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EFFICACY OF SOME INSECTICIDES, OILS AND THEIR MIXTURES FOR THE PROTECTION OF FABA BEAN PLANTS FROM THE LEGUMINOUS APHID, *Aphis craccivora* KOCH AND DETERMINATION RESIDUES IN PLANT AND SOIL

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ABSTRACT: Efficiency of three insecticides, two oils and their mixtures belonging to different groups of chemicals, namely lambda-cyhalothrin (Lambda-cyhalothrin 2.5%), acetamprid (Mospilane 20%), pymetrozine (Pymetrozine 25%), orange oil (Orange oil 98%) and mineral oil (Mineral oil KZ 95%) on faba bean plants against the leguminous aphid, *Aphis craccivora* Koch under field and laboratory conditions was investigated. The LC_{50} and LC_{90} values were calculated after 24 hr. post-treatment. The obtained results showed that a wide range of toxicity of the tested pesticides, however the insecticide lambda-cyhalothrin proved itself to be the highest toxic compound after 24hr., recording LC_{50} 0.098 ppm, on the other hand pymetrozine was the lowest one recording 90.53 ppm. Residual effects of insecticides and their mixtures on *A. craccivora* under field conditions in 2015 season showed that mineral oil (77.08%), acetamprid + mineral oil (75.35%) and lambda-cyhalothrin + mineral oil (53.87%), while in 2016 season, acetamprid + orange oil (27.12%) and lambda-cyhalothrin + orange oil (26.28%) recording the highest residual effects on *A. craccivora.* The residual effect of lambda-cyhalothrin in faba bean plants and soil under the environmental conditions of Egypt was studied. The tested insecticide was sprayed at recommended dose. The treated faba bean plants and soil were randomly sampled after 2 hr., 1, 3, 7 and 10 days. The tested samples were extracted, cleaned up and analyzed using gas chromatography. The recovery percentages were 75 and 90% in soil and leaves, respectively. The half life values were 0.1 and 0.2 day in leaves and soil samples, respectively.

Key words: Lambda-cyhalothrin, pymetrozine, acetamprid, oils, toxicity, residual effects, *Aphis craccivora*, residues, plant, soil.

INTRODUCTION

Faba bean (*Vicia faba* L.) is one of the most important legumes in Egypt. Leguminous aphid, *Aphis craccivora* Koch is one of the most destructive insect pestes of legumes (**Nasser *et al.*, 2000; Abdu-Allah, 2012; Abdu-Allah *et al.*, 2017**). Aphid cause damage for plants through sucking the sap from the leaves and stems and can transport virus (**Schepers, 1988**). This damage causes a big loss in yield, so application insecticides were very important for control aphids. Recently, used neonicotinoide insecticides due to the differential binding of these molecules to their target site. The nicotinic acetylcholine receptors, are stronger in insects than in vertebrates (**Casida and Durhin, 2013**). Also; used petroleum and paraffinic oils, collectively known as mineral oils have been part of spray programs for control aphids. These spray oils were used alone or in combination with insecticides. Therefore, the present work aimed to study the efficiency and the side effects of insecticides, mineral oil, orange oil and their mixtures on *A. craccivora* in the bield and laboratory as well as their residues in plant and soil were also estimated.

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MATERIALS AND METHODS

Laboratory Experiments

Aphid infestation

Three seeds of faba bean (*Vicia faba* L.) were sown in 15×17 cm deep pots. Each pot contains 0.5 kg soil. From the three plants, one plant was selected and protected by a plastic cover cage. The plants were kept and cared under laboratory conditions (22+2°C, 55+ 3% RH and 12 : 12 hr., light to dark photo period) until 27 days after sowing at Plant Protection Department Laboratory, Faculty of Agriculture, Zagazig University Egypt. At this plant age, one clonied nymph of leguminous aphid *Aphis craccivora* Koch was precisely transferred by a fine camel hairpaint brush to the pot plant. The artificial infestation used was carried out on one plant per pot.

Toxicological studies

The tested compounds were belonged to different groups of chemicals to assess the insecticidal activity of the tested compound were prepared using the commercial formulations. The faba bean leaves were infested with known number of *A. craccivora* and dipped in aqueous solution of the tested concentrations of lambda-cyhalothrin, orange oil, mineral oil, pymetrozine and acetamprid Table 1 for ten seconds. The treated leaves were then exposed to current air for drying and transferred separately to 50 cc plastic cupsicum plicated which used for each concentration under laboratory conditions (20°C and 70% RH) The percentage of mortalities were recorded after 24 hr., and corrected according to **Abbott (1925)**. The toxicity regression lines were ploted according to **Finney (1952)**. Slope values LC_{50} and LC_{90} were computed.

Field Evaluation of Lambda-cyhalothrin, Acetamprid, Pymetrzine and their Mixtures with Orange Oil and Mineral oil Against *A. Craccivora* Koch

Faba bean field heavily infested with *A. craccivora* at Zagazig District, Sharkia Governorate, was chosen for the field trials. The experimental design was complete randomized blocks with three replications. The tested insecticides used and their mixtures were sprayed using a Knapsack sprayer motor (40 psi and 72 liters/fad.) in separated plots (1/100 fad.) during the growing seasons of 2015 and 2016. Control plots were sprayed with water only. Numbers of aphids were recorded before spraying and after post-treatment periods 1, 3, 5, 7 and 10 days. Percentages of aphid population reduction were calculated according to **Henderson and Tilton (1955)** formula as follows:

R = 100. 1-(Ta. Cb)/ Tb. Ca)

Where:

R = Reduction percentage in infestation.

