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INTERACTION BETWEEN FERTILIZERS AND ACETAMPRID USED IN CONTROL WHITEFLY, *Bemisia tabaci* (GENN.) IN TOMATO PLANTS

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ABSTRACT: Tomato is the most widely grown vegetables in the world and also the most important item of the vegetables processing sector. Tomato is important vegetable plant in our agriculture map which used as food in many countries of the world and especially Egypt. It infested with many pests, among of the most serious pest, whitefly, *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae). This work was aimed to study effectiveness of acetamprid alone and binary mixtures with oil and foliar fertilizer against whitefly larvae mortality, egg hatchability (under laboratory condition) and yield of tomato plants. The results showed that in case of egg hatchability, adding fertilizer to oil, fertilizer to acetamprid and oil to acetamiprid cause decreased in hatchability percentage compared with other treatments. Also, the results illustrated that adding of fertilizer to acetamiprid or oil causing increasing in reduction percentage to *B. tabaci* larvae. In case of initial effect when adding fertilizer to acetamiprid cause increasing mean reduction percentage to 92.61% recording the first superior treatment. The results showed that adding foliar fertilizer to oil or acetamprid and oil to acetamprid recorded 85.48, 83.12 and 77.95% reduction, respectively. In case of tomato yield during two summer successive seasons 2016 and 2017, the results reported that the tomato yield increased when adding oil to acetamprid recorded 609.45 Kg during 2016 season with increasing value of 40.17% compared with control and other treatments, but control record the lowest yield (433.09 kg). During 2017 summer season, adding oil to acetamiprid recorded superior yield of 621.53 kg with increasing 35.53% compared with control. Impact of adding oil and fertilizer on residues of acetamprid on tomato fruits (washed and unwashed): Unwashed fruits in case of acetamiprid alone recorded residues up to maximum residue limit until 12 days from spray but addition fertilizer or oil to acetamiprid cause disappearance acetamiprid in 9th day from spray. Wash using water or acetic acid caused speed disappearance to acetamprid.

Key words: Tomato, Yield, whitefly, acetamprid, oil, fertilizer, residues.

INTRODUCTION

Recently in Egypt, tomato begin horizontal large scale production at sandy soil. It used as fresh, salads, juice, and export. Tomato (*Lycopersicon esculentum* Mill.) belongs to family Solanaceae. Tomato is considered one of most valuable vegetables crops, whereby tomato fruits contain moderate percentages of proteins, mineral salts, vitamins (A, B and C) and neutralization materials for gut acidity (**Abdel-Fattah *et al.*, 1989)**. Tomato plants infested with many insect pests as cut warm, aphids, thrips, two spotted spider mite, *Earias insulana*, cotton leaf worm, *tuta absoluta, Helicoverpa armigera, Pectinophora gossypiella*, *Bemisia tabaci* (Genn.) and *Phthorimaea operculella* (zeller), **(Soliman and Ismail, 2007; Soliman, 2015)**. Tomato plant is affected by many insects and fungal diseases, among which, the insects *Trialeurodes vaporariorum* and *Tuta absoluta* **(Martin *et al.*, 2002; Mayer *et al.*, 2002**). The

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whitefly insect adults feed on the leaves of several species of Solanaceae plants, causing direct and indirect damage to tomato plants. In order to maintain a high production yield, the use of pesticides is a conventional agricultural practice (**Engindeniz, 2006)**.

In addition, the extensive use of insecticides adversely affected non-target organisms and caused secondary pest resurgence with environmental and health concerns. Also, in recent years, disappearance of cotton seedling from year to year cause migration a lot of insect pests to vegetable plants. Usage of synthetic insecticides cause pollution to environment, so that beginning search on safety alternative such as biological control to whitefly. **Rafiqi *et al.* (2008)** found that pod borer, *Helicoverpa armigera* (Hubn.) (Lepidoptera: Noctuidae), plays a detrimental role in the destruction of tomato which infested tomato in all stages **(Rheenen and Van Rheenen, 1991)**.

This work was aimed to study the effect of tested insecticide alone and in binary mixtures with oil and foliar fertilizer against whitefly larvae, egg hatchability percent under laboratory condition.

