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TOXICOLOGICAL AND BIOLOGICAL STUDIES OF SOME ENVIRONMENTALLY SAFE CHEMICALS AGAINST *Aphis gossypii Glover.*

By

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ABSTRACT

The present study was directed to evaluate the bioactivity of some pesticides (i.e. malatox and propoxur) or their alternatives (i.e. mineral oil CAPL-2), plant extracts (black cumin and wormseed) and a commercial product of the entomopathogenic fungi, Biofly (*Beauveria bassiana*) against *Aphis gossypii* (Glover). The tested alternatives were also evaluated when combined in mixtures with classical pesticides. The results achieved in this study can be summarized in the following findings: Malatox showed the highest toxicity followed by propoxur (LC_{50} 16.31 and 105.22 p.p.m respectively), while Black cumin had a moderate toxic effect followed by the mineral oil CAPL-2 (LC_{50} 140.42 and 891.30 p.p.m. respectively) and Wormseed was the least toxic compound to adults of *A. gossypii* (LC_{50} 1704 p.p.m).The potentiation effect against adults of *A. gossypii* was obtained with the mixtures of malatox + CAPL-2, malatox + black cumin, malatox + wormseed, propoxur + CAPL-2, propoxur + black cumin and propoxur + wormseed. The microbial pesticide Biofly was highly toxic to aphid adults (LC_{50}

2920) conidia/ml). The mixture (malatox + CAPL-2), malatox, mixture (propoxur + CAPL-2) and propoxur were the most effective combinations on the prolongation of nymphal stage of different instars, also reduction in the number of produced nymphs was observed and significant higher mortality than the control. The mineral oil CAPL-2 was the least effective on prolongation of nymphal stage for different instars as well as the reduction in the number of produced nymphs and nymphal mortality.Black cumin extract was the highest effective compound on a prolongation of the nymphal stage of the different instars, also reduction in the number of produced nymphs followed by extract wormseed on *Aphis gossypii*. The biofly had a moderate effect on prolongation of the nymphal stage of the different instars as well reduction in the number of produced nymphs of *Aphis gossypii*.

INTRODUCTION

The cotton aphid, *Aphis gossypii* (Glover), in recent years become a deleterious pest infesting wide range of crops in Egypt. Therefore, laboratory screening of insecticides against this insect was required to find an effective control program (Haydar *et al.* 1996). In Egypt, *Aphis gossypii* (Glover) attack squash plants causing dangerous problem either directly or indirectly giving a reduction in the crop yield. The development of injurious population of the pest is associated with the increased use of insecticides which are ineffective against the pests and are known to create problems by destroying their natural enemies (Shaheen *et al.*, 1973).

Many authors concluded that malathion was effective against *A. gossypii* (Hussein and Fong, 1989; Ayad *et al.*, 1991; Kolaib and El-Dash, 1991 and Martin *et al.*, 1997). Guirguis *et al.* (1989, 1991), Matter *et al.* (1993), Rahbe *et al.* (1995), El-Gougary (1998), El-Hariry *et al.* (1998), Tunc and Sahinkaya (1998) indicated that plant extracts exhibited high effect against *Aphis gossypii*.

Bioresidual activity of certain organophosphorus, carbamates and other insecticides against *Aphis gossypii* was studied by Ibrahim *et al.* (1992). They found that monocrotophos (Nuvadrin or Nuvacron), furathiocarb (Deltanet) and diafenthiuron (Polo) showed high efficiency against both nymphs and adults. Adults were more susceptible to the tested insecticides than nymphs.

Haydar *et al.* (1996) found that adding pirimiphos-ethyl to each of KZ-oil and Super Mesrona displayed potentiation. On the other hand, the mixtures of the two oils with viz, monocrotophos and malathion resulted in an obvious antagonism, cotoxicity factor ranged between-11 to -85 against *A. gossypii*. Hollingsworth *et al.* (1997) studied relationship between susceptibility to four insecticides and fecundity across populations of cotton aphid, *Aphis gossypii*. Multiple regression showed that the relationship between the logarithm of LC_{50} and mean daily progeny production in the absence of insecticide exposure was negative for estenvalerate (a pyrethroid), positive for methomyl (a carbamate) and not significant for endosulfan (an organochlorine) or oxydemeton-methyl (an organophosphate). The association between methomyl susceptibility and fecundity was not evident in a simple regression analysis.