Cb = Insect number in the untreated control plot before insecticidal application.

Ta = Insect number in the treated plot after insecticidal application.

Ca = Insect number in the untreated control plot after insecticidal application.

Tb = Insect number in the treated control before insecticidal application.

Determenation of Lambda-cyhalothrin Residues in Faba Bean Plant and Soil

Field experiment

This experiment was carried out at Zagazig District farms, Sharkia Governorate Egypt during 2015 season of faba bean for both plant and soil samples. The mature plants were sprayed once with lambda-cyhalothrin 2.5% as using the recommended field rate to protect the plants from broad leaf weeds according to the pest control program of the **Ministry of Agriculture (2015)**.

Sampling preparation for residue analysis

Samples from both faba bean leaves and soil, were collected at random from treated and untreated plants after 1, 3, 5, 7 and 10 days post-treatment. Random samples were collected from three plots of each treatment for each plant and soil. The representative sample was cut into small pieces using knife and subjected to extraction and clean up procedures for leaves and digested for soil.

Extraction and clean up procedures

Extraction

Lambda-cyhalothrin residues were extracted from leaves of faba bean plants and soil according to the method of QUECHERS (**Lehotay, 2007; Raczkowski *et al.*, 2011**).

Table 1. Tested Chemicals

Trade name	Common name	Concentration used (recommended dose)
Mospilane 20%	Acetamprid	25 ml/faddan
Lambda-cyhalothrin 2.5%	Lambda-cyhalothrin	250 ml/faddan
Pymetrozine 25%	Pymetrozine	50 ml/faddan
Mineral oil KZ 95%	Mineral oil	62.5 ml/faddan
Orange oil 98%	Orange oil	105 ml/faddan

Weight of 10 g of the blended sample mixed with acetonitrile and 1% acetic acid and was shaken vigorously for 1 min and vortexed for 15 sec. Then extract including 6 g magnesium sulphate and 1.5 g anhydrous sodium acetate, 1g Na_3 citrate dehydrate was added, shake each tube directly after the salt addition shortly, shake vigorously for 1 min and centrifuge for 5 min at 4000 r.p.m.

Dispersive SPE clean up processes

Transfer 1 ml aliquot of supernatant to dispersive clean-up tube containing MgSO4 , C18 , PSA and GCB, Shake for 30 second and centrifuge for 5 min at 4000 r.p.m.

Determination of pesticide residues

Residue determination of lambda-cyhalothrin was carried out at Pesticides Central Laboratory, Dokki, Giza with gas chromatography. Gas liquid chromatography equipped with an electron capture detector GC/ECD. GC analysis was conducted on a PAS -5 (agilent fused silica capillary column of 30 mm length, 0.53 mm id, 0.5 mm film thickness. The oven temperature was programmed from an initial temperature 160^{o}C (2 min hold) to 280^{o}C at a rate of 5^{o}C/min and was maintained at 280^{o}C for 15 min. Injector and detector temperatures were maintained at 280 and 300^{o}C, respectively. Nitrogen was used as a carrier at flow rate of 4 ml/min.

Recovery test

Lambda-cyhalothrin was added to untreated control samples at three levels (0.05, 0.1 and 1.0 mg/kg). For method validation, control and fortified samples were analyzed under the same conditions. The average recoveries ranged from 75 and 90% in soil and leaves samples, respectively.

Kinetic study

The rate of degradation and half-life time were calculated according to **Ashour (1976) and Gomaa *et al.* (1979)**. The relationship between the logarithm of concentration of lambda-cyhalothrin residues and time intervals were plotted. A straight line was fitted using excel trend line with intercept equal to logarithm of initial concentration and the slope of the line was calculated.

Rate of degradation (K) = 2.303 × slope

The half-life time was calculated from the following equation: $T_{0.5} = 0.693 / K$

Statistical Analysis

Percentage of reduction in aphids population were estimated according to (**Henderson and Tilton, 1967**) equation as follows:

$$\text{Reduction percentage} = 1 - \frac{Cb \times Ta}{Ca \times Tb} \times 100$$

Where

Cb: the control counts before spraying.

Ca: the control counts after spraying.

Tb: the treatment counts before spraying.

Ta: the treatment counts after spraying.

The percentages of reduction for all treatments were subjected to a simple analysis of variance, the values were analyzed by one way analysis of variance (ANOVA) using **(Costat, 1998)** statistical software when the ANOVA statistics was significant ($p<0.05$), means were separated by **(Duncan, 1955)** multiple range test which calculated the least significant difference (LSD) between treatments and also between periods.

RESULTS AND DISCUSSION

Toxicity of Lambda-cyhalothrin, Pymetrozine, Acetamprid, Orange Oil and Mineral Oil Against *Aphis craccivora* Koch

The results presented in Table 2 show the toxicity of five insecticides lambda-cyhalothrin, pymetrozine, acetamprid, orange oil and mineral oil against *A. craccivora* after 24 hr. Among the insecticides and oils, lambda-cyhalothrin was the most effective compound followed by acetamprid while pymetrozine was the least effective one after 24 hr.The results indicated that the LC_{50} values were 098, 0.1125, 34.83, 58.29 and 90.53 ppm for lambda-cyhalothrin, acetamprid, orange oil, mineral oil and pymetrozine, respectively. The LC_{90} values were 43.20, 43.20, 73.25, 94.19, and 344.03 ppm for lambda-cyhalothrin, acetamprid, orange oil, mineral oil and pymetrozine, respectively after 24 hours. Generally, *A. craccivora* individuals were found to be more sensitive to the tested compounds. The obtained low values of slope indicated the homogenous response of the treated aphids to different concentrations of the tested compounds. The above obtained results are in agreement with those obtained by some authors (**Abou-Yousef, 2010; Jansen and warnier , 2011; Dai, 2014)**. Differece between compounds due to variation in liability toxicant penetration.

