EFFICIENCY OF SOME COMPOUNDS ALONE OR IN BINARY MIXTURES ON APHIDS UNDER LABORATORY AND FIELD CONDITIONS IN EGYPT

HOSNY, A. H.[1], R. M. SALEM,[2] SAMIRA H. METRI[2] AND A. M. A. NASSEF [2]

1- Faculty of Agriculture, Kafr El-Sheikh, Tanta University.
2- Plant Protection Research Institute, Agriculture Research Center.

(Manuscript received 31 May 2006)

Abstract

The pesticides Furathiocarb (Deltanet), Pirimiphos-methyl (Actellic), Tedifol (Kelthane "Dicofol"+Tedion), the insect growth regulators (IGR), Buprofesin (Applaud), the mineral oils, KZ and Schocrona, the liquid detergents, Nastabon and Oki and the natural vegetative oil isolated from black cumin seeds as well as certain binary mixtures were evaluated for their toxicity to the green peach aphid, *Myzus persica* (Sulz.) [under laboratory conditions] and their efficiency against the cotton aphid, *Aphis gossypii* Glover [under field conditions]. Laboratory bioassay tests on aphid adults showed the highest toxicity effect resulted from Furathiocarb followed by Pirimiphos-methyl (LC50 values: 32 and 150 ppm, respectively). The tested mineral oils were 28-33 times less toxic than Furathiocarb, while it was nearly 5-6 times more toxic than the vegetative oil. The detergent, Nastabon was more toxic than Oki. For the joint action of pesticides / alternative combinations (1: 10), the tested mineral oil (KZ oil) or the vegetative oil improved the toxicity of the pesticides. The effect was more pronounced with Tedifol (synergistic ratios: 80 and 41.18, respectively).

Field experiments indicated that Furathiocarb was highly effective against adults of *A. gossypii* on cotton plants (100% initial kill and 93.5% average of reduction) Buprofesin gave a moderate efficacy. A reasonable activity against aphids on cotton and squash plants was obtained by mineral or vegetative oils (initial kill ranged 78-99 and 78.5-93.1%, and average of reduction ranged 64.65-75.6 and 61.3-73.8%, respectively). For detergents, a considerable initial activity and moderate residual effect were observed on cotton and squash plants. The efficacy of Furathiocarb alone did not differ from that of mixed with alternatives. This result is of great importance since reduced doses of the insecticide may reduce their hazards.

INTRODUCTION

In Egypt, the green peach aphid, *Myzus persica* (Sulz.) and the cotton aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) are considered as one of the most damaging pests attacking plants. The aphid control in vegetable and field crops has become more difficult in recent years. Massive application of insecticides has led to resistance phenomenon and depleted the aphid parasitoids and predators. Alternatives such as oils, detergents, and IGRs might be solutions of pesticides problem. The advantages of pesticides/ alternatives are maximized against sucking insects especially when applied against coincident species. No doubt that, controlling more than one species simultaneously might reduce number of sprays and hazards of used pesticides as possible (Ishaaya *et al.*, 1988, El-Deeb *et al.*, 1989, Butler and Henneberry, 1990, El-Sayed *et al.*, 1991, Halawa *et al.*, 1992, Amer *et al.*, 1995, Hydar *et al.*, 1996 and El-Hariry *et al.*, 1998).

The aim of the present study was to evaluate the efficacy of certain conventional pesticides and some alternatives (i.e., mineral oils, plant derived oil, detergents, and insect growth regulator) as environmentally safe control of aphids under laboratory and field conditions.

MATERIALS AND METHODS

The green peach aphid, *Myzus persica* (Sulz.) was reared in the laboratory according to the method adopted by Norman and Sutton (1967). The reared strain was originated from Sucking Pests Dept., Sakha Agric. Res. Station, Kafr El-Sheikh. Sweet potato cuttings each holding 5 leaves were placed in 250 ml glass jars containing tap water changed every 3 days. Aphids were always transferred weekly from yellowish to greenish plants by cutting the heavily infested leaves and placed them on new plants. The culture was maintained in a breeding room under conditions of 20±2 °C, 70±5% R.H. and 12 hours daily illumination by 2 fluorescent bulbs of 40 wt each.