MATERIALS AND METHODS

Materials

Insecticides Used

1. Acetamiprid (Mospilan), 20% Soluble powder (SP), at a rate of 25 g/100 Litre water.
2. Oil: KZ oil (mineral oil 95% EC) at a rate of Litre/ 100 litre water.
3. Foliar fertilizer: Nitrogen (N): Phosphor (P): Potassium (K), called 20/20/20, at a rate f 100 g/100 Litre water.

Experimental Design

The field experiment was conducted in the present investigation during the two successive seasons to evaluate the efficiency of the acetamprid for controlling whitefly, *Bemisia tabaci* (Genn.) (egg and nymphs) infesting tomato plants, (*Lycopersicon esculentum* Mill.), under field conditions during the summer seasons of 2016 and 2017, respectively. In this respect, area of about 882 m^2 were selected at Kfr Aboagwa village, Zagazig district, Sharkia Governorate. Tomato plants, (variety, Yara) were cultivated at field in the both years, *i.e.,* 2016 and 2017 on first week of May, during two successive summer seasons, respectively. Mean temperature and relative humidity were (37, 42^{o}C) and (70.51, 72.13%); for the summer seasons of 2016 and 2017, respectively.

Effect of tested insecticide alone and their binary mixtures with oil and foliar fertilizer against whitefly, egg hatchability percent under laboratory condition

The experiment was carried out at laboratory condition, Plant Protection Department at Faculty of Agriculture, Zagazig University, to study the effect of acetamprid alone or in binary mixture with oil and foliar fertilizer on egg numbers, number of larvae and hatchability percent. Selected randomized leaves from treatment check control without spray any insecticides, thenceforth the leaves put in paper bags and transferred to laboratory, the leaves were cut to discs with one inch square. The eggs were count and recorded before treatment on the discs. The discs were dipped in solutions of insecticide alone or in binary mixture with oil and foliar fertilizer which prepared according to the rate of field application. The discs were dipped at solution at period about 10 seconds and after that discs of leaves were leaved to complete dryness. The discs of leaves were putting after completely dryness inter refrigerator, the discs were examined daily after 24, 48 and 72 hours from treatment using stereomicroscope to count eggs and larvae of *Bemisia tabaci* **(El-Aassar *et al.*, 2015)**.

Effectiveness of insecticide alone and their binary mixtures with oil and foliar fertilizer against whitefly larvae on tomato plants

The efficiency of acetamprid, applied either alone or in binary mixtures with foliar fertilizer or oil against eggs and nymphs of white fly, *Bemisia tabaci* (Genn.), infesting tomato plants was studied during two summer seasons in 2016 and 2017. In this respect, the field was cultivated with tomato plants and divided into 21 plots of 1/100 of a faddan each. The plots were arranged in completely randomized block design with seven treatments and each treatment was replicated three times. Such arrangement was

used in case of plots received insecticide alone or in binary mixtures with oil and foliar fertilizer.

The treatments were sprayed twice with 14 days interval. The applications in the first year, *i.e.*, 2016 was undertaken on May 25th and June 9th during summer season. Also, the chemicals were sprayed in the second year 2017 on the same time at May 25th and June 9th.

Knapsack sprayer fitted with one nozzle boom was used. Each plot was thoroughly sprayed using ten liters of the diluted pesticide solution. The effect of different treatments on eggs and nymph population of the *B. tabaci* infesting the tomato plants was evaluated. In this respect, the samples of tomato plant leaves were collected from each plot randomly just before and thence forward at 1st, 3rd, 5th, 7th, 11th and 14th days of treatments application in case of whitefly egg and nymphs. On each sampling date a sample of ten plant leaves was taken at random from each replicate for inspection in the laboratory, the number of Egg and nymphs were counted per inch square/leaves in case of white fly under stereomicroscope, thenceforth record. The reduction in pest population resulted was calculated according to **Henderson and Tilton equation (1955)** as follow :

$$\% \text{ reduction} = 1 - \frac{\text{No in check plot before spraying x No in treatment plot after spraying}}{\text{No in check plot after spraying x No in treatment plot before spraying}} \times 100$$

Data obtained were subjected to statistical analysis. Duncans multiple range test was used to determined the significance of the difference between the mean values of treatments according to least significant differences (L.S.D) method (**Stal and Torrie, 1960**)

Effect of the tested insecticide alone and their binary mixtures with oil and foliar fertilizer on yield of tomato

Edible fruit tomato in treated and untreated plots were harvested and weight every seven days until the end of the season. Total yield expressed as kilogram/ plot / treatment was calculated.