Results in Table 3 reveal that during 2015 season, lambda-cyhalothrin and its mixture with orange oil gave the highest reduction of *A. craccivora* (71.20%) after one day of the application, followed by orange oil (54.87%) and then lambda-cyhalothrin (54.00%). While, the lowest reduction was noticed in lambda-cyhalothrin mixture with mineral oil (18.83%) followed by mineral oil alone (20.13%). After 3 days the reduction percentage was decreased in case of lambda-cyhalothrin, mineral oil, lambda-cyhalothrin + orange oil and lambda-cyhalothrin + mineral oil (32.80, 8.34, 40.90 and 12.80%), respectively in treated plants but it decreased in orange oil (45.70%). This trend was nearly happened after 5 and 7 days. Obtained results after 10 days indicated that reduction percent was increased with mineral oil and lambda-cyhalothrin + mineral oil and decreased in other insecticides. According to the mean of residual effect, mineral oil was more effective against *A. craccivora* in comparison with other tested insecticides followed by lambda-cyhalothrin + mineral oil, while lambda-cyhalothrin showed the lowest toxic residual effect (33.82% reduction in aphid population).

Results presented in Table 4 indicate that the reduction percent after 1 day post-treatment ranged from 48.52% - 13.90% during 2016 season. This percent decreased after 3, 5, 7 days and reached its peak at 10 days (25.22 to 11.72%). General average of reduction percent indicated that lambda-cyhalothrin + orange oil was more effective as compared with other compounds followed by lambda-cyhalothrin (28.15%), while that of mineral oil was (18.74%).

Results presented in Table 5 reveal that the reduction percents after one day post-treatment in 2015 season were 56.17, 54.87, 20.13, 47.40 and 19.21% for pymetrozine, orange oil, mineral oil, pymetrozine + orange oil and pymetrozine + mineral oil, respectively during 2015 season. This percent decreased after 3 days in case of pymetrozine (42.90%), mineral oil (8.34%) and pymetrozine + mineral oil (9.88%) but slightly decreased in case of orange oil (45.70%) and increased for pymetrozine + orange oil (49.86). This trend was happened after 5, 7 and 10 days. General means of reduction percent of residual effect cleared that mineral oil was the more toxic treatment (77.08%) followed by pymetrozine + mineral oil (53.44%) whereas orange oil was the lowest toxic effect (39.96%).

Results presented in Table 6 indicate that the reduction percents after one day of application ranged from 48.79 to 29.49% for pymetrozine and pymetrozine + mineral oil during 2016 season. This percent decreased after 3, 5, 7 and 10 days and ranged from 34.18% and 9.10%.Regarding means of reduction of residual effect percent indicated that pymetrozine and orange oil were more effective as compared with other compounds followed by pymetrozine+ orange oil (15.45%), while mineral oil + pymetrozine (11.30%) had the lowest effect followed by mineral oil that valued 15.21% reduction.

Results presented in Table 7 show that the reduction percents after one day from treatment were 60.14, 54.87, 20.13, 32.52 and 8.45% for acetamprid, orange oil, mineral oil, acetamprid

Table 2. Toxicity of some pesticides against the leguminous aphid, *Aphis craccivora* Koch after 24 hr., post-treatment

Treatment	LC_{50}	LC_{90}	Slope
Lambda-cyhalothrin	0.098	43.20	0.4852
Orange oil	34.83	73.25	0.4468
Mineral oil	58.29	94.19	0.2316
Acetamprid	0.1125	43.20	0.2437
Pymetrozine	90.53	344.03	2.210

Table 3. Efficacy of lambda-cyhalothrin, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2015 growing season

Treatment	Count before spraying	Initial effect	Reduction at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Lambda-cyhalothrin	48.23	28.90	20.30	18.30	30.50	28.50	24.40[b]	25.30
	Red. %	(54.00)	(32.80)	(26.80)	(41.20)	(34.50)	(33.82)	(37.86)
Orange oil	46.82	28.50	27.20	29.20	30.20	22.10	27.17[b]	27.44
	Red. %	(54.87)	(45.70)	(44.70)	(42.08)	(27.36)	(39.96)	(42.94)
Mineral oil	46.47	10.70	5.40	0.00	0.00	0.00	1.35 [c]	3.22
	Red. %	(20.13)	(8.34)	(100.00)	(100.00)	(100.00)	(77.08)	(65.69)
Lambda-cyhalothrine + orange oil	48.05	37.80	25.10	23.60	35.60	42.20	31.62 [a]	32.86
	Red. %	(71.20)	(40.90)	(35.05)	(48.40)	(51.70)	(44.01)	(49.45)
Lambda-cyhalothrin + mineral oil	49,51	10.70	8.50	2.50	0.00	0.00	2.75[c]	4.34
	Red. %	(18.83)	(12.80)	(2.70)	(100.00)	(100.00)	(53.87)	(46.86)
Control (water)	48.21	52.50	59.90	65.60	72.10	80.20	69.45	66.06

