoba, jatropha and castor oil represent 28.68%, 41.49% and48.57% of the total fungal count respectively. Our results also in good agreement with those reported by Neves *et al.* (2009), Jayaraman *et al.(*2011), Srivastava *et. al.* (2011) on jatropha seed; Magi and Imolehim (2010) on castor oil and Sharma and Champawat (2000) and Tiwari *et al.* (2012) on jojoba seeds.

3.3 Antifungal Activity of Seed Extract

3.3.1 Ethanolic extract

The antifungal activity of ethanolic extracts of jatropha, jojoba and castor bean seeds against five phytopathogenic fungi is presented in Table (3). The seed extract having variable degree of inhibition. Results revealed that the increase in the percentage inhibition of all tested fungi was proportional to the increase in seed extract concentrations. It was observed that extracts of jojoba, jatropha and castor oil showed antifungal activity out of which castor oil showed minimum activity. Generally, the ethanolic extract of jojoba seed significantly reduced the mean % inhibition by 21.69%, followed by jetropha (10.63%) and the lowest one was castor bean (1.37%). Ethanolic extract of jatropha seed showed high significant antifungal activity against *F. solani* at concentrations of 500, 1000 and 2000 ppm, causing a reduction in the growth rate by 32.1%, 39.4% and 50.3% respectively with an average of 24.36% followed by *Alt. alternata* and *F. oxysporum* with an average of 12.46 and 10.91%, respectively.

Table 3: Antimicrobial activity (% inhibition) of ethanolic extracts of jatropha, jojoba and castor oil on the linear growth (mm) of some phytopathogenic fungi

Plant	*Tested fungi*	*Concentration*					*Mean*
		0	250	500	1000	2000	
Jatropha	*Alternaria alternata*	0.0 w	0.0 w	1.8 uv	16.5 o	44.fg	12.46 g
	Aspergillus flavus	0.0 w	0.0 w	0.0 w	6.2 r	17.0 o	4.64 i
	Aspergillus niger	0.0 w	0.0 w	0.0 w	0.0 w	3.9 st	0.79 k
	Fusarium oxysporum	0.0 w	0.0 w	3.1 t	18.6 n	32.9 ij	10.91 h
	Fusarium solani	0.0 w	0.0 w	32.1 j	39.4 h	50.3 c	24.36 b
Mean		0.0 i	0.0 i	7.41 f	16.11 e	29.63 c	10.63 b
Jojoba	*Alternaria alternata*	0.0 w	5.3 r	24.8 l	39.6 h	48.6 d	23.66 c
	Aspergillus flavus	0.0 w	21.8 m	33.4 i	44.5 f	57.2 a	31.37 a
	Aspergillus niger	0.0 w	8.6 pq	21.2 m	31.9 j	43.4 g	21.03 d
	Fusarium oxysporum	0.0 w	0.0 w	6.2 r	26.0 k	47.5 e	15.95 f
	Fusarium solani	0.0 w	0.0 w	4.2 s	25.2 kl	52.9 b	16.45 e
Mean		0.00 i	7.15 f	17.95 d	33.45 b	49.91 a	21.69 a
Castor bean	*Alternaria alternata*	0.0 w	0.0 w	0.0 w	0.0 w	2.1 u	0.42 kl
	Aspergillus flavus	0.0 w	0.0 w	0.0 w	0.0 w	1.1 v	0.23 l
	Aspergillus niger	0.0 w	0.0 w	0.0 w	1.8 uv	8.2 q	2.00 j
	Fusarium oxysporum	0.0 w	0.0 w	0.0 w	5.5 r	6.0 r	2.31 j
	Fusarium solani	0.0 w	0.0 w	0.0 w	0.0 w	9.4 p	1.88 j
Mean		0.0 i	0.00 i	0.00 i	1.47 h	5.37 g	1.39 c
Genaral mean		0.0 e	2.38 d	8.46 c	17.01b	28.31 a	

Values followed by the same letter are not significantly different at P ≥ 0.05 according to Duncan's multiple range test. While, the least effect was recorded on *A. niger*, where the % inhibitions were 0.0%, 0.0% and 3.9% on the same former concentrations respectively. Jojoba seed extract exhibit maximum antifungal activity against *A. flavus* and *F. solani* at 2000ppm (57. 2 and 52.9 % inhibition respectively) followed by *Alt. alternata* (48.6% inhibition) and *F. oxysporum* and *A. niger* (47.5% and 43.4% respectively).