Abbassy *et al.* (1998) found that the acetone/ethanol extract was toxic to *Aphis gossypii* followed by lycerine, soosan oil and crude alkaloids. Also, synergism studies on *A. gossypii* indicated that lycorine, the principal alkaloid of soosan bulbs, strongly synergized cyanophos, reducing its LC_{50} value from 120 to 48 p.p.m. Al-Shayji *et al.* (1998) determined the insecticidal activities of five preparations of *Bacillus thuringiensis* (Bt) on adults and nymphs of *Aphis gossypii*. They found that both nymphs and adults were highly susceptible to Bactospeine and Dipel, whereas Thuricide 64 was the least toxic. El-Gougary (1998) found that of the different solvent-extracts of *Atriplexhalimus*, ether and petroleum-ether extracts showed strong aphicidal activity against *Aphis gossypii* with LC_{50} values of 0.059 and 0.085%, respectively. El-Hariry *et al.* (1998) reported that mineral soils CAPL-1 and CAPL-2 exhibited high effect against *Aphis gossypii*.

The present study was carried out to investigate: The toxic effect of malathion and propoxur, plant extracts (black cumin and wormseed), mineral oil (CAPL-2), mixtures (malathion or propoxur with other compounds) and microbial pesticide (Biofly) against adults of aphid *Aphis gossypii* Glover. In addition the side effect of sublethal doses of tested compounds on some biological aspects for the aphid *Aphis gossypii* Glover.

MATERIALS AND METHODS

Culture t echnique:

Aphid culture:

The aphid used in this study was identified as *Aphis gossypii* (Glover), (Homoptera : Aphididae). *Hibiscus esculentus* plants were used for aphid mass-rearing. Okra plants were put in cages and the aphids were always transferred weekly from old to young seedlings, by cutting the heavily infested leaves in order to transfer it to new plants. The aphid culture were kept at 25± 2°C and 65 ± 5 R.H.

Chemicals used:

Six compounds including microbial one were used. All tested compounds were in the formulated form and the dosages were calculated on the basis of p.p.m. of active ingredient except the microbial pesticide Biofly *Beauveria bassiana* which calculated on the basis of number of conidia/ml. The chemical names for tested compounds are as follows:

1-Malatox: (diethyl-dimethoxythiophosphoryl thio) succinate; S-1-2-bis (ethoxy carbonyl) ethyl o, o-dimethyl phosphorodithioate.

2-Propoxur: -2-isoproxyphenyl methyl carbamate.

3- Mineral oil: $CAPL_2$: 96.62% E.C. was provided by Central Agricultural Pesticides Laboratory. Mineral oil was applied at rate of 7 L./feddan.

4-Biocontrol agent: Biofly: a trade name of entomopathogenic fungus (*Beauveria bassiana*) (Balsamo) as liquid microbial pesticide (1 ml include 3 x 10^7 conidia). It was supplied by El-Nasser Company for Fertilizers and pesticides-Egypt.

5-Plant materials:

Plant extract preparation:

The plant sample (wormseed) was thoroughly washed in detergent solution followed by rinsing in tap water. Plants were air dried at room temperature then in an oven at 40°C and then they were grounded to fine powder, The The powder was divded into batches each weighed 100 gm, which was macerated in 300 ml of acetone/methanol (1: 1 v/v) for 72 hours in dark bottle. During the maceration period sample was shaken for 6 hours using an electric shaker. Extract was filtered and placed in a refrigerator for 24 hrs, the extract was then refiltered, dried over an hydrous sodium sulphate and evaporated to dryness using a rotary evaporator. The residue was considered as active ingredient, weighted and dissolved in acetone to form the required concentrations. An amount of 5 g of black cumin seeds powder were extracted in 100 ml of absolute ethanol (75%). Extraction run over night followed by filtration.

Plants extracted and investigated in the present study.

Scientific Name	Arabic Name	Common name	Parts used
Fam. Ranunculaceae *Nigella sativum* Linn.	الحبة السوداء	Black cumin	Seeds
Fam. Compositae *Artemisia cinae* L.	الشيح الخرساني	Wormseed	Leaves

Experimental techniques:

1.Leaf disc:

The pepper plants or okra plants were cultured under the greenhouse conditions. When young plants bearing only 4 primary leaves, they were considered to be suitable to carry on experimental tests desired.