LSD ≤ 0.05 level for treatments =16.06 LSD ≤ 0.05 level for periods =7.88 LSD ≤ 0.05 level for treat.x per. = 14.12

Table 4. Efficacy of lambda-cyhalothrin, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2016 growing season

Treatment	Count before spraying	Initial effect	Reduction at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Lambda-cyhalothrin	49.57	35.00	28.00	20.00	19.00	21.00	22.00[b]	24.60
	Red. %	(41.64)	(31.14)	(22.48)	(20.31)	(25.22)	(24.78)	(28.15)
Orange oil	45.80	35.00	22.00	17.00	12.00	15.00	16.50[b]	20.20
	Red. %	(45.15)	(26.33)	(20.60)	(13.56)	(19.27)	(19.94)	(24.98)
Mineral oil	48.15	27.00	20.00	15.00	10.00	9.00	13.50[cd]	16.20
	Red. %	(32.86)	(22.63)	(17.13)	(10.54)	(10.57)	(15.21)	(18.74)
Lambda-cyhalothrine + orange oil	48.78	40.00	29.00	25.00	21.00	17.00	23.00[a]	26.40
	Red. %	(48.52)	(32.82)	(28.82)	(22.93)	(20.57)	(26.28)	(30.73)
Lambda-cyhalothrin + mineral oil	48.64	12.00	12.00	10.00	9.00	10.00	10.25[d]	10.60
	Red. %	(13.90)	(13.03)	(10.96)	(9.28)	(11.72)	(11.24)	(11.77)
Control (water)	49.53	82.00	87.00	85.00	89.00	80.00	85.25	84.60

LSD ≤ 0.05 level for treatments =17.78 LSD ≤ 0.05 level for periods =7.04 LSD ≤ 0.05 level for treat.x per. = 11.96

Table 5. Efficacy of pymetrozine, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2015 growing season

Treatment	Count before spraying	Initial effect	Reduction at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Pymetrozine	45.92	28.60	25.10	32.00	37.20	37.20	32.87[b]	32.02
	Red. %	(56.17)	(42.90)	(50.14)	(53.11)	(47.60)	(48.43)	(49.98)
Orange oil	46.82	28.50	27.20	29.20	30.20	22.10	27.17[b]	27.44
	Red. %	(54.87)	(45.70)	(44.70)	(42.08)	(27.36)	(39.96)	(42.94)
Mineral oil	46.47	10.70	5.40	0.00	0.00	0.00	1.35[c]	3.22
	Red. %	(20.13)	(8.34)	(100.00)	(100.00)	(100.00)	(77.08)	(65.69)
Pymetrozine + orange oil	48.05	25.20	30.40	32.90	35.50	40.50	34.82[a]	32.90
	Red. %	(47.40)	(49.86)	(49.25)	(48.07)	(49.65)	(49.20)	(48.84)
Pymetrozine +mineral oil	49.51	10.90	6.70	3.30	0.00	0.00	2.50[c]	4.18
	Red. %	(19.21)	(9.88)	(3.89)	(100.00)	(100.00)	(53.44)	(46.59)
Control (water)	48.21	52.50	59.90	65.60	72.10	80.20	69.45	66.06

LSD ≤ 0.05 level for treatments =16.25 LSD ≤ 0.05 level for periods =8.06 LSD ≤ 0.05 level for treat.x per. = 14.19

Table 6. Efficacy of pymetrozine, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2016 growing season

Treatment	Count before spraying	Initial effect	Reduction at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Pymetrozine	48.52	40.00	30.00	22.00	11.00	9.00	18.00[a]	22.40
	Red. %	(48.79)	(34.18)	(25.38)	(11.60)	(10.48)	(20.41)	(26.08)
Orange oil	45.80	35.00	22.00	17.00	12.00	15.00	16.50[b]	20.20
	Red. %	(45.15)	(26.33)	(20.60)	(13.56)	(19.27)	(19.94)	(24.98)
Mineral oil	48.15	27.00	20.00	15.00	10.00	9.00	13.50[cd]	16.20
	Red. %	(32.86)	(22.63)	(17.13)	(10.54)	(10.57)	(15.21)	(18.74)
Pymetrozine + orange oil	49.37	35.00	19.00	12.00	12.00	13.00	14.00[b]	18.20
	Red. %	(41.81)	(20.89)	(13.14)	(12.51)	(15.29)	(15.45)	(20.72)
Pymetrozine+mineral oil	49.51	25.00	15.00	8.00	9.00	10.00	10.50[c]	13.40
	Red. %	(29.49)	(16.23)	(8.40)	(9.10)	(11.50)	(11.30)	(14.94)
Control (water)	49.53	82.00	87.00	85.00	89.00	80.00	85.25	84.60

LSD ≤ 0.05 level for treatments =16.50 LSD ≤ 0.05 level for periods =7.19 LSD ≤ 0.05 level for treat.x per. = 10.08

Table 7. Efficacy of acetamprid, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2015 growing season

