

	<i>Aspergillus flavus</i>	0.0 p	0.0 p	0.0 p	0.0 p	0.0 p	0.00 h
	<i>Aspergillus niger</i>	0.0 p	0.0 p	0.0 p	1.9 op	6.3 lm	1.64 fgh
	<i>Fusarium oxysporum</i>	0.0 p	0.0 p	0.0 p	3.0 nop	13.3 j	3.27 f
	<i>Fusarium solani</i>	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
	General 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 $P \geq 0.05$ according to Duncan's multiple range test.

Results of the antifungal test of aqueous seed extracts of jatropha, jojoba 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 metabolites 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 \pm S.E.		
	0.5%	2%	3%
Jatropha w. extract	69.4 \pm 1.4	40.4 \pm 1.9	30.4 \pm 4.3
Jatropha ethy. extract	35.2 \pm 1.7	28.7 \pm 6.4	21.4 \pm 1.8
Castor bean w. extract	82.9 \pm 5.4	75 \pm 2.4	60.4 \pm 2.9
Castor bean ethy. extract	72.9 \pm 3.5	65 \pm 4.4	50.4 \pm 1.8
Jojoba w. extract	52.3 \pm 4.1	35 \pm 2.8	20.4 \pm 1.6
Jojoba ethy. extract	42.9 \pm 3.4	25 \pm 2.7	18.4 \pm 1.2
Control (untreated)	111 \pm 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 to 122 ± 6.8 eggs/female in the control. The study also showed that the aqueous extract of castor oil was weaker in its effect on the *Tuta absoluta* 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 \pm S.E.		
	0.5%	2%	3%
Jatropha w. extract	61.4 \pm 1.4	55.4 \pm 1.7	38.5 \pm 4.9
Jatropha ethy. extract	50.8 \pm 7.4	49.4 \pm 6.4	35.6 \pm 8.4
Castor bean. extract	88.4 \pm 1.8	65.4 \pm 9.0	45.5 \pm 2.7
Castor bean ethy. extract	72.9 \pm 3.6	55.7 \pm 2.4	40.4 \pm 1.4
Jojoba w. extract	42.0 \pm 7.4	35.3 \pm 2.4	30.6 \pm 6.4
Jojoba ethy. extract	32.1 \pm 9.4	25.4 \pm 5.6	20.7 \pm 1.8
Control(untreated)	122 \pm 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 to 123 ± 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 \pm S.E.		
	0.5%	2%	3%
Jatropha w. extract	45.7 \pm 7.4	39.4 \pm 2.8	28.8 \pm 1.9
Jatropha eth. extract	39.4 \pm 4.4	31.4 \pm 2.5	24.1 \pm 5.1
Castor bean w. extract	59.8 \pm 7.1	27.2 \pm 3.4	22.4 \pm 1.4
Castor bean eth. extract	42.4 \pm 3.4	32.0 \pm 3.0	29.4 \pm 4.4
Jojoba w. extract	40.4 \pm 1.4	30.4 \pm 6.4	20.4 \pm 8.4
Jojoba eth. extract	38.3 \pm 4.8	28.4 \pm 1.8	20.4 \pm 1.9
Control(untreated)	123 \pm 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 \pm 5.4, at concentration of 0.5% compared to 139 \pm 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 \pm 8.1, 22.4 \pm 1.7 and 20.4 \pm 7.7 eggs/female of Jojoba ethanolic extract at the concentrations of 0.5, 2 and 3%, respectively as compared to 139 \pm 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 \pm 3.3 and 69.4 \pm 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 \pm S.E.		
	0.5%	2%	3%
Jatropha w. extract	77.4 \pm 7.4	55.4 \pm 1.4	39.7 \pm 1.8
Jatropha eth. extract	40.1 \pm 5.4	30.4 \pm 1.2	30.4 \pm 1.1
Castor bean w. extract	85.7 \pm 3.3	69.4 \pm 1.3	30.4 \pm 4.4
Castor bean eth. extract	65.3 \pm 1.4	49.4 \pm 6.4	28.1 \pm 2.3
Jojoba w. extract	65.2 \pm 2.4	49.4 \pm 1.6	27.4 \pm 1.4
Jojoba eth. extract	55.3 \pm 8.1	22.4 \pm 1.7	20.4 \pm 7.7
Control(untreated)	139 \pm 1.5		
F value	11.5		
LSD at 5%	11.3		

In this research, the results obtained with jatropha, jojoba 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 Ismailia 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-Gabal Alasfer region, application of Jatropha water and ethy. extracts significantly increased the tomato yield which increased on average from 2009 \pm 31.12 kg/feddan in the control to 3210 \pm 16.32 (59.78% increase) and 3410 \pm 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 \pm 34.52 (83.37% increase) and 3599 \pm 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 \pm 86.22 (76.21 increase) and 3881 \pm 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 ethanolic 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 *Ephesia 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.

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