Residue Determination of Acetamiprid Alone and in Mixture with Oil and Foliar Fertilizer in Washed and Unwashed Tomato Fruits

After the second spray (during summer plantation of 2017), random samples of about 3 kg. edible tomato fruits were collected from the three plots of each treatment after two hours, 1, 3, 6, 9 and 12 days of spraying and well mixed. Fruit samples (tomato fruits) were divided into three subsamples, each subsample one kilogram, the first was left unwashed, the second was washed using running tap water and the third was washed with acetic acid 10% and left for air dryness. Each subsample was cut into small pieces then put on food chopper to samples admixing and homogeneous, then subjected to extraction and clean-up procedures.

Residues of acetamprid alone and in binary mixtures with oil and fertilizer substances were extracted from plant samples (leaves and fruits) according to the method of **Macnell *et al.* (1975**).

Glass plates (20 × 20 cm.) were coated with silica gel GF 254. After the silica gel was dispersed in distilled water at 1 : 2 w./v. fribos applicator was used for coating the glass plates with a thin layer (0.25 mm thickness), then the plates were put in an oven adjusted 110°C for one hour. An aliquot of the concentration extract was spotted on the plate at a distance of 3 cm from the lower edge. The plates were developed in hexane: acetone (7:3 V./V.) then exposed to U.V. light in order to detect the spots of the tested pesticides. The spots were scraped and the insecticide residues were extracted by acetone using a centrifuge. The solvent was then decanted and evaporated to dryness. The residues were determined using HPLC.

Final determination of insecticide residues

The final determination of insecticide residues carried out at central laboratory of pesticides at Dokky, Giaza. The high performance liquid chromatography technique (HPLC Beckman) was used for the quantitative analysis of acetamprid. The instrument used was HPLC perkin-Elmer serier 410.2 delivery system equipped with four pumps and attached to L-15 perkin-elmer U.V. fixed wave length (245 n.m.)

detector. Several columns and solvents were tried before establishing the best conditions for separation of acetamiprid. A satisfactory resolution results were obtained by using column Hs3 C18 (perkin-elmer) 3.3X5.6 cm and with perkin-elmer Lc-100 integrator. Different solvent were used in either a mixed mode or gradient mode.

Acetonitrile: water (60 : 40) in gradient mode was the best solvent giving separation in the present study with flow rate 1 ml./minute, Acetamiprid peak appears after 3.01 minute (R.T= 3.01).

HPLC Beckman 110 B solvent delivery module system cold analog interface module 406 programmable detector 166 capture P.C. 8300 sp – 4230 integrator.

Recoveries of the Tested Insecticide from Different Samples Through the Extraction and Clean- Up Procedure

The recoveries of acetamiprid from tomato fruit samples through the extraction and clean – up procedures were estimated. Results obtained were corrected according to their mean of recovery. The rates of degradation (K = 2.303 × slope) and half-life (t 1/2 = 0.693/K) was obtained according to **Gomaa and Belal (1975**).

RESULTS AND DISCUSSIONS

Effect of the Tested Insecticide Alone and Their Binary Mixtures with Oil and Foliar Fertilizer against Whitefly, Egg Hatchability under Laboratory Condition

Data in Table 1, illustrated that the results of statistical analysis appear not significant between each treatments in case of mean number of eggs per disc. On the other hand, in case of the emerged larvae, the results of statistical analysis show that there were significant differences between each tested treatments, wherever P value were ≤ 0.001. In case of oil ad fertilized treatment recorded the lowest mean number of larvae it was 1.10 but the fertilizer treatment recorded the highest number of larvae it was 9.20. In case of hatchability % oil and fertilizer treatment recorded the most effective treatment. It was 4.74 but the least effective treatment was fertilized treatment it was 43.09.