Treatment	Count before spraying	Initial effect	Reduction at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Acetamprid	48.79	32.50	29.80	28.30	25.10	21.00	26.05[b]	27.34
	Red. %	(60.14)	(48.10)	(40.93)	(33.67)	(24.86)	(36.89)	(41.54)
Orange oil	46.82	28.50	27.20	29.20	30.20	22.10	27.17[b]	27.44
	Red. %	(54.87)	(45.70)	(44.70)	(42.08)	(27.36)	(39.96)	(42.94)
Mineral oil	46.47	10.70	5.40	0.00	0.00	0.00	1.35[c]	3.22
	Red. %	(20.13)	(8.34)	(100.00)	(100.00)	(100.00)	(77.08)	(65.69)
Acetamprid + orange oil	47.92	17.50	9.00	4.20	2.80	1.50	4.37[c]	7.00
	Red. %	(32.52)	(14.10)	(5.43)	(2.93)	(0.88)	(5.83)	(11.17)
Acetamprid+mineral oil	49.51	5.10	1.50	0.00	0.00	0.00	0.37[c]	1.32
	Red. %	(8.45)	(1.43)	(100.00)	(100.00)	(100.00)	(75.35)	(61.97)
Control (water)	48.21	52.50	59.90	65.60	72.10	80.20	69.45	66.06

LSD ≤ 0.05 level for treatments =17.07 LSD ≤ 0.05 level for periods =8.13 LSD ≤ 0.05 level for treat.x per. = 15.22

+ orange oil and acetamprid + mineral oil, respectively during 2015 season. This percent decreased after 3 days in case of acetamprid (48.10%), orange oil (45.70%) , mineral oil (8.34%), acetamprid + orange oil (14.10) and acetamprid + mineral oil (1.43%). This trend happened after 5, 7 and 10 days. According to the means of residual effect, mineral oil had the highest percent of reduction (77.08 %) followed by acetamprid + mineral oil (75.35%) while acetamprid +orange oil had the lowest percent (5.83 %).

Results presented in Table 8 indicate that the reduction percent after 1 day post-treatment ranged from 46.39% - 32.86% in 2016 Season. This percent decreased after 3, 5, 7 days and reached its peak at 10 days ranged from 21.40 to 9.33%. Mean of reduction percents of residual effect indicated that acetamprid and acetamprid +orange oil were more effective as compared with other treatments followed by orange oil (19.94), while mineral oil showed the lowest percent reduction (15.21%).

Oils may have attractive or repellent effects and in some cases they volatized from plants which consist of cyclic and monocyclic mono-trepans that proved to be effective repellents against insects **(Rodriguez and Levin, 1975)**. It was found that these bioactive compounds are potentially toxic to insects and mites but relatively safe to human and wildlife. Recently there is a great need to find alternative pesticides instead the traditional chemical insecticides which proved to have toxic effect on human, animal and on the whole environment. Some essential oils are extracted from natural sources, such as eugenol which is extracted from clove fruits **(Farag *et al*., 1991)**.

Residues of Lambda-cyhalothrin in Faba Bean Plants

Faba bean plants were sprayed once with lambda-cyhalothrin at the concentration of 250 ml./fad. Sample of plants were collected at random from treated plots after 24 hr., 1, 3, 5, 7 and 10 days from application. The residues of the applied insecticide were determined chemically by gas chromatography apparatus after different intervals from application. The residues and dissipation percentage were presented in Table 9 and Fig. 1.

Results showed that the initial deposit 24 hr. after application of lambda-cyhalothrin in leaves of faba bean plants was 3.12 ppm. This amount decreased to 2.34, 1.03, ND ppm after 1, 3, 7 and 10 days from spraying in lambda-cyhalothrin, respectively. Reduction in lambda-cyhalothrin initial deposit reached 25, 66.98, 100 and 100% after 1, 3, 7 and 10 days after application, results presented in Table 9 and Fig. 1 indicated that the residue half-life (T1/2) values were 3 days in lambda-cyhalothrin in leaves of faba bean plants, as determined by gas chromatography. Maximum residue limit (MRL) was 0.01 ppm **(Zhang *et al.,* 2007; Shweta *et al.,* 2010; Walia and Kumari, 2010; Mac Bean, 2012; EFSA, 2013; Ryad and Mahmoud, 2016)** These results are in harmony with those obtained by **Jain *et al.* (2013), Lofty *et al.* (2013)** and **Shalaby (2017)**

Residues of Lambda-cyhalothrin in the Soil of Faba Bean Field

Samples of soil were collected at random from treated plots after 2 hr., 1, 3, 7 and 10 days from application. The residues of the applied insecticide were determined chemically by gas chromatography apparatus after different intervals from application the residues figure and dissipation percentages were presented in Table 10 and Fig. 2. Results showed that the initial deposit (2 hr., after application) of lambda-cyhalothrin in the faba bean soil was 2.58 ppm. This amount decreased to 1.01, 0.73, ND and ND mg/kg after 1, 3, 7 and 10 days from spraying lambda-cyhalothrin, respectively Reduction in lambda-cyhalothrin initial deposit reached 60.85 to 71.70,100 and 100% after 1, 3, 7 and 10 days from application, successively. Results presented in Table 10 and Fig. 2 revealed that the calculated half-value (RL_{50}) of lambda-cyhalothrin 2days.

Insecticide residues in crop produced above the safe level can cause health hazards to men and animals the fate of insecticides in soil depends on number of processes such as volatilization, leaching, run off and degradation by microbes, chemical processes and photo decomposition (**Salem, 2016**). Lambda-cyhalothrin rapidly degraded in soil, DT_{50} values for microbial degradation was 21-82 days, for field soil they valued 6 – 40 days. Lambda-cyhalothrin was strongly adsorbed to soil and sediment organic matter. Negligible potential for leaching of lambda-cyhalothrin and its degradation products through soil (**Chavarri and Arimo 2004; Manual of Pesticides, 2011**).