3.3.2 aqueous extract: the results presented in Table (4) showed that majority of the fungi were not sensitive to the water extract concentrations of 250 and 500 ppm unlike at higher concentrations of 1000 and 2000 ppm. *Fusarium solani* was the most sensitive fungi to jatropha water extract with 14.22 % mean inhibition and *A. flavus* was the most sensitive to aqueous jojoba extract with 19.99% mean inhibition. While, *F. oxysporum* was the most sensitive fungi to aqueous castor oil extract with 3.27% mean inhibition.

Table 4: Antimicrobial activity (% inhibition) of water extracts of jatropha, jojoba and castor oil on the linear growth (mm) of some phytopathogenic fungi.

Plant	Tested fungi	Concentration					Mean
		0	250	500	1000	2000	
Jatropha	*Alternaria alternata*	0.0 P	0.0 P	0.0 p	5.6 lmn	26.5 f	6.42 e
	Aspergillus flavus	0.0 p	0.0 p	0.0 p	4.6 mno	6.9 lm	2.31 f
	Aspergillus niger	0.0 p	0.0 p	0.0	0.0	2.6 nop	0.53 gh
	Fusarium oxysporum	0.0 p	0.0 p	0.0 p	8.5 kl	18.6 i	5.43 e
	Fusarium solani	0.0 p	0.0 p	21.9 gh	19.2 hi	30.0 de	14.22 c
Mean	*Mean*	0.0 g	0.0 g	4.39 f	7.58 e	16.94 c	5.78 b
Jojoba	*Alternaria alternata*	0.0 p	0.0 p	19.4 hi	30.0 de	37.7 b	17.42 b
	Aspergillus flavus	0.0 p	0.0 p	27.7 ef	28.8 def	43.5 a	19.99 a
	Aspergillus niger	0.0 p	0.0 p	10.6 jk	22.6 g	31.7 cd	12.99 cd
	Fusarium oxysporum	0.0 p	0.0 p	0.0 p	28.0 ef	34.7 bc	12.53 d
	Fusarium solani	0.0 p	0.0 p	0.0 p	19.4 hi	41.9 a	12.24 d
	Mean	0.00 g	0.0 g	11.52 d	25.77 b	37.88 a	15.04 a
Castor bean	*Alternaria alternata*	0.0 p	0.0 p	0.0 p	0.0 p	0.0 p	0.00 h

	Aspergillus flavus	0.0 p	0.0 p	0.0 p	0.0 p	0.0 p	0.00 h
	Aspergillus niger	0.0 p	0.0 p	0.0 p	1.9 op	6.3 lm	1.64 fgh
	Fusarium oxysporum	0.0 p	0.0 p	0.0 p	3.0 nop	13.3 j	3.27 f
	Fusarium solani	0.0 p	0.0 p	0.0 p	1.8 op	8.6 kl	2.08 fg
Mean		0.00 g	0.00 j	0.00 g	1.35 g	5.64 f	1.39 c
Genaral mean		0.00 d	0.00 d	5.30 c	11.57 b	20.15 a	

* Values followed by the same letter are not significantly different at P ≥ 0.05 according to Duncan's multiple range test.

Results of the antifungal test of aqueous seed extracts of jatropha, jojopa and castor oil showed broad spectrum of activities by inhabiting the growth of the five fungi. Extracts of many higher plants have been reported to exhibit antifungal properties under laboratory trails (Aliero and Afolayan, 2006 and Mohana *et al.*, 2008). Exploitation of plant metabolities in crop protection and prevent of biodeterioration caused by fungi appear to be promising in an eco-friendly way (Pawar, 2011).

