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TOXICITY AND LATENT EFFECT OF LANNATE, VERTIMIC and TRACER PESTICIDES AGAINST *Bactrocera zonata* (Saunders) (Diptera:Tephritidae).

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ABSTRACT

The peach fruit fly, (PFF) Bactrocera zonata (Diptera, Tephritidae) is one of the most serious pests on Egypt. This study was carried out to evaluate three pesticides; Lannate, Vertimic and Tracer against adults of (PFF.) under laboratory conditions. Lannate was the most toxic among the three tested compounds following by Vertimic and then Tracer on the flies at 24, 48 and 72 hours post-treatment. LC_{50} values were 0.25, 3.26 and 9.34 ppm for males and 0.16, 3.64 and 11.59 ppm for females after 72 hours to Lannate, Vertimic and Tracer respectively. The treatment of LC_{50}'s pesticides have significant effecte on biological behavior of female. All pesticides shorted longevity and reduced the fecundity. The deterrent index % were 27.39, 34.98 and 16.48 for Lannate, Vertimic and Tracer respectively.

Conclusively, *on the basis of the results achieved, it was concluded that Lannate was most effective pesticides on B zonata in comparison with Vertimec and Tracer. But the two pesticides Vertimec and Tracer are a new and highly promising pesticides with efficacy against B zonata . Because the contact toxicity of two pesticides are very low for both vertebrates and invertebrates in comparison with Lannate.*

Key words: *Bactrocera zonata*, Lannate, Vertimic, Tracer.

INTRODUCTION

Peach fruit fly, (PFF) *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) is a serious pest attacking a wide range of fruits in Egypt (Mohamed Lamiaa *et al.*, 2009). Four hundred species belonging to genus *Bactrocera* widely distributed in tropical Asia, South Pacific and Australia regions, but very few species of such genus were recorded in Africa (Drew

and Hancock, 1994). Recently in 1993, the peach fruit fly *B. zonata* was recognized in Egypt causing most of fruit damage. It attacks a range of fruits including mango, guava, apricot, peach, apple, fig, ….etc. although this insect species was recorded in Egypt as early as 1924, (Efflaton, 1924). This pest is a strong flier capable of dispersing more than 24 km in its search for host plants. It is active throughout the year when temperatures exceed 10ºC. Adults appear in early spring, feeding on nectar, plant sap, and decaying fruit (Mahmoud, 2007). Female flies lay eggs in the fruits hatching maggots devour into the pulp, (White and Elson-Harris, 1994). Fruit exportation usually affected by the infestation of fruit flies, where immature stages complete their development during the period of shipping, which takes about two weeks to reach the destination country. The pest not only deteriorates its quality but inflicts heavy losses in quantity also due to premature droppage of infested fruits. Generally, fruit flies were controlled with the chemical pesticides and due to its life cycle, the actual damage is virtually safe from the insecticide applications as the eggs and larvae which feed inside on the pulp. Therefore, control measures are directed to the adult flies. The adults are long lived and quite mobile but their longevity associated with frequent feeding enables them exposed to the poison baits and other control strategies. The present study aims to evaluate the efficiency of three pesticides belonged to three groups which are differing in its mode of actions against the *B. zonata.*

MATERIALS AND METHODS

Rearing technique:

The culture of *B. zonata* was collected from infested guava fruits and maintained in the laboratory condition of (27 ± 3ºC and 65 – 75% RH). The adults fruit flies were reared on artificial diet that consisted of (1 part of protein hydrolysate: 3 part of sugar and source of water) (El-Minshawy *et al.,* 1999) in fruit fly rearing cage (30 × 30 × 30 cm). On alternate day fresh fruits were offered to adult flies for oviposition. After infestation, these fruits were placed in plastic containers (27 x 17.5 x 6 cm) having a layer of sand at the base of pupation which was coated with muslin cloth. After pupation the pupae were separated from the sand with 20m sieve. The pupae were transferred in rearing cage (it is wooden frames, coated with wire screen from different sides except one side which has a sleeve opening and the cage floor was mad of wooden sheet) until emergence of flies. This method was repeated many times for obtained the culture of *B. zonata.* The laboratory rearing method described by (El-Minshawy *et al.,* 1999 and El-Aw *et al.,* 2003).

Tested pesticides:

The three tested pesticides belong to different chemical groups (Carbamit, Lannate 90% S.P.), (Abamectin, vertimec 1.8% E.C.) and (Actinomycete, Tracer 24% S.C.) were applied on adult stage of the fly under laboratory conditions (27 ± 3ºC and 65 – 75% RH.). These pesticides were bring from Central Agricultural Pesticides laboratory.