Table 8. Efficacy of acetamprid, orange oil, mineral oil alone and their mixtures against the leguminous aphid, *Aphis craccivora* Koch in faba bean field during 2016 growing season

Treatment	Count before spraying	Initial effect	Redution at indicated days post-treatment (%)				Mean of residual effect	General average
		1	3	5	7	10		
Acetamprid	49.73	38.00	25.00	21.00	24.00	18.00	22.00^{b}	25.20
	Red. %	(45.15)	(27.60)	(23.57)	(25.80)	(21.40)	(24.59)	(28.70)
Orange oil	45.80	35.00	22.00	17.00	12.00	15.00	16.50^{b}	20.20
	Red. %	(45.15)	(26.33)	(20.60)	(13.56)	(19.27)	(19.94)	(24.98)
Mineral oil	48.15	27.00	20.00	15.00	10.00	9.00	13.50^{cd}	16.20
	Red. %	(32.86)	(22.63)	(17.13)	(10.54)	(10.57)	(15.21)	(18.74)
Acetamprid + orange oil	47.15	37.00	32.00	30.00	19.00	11.00	23.00^{a}	25.80
	Red. %	(46.39)	(37.61)	(36.03)	(21.40)	(13.44)	(27.12)	(30.97)
Acetamprid+ mineral oil	47.92	27.00	20.00	18.00	12.00	8.00	14.50^{c}	17.00
	Red. %	(33.03)	(22.74)	(20.86)	(12.92)	(9.33)	(16.46)	(19.77)
Control (water)	49.53	82.00	87.00	85.00	89.00	80.00	85.25	84.60

LSD ≤ 0.05 level for treatments =17.49 LSD ≤ 0.05 level for periods =7.33 LSD ≤ 0.05 level for treat.xper. = 11.52

Table 9. Residues (mg/kg) of lambda-cyhalothrin in the leaves of faba bean plants

Days After spraying	Residue	Dissipation* (%)
Initial	3.12	-
1	2.34	25
3	1.03	66.98
7	ND	100
10	ND	100

***** Based on the actual remainder of the residues . ND = Not detectable residues.

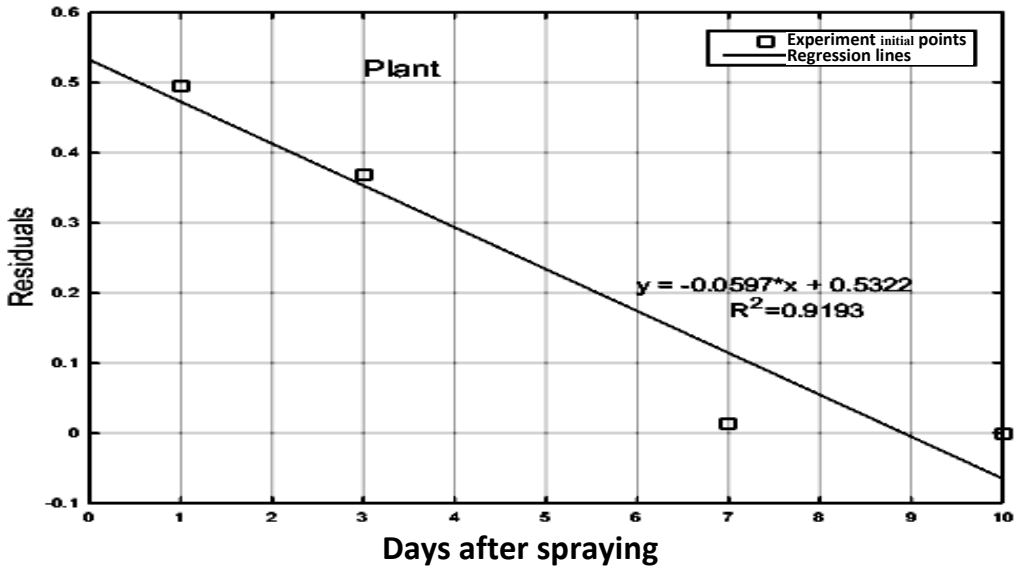

Fig. 1. Regression lines of logarithm lambda-cyhalothrin residue concentrations versus days after application on the leaves of faba bean plants

Table 10. Residues (mg/kg) of lambda-cyhalothrin in the soil of faba bean field

Days after spraying	Residue	Dissipation* (%)
Initial	2.58	-
1	1.01	60.85
3	0.73	71.70
7	ND	100
10	ND	100

* Based on the actual remainder of the residues. ND = Not detectable residues.