The toxic effect for the tested compounds were evaluated by leaf disc dip technique according to Siegler (1947). Leaf disc experiments were conducted at 25 ± 2°C. To determine the joint effect of mixtures of some pesticides with mineral oil or plant extracts to *A. gossypii*, the LC_{25} determined from the previous bioassay test was mixed with plant extracts or mineral oil causing 25% mortality. The leaf disc dip technique was used according to Siegler (1947). The mixture was evaluated by the equation of co-toxicity factor, described by Mansour *et al.* (1966).

2.Dipping of whole plants:

To assay the residual effect of the tested compounds on biological aspects of aphids such as, reproduction, developmental stages, mortality of different instars and off spring; the method of Smith *et al.* (1963) was used. In the case of plant extracts, the plants were infested with 8 adults on each plant. These plants were dipped in the required concentration of plant extracts. Aphids (newly born) were transferred on the treated plants. Five individuals first instar were transferred on each plant. Each treatment was replicated four times. First instar was allowed to complete its development on treated plants and the duration of each instar as well as the number of dead individuals were recorded. When nymphs reached the adult stage, newly born nymphs were counted. The experiments were conducted under the controlled condition of 25 ± 2°C and 65 ± 5 R.H.

RESULTS AND DISCUSSION

1.Toxicity of tested compounds against *A. gossypii* adults:

Two pesticides (malatox and propoxur), one (mineral oil CAPL-2) and two plant extracts (black cumin and wormseed) were tested for their toxicity to adult stage of laboratory strain of *A. gossypii* by the leaf disc technique. Probit regression lines were statistically analyzed according to Finney (1952) this supplies information on confidence limits of LC_{50} and slope values.

Based on LC_{50}values (table 1), the results indicated that malatox was the most toxic compound to adults of *A. gossypii* with LC_{50} value of 16.31 p.p.m. While propoxur and black cumin have a moderate toxicity of LC_{50} values 105.22 and 140.42 p.p.m., respectively. CAPL-2 and wormseed were the least toxic to adult of *A. gossypii* with LC_{50} values of 891.30 and 1704 p.p.m., respectively. In the same time, the black cumin, as a plant extract was more toxic to adults of *A. gossypii* than wormseed. The slope values of log concentration-probit lines showed in table (1) indicated that black cumin has the highest slope value (1.68), while propoxur has the lowest one (0.90). Wormseed, malathion and CAPL-2 have slope values of 1.58, 1.52 and 1.09, respectively.

Concerning the toxicity index at LC_{50} level, the data in table (1) confirmed that, malatox was the most toxic compound on adults of *A. gossypii* (100). While propoxur and black cumin have a moderate toxic effect and the toxicity indexes were (15.50 and 11.61, respectively). The mineral oil CAPL-2 and wormseed were the least toxic with toxicity indexes of (1.82 and 0.95, respectively).

Malatox was found effective against *A. gossypii*. The results obtained are in agreement with that recorded by (Zidan *et al.* 1988; Hussein and Fong, 1989; Ayad *et al.* 1991). However, while CAPL-2 was the least toxic compound tested against the adults of *A. gossypii* after wormseed in the present results; El-Hariry *et al.* (1998) found that CAPL-1 and CAPL-2 (petroleum oil fractions) exhibited higher effectiveness against *A. gossypii*.

Plant extracts were found effective against *A. gossypii* by many investigators in laboratory (Dhandapani *et al.* 1985; Guirguis *et al.* 1989; Guirguis *et al.* 1991; Lowery *et al.*, 1993; Matter *et al.*, 1993; Rahbe *et al.* 1995; Hutton *et al.*, 1996 and Tunc and Sahinkaya, 1998). Nassef (1998) obtained from vegetative oil (black cumin) % initial kill ranged 78.8-93.1 and average % reduction 61.3-73.1 on cotton and squash respectively in field against *A. gossypii.* Metwally *et al.* (1999) indicated that natural oils gave high percentage initial mortality on the population of *A. gossypii.*

Table(1):Toxicity and joint action of tested compounds against *A. gossypii* adults.