1. The used pesticides / alternatives were Furathiocarb (Deltanet) 40% EC, Pirimiphos-methyl (Actellic) 50% EC, Tedifol 24.5% (Kelthane "Dicofol" 18.5% +Tedion 6%) were applied at the rates of 0.5, 1.5, and 1 liter/feddan. The insect growth regulator (IGR), Buprofesin (Applaud) 25% S.I. was applied at the rates of 0.8 liter/feddan. The mineral oils, KZ oil 95% EC and Schocrona 95% were applied at the rates of 2 liter/feddan. The liquid detergents, Nastabon and Oki were applied at the rates of 2 liter/feddan. The natural vegetative oil was isolated from seeds of black cumin, *Nigella sativum.* The seed powder was soaked in distilled petroleum ether at 40-60 °C for 3 days. The mixture was agitated for 6 hr using mechanical shaker. The extract was filtered, dried over anyhydrous sodium sulfate and the solvent was evaporated under pressure using a rotary evaporator.

2. Toxicity tests against adults: The toxicity of pesticides, alternatives or their mixture at 1:10 pesticides: alternatives) were evaluated against *M. persica.* Serial dilutions of the toxicants were prepared using tap water. Triton X-100 was added to vegetative oil at 0.075% as an emulsifier. The rapid dip test technique (FAO, 1980) was applied. Batches of aphids were immersed in different concentrations, for 5 seconds partly dried and transferred to discs of sweet potato leaves, which were held in Petri dishes 9 cm in diameter. Control insects were immersed in the same preparations without any toxicants. All treatments were replicated 4 times and kept in rearing chamber under the above-mentioned conditions. Mortality counts were recorded after 24 hours. Mortality percentages were calculated and corrected according to Abbott formula (1925) and LCp-lines were drawn and statistically analyzed according to Litchfield and Wilcoxon (1949). Toxicity index was calculated according to the equation of Sun (1950) as follows:

$$\text{Toxicity index} = \frac{\text{LC50 of the most toxic compound}}{\text{LC50 of the candidate compound}} \times 100$$

3. For pesticides/alternative mixtures, synergistic ratio was calculated according to Metcalf equation (1967) as follows:

$$\text{Synergistic ratio} = \frac{\text{LC50 of the pesticide alone}}{\text{LC50 of the pesticide in the mixture}}$$

4. Calculation for susceptibility factor: To predict the possibility of applying toxicants (tested in the laboratory) effectively in the field, the susceptibility factor was calculated as described by Nazer *et al.* (1983) as follows:

$$\text{Susceptibility factor} = \frac{\text{LC90 of the tested toxicant from LCp line (ppm)}}{\text{Field recommended concentration (ppm)}}$$

Field recommended concentration based on that dose/feddan diluted to 400 L as final volume of spray. The toxicant expected to be effective under field conditions are those having values less or equal to 0.5 only.

5. Field experiments:

The efficiency of pesticides, alternatives or their mixture, was evaluated under field conditions on squash or cotton plants at Sakha Agric. Res. Station, Kafr El-Sheikh. The cultivated cotton area (var., Giza 75) was divided into plots, each of 1/100 feddan. Another cultivated squash area (var., Eskandarani) was divided into plots, each of 10 m². A complete randomized block design was adopted. Mature plants in late season were sprayed with pesticides, alternatives or their combinations. Pesticides were mixed with alternatives at half dose of each. Each dose per feddan was completed to 400 liters of water as a final volume of spraying liquid. In case of vegetative oil, Triton X100 was added to the diluting water at 0.075% to ensure a good emulsification. A knapsack sprayer (20 liters) was used. Four plots were replicated for each treatment. Four plots were left untreated as check control. After application, 2, 3, 5, 7, and 14 days samples of cotton (20 leaves) or squash (5 leaves) were randomly chosen from each replicate and the number of insects were visibly counted in the field at 6-9 AM. The same samples were carefully taken to the laboratory in cloth bags to count the number of living immature stages using a stereomicroscope. Initial kill after 48 hrs and percentage reduction of infestation were estimated according to Henderson and Tilton (1955) as follow:

% reduction of infestation = 100 [1- (A / A*) / (B / B*)]

Where, A: number of individuals in check before spraying

B: number of individuals in treatment after spraying

A*: number of individuals in check after spraying

B*: number of individuals in treatment before spraying

The treated plants were examined during the season for any phytotoxicity or morphological changes compared with the untreated check.

