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Effect of mixing ratio and oil kind on toxicity activation of Acetamprid against Trogoderma granarium larvae

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ABSTRACT: *The current study aimed to test the effect of five vegetable oils, sesame, pistachio field, soybean, and almond with Acetamprid pesticide, using three different mixing ratios (pesticide:vegetable oil) 1: 0.5, 1:1, 1: 2, and 1: 3 and four different concentrations 50, 100, 150, and 200 ppm for each mixing ratio, and mixture ratio in the proportion of activation, synergy and potentiation on the % mortality of grain beetle larvae Trogoderma granarium. The study results showed that the effect of mixture Soybean oil by mixing 3 oil : 1 pesticide toxicity to the revitalization of the pesticide in the grain beetle larvae of the third instar of poetry at a rate of 2.46, which was the rate of activation synergistically 2.4, The sesame oil gave a mixture with the pesticide Acetamprid by mixing oil 3: 1 ratio less pesticide antagonism reached 0.56.*

Keywords: *Mixing ratio, Vegetable oil, Activation, Synergy, Potentiation, Grain beetle, Acetamprid*

I. INTRODUCTION

The extensive and uncontrolled pesticides application has led to appearance of numerous species of resistance insect to pesticides, this reach to 460 species in 2003 (Al Mallah and Al jubury, 2012).

The side effects of adding pesticides led many environmentalists to call to stop use of pesticides preventing its production, but unfortunately, this call that unrealistic evidence that there is an increase in the production and use of pesticides in the world, which of course indication that pesticides are still the means adopted by man to control the pests. (Meister, 2010).

The most realistic alternative to reduce the use of pesticides is to rationalize the use and follow the correct methods in order to reduce collateral damage, in addition to reduce the damage of side effect.

The addition of doping substances of pesticides to increase their effectiveness at low concentrations and use other methods and strategies that helps in this direction.

Therefore, the present study aimed to protect the environment from the negative effects of pesticides through the study of the dynamic influence of some vegetable oils In response grain beetle noodles larvae for some modern pesticides through the study of the influence of type of oil and the mixing ratio of oil with Acetamprid pesticide in rate of activation, synergy, and potentiation of the pesticide. Determine the mechanism of activation in the Acetamprid pesticide, whether synergy or potentiation.

II. MATERIALS ANS METHODS

For the implementation of this study, we made three different mixing ratios (pesticide: vegetable oil) 1: 0.5, 1:1, 1: 2, and 1: 3 respectively, five vegetable oils were used for each ratios sunflower oil, sesame oil, pistachio field oil, soybean oil, and almond oil, with Acetamprid pesticide, and all mixtures have been mitigated with Acetone for different concentrations 50, 100, 150, and 200 ppm for each mixing ratio.

Three replication and ten grain beetle poetry larvae third instars old were treated by dowsing in each mixing ratio, and control treated with Acetone only.

All larvae placed inside Petri dishes 9 Cm Diameter in incubator with Temperature of 30 C and Humidity 65-70%

The results were collected after 24 hours, % mortality calculated using equation Abbott (1925), extract values of 50 LC manner using Finney (1971), activation ratio using equation Metcalf (1972), and the interactive between the activation, synergy, and potentiation for each mixing ratio.

Synergy ratio, we excluded Relay ratio, which represents the % mortality caused by stimulant through the following steps:

- Find a mortality rate of the corrected concentrations used for each of the oils and pesticides used in the study.
- Find a mortality rate corrected for concentrations of the mixture used (oil + pesticide).
- Correction mortality rate of the mixture using the modified equation Abbott mentioned in the navigator Al mallah and Al-Juboury (2011), and to get rid of the deadly effect of the stimulant substance, which represents the proportion of Relay and humble is to keep the synergistic impact only, as in the equation:
  % mortality corrected (pesticide) = (% mortality of a mixture - % mortality of anabolic substance)/(100- % mortality of anabolic substance)* 100.

- Draw lines of toxicity for the pesticide and its mixture separately using the corrected % killing which calculated for each of the LC 50 for the pesticide and its mixture.
- Calculate the proportion of synergistic effect of using the equation Metcalf (1972), which requires modified to make it clear to Article servo toxic effect.
- Ratio of synergistic effect = 50 LC value of the pesticide \ 50 LC value of the pesticide apron (mixture corrected).
- The total expense ratio of activation = 50 LC value of the pesticide \ 50 LC value of the mixture.
- Calculate the proportion of oil in the Relay activated after the activation ratio was calculated and the percentage of total synergies it can be calculated using the ratio of Relay the following equation:
- Relay ratio = ratio of activation - the proportion of synergy.