Effectiveness of Insecticide Alone and in Binary Mixtures with Oil and Foliar Fertilizer against Whitefly Larvae Infesting Tomato Plants

Data in Table 2 and Fig. 1 show efficiency of the tested pesticides after application during two successive seasons 2016 and 2017 summer seasons, respectively. The results in this table concentrate on comparison between treatments, whereat that the results of statistical analysis appeared significant differences between each treatment. Regarding initial effect adding fertilizer to acetamiprid was causation in increasing mean reduction percentage 92.61% recording the first superior treatment, followed by other treatments as follow, oil with fertilizer, acetamiprid with oil, acetamiprid, oil and fertilizer recording 91.31, 87.31, 83.9, 72.29 and 69.42% reduction in Table 2, especially residual effect the results illustrate that additional fertilizer to oil, foliar to acetamiprid and oil with acetamiprid record 85.48, 83.12 and 77.95% reduction while other treatments recorded 76.53, 54.18 and 51.35% with acetamiprid alone, oil alone and fertilizer, respectively. The same trend occur with general mean, where additional come to at the first followed other treatments, oil with fertilizer 88.38, acetamiprid with fertilizer, acetamiprid wit oil 82.63, thenceforth other treatments acetamiprid 80.22, oil 62.33 and fertilizer 60.35% reduction, respectively. These results agree with **Soliman (1998)**, who found that adding green cite as foliar fertilizer to pirimiphos methyl cause the most efficient against white fly infesting squash **Soliman (2004)** found that adding emulgator as surfactants to Profenofos recorded 98.2% reduction but Profenofos alone recorded 98% reduction against whitefly. **Zawrah *et al.* (2020)** elucidated that acetamprid, imidacloprid and abamectin were the most effective compounds. Also, the orange oil and azadirachtin can suitable to whitefly. **Barrania and Abou-Taleb (2014)**, indicated that thiamethoxam, imidacloprid and acetamiprid were effective against whitefly adults compared to Chlorantraniliprole which recorded the least reduction percentage.

Table 1. Efficiency of the tested insecticide alone and in binary mixtures with foliar fertilizer and oil on the egg hatchability percentage of *B. tabaci* (Genn.) under laboratory conditions

Tested insecticides		Mean No. of eggs	Mean No. of larvae	Hatchability %
Control		22.26 [a]	21.34 [a]	95.86 [a]
Acetamiprid		23.10 [a]	5.65 [c]	24.45 [c]
Fertilizer		21.35 [a]	9.20 [b]	43.09 [b]
Oil		22.63 [a]	9.10 [b]	40.21 [b]
Acetamiprid +Oil		20.10 [a]	4.20 [cd]	20.89 [c]
Acetamiprid + Fertilizer.		25.34 [a]	3.20 [d]	12.62 [d]
Oil+ Fertilizer		23.20 [a]	1.10 [e]	4.74 [e]
ANOVA	df		*P*-value	
Insecticides	6	0.291 [ns]	≤ 0.001 [**]	≤ 0.001 [**]

NS: Not significant, **: Highly significant
Means followed by the same letters are not significantly different by least significant difference at P ≤ 0.01.

Table 2. Mean reduction percentages after application of acetamprid during 2016 and 2017 summer seasons

Tested insecticides		Initial effect	Residual effect	General mean
Acetamiprid		83.9 [c]	76.53 [b]	80.22 [b]
Fertilizer		69.42 [e]	51.35 [c]	60.35 [c]
Oil		72.29 [d]	54.18 [c]	63.23 [c]
Acetamiprid + Oil		87.31 [b]	77.95 [b]	82.63 [b]
Acetamiprid + Fertilizer		92.61 [a]	83.12 [a]	87.86 [a]
Oil + Fertilizer		91.31 [a]	85.48 [a]	88.38 [a]
ANOVA	**df**		**P-value**	
Treatments	**5**	**≤ 0.001****	**≤ 0.001****	**≤ 0.001****