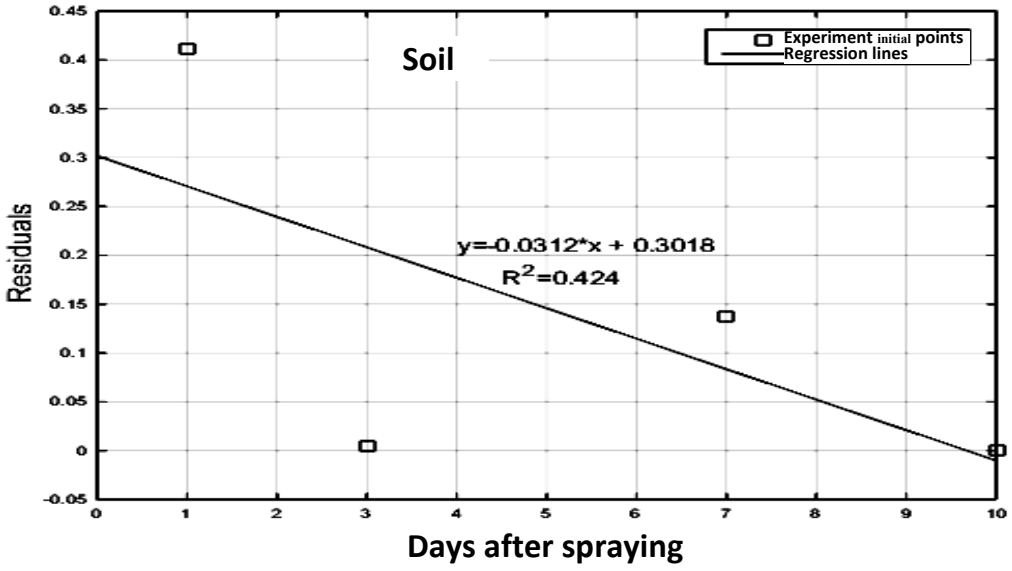

Fig. 2. Regression lines of logarithm lambda-cyhalothrin residues concentration versus days after application in faba bean soil

REFERENCES

Abbott, W.S. (1925). A method of computing the effectiveness of an insecticides. J. Econ. Entomol., 18 : 265- 267.

Abdu-Allah, G.A.M, Hashem and M. Mohamed (2017). Efficiency and side effects of three neonicotinoid insecticides used as faba bean seed treatments for controlling cowpea aphid . J. Pesticides Sci. Fac. Agric., Assiut Univ., Egypt.3(3); 20-27

Abdu-Allah, G.A.M. (2012). Aphicidal activity of imidaclopride and primicarb compard with certain plant extracts on *Brevicoryne brassicae* L. and *Aphis craccivora* Koch. Assiut. Agric. Sci., 43 : 104-114.

Abou-Yosuef, H.M. (2010). Resistance to Lambda-cyhalothrin in laboratory strain of whitefly, *Bemisia tabaci* (Genn.) and cross resistance to several insecticide. Ame.-Eurasian J. Agric. and Environ. Sci., 7 (6): 693-696.

Ashour, M.B.A. (1976). Residual effect of certain soil pesticides on some field crops. M.Sc. Thesis, Fac. Agric., Zagazig Univ., Egypt.

Casida, E. and K.A. Durhin (2013). Neuroactive insecticides targets, selectivity, resistance and secondary effects. Annu. Rev. Entomol., 58: 99-117.

Chavarri, M.J.A.H. and A. Arino (2004). Pesticide residues in field sprayed and

processed fruits and vegetables. J. Sci. Food and Agric., 84 (10): 1253-1259.

Costat (1998). Costat version 6.3111, Copyright 1998 - 2005. Co Hort software. 2798 Lighthouse Ave. PMb 320, Monteray, CA, 93940, USA.

Dai, X. (2014). Mechanism of the testis toxicity induced by chronic exposure to mequindor. Entomol. Dept., China Agric. Univ., Beijing, 100193, China.

Duncan, D. B. (1955). Multiple Range and Multiple F Tests. Biomet., 11:1-42.

EFSA (2013). European Food Safety Authority. Reasoned opinion on the modification of the existing MRLS for bentazone in legume and vegetables. EFSA Journal, 9 (5): 2188 – 29PP.

Farag, R.S., S.H. Abu-Raiia, G.E. El-Desoky and G.S.A. El-Baroty (1991). Safety evolution of thyme and clove essential oil as natural antioxidants Afr. J. Agric. Sci., 18: 169-176.

Finney, D.J. (1952). Probit Analysis. 2nd Ed. Cambridge University, 162.

Gomaa, E.A., M.H. Belal and M.B.A. Ashour (1979). Influence Temik on herbicide persistence in cultivated cotton field soil under field condition. Bulletin of Environ. Contamination and Toxicol (22):717-725

Henderson, C.F. and E.W. Tilton (1955). Tests with acaricides against the brown wheat mite J. Econ. Entomol., 48: 157 - 161.

Jain D.K., S.S. Rawat and S. Ghosh (2013).Use of pesticides in agriculture and livestock animal and-its impact on environment of India . Sain J. Environ.l Sci. 51-57 .

Jansen, J.P. and D.A.M. Warnier (2011). Side effect of flonicamide and pymetrozine on five aphid natural enemy species. Int. Organization for Biol. Control (IOBC), 56 : 759-770.

Lehotay, S.L. (2007). Determination of pesticide residues in foods by acetonitrile extraction and partitioning with magnesium sulfate: collaborative study. J. AOAC Int., 90 (2): 485-520.

Lofty, H.M., A.A. Abd El-Aleem and H.H. Monir (2013). Determination of insecticide malathion and lambda-cyhalothrin residues in zucchini by gas chromatography Bulletin of Faculty of Pharmacy, Cairo Univ., 51: 255-260.

Mac Bean, C. (2012). The Pesticide. Manual Version 5.2, 15th Ed. Lambda-cyhalothrin, 2013.

Manual of Pesticides (2011). New Pesticides Registered launched in Insecticides and Others. 1440 pages; Publisher: CABI: 16th Ed.