III. RESULTS AND DISCSSION

1- The effect of mixing ratio of Acetamprid pesticide with some oils and % mortality in the *Trogoderma granarium* larvae larvae.

The results showed that the average of % mortality in *Trogoderma granarium* larvae treated with Acetamprid pesticide mixed with sunflower oil and has varied depending on the mixing ratio and the concentration used in the mixture, and mixing ratio 1:1 (oil: pesticide) gave the highest average mortality rate reaching 90.47% at 200 ppm, followed by the mixing ratio of 1:0.5 where is the % mortality 80% at the same concentration and the lowest number at a concentration of 50 ppm by mixing 1:3. And showed that the best mixing ratio is 1:0.5 which gave lower LC 50 value was 69.9, which indicates the toxicity of the oil mixture as in Table (1).

The results showed that the average % mortality in the larval treated with a mixture sesame oil and pesticide has varied depending on the mixing ratio and the concentration used in the mixture, and the highest average % mortality was 80% when using sesame oil mixed with the pesticide by 0.5: 1 (oil: pesticide), and at 200 ppm while the lowest % mortality was 15% at the same mixing ratio concentration of 50 ppm. Also shown that the best mixing ratio is 1:3, where given less value LC50 reached 72.04, which confirms the toxicity of the oil mixture as shown in Table (2).

While Mohammed (2009) mentioned that the sesame oil was best oils activation with pesticide Phenam activated by 1.9% and the relative effectiveness of 47.61 and the evidence did not show the toxicity of 100 clove oil activation against *C. maculates* F. with mixing 1:1 (pesticide: oil).

The results also show that the average of % mortality in the larval treated with a mixture peanut oil and pesticide has varied depending on the mixing ratio and the concentration of mixture, and the highest mortality rate 95% when using peanut oil mixed with the pesticides by 0.5: 1 (oil: pesticide) at 200 Ppm, while mixing ratio 1:2 mortality ratio less at the same concentration amounted to 52% and less mortality ratio reached 28% at the same mixing ratio 1:2 concentration of 50 ppm. Also shown that the best mixing ratio is 1:0.5, where given less value amounted to 63.6 L50 where the overall average of 69.5 and killed by confirming the toxicity of the oil mixture, Table (3) .

The results also showed that the average of % mortality in larvae with a mixture of soybean oil and pesticide has varied depending on the mixing ratio and the concentration, and mixing ratio of 0.5: 1 and 1:3 (oil: pesticide) gave the highest average of mortality reached to 95% at 200 ppm and less % mortality at a concentration 50 ppm by mixing 1:1 amounted to 28.5%, followed by 42% at the same concentration, and by mixing 1:0.5 as showed in Table (4). The results in the same table showed that the best Longs mixing ratio is 1:3, where given the lower value LC50 amounted to 45.36 and the % mortality reached to 77% and this indicates that the toxicity of the oil mixture.

The results also show that the average of % mortality in the larval treated with a mix Almond oil and pesticide has varied depending on the mixing ratio and the concentration, and mixing ratio of 0.5: 1 and 1:2 (oil: pesticide) gave the highest average at 76% at 200 ppm the lowest rate was at a concentration of 50 ppm by mixing 1:3 of 14%, as showed in table (5), and the best mixing ratio is 1:1 which gave less value LC50 amounted to 69.8 and the average for the year amounted to 59.5% and this indicates the toxicity of the oil mixture.