4. Insecticidal Activity

4.1 Effect of Water and Ethanolic Seed Extracts in laboratory

a- on *Tuta absoluta*

The activity of crude plant extract is often attributed to the complex mixture of active compounds. Data in Tables (5 and 6) show the effect of the tested water and ethanolic extracts against target pest of *Tuta absoluta* under laboratory conditions. Data in Table (5) showed that the tested seed extract of Ismailia Governorate having variable degree of insecticidal activity. The ethanolic extract of jojoba showed highest activity as the means numbers of eggs deposited /female were significantly decreased to 42.9±3.4, 25±2.7 and 18.4±1.2 at concentrations of 0.5%, 2% and 3% respectively compared to 111±3.8 eggs laid/female in the control. The study also showed that the aqueous extract of jojoba has also led to a reduction in number of eggs/female (20.4±1.6) at concentration of 3% followed by alcoholic extract of jatropha which led to the reduction to 21.4±1.8 compared to the control. Generally, when *Tuta absoluta* treated with different seed extracts at concentrations of 0.5, 2, and 3%, the eggs laid per female showed a significant decrease compared to control

Table 5: Effect of water and ethanolic seed extracts of Jatropha, jojoba and castor bean of Ismailia Governorate agents against *Tuta absoluta*

Treatments	Mean number of eggs/female ±S.E.		
	0.5%	2%	3%
Jatropha w. extract	69.4±1.4	40.4±1.9	30.4±4.3
Jatropha ethy. extract	35.2±1.7	28.7±6.4	21.4±1.8
Castor bean w. extract	82.9±5.4	75±2.4	60.4±2.9
Castor bean ethy. extract	72.9±3.5	65±4.4	50.4±1.8
Jojoba w. extract	52.3±4.1	35±2.8	20.4±1.6
Jojoba ethy. extract	42.9±3.4	25±2.7	18.4±1.2
Control (untreated)	111±3.8		
F value	12.1		
LSD at 5%	10.5		

The same trends were also observed when *Tuta absoluta* treated with all different concentrations of seed extracts obtained from Al-Gabal Alasfar region, where the eggs laid per female showed a significant decrease compared to control (Table, 6). Alcoholic and aqueous extracts of jojoba seed of Al-Gabal Alasfar region showed the higher effect against *Tuta absoluta* insect led to a reduction in number of eggs/female compared to the control. Since, the eggs laid/female significantly decreased to 32.1± 9.4, 25.4 ± 5.6 and 20.7± 1.8 eggs/female in jojoba ethanolic extract and 42.0±7.4, 35.3±2.4 and 30.6±6.4 of jojoba w. extract at 0.5%, 2% and 3% respectively compared to122±6.8 eggs/female in the control. The study also showed that the aqueous extract of cast r oil was weaker in its effect on the *Tuta absolut*a insect compared to the other treatments, as the eggs laid/female were 88.4±1.8, 65.4±9.0 and 45.5±2.7 at concentrations of 0.5, 2 and 3%, respectively.

Table 6: Effect of water and ethanolic seed extracts of Jatropha, jojoba and castor bean of Al-Gabal Alasfar region agents against *Tuta absoluta*

Treatments	Mean number of eggs/female ±S.E.		
	0.5%	2%	3%
Jatropha w. extract	61.4±1.4	55.4±1.7	38.5±4.9
Jatropha ethy. extract	50.8±7.4	49.4±6.4	35.6±8.4
Castor bean. extract	88.4±1.8	65.4±9.0	45.5±2.7
Castor bean ethy. extract	72.9±3.6	55.7±2.4	40.4±1.4
Jojoba w. extract	42.0±7.4	35.3±2.4	30.6±6.4
Jojoba ethy. extract	32.1±9.4	25.4±5.6	20.7±1.8
Control(untreated)	122±6.8		
F value	10.4		
LSD at 5%	8.9		

b- on *Phthorimaea operculella*:

During present study it was found that all seed extracts of Ismailia Governorate were exhibiting potent insecticidal action against *Phthorimaea operculella* insect (Table, 7). The highest reduction in number of eggs/female was found when *P. operculella* treated with ethanolic extract of jojoba seed, followed by ethanolic extract of jatropha. from Ismailia Governorate. The means number of the eggs laid by the female were decreased to 45.7±7.4, 39.4±2.8 and 28.8±1.9 eggs/female at the concentrations of 0.5, 2 and 3% of jatropha water ext,. respectively. While, jatropha ethanolic extract at corresponding concentrations recorded 39.4±4.4, 31.4±2.5 and 24.1±5.1 eggs/ female, respectively. On the other hand, the treatment with 3% of castor and jojoba ethanolic extracts, number of eggs laid / female were significantly also decreased to 29.4±4.4, and 20.4±1.9 eggs/female as compared to123±3.1 eggs/female in the control (Table 7).

Table 7: Effect of water and ethanolic seed extracts of Jatropha, jojoba and castor bean of Ismailia Governorate agents against *Phthorimaea operculella*

Treatments	*Mean number of eggs/female ±S.E.*		
	0.5%	2%	3%
Jatropha w. extract	45.7±7.4	39.4±2.8	28.8±1.9
Jatropha eth. extract	39.4±4.4	31.4±2.5	24.1±5.1
Castor bean w. extract	59.8±7.1	27.2±3.4	22.4±1.4
Castor bean eth. extract	42.4±3.4	32.0±3.0	29.4±4.4
Jojoba w. extract	40.4±1.4	30.4±6.4	20.4±8.4
Jojoba eth. extract	38.3±4.8	28.4±1.8	20.4±1.9
Control(untreated)	123±3.1		
F value	11.5		
LSD at 5%	9.9		

The same trends were also observed when *P. operculella* treated with all different concentrations of seed extracts obtained from Al-Gabal Alasfar region, where the eggs laid per female showed a significant decrease compared to control (Table 8). The ethanolic extract of jatropha showed highest activity as the means numbers of eggs deposited /female were significantly decreased to 40.1±5.4, at concentration of 0.5% compared to 139±1.5 eggs laid/female in the control. Result also showed that the means numbers of eggs laid/female were significantly decreased to 55.3±8.1, 22.4±1.7 and 20.4±7.7 eggs/female of Jojoba ethanolic extract at the concentrations of 0.5, 2 and 3%, respectively as compared to 139±1.5 eggs/female in the control. This could lead to an assumption that there is same general metabolites in all extracts that could be having an effect. The study also showed that the aqueous extract of castor oil was weaker in its effect on *P. operculella* insect compared to the other treatments, as the eggs laid/female were 85.7±3.3 and 69.4±1.3 at concentrations of 0.5% and 2%, respectively.

Table 8: Effect of water and ethanolic seed extracts of Jatropha, jojoba and castor bean of Al-Gabal Alasfar region agents against *Phthorimaea operculella*

Treatments	*Mean number of eggs/female ±S.E.*		
	0.5%	2%	3%
Jatropha w. extract	77.4±7.4	55.4±1.4	39.7±1.8
Jatropha eth. extract	40.1±5.4	30.4±1.2	30.4±1.1
Castor bean w. extract	85.7±3.3	69.4±1.3	30.4±4.4
Castor bean eth. extract	65.3±1.4	49.4±6.4	28.1±2.3
Jojoba w. extract	65.2±2.4	49.4±1.6	27.4±1.4
Jojoba eth. extract	55.3±8.1	22.4±1.7	20.4±7.7
Control(untreated)	139±1.5		
F value	11.5		
LSD at 5%	11.3		

In this research, the results obtained with jatropha, jojopa and castor oil seed extracts of all treatments showed that a promising tool for control of *Tuta absoluta* and *Phthorimaea operculella* insect pests was found. Similar results were obtained by Bashir and El-Shafie (2013)on jatropha against desert locust. Sabbour and Abde El-Rahman (2013) reported that jatropha and jojoba seed oil acted not only as oviposition deterrents but also adversely influence fecundity against *Callosobruchus maculates*. Bhagat and Kulkarni (2012) reported that the jatropha species were exhibiting potent insecticidal activity against *S. litura*.