Compound	LC_{50} p.p.m	Confidence limits of LC_{50}		Toxiciy Index	Slope Value	Co-toxicity Factor	
		Lower	Upper				
Pesticides							
Malatox	16.31	12.17	21.34	100	1.52	--	
Propoxur	105.22	.68	157	15.50	0.90		--
Mineral oils							
CAPL-2	891.30	616	1245	1.82	1.09	+55*	+72.98$^{\Delta}$
Plant extracts							
Black cumin	140.42	99.42	186.73	11.61	1.68	+50**	+30 $^{\Delta\Delta}$
Wormseed	1704	1228	2230	0.95	1.58	+35***	+25 $^{\Delta\Delta\Delta}$

*Malatox with CAPL-2 Δ Propoxur with CAPL-2

**Malatox with blackcunim ΔΔPropoxur with black cumin

***Malatox with wormseed ΔΔΔ Propoxur with wormseed

2.Joint action of some pesticides with plant extracts or mineral oil against *A. gossypii* (Glover):

To determine the toxic effect of applying pairs of the tested compounds, the expected LC_{25} doses of each compound separately was

applied. When the mixture was used, it was thought that the resulted mortality will be around 50%. The joint action was evaluated by the equation of co-toxicity factor, described by Mansour *et al.* (1966).

Data presented in table 1 indicated that 6 pairs of mixtures showed potentiation, and the Co-toxicity factor values obtained were as follows:

1-CAPL-2 with malathion and propoxur +55 and +72.98 respectively.
2-Black cumin with malathion and propoxur +50 and +30 respectively.
3-Wormseed with malathion and propoxur +35 and +25 respectively.

Omar *et al.* (1987) showed that when missible oil was combined with insecticides satisfactory controlled aphids. El-Deeb *et al.* (1989) found that the wettable powder pirimiphos-ethyl was highly synergised by Shokrona super and moderately synergised by star oil. Mourad *et al.* (1994) showed that combination of half recommended rates between modified vegetable oil and malathion produced above 90% mortality. Webb (1994) found that mineral oil in combination with bifenthrin was effective against aphids *A. gossypii*.

3.Toxicity of Biofly (*B. bassiana*) on *A. gossypii* (Glover.):

The aim of this experiment is to evaluate the residual effect of entomopathogenic *B. bassiana* on adults of *A. gossypii* under laboratory conditions. The aphicidal activity of the microbial pesticide Biofly on adults of *A. gossypii* is presented in Tables (2&3). The results in Table (3) showed that microbial pesticide was LC_{50} (29201 conidia/ml).

The recommended dose for field application is 3×10^4 conidia/ml,while the upper LC_{50} confidence limits was about 4.3709×10^4 conidia/ml. Knudsen *et al.* (1990) found that 3-44% of aphid was killed by *Beauveria bassiana* 9-15 days after treatment on wheat, 0% in controls. Vandenberg (1996) found that LC_{50} estimates were 91 and 282 spores per square centimeter for two *B. bassiana* isolates and 46 and 56 spores per square centimeter for two *P. fumosoroseus* isolates.

Table (2): %Mortality of *A .gossypii* adults treated with different concentrations of Biofly.

Concentration Conidia/ml	Mortality % after		
	24 hrs.	48 hrs.	72 hrs.
0.75×10^4	0	10	27.5
1.5×10^4	0	25	42.5
3×10^4	0	30	47.5
6×10^4	0	37.5	62.5
9×10^4	0	40	67.5
12×10^4	0	47.5	72.5

Table (3): Toxicity of Biofly (*B.bassiana*) against *A.gossypii* adults.

Compound	LC_{50} conidia/ml	Confidence limits of LC_{50}		Slope Value
		Lower	Upper	
Biofly	29201	17476	43709	0.95

4.Effect of tested compound residues on biology of *Aphis gossypii*

a.Effect of tested compounds on nymph developmental time, mortality of different instars and offspring of *Aphis gossypii*:

Malathion (Malatox), and the mixture of (malathion + CAPL-2) significantly increased the first instar duration while no significant

differences were found between malathion and malathion + CAPL-2 mixture. No significant differences were found between propoxur, propoxur + CAPL-2, CAPL-2 and control. The durations were 2.67, 1.83, 2.83, 1.67 and 1.50 days for malathion, propoxur, malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 respectively, while it was 1.33 days for the control (table 4).