The results showed also that the type of oil and the mixing ratio has varying effect in the average of the larvae % mortality table (6), It was found that the highest average in the % mortality in the larvae resulting from the interaction between the type of oil and the mixing ratio with the pesticide reached 77% when the mixing ratio of one to the mixture of soybean oil and pesticide, followed by the mixture of oil, peanut and pesticide and a mixture of soybean and pesticide reaching to 69.5 % oil by mixing 0.5 : 1 pesticide, and compared to less average ratio was when treated with a mixture of sun flower oil and pesticide at mixing 3 : 1, reached to 31.75 % , followed by the mixture of soybean oil and pesticide by mixing 1 : 1, reaching to 44.01 %, this result is contrary to what the Mohammed (2009) mentioned that the sesame oil was best activating at 1.9% and 47.61 relative effectiveness and toxicity of evidence 100, while the Clove oil did not show activation, the reason for the superiority of soybean oil in activating the mortality rate that the density of soybean oil was high. Shahidi (2005) mentioned that the density of soybean oil ranges between 0.916 - 0.926, and viscosity range from 58.5 – 62.2 cp. (Shaaban and Al Mallah 1993) and (Abu Shanab, 2011) mentioned that the density of oil increased the stability on the body of the insect and thereby prevents the process of breathing insect which lied to insects dies by suffocation and thus explain the high rate of mortality to a mixture of soybean oil and pesticide. Dawood (1991) stressed also that the soybean oil and kernel dates oil, mineral oils, Thanite, and Phenobarbital with pesticide Deltametherin in studying the effect of activation of the pesticide against adult beetle cowpea South C. maculatus, when used mixture 5:1 pesticide: oil, while the mixture of pesticide with sesame oil gave the lower activation as shown in Table(5).

2- The effect of oil type and mixing ratio in the proportion of activation and synergy and potentiation in pesticide Acetamprid.

Synergy ratios of mixtures oils and pesticide varied in our study depending on the type of oil and the mixing ratio. The results of the statistical analysis presence significant differences in the rates of activation at the level % 0.05 depending on the factors, the highest synergy 2.4 gave by the mixture pesticide with soybean at mixing ratio of 1:3, while the less synergy ratio 0.36 appeared when mixing ratio 1:2 and mixture of peanut oil as shown in table (7). The results showed also wide variation in the potentiation rate for mixtures of oils and pesticide depending on the type of oil and the rate of mixing it was found that the higher proportion 0.63 in a mixture of pesticide and sesame oil, at the mixing ratio 1:2, while gave a mixture of the pesticide with soybean oil and peanut field oil the lowest rate 0 at the same ration 1:0.5 as shown in table (8).

Finally, and as the activation result is the sum of Synergy ratio and potentiation ratio, the results showed wide variation in the rates of activation of mixtures, the higher activation found in the mixture pesticide with soybean oil where reached to 2.47 at the mixing ratio 1:3, while the lowest activation 0.56 rate shown at the same mixing ratio with sun flower oil compared to as shown in Table (9).

In general, the mixing ratio 1:0.5 was the best, followed by the mixing ratio of 1:3, where the overall average for the activation 1.51 and 1.41, respectively.Finally, the results of this study showed that the vegetable oils were used in this study has synergistic effect on the pesticide, and this is consistent with several studies that show the synergistic effect of the material added to a pesticide. Shaaban and Al Mallah (1993), Sun and Johnson (1960). Reported that The synergies mainly depends on the materials that may be motivating or inhibitory the enzymes and thus on the chemical composition of pesticides. O'Brien (1967). Mentioned that the increased of toxicity pesticides by adding synergies materials depends on several factors, like increased speed of entry into force of the pesticide through the body and the speed of arrival at the target sites, Wilkinson (1979). Reported that the additives materials can inhibitory the enzyme which responsible for the removal of toxic pesticides within the body of the insect, which leads to the accumulation of the active ingredient of the pesticide and the speed of the killings. Karso (2012). Confirmed that the influence of activation shown by vegetable oils in some pesticides due to the mechanism of synergism more than what is due to the mechanism potentintion, although rates of activation and antagonism shown by the results of the study did not only rely on type of oil used in the study, but had a mix proportions important role in this area, results of the study showed that the rates of increase of oil led to the activation contrast ratio and the ratio of 1:0.5 gave the best rates of activation. Also Karso and Nazar (2013) founded that the best mixture was peanut oil by mixing 3 Oil:1 pesticide toxicity to the revitalization of the pesticide in the grain beetle larvae of the third instar of poetry at a rate of 1.62, which was the rate of activation synergistically1.57 ,The sesame oil gave a mixture with the insecticide Alpha-Cypermtherin by mixing oil 2: 1 ratio less insecticide antagonism reached 0.15 .