Toxicological experiment:

Forty pairs from newly emerged adult flies for each treatment were replicated for four times (10 pairs / replicate) and placed without food (starvation). Four concentrations (Lannate; 1, 0.5, 0.1, 0.05 Vertimic; 15, 10, 5, 1 and Tracer; 30, 20, 10, 5) of each previously tested pesticide were prepared. The four replicate of adult flies provided with adult diets mixed with the concentration of used pesticide. The same number of fruit flies was released in the normal diet (control). The replicates were examined after 24, 48 and 72 hrs the died flies were counted and recorded. The mortality percentage in all treatments was corrected using Abbott's formula (Abbott, 1925). The potency of the tested toxicants was compared using the toxicity index calculated according to the equation of Sun (1950).

Latent effects:

Sixty pairs from newly emerged adult flies for each treatment were placed without food. The diet which mixed with LC_{50} of tested pesticides was offered to adult flies to fed in it about (72) hrs. The residual adult flies were examined to evaluate the latent effects of previously tested pesticides on female biological behavior of *B. zonata* and deterrent index was estimated (based on the number of eggs on control and treated adult female) (Lundgren, 1975).

$$\text{Deterrent index} = \frac{B - A}{A + B} \times 100$$

B: number of eggs in control, A: number of eggs in treatment. of *B. zonata.*

RESULTS AND DISCUSSION

Data in Table (1) show the toxicity of Lannate,Vertimic and Tracer to adult male and female of *Bactrocera Zonata* and the mortality percentages were recorded after 24, 48 and 72 hrs of exposure period.

The toxicity result cleared that males of *B. Zonata* were more susceptible to the action of three pesticides (i.e. Lannate, Vertimic and Tracer) than females after 24, 48 and 72 hrs of treatment. After 72 hrs., the mortality percentages of Lannate, Vertemic and Tracer reached to 25-87.5,

25-90 and 30-80 in females of *B. Zonata*, while it increased respectively, to 35-100, 30-95 and 37.5-90 in males (Table 1).The elevated toxicity of three pesticide in males than females may be due to that female adults of *B. zonata* are less sensitive to the different tested pesticides. However, present finding confirm the results of (Stark *et al.*, 2004) who indicated that adult males of *Ceratitis capitata* were significantly more susceptible than females. Mohamed Lamiaa (2009) observed that LC_{50} values for treated

Table 1. **Pesticidal efficiency of Lannate, Vertimic and Tracer against peach fruit fly *Bactrocera zonata***

Pesticides	Concent. P.P.M	Mortality %					
		24 hour		48 hour		72 hour	
		Male	Female	Male	Female	Male	Female
Lannate	1	70 a	57.5	87.5	67.5	100 a	87.5 a
	0.5	57.5b	50.0	75.0	62.5	80 b	70 b
	0.1	35.0c	27.5	37.5	35.0	42.5 c	40 c
	0.05	22.5c	15.0	27.5	22.5	35 c	25 d
L.S.D						11.32	9.06
Vertimic	15	62.5	52.5	77.5	72.5	95 a	90 a
	10	60	52.5	67.5	57.5	80 b	67.5 b
	5	30	20	37.5	35	40 c	45 c
	1	17.5	15	25	17.5	30 c	25 d
L.S.D						13.52	16.03
Tracer	30	67.5	57.5	77.5	62.5	90 a	80 a
	20	47.75	42.5	55	47.5	67.5b	62.5b
	10	40	30	47.5	32.5	50 c	32 c
	5	27.5	25	32.5	27.5	37.5d	30 c
L.S.D						10.89	12.10

adult females increased than treated adult males at 24, 48 and 72 her post treatment, that means the adult males were more susceptible than adult females to the tested insecticides. There were significant differences between the treatment of 1, 15 and 30 ppm of Lannate ،Vertimic and Tracer against *B. zonata*.

As shown in Table (2), it is evident that Lannate was more toxic to adult males and females of *B. Zonate* than Vertimic or Tracer after 72 hrs of treatment. The results revealed that at LC_{50} and LC_{90}, Vertimic was more toxic than Tracer. The toxicity index of Vertimic and Tracer were 7.66 and 1.38 % against adult males of *B. Zonate* as compared with Lannate (100%) after 72 hrs of exposure period. Our results strongly support the finding of EL-AW *et al.* (2008) who mentioned that the toxicity of spinosad, actra, malathion and methomyl baits was assessed against male and female adults of *B. zonata* under laboratory condition. In a laboratory feeding assay, the carbamate insecticide, methomyl affected flies more than the neonicotinoid, actara, the biorational insecticide, spinosad, and the op-insecticide, malathion.