In case of plant extracts; black cumin significantly increased the duration period of the first instar while no significant differences were found between wormseed and control. The durations were 2.50 and 2.00 days for black cumin and wormseed respectively, compared with 1.33 days for the control. The duration of the second instar was the longest for malathion (Malatox), propoxur (Unden), malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 (2.00, 1.83, 2.17, 1.83 and 1.67 days compared with 1.50 days in the control). The duration of the third instar averaged 1.83, 2.17, 2.00, 1.83 and 1.33 days for malathion, propoxur, malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 respectively, compared with 1.17 days in the control. The duration of the third instar was the longest for black cumin and wormseed extracts (2.2 and 1.8 days) compared with 1.7 days in the control. The duration of the fourth instar was the longest for malathion (Malatox), propoxur (Unden), malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 (1.83, 1.67, 2.00, 1.67 and 1.50 days) compared with 1.33 days in the control. The duration of the fourth instar was the longest for black cumin and wormseed (1.67 and 1.67 days compared with 1.33 days in the control). Treated individuals produced fewer nymphs than the control (2.00, 2.00, 1.33, 1.67 and 5.33 nymphs per individual for malathion (Malatox), propoxur (Unden), malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 respectively) versus 7.00 nymphs per individuals for the control (table 4).

Malathion (Malatox), propoxur, malathion + CAPL-2 and propoxur + CAPL-2 significantly decreased the offspring followed by CAPL-2. Plant extracts (black cumin and wormseed) decreased the number of nymphs than the control (1.67 and 2.67 nymphs per individual for black cumin and wormseed respectively), while control showed 5.00

Table (4):Effect of compounds on nymph developmental time, mortality of different instars and offspring of *A. gossypii* transferred on treat ed plants with LC_{25} level.

Compounds	Developmental stages and mortality									
	Off spring/ Individual *	1st instar	Mortality %	2nd instar	Mortality %	3rd instar	Mortality %	4th instar	Mortality %	Offspring/ individual**
Pesticides										
Malathion (Malatox)	2.33±0.58 b	2.67 ± 0.29 a	26.67	2.00± 0.5	6.67	1.83± 0.29 ab	6.67	1.83± 0.29	6.67	2.00±1 c
Propoxur (Unden)	2.67±0.58 b	1.83± 0.29 b	20	1.83± 0.29	6.67	2.17± 0.29 a	6.67	1.67± 0.29	6.67	2.00±0.58 c
Mineral oil										
CAPL-2	5.00±1 a	1.50± 0.50 b	6.67	1.67± 0.29	0.0	1.33± 0.29 bc	0.0	1.50± 0.50	0.0	5.33±0.58 b
Mixtures										
Malathion +CAPL-2	2.00±1 b	2.83± 0.76 a	33.33	2.17± 0.29	13.33	2.00± 0.5 a	6.67	2.00± .50	0.0	1.33±0.58 c
Propoxur + CAPL-2	2.00±1 b	1.67± 0.29 b	6.67	1.83± 0.29	13.33	1.83± 0.29 ab	13.33	1.67± 0.29	6.67	1.67±0.58 c
Control	5.33±0.58 a	1.33±0.29 b	6.67	1.50±0.5	0.0	1.17± 0.29 c	0.0	1.33± 0.29	0.0	7.00±1 a
L.S.D. 5%	1.46	0.78		-		0.59		-		1.33
1%	2.05	1.10		-		0.82		-		1.87
Plant extracts										
Black cumin	2.33±0.58 b	2.50± 0.50 a	40	1.83± 0.29	6.67	2.2± 0.29	6.67	1.67± 0.29	6.67	1.67±0.58 b
Worm seed	3.00±1 b	2.00± 0.50 ab	20	1.50± 0.50	13.33	1.8± 0.29	0.0	1.67± 0.29	6.67	2.67±0.58 b
Control	4.67±0.58 a	1.33± 0.29 b	6.67	1.17±0.29	0.0	1.7± 0.29	0.0	1.33± 0.29	0.0	5.00±1 a
L.S.D 5%	1.49	0.88		-		-		-		1.49
1%	2.26	1.33		-		-		-		2.26

Means followed by a common letter are not significantly different at the 5% level by Duncan's multiple range test (1955)
* After treatment ** After generation

nymphs/individual. The total mortality was 46.68, 40.01, 53.33, 40.00 and 6.67%during the hall instars treated with malathion (Malatox), propoxur (Unden), malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 respectively. The total mortality was 60.01 and 40% during instars treated with black cumin and wormseed respectively.