5. Effect of water and ethanolic seed extracts in the field:

Field trials were carried out at Ismalia Governorate and El-Gabal Alasfer region (Giza Governorate), Egypt to study the effectiveness of the tested water and ethanolic seed extracts of jojoba, jatropha and castor oil on tomato yield under natural conditions. Data in Table (9) showed that all treatments in the two locations exhibited significant increase in the tomato yield /feddan compare with the untreated control. The same results obtained by, Sabbour 2008, 2009, 2012, 2013; Sabbour, and (Nayera 2014. a&b), Sabbour, and Abdel-Rahman,. (2007 &2013), Sabbour,. and Sahab (2005&2007). Sabbour, and Shadia, (2010 &2014). At El-Gable Alasfer region, application of Jatropha water and ethy. extracts significantly increased the tomato yield which increased on average from 2009± 31.12 kg/feddan in the control to 3210± 16.32 (59.78% increase)and 3410± 46.02 kg/feddan (69.74% increase) respectively. The same trend was also observed in Ismailia Governorate, as the estimated weights of tomato yields were 3319± 34.52 (83.37% increase) and 3599± 16.12 kg/feddan (98.83% increase) in treated plants with Jatropha water and ethy. Extracts, respectively compare with control. Application of jojoba w. and ethy. extracts in El-Gabal Alasfer region also significantly increased the tomato yield which increased on average to 3540±86.22 (76.21 increase) and 3881±76.72 kg/feddan (93.18% increase) respectively. The same trend was also observed in Ismailia Governorate compare to the untreated plants. Whereas, application of castor oil as aqueous or ethanlic extracts led to an increase in tomato yield crop than the control, in the two regions, but to a lesser extent from the use of jatropha and jojoba seed extracts. Data also showed that the yield loss in El-Gabal Alasfer region ranged between 8 to 22% in all treatments as compared to 48% in the control plot. In Ismailia Governorate the yield loss ranged between 7 to 20% as compared to 53% in the control.

Table 9: Weight of harvested tomatoes and percentage of yield loss after treatment with water and ethanolic seed extracts against *T. absoluta* and *P. operculella* in farms from two regions.

Treatments	Al-Gabal Alasfar region		Ismailia Governorate	
	Weight tomatoes (Kg/feddan)	% of yield loss	Weight tomatoes (Kg/feddan)	% of yield loss
Jatropha w. extract	3210±16.32	17	3319± 34.52	14
Jatropha eth. extract	3410±46.02	12	3599± 16.12	7
Castor bean w. extract	3000± 30.82	22	3110± 56.62	20
Castor bean eth. extract	3010± 30.42	22	3118± 26.82	20
Jojoba w. extract	3540±86.22	8	3620± 76.22	7
Jojoba eth. extract Control	3881±76.72	-	3899± 86.29	-
	2009± 31.12	48	1810± 38.81	53
F values	31.42		32.62	
LSD at 5%	83		80	

The same results were also reported by Sabbour *et al* (2013) who studied the repellency test of three extracted oils (jatropha, canola and Jojoba seed oils, against *Ephestia cautella* and *Plodia interpunctella* pests and Sabbour and Abd El-Raheem (2013) against stored product insect pests. Many reports revealed that plant metabolites and plant based pesticides appear to be one of the better alternatives as they are known to have minimal environmental impact and danger to consumers in contrast to synthetic pesticides (Gottlieb *et al.*, 2002 and Pawar, 2011). Toxicity of seed extracts may be attributed to several components including saponins, lectins, phytates, protease inhibitors, curcalonic acid and phorbol esters (Makkar *et al.*, 1997). Based on results of the present studies, it can be concluded that alcoholic or aqueous extracts of seeds can be used for isolating the toxic active fraction which have exhibited not only toxic action to insects but also to phytopathogenic fungi.