RESULTS AND DISCUSSION

A. Laboratory Bioassay Tests:

1. Toxicity against adults:

Data (based on LC50) presented in Table (1) indicated that the toxicity effect of the conventional pesticides, Furathiocarb was the highest on the adults of the green peach aphid, *Myzus persica* followed by Pirimiphos-methyl (LC50 values: 32 and 150 ppm, respectively). Tedifol showed very weak toxicity (LC50 value: 2800 ppm). Also, the direct (acute) toxicity of the IGR, Buprofesin against aphids was low (LC50 value: 940 ppm). The tested mineral oils (KZ and Schocrona) were 28-33 times less toxic than Furathiocarb while nearly 5-6 times more toxic than the vegetative oil (LC50 value of vegetative oil: 6000 ppm). For the detergents, Nastabon was more toxic than Oki (LC50 values: 10120 and 16000 ppm, respectively).

These results are in agreement with Halawa *et al.* (1992) who stated that Furathiocarb was more effective against cotton aphids than the petroleum oil. They added that the vegetative neem seed oil was found to reduce aphid numbers in a dose-dependant manner, with estimated concentrations for a 50% reduction in aphid populations (LC50) ranging from 0.2-1.4% (2000-14000 ppm). In the present study, obtained LC50 values of the vegetative oil of black cumin lies in this range (i.e., 6000 ppm). In this respect, Butler and Henneberry, (1990) found that numbers of living green peach aphids on cotton plants were significantly reduced for 7 days following application of 5% (50000 ppm) cotton seed oil while an insecticidal soap was ineffective at 2% (20000 ppm). These results agree with the current study because LC90 value of the tested vegetative oil is 10500 ppm while that of the tested detergents ranged 40000-50000 ppm. For the mineral oils, the results of the present study are not in parallel to those of Hydar *et al.* (1996) who found that LC50 of KZ oil against the cotton aphid, *Aphis gossypii* Glover was 207.5 ppm (compared to 900 ppm obtained in the current study). The variations might be due to differences in the adopted technique or that of the tested species of aphids.

Table 1. The toxicity of the tested pesticides or their alternatives to apterous adults of *Myzus persicae* under laboratory conditions.

pesticide or alternative	Compound (Trade name)	LC50 in ppm	Confidence limits	Slope	Toxicity index *	LC90 in ppm	Confidence limits	Toxicity index *
Pesticides	Furathiocarb	32	18.07-56.6	1.7	100	120	70.5-204	100
	Pirimiphos-methyl	150	95-235	2.2	21.3	580	369.4-910.3	20.7
	Tedifol	2800	1750-4480	1.9	1.14	12000	7500-19200	1
IGR	Buprofesin	940	671.4-1316	3.1	3.4	2600	1857-3640	4.6
Mineral oils	KZ oil	900	508-1593	1.7	3.5	500	294.1-850	24
	Schocrona	1060	821.7-1367.5	3.8	3	2700	2093-3483	4.4
Vegetative oil	Oil of black cumin	6000	4729-7618	4.1	0.5	10500	8333-13230	1.1
Soap detergents	Nastabon	10120	6570-15180	2.3	0.31	50000	33300-75000	0.2
	Oki	16000	12120-21120	3.5	0.2	40000	30700-52000	0.3

$$\text{* Toxicity index} = \frac{\text{LC50 or LC90 of the most toxic compound}}{\text{LC50 or LC90 of the candidate compound}} \times 100$$

2. Joint action of pesticides and their alternatives:

It was evident from Table (2) that the tested mineral oil (KZ oil) or the vegetative oil improved the toxicity of the pesticide. The effect was more pronounced with Tedifol (synergistic ratios: 80 and 41.18, respectively). This means that Tedifol mixed with KZ oil at 1 : 10, induced toxicity to aphids equal to that produced by Furathiocarb alone, the most toxic compound (LC50 values: 35 and 32 ppm, respectively). Such results might be of great importance in IPM programs where it is desirable to control simultaneously more than one pest (i.e., aphids and mites). However, Furathiocarb / KZ oil was not a synergized mixture (S.R.: 1). The diverse effects of mineral oils when combined with insecticides might be due to the difference of their standard specifications or chemical contents of unsulfonated residues, saturated paraffin, aromatics and napthanes.