As noted before:

1.mixture (malathion + CAPL-2), malathion, mixture (propoxur + CAPL-2) and propoxur were the most effective compounds on the prolongation of nymphal stage of different instars, also reduction in the number of produced nymphs was observed and significant higher mortality than the control of *Aphis gossypii*.

2.Mineral oil CAPL-2 was the least effect compound on prolongation of nymphal stage for different instars as well as the reduction in the number of produced nymphs and nymphal mortality.

3.Black cumin extract was highest effect compound on a prolongation of the nymphal stage of the different instars, also reduction in the number of produced nymphs followed by extract wormseed on *Aphis gossypii*. These results are in agreement with that recorded by (Sheila *et al.*, 1991; Kerns and Gaylor, 1992 and Hollingsworth *et al.*, 1997).

b.Effect of Biofly on nymph developmental time, percentage of mortality of different instars and offspring of *Aphis gossypii*:

When aphids were transferred on Biofly treated plants, the duration of the different instars was longer than the untreated ones. The aphids treated had developed in a longer time with considerable mortality after each moult. Tne duration of the first, second, third and fourth instar was longer, 2.33, 2, 1.67 and 2.17 respectively in treated insects in comparison to control (1.83, 1.67, 1.17 and 1.67 respectively). The lowest number of survivals which produced nymphs was for Biofly treatment. Treated individuals produced fewer nymphs than the control (2.67 nymphs per individuals for Biofly versus 6.67 nymphs per individual for the control). The mortality percentage were 33.33, 13.33,

6.67 and 6.67 in the first instar, second instar, third instar and fourth instar of *Aphis gossypii* respectively.

Generally, the total mortality was 60% during the instars treated with Biofly. The reduction percentage of fecundity was 59% (table 5).The nymphal stage for survivors was increased to 8.17 days for treated individuals with Biofly compared with 6.33 days of the control. The duration of offspring was decreased to 3.5 days for treated individuals with Biofly compared with 5.33 days of the control. (table 5). Biofly had a moderate effect on a prolongation of the nymphal stage of the different instars as well reduction in the number of produced nymphs of *Aphis gossypii*.

Table (5): Effect of Biofly (LC_{25}) on nymph developmental time, mortality of different instars and offspring of *Aphis gossypii*.

Development Stages	Biofly		Control	
	Duration (in days)	Mortality %	Duration (in days)	Mortality %
Offspring /individual	3.67+0.58		4.67+0.58	
First instar	2.33+0.58	33.33	1.83+0.29	6.67
Second instar	2.00+0.5	13.33	1.67+0.29	0.00
Third instar	1.67+0.29	6.67	1.17+0.29	0.00
Fourth instar	2.17+0.29	6.67	1.67+0.29	0.00
Nymphal stage	8.17 + 0.29		3.5 + 0.5	
Offspring	6.33 + 0.58		5.33 + 0.29	
Offspring/individual	2.67+0.58		6.67+0.58	
Reduction % of fecundity	59.97		0.0	

Table (6): Duration of nymphal stage and offspring of newly emerged nymphs of *A. gossypii* surviving compounds when transferred on treated plants (with LC_{25} level).

Treatment		Nymphal stage	Offspring
Pesticides			
Malathion (Malatox)		8.00 + 1 ab	2.33 + 0.58 c
Propoxur (Unden)		7.50 + 0.50 abc	3.00 + 0.50 c
Mineral oil			
CAPL-2		6.00 + 1 cd	4.50 + 0.50 b
Mixtures			
Malathion + CAPL-2		9.00 + 0.87 a	2.17 + 0.29 c
Propoxur + CAPL-2		7.00 + 0.87 bc	2.33 + 0.29 c
Control		5.33 + 0.58 d	5.67 + 0.58 a
LSD	5%	1.47	0.84
	1%	2.06	1.18
Plant extracts			
Black cumin		8.17 + 0.58 a	2.33 + 0.58 b
Wormseed		7.00 + 0.50 b	3.33 + 0.58 b
Control		5.50 + 0.50 c	5.67 + 0.58 a
LSD	5%	1.05	1.15
	1%	1.60	1.75

Means followed by a common letter are not significantly different at the level by DMRT.

c.Effect of compounds on duration of offspring of newly emerged nymphs of *A.gossypii:*

The duration of offspring was significantly decreased to 2.33, 3.00, 2.17, 2.33 and 4.50 days for treated individuals with malathion (malatox), propoxur (Unden), malathion + CAPL-2, propoxur + CAPL-2 and CAPL-2 compared with 5.67 days for the control, respectively (table 6). The duration of offspring was significantly decreased to 2.33 and 3.33

days for treated individuals with black cumin and wormseed compared with 5.67 days for the control, respectively.