References

[1] Abbott W.S. (1925). A method of computing the effectiveness of an insecticide.J. Econ. Entomol. 18 (1): 265–267

[2] Abul-Nasr, S.E., S.M. Fahmy and El-Sherief, A. (1971). Studies on the potato tuber moth *Phthorimaea operculella* Zeller. Bulletin Society of Entomology of Egypt, 5: 185-191.

[3] Aliero, A.A., and Afolayan A.J (2006). Antimicrobial activity of *Solanum tomentosum*. Afr. J. Biotech 5 (4): 369 – 372.

[4] Arekemase, M. O., Kayode R.M.O., Ajiboye A.E. (2011). Antimicrobial activity and phytochemical analysis of *Jatropha curcas* plant against some selected microorganisms.*Int. J. Biol.* 3 52–59.10.5539/ijb.v3n3p52

[5] Barnett, H.L. and Hunter, B.B. (1972)Illustrated genera of Imperfect fungi. Burgess Publishing Co.Minnesota.

[6] Bashir, (Ebtisam) M. and El Shafie (Hamadttu), A.F. (2013). Insecticidal and antifeedent efficacy of Jatropha oil extract against the desert locust, *Schistocerca gregaria* Agric. and Biology J. of N. Am., 4(3): 260-267.

[7] Bellirou, A., B. Bouali, N. Bouammali, B.N. Boukhatem, A. Elmtili and Hamal M.(2005). Extraction of simmondsin and oil in one step from jojoba seeds.Industrial Crop Production, 21: 229-233.

[8] Bhagat, R. and Kulkarni D.K. (2012). Evaluation of larvicidal and antifeedant potential of three jatropha species against *Spodoptera litura* and two predators.Ann. of Biol. Res., 3(6): 2911-2916.

[9] Dharamputra, O.S., Worang, R.L., Syarief, R. and Miftahudin R. (2009) The quality of physic nut (*Jatropha curcas*) seeds affected by water activity and duration of storage.Microbiology, 3, 139-145.

[10] Domsch, K.H., Gams W. and Anderson T.H. (2007). Compendium of soil fungi. 2nd dition.IHW-Verlag, Eching.

[11] Elarosi, H. (1993). Diseases of vegetables. New Publishing House, Alexandria.

[12] El-Sherif, A.R.A. (1966). Studies on the morphology and biology of potato tuber moth, *Phthorimaea operculella* (Zeller). M. Sc. Thesis, Faculty of Agriculture, Cairo University, pp: 297.

[13] Finney, D.J. (1964). Probit Analysis. 2nd ed. Cambridge. Univ. Press. England, 318 pp.

[14] Gottlieb, O.R., Borin M.R. and Brito N.R. (2002). Integration of ethnobotany and phytochemistry: dream or reality? Phytochemistry, 60(2): 145-152.

[15] Jayaraman, P., NesaPariya S. Parameshwari S., priya S.S. Jawahar N. and Babu H.S.(2011). Occurrence of storage fungi in jatropha (Jatropha curcas L.) seeds. Af. J. of Microbiol. Res., 5(5): 475-480.

[16] Khalil, A and Dababneh, B. F. (2007). Inhibition of Phytopathogenic Fungi by Extracts from Medicinal Plants in Jordan. Journal of Biological Sciences, 7: 579-581.

[17] Maji, E.A. and Imolehin E.D. (2010) Seed Borne fungi Castor Oil (Ricinus cummunis): Effect of Their Metabolites and Fungicides on Seed Germination and Other Seedling Parameters. Nigeria Agric. J. 41(1): 32-38.

[18] Makkar, H.P., Becker S., Sporer K. and Wink M.(1997). Studies on nutritive potential and toxic constituents of different provenances of *jatropha curcas*.J. Agric. Food Chem. 45: 3152-3157.