The obtained results are agree with those of El-Deeb *et al.* (1989) found that Pirimiphos-ethyl was highly synergized by Schocrona, super and moderately synergized by star oil, however, the three mineral oils antagonized other EC insecticides when tested against the mealy plum aphid, *Hyalopterus pruni* (Geofry). Improving the toxicity of insecticide against aphids by mixing with mineral oils were also reported by Hydar *et al.,* 1996.

Table 2. The toxicity of the tested pesticides alone or mixed with certain alternatives at ratio 1: 10 and the synergistic action of some alternatives on the toxicity of pesticides against adults of *Myzus persicae* under laboratory conditions.

Pesticide or alternative compound	LC50 in ppm	Confidence limits	Slope	LC90 in ppm	Confidence limits	Synergistic ratio at LC50
Furathiocarb (Fura)	32	18.07-56.6	1.7	120	70.5-204	-
Fura.+KZ oil	32	25.8-39.6	4.7	62	50-76.8	1
Fura.+Vegetative oil	7	5.73-11.13	4.9	13	10.65-15.68	4.6
Fura.+Nastabon	85	65.38-110	3.7	190	146.15-247	0.38
Fura.+Oki	320	172-595.2	1.6	2100	1129-3906.9	0.1
Pirimiphos-methyl (Pir-me)	150	95-235	2.2	580	369.4-910.6	-
Pir-me. + KZ oil	70	40.5-106.4	2.4	240	141.17-408	2.14
Pir-me. +Vegetative oil	20	13.4-23.8	5.5	48	32.2-71.52	7.5
Pir-me. + Nastabon	160	152.4-168	6.7	250	240.3-260	0.93
Pir-me. + Oki	270	230.7-315.9	6.2	440	376.06-514.8	0.56
Tedifol	2800	1750-4480	1.9	12000	7500-19200	-
Tedifol+ KZ oil	35	29.2-42	5	62	52.1-73.78	80
Tedifol+Vegetative oil	68	56.6-81.6	4.8	125	104.16-150	41.18
Tedifol+ Nastabon	480	369-624	9	680	523-884	5.83
Tedifol+ Oki	1800	1500-2160	5	3200	2266-3840	1.5
Buprofesin	940	671.4-1316	3.1	2600	1857-3640	-
Buprofesin+KZ oil	68	45.3-102	2.4	250	166.6-375	13.82
Buprofesin+Vegetative oil	58	44.6-75.4	4.3	115	88.5-149.5	16.21
Buprofesin+Nastabon	540	385-756	2.9	1500	1071.4-2100	1.74
Buprofesin+Oki	550	392.8-770	3.1	1450	1035.7-2030	1.71

$$\text{S.R.: Synergistic ratio} = \frac{\text{LC50 of the pesticide alone}}{\text{LC50 of the pesticide in the mixture}}$$

B. Field Experiments:

1. Insecticidal activity of single toxicants:

Results recorded in Tables (3) and (4) showed that the cotton aphid, *Aphis gossypii* was only observed on cotton plants, while more than one species of aphids were observed on squash. Squash plants were heavily infested compared with cotton plants. The average number / leaf ranged 3-8 and 10-16.5 individuals on cotton and squash, respectively.

Furathiocarb was highly effective against adults of *A. gossypii* on cotton plants (initial kill: 100%, and average of reduction: 93.5%) whereas Pirimiphos-methyl showed high initial kill (100%) but low residual toxicity (average of reduction: 57.5%). Furathiocarb as well as Pirimiphos-methyl were highly effective against aphid infested squash plants.