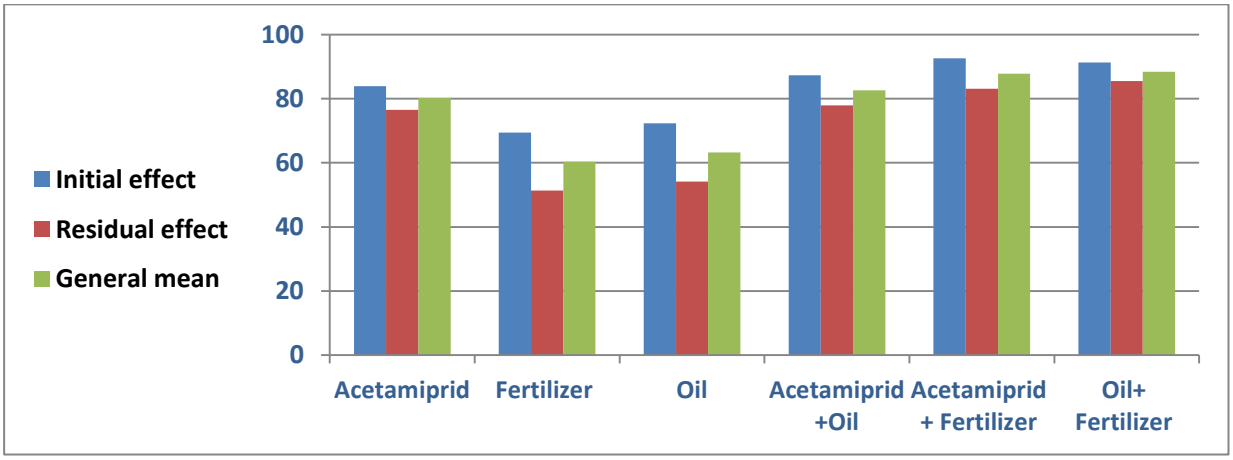

Fig. 1. Mean reduction percentages after application of acetamprid during 2016 and 2017 summer seasons

Effect of the Tested Insecticide Alone and in Binary Mixtures with Oil and Foliar Fertilizer on Yield of Tomato

The data illustrate that using alternative material alone or in binary mixtures with acetamprid cause yield increasing compared with control treatment, these yielder increasing were evidenced in Table 3 and Fig. 2. In case of first season 2016 summer season, the results of statistical analysis indicate that there were significant differences among treatments compared with control. The results show that the yield increased in each treatment, when adding oil to acetamiprid record high yield (609.45 Kg) during 2016 season with increasing value 40.17% compared to other treatments, other treatments were ordered according to weight of yield and increasing% as follows: acetamiprid (566.05 kg & 30.07%), acetamiprid with fertilizer (533.41 kg & 23.16%) oil with fertilizer (513.05 kg & 18.46%), fertilizer alone (510.11 kg & 17.78%), oil alone (508.76 kg & 17.47%), and control recorded the lowest yield 433.09 kg.

Also, the same trend in Table 3 and Fig. 2 during 2017 summer season occur with acetamiprid with oil record superior treatment where record 621.53 kg with increasing % 35.53 compared with control. Also, adding fertilizer to oil and fertilizer to acetamiprid record 544.97 kg tomato fruits and 515.12 kg with increasing percent 18.83 and 12.32%, thenceforth other treatments come to as follow : fertilizer, oil, acetamiprid and control record (543.21 kg & 18.45%), (520.58 kg & 13.52%), (514.37 kg & 12.16%) and (458.6 kg), respectively. These results agree with **Soliman (1998)** who indicated that yield of cucumber and squash was pronounced when insecticides were applied in binary mixtures with foliar fertilizer (Greenzite).

Impact of Adding Mineral Oil and Fertilizer on Residues of Acetamiprid in Tomato Fruits (Washed and Unwashed)

Data in Table 4 show that the initial amounts of acetamiprid in unwashed tomato fruits as determined after two hours of the second spray was 3.92 μg/g. Such amount decreased to be 3.65, 3.12, 2.66, 2.25 and 1.48 μg/g after 1, 3, 6, 9 and 12 days from spraying, respectively recording 6.89, 20.40, 32.14, 42.6 and 62.24% loss.

The effect of washing with tap water on the residues amounts of acetamprid alone detected in washed tomato fruits was estimated in Table 4. It is obvious that the initial amount decreased to be 2.39 μg/g indicating 39.03 loss by washing compared with acetamiprid alone in unwashed tomato fruits after 2 hours (initial). The values for total residues of acetamiprid in washed tomato fruits with water were 2.07, 1.08, 1.4, 0.89 and 0.47 μg/g after 1.3, 6, 9 and 12 days of spraying, respectively. The loss percentages of acetamiprid residues ranged from 13.38 to 80.33% due to washing with tap water to the treated tomato fruits. Also, in Table 4 the results showed that the impact of tomato fruits contaminated with acetamiprid alone, washed with acetic acid. In case initial, the results obvious that, acetamiprid alone in tomato fruits washed with acetic acid recorded 2.73 μg/g after two hours, such amount decreased by time till the 6^{th} days recorded 0.73 μg / g and loss % was 73.26%, the residues ablated initiating from 9^{th} and 12^{th} day. There was positive correlation between the values of acetamiprid residues in tomato fruits and the efficiency of washing process. In the other words, as the amount of acetamiprid residues in tomato fruits washed with acetic acid was decreased.