Ministry of Agriculture (2015). Pest Control Program, Pages 29-31 . po Box 9120

Nasser, M.A.K., A.M. El-Ghareeb, A.M.K. El-Sayed and G.A. Mohamed (2000). Toxicological effects of some insecticides against susceptible and field populations of the cowpea aphid Assiut. Agric.J, 31:217-230.

Raczkowski, M., A. Holodynska, A. Nowacka and B. Gnusowski (2011). Application of the QuEchERS method for determination of pesticide residues in tomato samples using GC-NPD/ECD. Progress in Plant, 51 (2): 727-731.

Rodriguez, E. and D.H. Levin (1975). Biochemical Parallelism of Repellents and Attractants in Higher Plants and Arthropods. In: Recent Advances in Phytochemistry Biochemical Interaction between Plants and Insects, Wallace, J.M. and L.R. Mansell (Eds.), Plenum Press, New York, 215 – 270.

Ryad, L.M. and A.A. Mahmoud (2016). Study the effect of household processing on some pesticide residues in olive fruits. Middle East J. Appl. Sci., 6 (3): 588-593.

Salem, R.E.M.E. (2016). Determination of the herbicide Basagran residues in maize plants and soil. J. Agric. Res. Kafer El-Sheikh Univ., 42 : (4). 21 -31.

Schepers, A. (1988). Control of aphids Chemical Control 2C. EL serier, Amstredam, 89 - 121.

Shalaby, A.A. (2017). Residues of lambda-cyhalothrin insecticide and its biochemical

effects on sweet pepper fruits. Plant Prot. Dept. J. Prod. Dev., 22 (1) : 65-81

Shweta, W., P. Boora and B. Kumari (2010). Effect of processing on dislodging of cypermethrin residues on brinjal. Bulletin of Environ. Contamination and Toxicol., 84 (4): 465-468.

Walia, S.P.B. and B. Kumari (2010). Effect of processing on dislodging of cypermethrin Residues on Brinjal. Bulletin of Environ. Contamination and Toxicol., 84 (4): 465-468.

Zhang, Z.Y., X.J. Liub and X.Y. Hong (2007). Effects of home preparation pesticide residues in cabbage. Food Control, 18 (12): 1484-1487.

فعالية بعض المبيدات الحشرية والزيوت ومخاليطها لوقاية نباتات الفول من حشرة مَنْ البقوليات وتقدير المتبقيات في النبات والتربة

أمانـــي كمـــال إبراهيم إبراهيـــم - رفعت مصطفـى محمـد شـريف
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تم تقييم فعالية ثلاثة مبيدات تندرج تحت مجاميع كيميائية مختلفة وهى اللمباداثيهالوثرين (لمباداثيهالوثرين ٢,٥%)، الاسيتامبيريد (موسبيلان ٢٠%) والبيمتروزين (بيمتروزين ٢٥%) واثنين من الزيوت هما زيت البرتقال (زيت البرتقال ٩٨%) والزيت المعدني (كزد ٩٥%) ومخاليطها على نباتات الفول ضد حشرة مَنْ البقوليات *Aphis craccivora* Koch تحت الظروف المعملية والحقلية، تم تقدير التركيز القاتل لـ ٥٠% من الأفراد و٩٠% من الأفراد بعد ٢٤ ساعة من المعاملة، وقد أوضحت النتائج المتحصل عليها وجود مدى واسع من سميه هذه المبيدات فلقد أوضح مبيد اللمباداثيهالوثرين أعلى درجة سمية بعد ٢٤ ساعة عند تركيز ٩٠,٥٣ و٤٣,٢٠ جزء من المليون، على الجانب الآخر أظهر مبيد البيمتروزين درجة سميه أقل حيث سجل التركيز والنصفي القاتل من الأفراد ٩٠,٥٣ جزء من المليون، وأوضحت التأثيرات المتبقية للمبيدات ومخاليطها على حشره مَنْ البقوليات تحت الظروف الحقلية في موسم ٢٠١٥ أن الزيت المعدنى أعطى نسبة انخفاض بمقدار ٧٧,٠٨ % ومبيد الاسيتامبيريد + الزيت المعدنى أعطى نسبة انخفاض بمقدار ٧٥,٣٥% فى حين أعطى مبيد اللمباداثيهالوثرين + الزيت المعدنى نسبة انخفاض قدره ٥٣,٨٧%، بينما في موسم ٢٠١٦ أظهرت النتائج أن مبيد الاسيتامبيريد + زيت البرتقال أعطى نسبة انخفاض بمقدار ٢٧,١٢% فى حين أعطى مبيد اللمباداثيهالوثرين + زيت البرتقال نسبة انخفاض قدره ٢٦,٢٨% كتأثير متبقي على حشرة مَنْ البقوليات، كما أظهرت النتائج أن التأثير المتبقي لمبيد اللمباداثيهالوثرين على نبات الفول والتربة تحت الظروف الحقلية حيث تم رش المبيد بالجرعة الموصى بها على نبات الفول، ثم أخذ العينات من الأوراق والتربة المعاملة بعد ٢ ساعة، ١ ، ٣، ٧، ١٠ أيام، وتم استخلاص وتنقية العينات المختبرة وتحليلها بواسطة الجهاز الكروماتوجرافي وكانت نسبه الإسترجاع ٧٥ %و٩٠% لكل من الأوراق والتربة على الترتيب وكانت فترة نصف العمر ٠,١ و ٠,٢ يوم على التوالى.

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