The IGR, Buprofesin was of moderate efficacy against adults of *A. gossypii* on cotton plants (initial kill: 74.5%, and average of reduction: 63%) and on squash plants (initial kill: 57.9%, and average of reduction: 75.5%). The efficacy of Buprofesin might be enhanced after prolonged time that exceeds testing period because of the delayed toxic properties of IGRs. Buprofesin acts specially against homopteran pests such as aphids, whiteflies, plant hoppers, leaf hoppers and scale insects. The compound inhibits chitin synthesis and results in larval death during ecdysis. In some cases, Buprofesin affects oviposition and egg fertility (Ishaaya *et al.,* 1988) which may result from suppression of prostaglandin formation.

For oils (mineral or vegetative oils), reasonable activity against aphids on cotton and squash plants was obtained (initial kill ranged 78-99 and 78.5-93.1%, and rate of reduction ranged 64.65-75.6 and 61.3-73.8%, respectively). Previous work demonstrated the potential of mineral oils against aphids with various degrees of efficacy depending on the type of soil and dose per feddan (El-Sayed *et al.,* 1991).

Table 3. Efficacy of the tested pesticides or their alternatives against adults of *Aphis gossypii* on cotton plants under field conditions.

pesticide or alternative	Common or trade name	Application rate (L/Fed)	Average no./leaf/ treat-ment	% initial kill 48 hr after applica-tion	% Reduction after application at days				Aver-age of % reduc-tion
					3	5	7	14	
Pesticides	Furathiocarb	0.4	7.5	100 a	100	100	100	73.8	93.5 a
	Pirimiphos-methyl	1.5	7.5	100a	65	61.6	55.9	47.5	57.5c
	Tedifol	1.0	5	57 d	23.5	21.5	22	22	22.5 d
IGR	Buprofesin	0.8	6	74.5c	62	55	60	75	63 bc
Mineral oils	KZ oil	2.0	7	87.2 d	80.5	60.5	54.1	63	64.5 bc
	Schocrona	2.0	3	99a	89	76	72	65.5	75.6b
Vegetative oil	Oil of black Cumin	2.0	8	78 c	82.7	77.3	79.8	60.5	75.1 b
Soap detergents	Nastabon	2.0	3	86b	84.6	52	64.2	48.5	62.3 bc
	Oki	2.0	7	93 b	72	55	61.6	33	55.4c
Untreated check		--	18.5	0	0	0	0	0	0

In the same column, means followed by the same letter are not significantly different according to Duncan (1955).

When the dose per feddan of star oil was raised from 3 to 6 L, the infestation of the cabbage aphid *Brevicoryne brassica* (L.) was greatly reduced (El-Sayed *et al.*, 1991). To avoid phytotoxic effects, the tested rate of oils was only 2 L / feddan in the present study.

High levels of mortality of aphids as induced by vegetative oils were observed in the laboratory and field experiments. This was confirmed by Butler and Henneberry, 1990) and El-Hariry *et al.*, 1998). The effectiveness appeared to be influenced by the host plant, the aphid species and weather conditions. For detergents, a considerable initial activity and moderate residual effect were observed on cotton and squash plants (the respective initial kill: 86 or 93 and 87.4 or 78.5%, while the rate of reduction showed 62.3 or 55.4% and 83.8 or 68.3%, for Nastabon or Oki). The weak residual action of detergents might be compensated by repeated applications. In this respect, Amer *et al.* (1995) reported that Nastabon which caused reasonable initial activity and low residual effect, could be recommended for controlling faba bean aphids instead of conventional insecticides even it needed 2-3 applications to avoid insecticidal hazards. Bioactivity of detergents and soaps was successfully obtained against aphids by many researchers (Butler and Henneberry, 1990 and Amer *et al.*, 1995).