Table 2. **Toxicity of three pesticides against adult flies of *Bactrocera zonata* after 72 hours from treated.**

Pesticides	Sex	LC_{50} ppm	LC_{90} ppm	Toxicity index		Slope	Confidence limits of LC_{50}	
				LC_{50}	LC_{90}		Upper	lower
Lannate	♂	0.25	4.73	100	100	1.18	0.30	0.19
	♀	0.16	1.47	100	100	1.33	0.21	0.12
Vertimec	♂	3.26	17.21	7.66	27.48	1.77	5.13	1.78
	♀	0.64	26.38	4.39	5.57	1.49	5.86	2.14
Tracer	♂	9.34	41.11	2.67	11.50	1.99	11.07	7.56
	♀	11.59	63.66	1.38	2.30	1.73	14.26	9.18

At LC_{50} the toxicity of Lannate and Vertimic were 37.36 and 2.86 times more toxic to adult males of *B. Zonate* than Tracer while 72.44 and 3.18 times to adult female after 72 hrs of treatment.

Data in Table (3) revealed the changes in some biological aspects of adult females of *B. zonate*, after exposure to three pesticides at the level of LC_{50}. The three pesticides shortened the oviposition period post-ovi position period and daily eggs while prolonged the pre-oviposition period as compared with control. The three pesticides highly significantly shortened the total number of eggs /female of *B. Zonate*. The present study is near similar that finding from Mahfuza *et al.* (2007**)**, who tested the neem leaf dust and a commercial formulation of neem on adult of *Bactrocera cucurbitae* (Coquillett) and *Bactrocera dorsalis* (Hendel) to determine their

Table 3. Latent effect of three pesticides LC_{50} on female biological behavior of peach fruit fly *Bactrocera zonata.*

Biological aspects / Pesticide	Pre-oviposition period (in days)	Oviposition periods (in days)	Post-oviposition periods (in days)	Longevity (in days)	Total deposited eggs /female	Daily eggs	Deterrent index %
Lannate 90%	27	63.14	7.25	97.39b	226.02c	3.57	27.39
Vertimec 1.8%	30.20	55.80	4.37	90.30b	191.0d	3.42	34.98
Tracer 24%	23.16	70.74	11.70	105.60a	284.32b	4.01	16.48
Control	19.28	79.14	19.37	112.79a	396.60a	5.02	0
L.S.D 5%				**8.63**	**20.85**		

effects on the longevity, fecundity and ovarian development. The Laboratory tests showed that ingestion of neem can significantly reduced the longevity and fertility of both the fly species.

Conclusively, on the basis of the results achieved, it was concluded that Lannate was most effective pesticides on *B zonata* in comparison with Vertimec and Tracer. But the two pesticides Vertimec and Tracer are a new and highly promising pesticides with efficacy against *B zonata* . Because the contact toxicity of two pesticides are very low for both vertebrates and invertebrates in comparison with Lannate.

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السميه والتأثير المتأخر لمبيدات اللانيت و الفرتيمك و الترسر ضد ذبابه ثمارالخوخ (Saundar) *Bactrocera zonata* (Diptera: Tephritidae)

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تعد ذبابة ثمار الخوخ واحدة من اهم الأفات فى مصر لذلك أجريت هذة الدراسة لتقييم ثلاث مبيدات وهى اللانيت و الفيرتيمك و التريسر ضد الأفراد البالغة لذبابة ثمار الخوخ تحت الظروف المعملية . وقد اظهرت الدراسة ان مبيد اللانيت كان اكثر هذة المبيدات سمية ضد الافراد البالغة يليه الفيرتيمك ثم التريسر وذلك بعد ٢٤ و ٤٨ و٧٢ ساعة من المعامله . وكانت قيمه التركيز النصف قاتل هو ٠.٢٥ و ٣.٢٦ و ٩.٣٤ جزء فى المليون للذكور أما بالنسبه للأناث فكانت قيمة التركيز النصف قاتل هو ٠.١٦ و ٣.٦٤ و ١١.٥٩ جزء فى المليون وذلك لكل من اللأنيت و الفيرتيمك والتريسر على التوالى. وقد اظهرت المعامله ان التركيز النصف قاتل من المبيدات المختبرة لة تأثيرا معنويا على السلوك البيولوجى للاناث المعامله حيث أدت الى تقليل مدة معيشه الأناث وكذلك قله عدد البيض الموضوع من قبل الاناث مقارنتا بلاناث فى الكنترول. أما بالنسبة لدليل اعاقه وضع البيض فكانت نسبه الاعاقة كالتالى ٢٧.٣٩% و ٣٤.٩٨% و١٦.٤٨% وذلك للانيت و الفيرتيمك و التريسر على التوالى .

التوصية: يعتبر مبيد الانييت افضل المبيدات المختبرة ضد ذبابة ثمار الخوخ مقارنة بمبيد الفرتميك و التريسر و لكن مبيدى الفرتميك و التريسر من المبيدات الحديثة والتى ينتظرها مستقبل جيد فى مكافحة الافة نظرا لقلة سميتها على الفقاريات والافقاريات و كذلك تأثيرها السام على الافة مقارنة بمبيد الانييت