[19] Meshram, P.B., N. Kulkarni, and Joshi K.C. (1996). Antifeedant activity of *Azadirachta indica* and *Jatropha curcas* against *Papilio demoleus*L. J. Environ. Biol., 17: 295-298.

[20] Mohana, D.C., K.A. Raveesha and R. Loknath. (2008). Herbal remedies for the management of seed-borne fungal pathogens by an edible plant *Decalephis hamiltonii*.Phytopathol. Plant Protect., 41(1): 38-49.

[21] Neves, W. S. Parreira D.F., Ferreira P.A. and Lopes E.A.(2009). Phytosanitary status of *Jatropha curcas* seeds from Jequitinhonho and Mucuri Valleys. Revista Tropica Cienciase Biologicas, ; 3(2): 17-23

[22] Nwosu, M.O. and Okafor J.I. (1995). Preliminary studies of the antifungal activities of some medicinal plants against *Basidiobolus* and some other pathogenic fungi. Mycoses, 38: 191-195.

[23] Pawar, B.T. (2011). Antifungal activity of some leaf extracts against seed-borne pathogenic fungi. Int. Multidisciplinary Res. J., 1/4: 11-13.
[24] Rozman, V., Kalinovic I. and Korunic, Z. (2007). Toxicity of naturally occurring compounds of Limiaceae and Lauraceae to three stored- product insects. Journal of Stored Products Research, 43: 349-355.
[25] Rug, M. and Ruppel, A.(2000). Toxic activities of the plant *Jatropha curcas* against intermediate snail hosts and larvae of schistosomes. Trop. Med. Int. Health., 5: 423-430.
[26] Sabbour, M. and Ismail, I.A. (2002). The combined effect of some microbial control agents and plant extracts against potato tuber moth*Phthorimaea operculella* (Zeller). Bull. N.R.C. Egypt, 27: 459-467.
[27] Sabbour M.M. and Abd-El-Raheem M.A. (2013). Repellent effects of *Jatropha curcas*, canola and Jojoba seed oil, against *Callosobruchus maculates* (F.) and *Callosobruchu schinensis* (L.).Journal of Applied Sciences Research, 9(8): 4678-4682.
[28] Sabbour M.M.and Abdel-Rahman.2013. Efficacy of isolated *Nomuraea rileyi* and Spinosad against corn pests under laboratory and field conditions in Egypt Annual review and research in biology, ***3(4): 903-912.***
[29] Sabbour, M.M., M. Ragei and A. Abd-El Rahman, 2011. Effect of Some Ecological Factors on The Growth of *Beauveria bassiana* and *Paecilomyces fumosoroseus* Against Corn Borers**.** Australian Journal of Basic and Applied Sciences, 5(11): 228-235, 2011
[30] Sabbour, Magda M, 2002.Evaluation studies of some bio-control agents against corn borers in Egypt. Annal Agric. Sci. Ain Shams Univ. Cairo, 47(3): 1033-1043
[31] Sabbour, M.M. and Shadia E. Abed El-Aziz.2002, Efficacy of some botanical oils formulated with microbial agents against the cotton leafworm and greasy cutworm attaching cotton plants. Bull. ENT. Soc. Egypt. 2002: 5(28): 135-151.
[32] Sabbour, M.M. and Sahab, A.F. 2005 Efficacy of some microbial control agents against cabbage pests in Egypt. Pak. J. Biol. Sci.:5(8): 1351-1356.
[33] Sabbour, M.M. and Sahab, A.F. 2007. Efficacy of some microbial control agents against *Agrotis ipsilon* and *Heliothis armigera* in Egypt. Bull. N.R.C. Egypt. 2007: 13(33): 165-174
[34] Sabbour, M.M. and Shadia, E. Abd-El-Aziz. 2010.Efficacy of some bioinsecticides against *Bruchidius incarnatus* (BOH.) (Coleoptera: Bruchidae) Infestation during storage. 2010J. Plant Prot. Res. 2010: 50 (1): 28-34.