Unfortunately, the residues of acetamiprid alone at the recommended rate in tomato fruits are higher than the maximum residue level (0.5 μg/g) as adapted by Eu pesticides data base MRL, (SANTE/10617/2018 N/A, so these tomato fruits must be carefully offered to consumers after a period more than 12 days of spraying time till residues from this pesticide less than MRL level. While, acetamiprid alone was less than MRL at 12^{th} days when tomato fruits washed with water, whilst that acetamiprid alone disappears after tomato fruits washing with acetic acid at 9^{th} and 12^{th} days from spray.

Summarized results indicate that the initial deposits of acetamiprid at complete recommended rate mixed with mineral oil in unwashed tomato fruits after two hours were 4.38 μg/g (Table 4) which were higher than that in washed tomato fruits treated with acetamiprid alone by 11.73 folds. Such amount decreased to be as follows:

Table 3. Effect of tested acetamprid on the tomato yield (Kg.) during 2016 and 2017 summer seasons

Treatments		Weight of tomato fruits / treatment (kg)			
		First season (2016)	Second season (2017)	Increasing% during 2016	Increasing% during 2017
Control		433.09 [d]	458.60 [d]	----	----
Acetamiprid		566.05 [b]	514.37 [c]	30.07	12.16
Fertilizer		510.11 [c]	543.21 [b]	17.78	18.45
Oil		508.76 [c]	520.58 [c]	17.47	13.52
Acetamiprid +Oil		609.45 [a]	621.53 [a]	40.17	35.53
Acetamiprid +Fertilizer		533.41 [bc]	515.12 [c]	23.16	12.32
Oil+ Fertilizer		513.05 [c]	544.97 [b]	18.46	18.83
ANOVA	df	*P*-value			
Insecticides	6	≤ 0.001**	≤ 0.001**	----------	

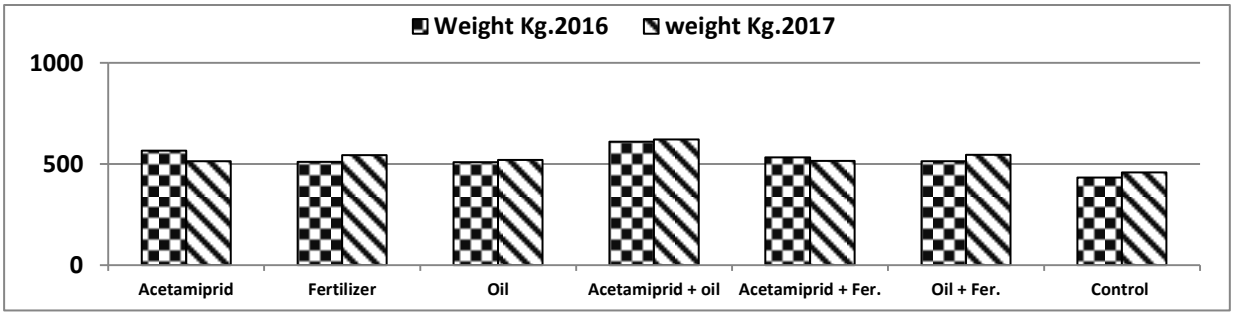

Fig. 2. Effect of tested acetamprid on the tomato yield (Kg.) during 2016 and 2017 summer seasons

Table 4. Impact of adding petroleum oil and fertilizer on residues of acetamiprid alone and in binary mixtures in tomato fruits (washed and unwashed)