The results in table (6) proved that malathion, malathion +CAPL-2 and black cumin were the most effective compounds on duration of offspring followed by propoxur + CAPL-2, propoxur and wormseed. CAPL-2 was the least effective compound on duration of offspring of *Aphis gossypii*.

The present results are in agreement with the findings of Bachatly *et al.* (1995) the duration of the different instars were less prolonged with chlorfluzauron. Prolongation as well as reduction of offspring. Survivors produced significant fewer nymphs than those of the control.

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ملاتوكس+ مستخلص الشيح الخرساني ، بروبكسر + الزيت المعدني ، بروبكسر + مستخلص حبة البركة وبروبكسر + مستخلص الشيح الخرساني.

٣- اظهرت النتائج أن المبيد الحيوى كانت سميته عالية على الطور الكامل حيث كانت LC_{50} (٢٩٢٠١ كونيديا/مل).

٤- خليط (ملاتوكس + كابل ٢) ،ملاتوكس ، خليط (بروبكسر + كابل ٢) ، وبروبكسر كانوا أكثر المركبات تأثيرا على إطالة فترة حياة الحوريات للأعمار المختلفة وانخفاض أعداد الولادات الناتجة من الأطوار الكاملة وأيضا كانت النسبة المئوية للموت أعلى معنويا بمقارنتها بالأفراد الغير معاملة.

٥ - الزيت المعدني كابل ٢ كان أقل المركبات تأثيرا على إطاله فترة حياة الحوريات للأعمار المختلفة وانخفاض أعداد الولادات الناتجة من الأطوار الكاملة وأيضا النسبة المئوية للموت.

٦- مستخلص حبة البركة كان له تأثير عالى على إطاله فترة حياة الحوريات للأعمار المختلفة وانخفاض أعداد الولادات الناتجة من الأطوار الكاملة وأيضا نسبة الموت يليه مستخلص الشيح الخرساني.

٧ - المبيد الحيوى بيوفلاى كان له تأثير متوسط على إطاله فترة حياة الحوريات للأعمار المختلفة وانخفاض أعداد الولادات الناتجة من الأطوار الكاملة لحشرات من القطن.

الملخص العربى

دراسات تكسوكولوجية و بيولوجية لبعض المركبات الكيماوية الآمنة بيئيا ضد حشرة المن.

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لقد وجهت الدراسة الحالية لتقييم النشاط الإبادى لبعض المبيدات وهى(الملاتوكس ، بروبكسر) وبعض بدائل المبيدات ومنها واحد من الزيوت المعدنية (كابل ٢) ، وأثنان من المستخلصات النباتية (بذور حبة البركة ، الشيح الخرسانى) ، وكذلك تم تقييم أحد المستحضرات الحيوية (البيوفلاى) وهو مستحضر من فطر (بيوفيريا باسيانا) ضد حشرة المن. وأيضا تم تقييم التأثير المشترك لخلائط المبيدات مع البدائل المختلفة.
ويمكن تلخيص النتائج التى تحققت من هذه الدراسة فى النقاط التالية:

١-مبيد الملاتوكس كان أعلى المركبات سمية يليه بروبكسر حيث بلغت قيم LC_{50} ١٦,٣١ ، ١٠٥. جزء فى المليون على الترتيب ، بينما مستخلص حبة البركة كانت له سمية متوسطة على الطور الكامل للمن ويليه الزيت المعدنى (كابل ٢) حيث بلغت قيم LC_{50} ١٤٠,٤٢ ، ٨٩١,٣٠ جزء فى المليون على الترتيب ، و مستخلص الشيح الخرسانى كان أقل المركبات سمية على الطور الكامل لحشرات من القطن حيث بلغت قيمة LC_{50} ١٧٠٤ جزء فى المليون.

٢- اتضح من النتائج أن المخاليط أحدثت تأثير "تقوية"ضد الطور الكامل لحشرات المن وهذه المخاليط هى: ملاتوكس + الزيت المعدنى ، ملاتوكس + مستخلص حبة البركة ،