[35] Sabbour M.M.and abdel-Rahman.2013. Efficacy of isolated *Nomuraea rileyi* and Spinosad against corn pests under laboratory and field conditions in Egypt Annual review and research in biology, ***3(4): 903-912.***
[36] Sabbour, M. M and Abdel-Rahman, A. 2007. Evaluations of some terpenes and entomopathogenic fungi on three sugar beet insect pests. J. Boil. Pest. Cont. 17:22-29
[37] Sabbour, M. M, (2008).Evaluations of some microbial control agents against olive moth *Prays oleae* under field conditions under publication.
[38] Sabbour, M.M and Nayera, Y. Soliman, 2014a,. Evaluations of three *Bacillus thuringiensis* against *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) in Egypt. ***Volume 3 Issue 8, August 2014***. 2319-7064.
[39] .Sabbour, M.M. and Nayera, Y. Soliman. 2014b. Preliminary Investigations Into The Biological Control Of Red Palm Weevil *Rhynchophorus ferrugineus* By Using *three isolates of the fungus Lecanicillium* (*Verticillium*) *lecanii In Egypt* ***Volume 3 Issue 8, August 2014***. **2319-7064**
[40] Sabbour, M.M. 2009. Evaluation of two entomopathogenic fungi against some insect pests infesting tomato crops in Egypt, IOBC/wprs Bulletin, Vol. 49: 273-278.
[41] Sabbour, M.M. (2012). Evaluations of some bioagents against the rice weevil *Sitophilus oryzae* under laboratory and store conditions. *Integrated Protection of Stored Products. IOBC-WPRS Bulletin Vol. 81, pp. 135-142*
[42] Sahab A.F., Soher E. Aly, Lobna S. Nawar and Sawsan Y. El-Faham (2011).Fungal occurrence in physic nut (*Jatropha curcas*) seeds during storage and possibility aflatoxin production by *Aspergillus flavs* and *Aspergillus paraziticus* isolates.J. of American Sci., 7(5): 511-516.
[43] Samson, R., Houbraken J., Thrane U., frisvad J. and Andersen B. (2010). Food and indoor fungi.CBS-KNAW Fungal Biodiversity Centre Utrecht, The Netherlands
[44] Sarhan, A.A. (2004). One of the applied biological control programs against the potato tuber moth, (*Phthorimaea operculella* Zeller) in stores. Egypt. Journal of Bioogical Pest Control., 14: 291-298.
[45] Sharma, P., Champawat, R. S. (2000): Seed mycoflora of Jojoba, their pathogenic potential and control. Journal Of Mycology & Plant Pathology. 30(3): 398-401,
[46] Soliman, M.H.,. Gehad M.M and Farag, E.M. (2008). Infestation of tomato fruit with tomato fruit borer *Helicover paarmigera* (Hübn.) and its control using some local and more safe materials compared with conventional insecticide. Egyptian Journal of.Agricultrual Research, 86: 775-783.
[47] Srivastava, S., Sinha, A. and Srivastava, C.P. (2011). Screening of seed-borne mycoflora of *Jatropha curcas* L. Research Journal of Seed Science. 4(2), 94-105
[48] Tiwari, P., Kannojia P. and Pandey A. (2012). Jatropha seed borne fungi in the Haryana. Int. J. of Advanced Biol. Res., 2(1): 83-85.
[49] Vincent, J.M. (1947). Distortion of fungal hyphae in presence of certain inhibitors. Nature, 159: 850-850.
[50] Worang, R.L., O.S. Dharmaputra and Miftahuddin, R.S. (2008). The quality of physic nut (*Jatropha curcas* L.) seeds packed in plastic material during storage. Biotropia, 15: 25-36.
[51] Zurina, Z.A.(2009). Extraction of oil from jatropha seed optimization and kinetics.Am. J. Appl., Sci. 6(7): 1390-13954.