Treatments	Tomato fruits											
	Residues of acetamiprid after Days spray											
	Initial		1		3		6		9		12	
	µg/g	% loss	µg/g	% loss	µg/g	% loss	µg/g	% loss	µg/g	% loss	µg/g	% loss
Acetamiprid alone in unwashed tomato fruits	3.92	0.0	3.65	6.89	3.12	20.40	2.66	32.14	2.25	42.60	1.48	62.24
Acetamiprid alone in washed tomato fruits with water	2.39	0.0	2.07	13.38	1.8	24.68	1.4	41.42	0.89	62.76	0.47	80.33
Acetamiprid alone in washed tomato fruits with acetic acid	2.73	0.0	2.3	15.75	1.5	58.97	0.73	73.26	UND	100	UND	100
Acetamiprid with oil in unwashed tomato fruits	4.38	0.0	3.9	10.95	2.4	45.20	1.01	76.94	UND	100	UND	100
Acetamiprid with oil in washed tomato fruits with water	2.59	0.0	2.2	15.05	1.44	44.40	0.705	72.77	UND	100	UND	100
Acetamiprid with oil in washed tomato fruits with acetic acid	2.75	0.0	2.4	12.72	1.63	40.72	1.13	58.91	0.05	98.18	UND	100
Acetamiprid with fertilizer in unwashed tomato fruits	5.6	0.0	4.9	12.5	3.25	41.96	1.1	80.35	UND	100	UND	100
Acetamiprid with fertilizer in tomato fruits washed with water	1.43	0.0	1.15	19.58	1.01	29.37	0.72	49.65	0.31	78.32	UND	100
Acetamiprid with fertilizer in tomato fruits washed with acetic acid	4.38	0.0	3.9	10.95	2.4	45.21	1.01	76.94	UND	100	UND	100

UND = undetectable

3.9, 2.4, 1.01 and undetectable amounts after 1, 3, 6, 9 and 12 days of application, whereas the respective values of dissipation percentages were 10.95, 45.2, 76.94, 100 and 100%. Also, in the same Table results show that the initial deposits of acetamprid with oil in washed tomato fruits with water was 2.59 μg/g. After two hours of application. Such amount was decreased gradually to reach 0.705 μg/g after sixth day of spraying. The loss percentages of acetamprid ranged from 15.05 to 100% from the first to twelfth day of spraying. On the other hand, the results in Table 4 illustrated that, washing of tomato fruits with acetic acid affect on the amount of the residues of acetamprid mixed with oil. Whereas the loss of residues ranged between 12.72 to 100% loss by washing was achieved. The higher reduction in the residue amounts of acetamprid mixed with oil was noticed with the samples of high amount of residue after washing.

The residue amounts of acetamprid in binary mixture with fertilizer in tomato unwashed and washed tomato fruits are shown in Table 4. It is obvious that when tomato fruits were treated with acetamprid mixed with fertilizer without washing had higher amounts by 4.17 and 1.22 times comparing with acetamprid mixed with fertilizer washing with water and acetic acid treatment. The initial deposits of acetamprid with fertilizer in unwashed tomato fruits after two hours were 5.6 μg/g, such amount decreased to 4.9,2.5 and 1.1 μg/g. after 1,3 and 6^{th} days of application, whereas the respective values of dissipation percentages were 12.5, 41.96 and 80.35%, while, acetamprid with fertilizer completely dissipation during 9^{th} and 12^{th} day of application. Also, in the same Table 4 the results show that the residues of acetamprid mixed with fertilizer in washed tomato fruits with water was 1.43 after two hours post-treatment. Such amount was decreased gradually to reach 0.31 in the ninth day of spraying. The loss percentages of the residues of acetamprid mixed with fertilizer in tomato fruits washed with water ranged from 29.37 to 100%.

Concerning the effect of washing the treated tomato fruits with acetic acid on the residue amount of acetamprid used in mixture with fertilizer (Table 4) it is obvious that 10.95 to 100% loss by washing to tomato fruits with acetic acid was achieved. In case of washed tomato fruits treated with acetamiprid mixed with the fertilizer, the initial deposits was decreased by washing till reached to 1.01 μg/g indicating 76.94% loss after 6^{th} days of spraying. On the other, residues of acetamiprid with fertilizer in tomato fruits washing with acetic acid completely losses in ninth and twelve day.

Impact of Adding Mineral Oil and Fertilizer on Rate of Degradation and Half Life of Acetamprid in and on Tomato Fruits

The calculated values of the rate of decomposition and the half life periods of the acetamprid alone and in binary mixtures with oil and fertilizer in tomato fruits are presented in Table 5. Data show that disappearance of acetamiprid due to degradation in all treatments, however, much a large amount of acetamprid alone in unwashed tomato fruits and acetamprid with fertilizer in tomato fruits washed with water was degrading faster comparing with other treatments.