Table 4. Efficacy of the tested pesticides or their alternatives against adults of *Aphis gossypii* on squash plants under field conditions.

pesticide or alternative	Common or trade name	Application rate (L/Fed)	Average no./leaf/ treatment	% initial kill 48 hr after applica-tion	% Reduction after application at days				Aver-age of % reduc-tion
					3	5	7	14	
Pesticides	Furathiocarb	0.4	11.25	100 a	100	--	94	59.3	84.4 b
	Pirimiphos-methyl	1.5	19.5	98.5 a	100	--	96	95	97 a
	Tedifol	1.0	16.25	58.5 e	72.9	--	55	45	57.6 e
IGR	Buprofesin	0.8	12	57.9 e	62.5	--	72	92	75.5 c
Mineral oils	KZ oil	2.0	16.5	93.1 b	75	--	60	70.2	68.3 d
	Schocrona	2.0	7.5	85.3 c	80	--	67.4	36.6	61.3 de
Vegetative oil	Oil of black Cumin	2.0	20	78.5 d	93.4	--	73	55	73.1 c
Soap detergents	Nastabon	2.0	10.25	87.4 c	99	--	92.5	60	83.8 b
	Oki	2.0	10	78.5 d	65.5	--	69.8	70	68.3 d
Untreated check		--	20	0	0	--	0	0	0

In the same column, means followed by the same letter are not significantly different according to Duncan (1955).

2. Efficacy of pesticides / alternative mixtures against aphids:

Results recorded in Table (5) revealed that the efficacy of Furathiocarb alone against adults of aphid did not differ from that of mixing the insecticide with alternatives. This result is of great importance since a half dose of the severely toxic Furathiocarb combined with a half dose of each of the relatively safe alternatives gave efficient control as did a complete dose of the insecticide alone (the initial kill and the average of reduction for the mixtures ranged 98-100% and 86-99.8%, respectively) compared with those of Furathiocarb alone (initial kill: 100% and the average of reduction 84.4%).

The same trend was observed with Pirimiphos-methyl. The detergent, Nastabon significantly enhanced the efficacy of Tedifol against aphids (initial kill: 58 and 89.3%, and the average of reduction: 57.6 and 96% for Tedifol alone and its combinations, respectively). Thus, the acaricidal compound might be efficiently applied against aphids (coexisting with mites) when combined with Nastabon.

El-Sayed *et al.* (1991) found that the application of insecticide / Star oil mixtures at half recommended dosages of each was the best treatment giving control of the cabbage aphid *B. brassicae* (43-86% reduction). Combinations of conventional pesticides and mineral or vegetative oils were found to be efficient as protectants against aphids (El-Hariry *et al.*, 1998).

3. Phytotoxicity observations:

For all treatments, especially those of oils and detergents, examination during the season showed that no phytotoxicity as leaves injuries, burns, abnormalities or morphological changes could be noticed on the vegetative growth of all treated cotton and squash plants compared with those of untreated check ones.

Table 5. Efficacy of pesticides alone or combined with certain alternatives (mixed at half dose of each) against adults of aphids *Aphis* spp. on squash plants under field conditions.

Pesticide or alternative compound	Average no. of adult/leaf/ treatment	% initial kill 48 hr after application	% Reduction after application at days				Average of % reduction
			3	5	7	14	
Furathiocarb (Fura)	11.25	100 a	100	-	94	59.3	84.4 ab
Fura. + KZ oil	23.12	100 a	100	-	88	94.5	94.1 a
Fura. + Vegetative oil	15.6	100 a	100	-	85	75	86.6 ab
Fura. + Nastabon	17.5	100 a	100	-	100	99.4	99.8 a
Fura. + IGR	19.4	98 a	98	-	100	96.7	98.2 a
Pirimiphos-methyl (Pir-me)	19.5	98.5 a	100	-	96	95	97 a
Pir-me. + KZ oil	18.75	80.6 d	78.5	-	100	20	66.2 bc
Pir-me. +Vegetative oil	16.25	79 d	63	-	56.3	93.8	71.2 b
Pir-me. + Nastabon	10	86 bc	85.2	-	11.15	100	65.2 bc
Pir-me. + IGR	11.25	94 b	34.2	-	100	73.3	69.2 bc
Tedifol	16.25	58.5 e	72.9	-	0	100	57.6 c
Tedifo + KZ oil	22.5	37.8 f	80	-	0	90	56.6 c
Tedifol +Vegetative oil	20	19.9 g	0	-	0	100	33.3 d
Tedifol + Nastabon	12.5	89.3 bc	88.2	-	100	100	96 a
Tedifol + IGR	21	21 g	30.4	-	47.9	99.5	60.7 c
Control				-			