Table (1): The effect of Sunflower oil mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Mixture ratio	Concentrate/ppm	% mortality	LC50	Mean
1: 0.5	50	42	69.932	62.5
	100	57		
	150	71		
	200	80		
1:1	50	33.32	91.06	59.51
	100	42.85		
	150	71.42		
	200	90.47		
1:2	50	29.	91.22	56
	100	57		
	150	67		
	200	71		
1:3	50	14	201.69	31.75
	100	19		
	150	42		
	200	52		

Table (2): The effect of Sesame oil mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Mixture ratio	Concentrate/ppm	% mortality	LC50	Mean
1: 0.5	50	15	122.6	46.2
	100	35		
	150	55		
	200	80		
1:1	50	33.33	111.89	49.96
	100	44.4		
	150	55.5		
	200	66.6		
1:2	50	43	72.9	58
	100	57		
	150	60		
	200	72		
1:3	50	43	72.04	58.25
	100	57		
	150	62		
	200	71		

Table (3): The effect of Peanut oil mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Mixture ratio	Concentrate/ppm	% mortality	LC50	Mean
1: 0.5	50	42	63.6	69.5
	100	65		
	150	76		
	200	95		
1:1	50	42.85	72.6	58.12
	100	57.12		
	150	61.1		
	200	71.41		
1:2	50	28	167.79	45.25
	100	43		
	150	48		
	200	52		
1:3	50	43	68.41	62
	100	57		
	150	71		
	200	77		

Table (4): The effect of Soybean oil mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Mixture ratio	Concentrate/ppm	% mortality	LC50	Mean
1: 0.5	50	42	65.85	69.5
	100	61		
	150	80		
	200	95		
1:1	50	28.5	151.73	44.01
	100	42.8		
	150	47.6		
	200	57.14		
1:2	50	43	69.78	59.5
	100	57		
	150	67		
	200	71		
1:3	50	57	45.36	77
	100	71		
	150	85		
	200	95		

Table (5): The effect of Almond oil mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Mixture ratio	Concentrate/ppm	% mortality	LC50	Mean
1: 0.5	50	40	69.93	58.5
	100	51		
	150	67		
	200	76		
1:1	50	42.85	69.8	59.51
	100	57.14		
	150	66.65		
	200	71.42		
1:2	50	29	87.096	58.25
	100	57		
	150	71		
	200	76		
1:3	50	14	69.93	43.75
	100	42		
	150	57		
	200	62		

Table (6): The effect of oil type mixed with Acetamprid pesticide on the mortality of grain beetle larvae.

Oil Type	Mixture ratio (pesticide : oil)			
	1 –0.5	1 – 1	1 – 2	1 – 3
Sunflower	62.5	59.51	56	31.75
Sesame	46.2	49.96	58	58.25
Peanut	69.5	58.12	45.25	62
Soybean	69.5	44.01	59.5	77
Almond	58.5	59.51	58.25	43.75

Table (7): Effect of vegetables oils and pesticide mixture ratio on the Synergism on Grain beetle larvae.

Type of oil	Mixing ratio			
	1:0.5	1 :1	1 :2	1 :3
Sunflower	1.24	0.99	1.20	0.42
Sesame	0.80	0.70	0.99	1.17
Peanut	1.75	1.20	0.36	1.45
Soybean	1.70	0.59	1.42	2.47
Almond	1.40	1.30	1.12	0.70
Mean	**1.38**	**0.96**	**1.02**	**1.24**

Table (8): Effect of vegetables oils and pesticide mixture ratio on the Potentation on Grain beetle larvae.

Type of oil	Mixing ratio			
	1:0.5	**1: 1**	**1 :2**	**1:3**
Sunflower	0.40	0.24	0.03	0.14
Sesame	0.11	0.34	0.63	0.38
Peanut	0.00	0.34	0.34	0.19
Soybean	0.00	0.15	0.20	0.07
Almond	0.20	0.30	0.16	0.14
Mean	**0.14**	**0.27**	**0.27**	**0.18**

Table (9): Effect of vegetables oils and pesticide mixture ratio on the activation on Grain beetle larvae.

Type of oil	Mixing ratio			
	1:0.5	**1 :1**	**1: 2**	**1 :3**
Sunflower	1.60	1.23	1.23	0.56
Sesame	0.91	1.00	1.53	1.55
Peanut	1.75	1.50	0.70	1.64
Soybean	1.70	0.70	1.60	2.47
Almond	1.60	1.60	1.28	084
Mean	**1.51**	**1.20**	**1.26**	**1.41**

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