From the data tabulated in Table 5 it is obvious that the insecticide acetamprid alone and mixed with oil and fertilizer decomposed faster in unwashed and washed tomato fruits such as acetamiprid alone in unwashed tomato fruits and acetamiprid with fertilizer in washed tomato fruits with water recorded rate of degradation and half life period (0.377, 1.83 day) and (0.44, 1.58 day) followed by acetamprid with oil in unwashed, acetamprid with fertilizer in tomato washed with acetic acid, Acetamiprid alone in tomato washed with water, acetamprid alone in tomato washed with acetic acid, acetamprid with oil in tomato washed with acetic acid and acetamprid with fertilizer in tomato unwashed recorded less rate of degradation. Whereas the corresponding degradation rates (K) were 0.127, 0.127, 0.195, 0.176, 0.166, 0.16 and 0.074, respectively. As showed in the same table, the half life periods (T 1/2) were 2.37, 2.37, 3.55, 3.93, 4.17, 4.33 and 9.36 days. Addition of oil and fertilizer to acetamiprid increase T 1/2 values in case of all treatments except fertilizer addition to acetamprid with tomato fruits unwashed.

Table 5. Slope, rate of degradation and half life period of acetamprid alone and in binary mixtures with fertilizer and oil

Treatments	Washed and unwashed tomato fruits		
	Slope	K	T 1/2 (days)
Acetamiprid alone in unwashed tomato fruits	0.164	0.377	1.83
Acetamiprid alone in washed tomato fruits with water	0.085	0.195	3.55
Acetamiprid alone in washed tomato fruits with acetic acid	0.08	0.176	3.93
Acetamiprid with oil in unwashed tomato fruits	0.127	0.292	2.37
Acetamiprid with oil in washed tomato fruits with water	0.072	0.166	4.17
Acetamiprid with oil in washed tomato fruits with acetic acid	0.07	0.16	4.33
Acetamiprid with fertilizer in unwashed tomato fruits	0.032	0.074	9.36
Acetamiprid with fertilizer in tomato fruits washed with water	0.19	0.44	1.58
Acetamiprid with fertilizer in tomato fruits washed with acetic acid	0.127	0.292	2.37

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التداخل بين الأسمدة والأسيتامبريد المستخدم في مكافحة الذبابة البيضاء (*Bemisia tabaci* GENN.) في نباتات الطماطم

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أظهرت النتائج أنه في حالة فقس البيض عند خلط المخصبات للزيت المعدني أو خلط المخصبات للأسيتامبريد سبب خفض مقارنة بالمعاملات الأخرى، كما أظهرت أن إضافة كلا من المخصبات أو الزيوت للأسيتامبريد سبب زيادة في النسبة المئوية للخفض في عدد يرقات الذبابة البيضاء، في حالة التأثير الفوري عند اضافه المخصبات للأسيتامبريد سبب زياده في متوسط النسبة المئوية للخفض لـ92.51% مسجلاً أولى المعاملات تأثيرًا: ونفس النتيجة حدثت في التأثير المتبقي حيث اضافه المخصبات للزيت المعدني والمخصبات للأسيتامبريد والزيت للأسيتامبريد سجل 85.48، 83.12 و77.95% نسبه خفض متبوعة بباقي المعاملات. في المتوسط العام أتت هذه الإضافات في المقدمة متبوعة بباقي المعاملات في حالة محصول الطماطم خلا موسمين صيفيين متتاليين 2016 و2017، أظهرت النتائج أنه عند إضافة الزيت للأسيتامبريد زاد محصول الطماطم وسجل أعلى محصول 609.45 كجم خلال عام 2016 بنسبه زيادة 40.17% مقارنة بالكنترول وباقي المعاملات الأخرى وبينما سجل الكنترول أقل نسبة في المحصول 433.09 كجم خلال الموسم الصيفي 2017عند اضافه الزيت للأسيتامبريد سجل أعلى المعاملات حيث سجل محصول 621.53 كجم بنسبه زياده 35.53% مقارنه بباقي المعاملات، تأثير اضافه الزيت والمخصبات على متبقيات الأسيتامبريد في ثمار الطماطم المغسولة والغير مغسولة -1 الثمار الغير مغسولة في حاله للأسيتامبريد سجل أعلى نسبة متبقى في اليوم 12من الرش ولكن اضافه المخصبات أو الزيوت للأسيتامبريد سبب اختفاء للأسيتامبريد في اليوم التاسع من الرش الغسيل باستخدام الماء أو حمض الاسيتيك سبب اختفاء سريع للأسيتامبريد.

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