Butler and Henneberry (1990) found that minimal or no plant leaf phytotoxicity was caused by applying 1 or 2% of vegetative oil but rates of 5% usually caused identifiable plant leaf phytotoxicity. Also they stated that cotton seed oil was phytotoxic to collar plants. They deduced that oils caused some phytotoxic effects when these oils were used for pest (insect and mite) control on certain plants such as squash. In the present study, the rates of oils used (2 L / 400 L water / feddan) is much lower to the rates reported to be phytotoxic.

REFERENCES

1. Abbott W. S. 1925. A method of computing of the effectiveness of an insecticide. J. Econ. Ent. 18(2): 265-273.
2. Amer,M. I., R. M. Salem, A. A. S. El-Zanan and M.B. Abo Salem. 1995. Response of faba bean, Vicia faba L. to some chemical application against Aphis craccivora Koch and Liriomyza trifolii Burgess, Egypt. J. Appl. Sci. 10 (6): 885-892.
3. Butler, G. D. and T. J. Henneberry. 1990. Pestcontrol on vegetables and cotton with household cooking and liquid detergents. Southwestern Entomologist, 15 (2): 123-131.
4. Duncan, D. B. 1955. Multiple ranges and multiple F. test. Biometrics, 11 1-42.
5. El-Deeb, W. M., M.E. Keddis, F.A. Ayad and M.A. EL-Guindy. 1989. Aphicidal potency of certain mineral oils, organophosphate insecticides and their mixtures against adults of the apricot aphid *Hyalopterus pruni* (Geofry). Proc. 1st Int. Conf. Econ. Ent., 11: 259-265.
6. El-Hariry, M. A., I. A. Marzouk, R. M. Salem, E. M. E. Khalafalla and A. G. El-Sisi. 1998. Field and laboratory evaluation of environmentally safe chemicals against some aphid species. Egypt. J. Agric. Res. 76: 127-139.
7. El-Sayed, A. M., M. O. Kolaib and A. El-Dash. 1991. Potency of insecticides, star oil and their mixtures on cabbage aphid and its parasitoid, *Diaeretiella rapae* (Mintosh). Menofiya J. Agric Res., 16 (2): 1093-1095.
8. FAO,. 1980. Tentative method for the peach-potato aphid. Recommended methods for the detection and measurement of resistance. Bull., 18: 16-18.
9. Halawa, L. A., R. M. Salem, A. A. Korkor and M. Z. F. Awad. 1992. Field evaluation of certain pesticides against sucking insect pests attacking cotton plants. J. Agric. Sci., Mansoura Univ., 17 (10): 3366-3371.
10. Henderson, C. F. and E.W. Tilton. 1955. Test with acaricides against the brown wheat mite. J. Econ. Entomol., 48: 157-161.
11. Hydar, M. F., M. Z. Dawood and S.M.Ibrahim. 1996. The efficiency of mineral oils, some insecticides and their mixtures against *Aphis gossypii* Glover. J. Agric. Sci., Mansoura Univ., 21 (6): 2343-2346.
12. Ishaaya, I., Z. Mendlson and M. Madjar. 1988. Effect of buprofezin on embrogenesis and progeny formulation of sweet potato whitefly (Homoptera: Aleyrodidae). J. Econ. Ent. 81(3): 780-784.
13. Litchfield, J. T. and F. Wilcoxon. 1949. A simplified method of evaluating dose-effect experiments. J. Pharmacol and Exp. Therap. 96: 99-113.
14. Metcalf, R. L. 1967. Mode of action of insecticide synergists. Ann. Rev. Entomol. 12: 229-256.

15. Nazer, I. R., M.N. Obidat and N. S. Sharaf. 1983. Susceptibility of the melon aphid, *Aphis gossypii* (Glover) to certain insecticides. Proc. Int. Conf. Env. Haz. Agrochem, 11: 921-931.
16. Norman, P. A. and K.P. Sutton. 1967. Host plants for laboratory rearing of melon aphid. J. Econ. Ent., 60 (5): 1205-1207.
17. Sun, Y. P. 1950. Toxicity index, an improved method of comparing the relative toxicity of insecticide. J. Econ. Entomol. 43: 45-53.

فاعلية بعض المركبات منفردة أو مخاليطها علي حشرات المن تحت الظروف المعملية والحقلية

عبد العزيز حسني [١] ، رمضان محمد بهي الدين سالم [2] ، سميرة حنين متري [2] ، علي ممدوح ناصف [2]

١. كلية الزراعة بكفر الشيخ- جامعة طنطا
٢. معهد بحوث وقاية النباتات- مركز البحوث الزراعية- وزارة الزراعة- الدقي - الجيزة

تم تقييم سمية وفعالية بعض مبيدات الآفات مثل فيوراثيوكارب (دلتانت) والبريميفوس ميثايل (أكتيلك) والتيديفول (كلثين "ديكوفول"+ تيديون) ومنظمات النمو الحشرية (IGR) مثل بوبروفيزين (أبلود) والزيوت المعدنية كزد وشيكرونا والمنظفات الصناعية السائلة مثل النستابون وأوكاي والزيوت النباتية الطبيعية المعزولة من بذور نبات الكمون في مكافحة من الخوخ الأخضر *Myzus persica* ومن القطن *Aphis gossypii* تحت الظروف المعملية والحقلية.

أظهرت نتائج التجارب المعملية السمية العالية للفيوراثيوكارب علي الحشرات الكاملة، يليه البريميفوس ميثايل (الجرعة النصفية القاتلة: ٣٢ و ١٥٠ جزء في المليون، علي التوالي). كانت الزيوت المعدنية أقل في سميتها بمقدار ٢٨-٣٣ مرة من الفيوراثيوكارب، في حين كانت الزيوت المعدنية أكثر سمية بحوالي ٥-٦ مرات من الزيوت النباتية الطبيعية. بالنسبة للمنظفات الصناعية، كان النستابون أكثر سمية من أوكاي. و.بالنسبة للتأثير المشترك لخلائط المبيدات مع البدائل المختلفة، وأدي كل من الزيت المعدني كزد أو الزيت النباتي إلي تحسين سمية المبيدات، وكان التأثير المشترك أكثر وضوحا مع المبيد الأكاروسي تيديفول (نسبة التنشيط ٨٠ و ٤١,١٨ للزيت المعدني والزيت النباتي، علي التوالي).

أظهرت التجارب الحقلية علي نبات القطن أن لمركب فيوراثيوكارب تأثيرا فعالا خافضا لأعداد من القطن *A. gossypii* (النسبة المئوية للقتل الأولي ١٠٠% ومتوسط النسبة المئوية لخفض لأعداد ٩٣,٥%). أظهر منظم النمو بوبروفيزين ذو فعالية متوسطة، وربما تحسنت الكفاءة الإبادية لهذا المركب بعد انقضاء الفترة المناسبة والتي لم تتوافر في هذه الدراسة حيث كانت فترة التجارب أسبوعان فقط. أما الزيوت المعدنية أو الزيوت النباتية الطبيعية فقد أظهرت كفاءة مرضية ومعتدلة علي المن (النسبة المئوية للقتل الأولي ٨٠,٥-٨٢,٧% و ٧٨,٥-٩٣,١%، ومتوسط النسبة المئوية لخفض لأعداد ٦٤,٥-٧٥,١% و ٦١,٣-٧٣,١%، علي نباتات القطن والكوسة، علي الترتيب). أما بالنسبة للمنظفات الصناعية فقد أظهرت فعل أولي عالي وسمية متبقية منخفضة علي نباتات القطن والكوسة. لم يلاحظ اختلاف بين فعالية مبيد فيوراثيوكارب بمفرده وعند خلطه مع البدائل بنسبة ١:١٠. وهذه نتيجة غاية في الأهمية حيث يمكن خفض الجرعة المستخدمة من المركب إلي النصف مع الخلط بالبدائل وهذا يؤدي إلي خفض أضرار المبيدات التقليدية علي الثدييات.