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Suitability of Some Insecticides for Controlling the Tomato Leaf Miner, *Tutaabsoluta* (Meyrick) (Lepidoptera: Gelechiidae) on Tomato Plants in Egypt.

YA Mahmoud*, Sh EM Shalaby, AS Abdel-Razek, SM Moawed, and IM Ebadah.

Pests and Plant protection Department, National Research Centre, El-Behooth Street, Dokki, Cairo, Eypt.

ABSTRACT

Tomato leaf miner, *Tutaabsoluta* is one of the most vegetable crop pests all over the world. Recenly, it invaded tomato crop in Egypt. So, this work is a try to estimate the efficiency of different insecticides widely used in controlling this pest in Egypt. The results indicated that coragen was the most effective insecticides against the larvae while abamactine was highly efficient against eggs. On the other hand, pestban, tamaron and siliton insecticides have the lowest effect against this pest, while bioinsecticide, biosect gave moderate efficiency against larvae, but it had bad effect against eggs. So, we concluded that coragen, abamectin, cyfluthrin and phosfan insecticides could be recommended and included in the IPM programs for controlling *T. absoluta* on tomato plants.

Keywords: Tomato leaf miner, *Tutaabsoluta,* control, insecticides.

**Corresponding author*

INTRODUCTION

Tomato (*Lycopersiconesculentum*Mill) is considered as one of the most important vegetable crops in Egypt where in 2002, it recorded 10 million tons of tomato fruits [1]. This crop is grown in both open fields and greenhouses [2]. *Tutaabsoluta* is one of the most important vegetable insect pests that attack tomato crop at any stage from planting (seedling) to fruiting stage [3-5]. In heavy infestation the losses can be reached to 100% [6]. The adult females lays their eggs on any green part of tomato plant and the newly hatched larvae feed on the leaf surface and then penetrat into the mine inside the leaf [7,8]. Chemical insecticides continue to be the rapid and major mean of controlling leaf miners [9-13]. In the Mediterranean basin, the principle control strategy against *T. absoluta* is the use of chemical insecticides [14, 15]. Recently tomato leaf miner, *Tutaabsoluta,* has become one of the most devastating pests of tomato in Egypt, and caused serious damages to tomato production in invaded areas [16, 17]. For this reason, the present study was undertaken to determine the efficacy of 12 insecticides representing different pesticide groups against this insect under field conditions.

MATERIALS AND METHODS

During 2011, the field experiment was carried out in Giza Governorate, Bernisht village a series of field tests were conducted to assess the control of *T. absoluta* on tomato following application of about twelve insecticides. Tomato seeds (variety G.S) were cultivated and plants received all normal agricultural practices during the growing season. An area of about 10 feddans (Feddan=4200m^2) was selected for field experimental work. In this area, a high infestation level with *T. absoluta* was found. All insecticides were diluted and applied at field rates based on the recommended label dilutions without surfactants. The experiment block design was randomized with each treatment replicated four times. Each plot had five rows with 25 plants row^{-1}. The 15 plants of medium row were used for data collection. Treatments were applied by using a backpack sprayer (20 Liter capacity) in many plots (20m x 20m = 400m^2/each insecticide), while the control plot was left without any treatments except the normal agricultural practices. To assess the *T. absoluta* infestation, samples of twenty leaflets were collected from about 20 different plants just before 24hr, 48hr and 72hr after spraying. The samples were examined under binocular at 10X to record the number of mines or tunnels, larvae (alive or dead) and eggs. At least 4 counts, 20 leaflets/ count were used for each insecticide. Percent reduction in the numbers of both tunnels and eggs were calculated [18]). Data were analyzed by multiple range tests [19]. Percentage of larval mortality was calculated as follows:

$$\text{\% larval mortality} = \frac{\text{Number of dead larvae}}{\text{Sum of dead and alive larvae}} \times 100$$

RESULTS AND DISCUSSION

Efficiency of the tested insecticides against larvae:

After 24hrs from application the mortality percent of *T. absoluta* larvae ranged from 7.5 to 84.0 %, the highest percent was noticed in coragen treatment followed by cyfluthrin (84.0 and 81.4 %), while chlorpyrifos had the lowest effect (7.5 %) then profenofos (13.3 %). Obtained data revealed also, there are significant differences between all treatments with each other (Table-1). By time elapsed, toxic effect of tested compounds was fluctuated, mortality percent was increased in some treatments its reached 92.3 in coragen treated plants and decreased in others; it reached 5.2 % in case of chlorpyrifos. Similar results were obtained by several researchers; they reported that the high acute toxicity of some insecticides reduced the densities of larvae and maximum mortalities within four days [7,20]. According to general mean of mortality percent (Figure 1), coragen had a high toxic effect followed by cyfluthrin (87.3 and 64.5 %, respectively), while the mortality percentages of both chloropyrifose and profenofose were 5.3 and 13.5%, respectively. Biosect, on the other hand, caused 39.5% larval mortality where the hyphae of the bioinsecticide were observed to cover the whole surface of the treated larvae. These results are agreed with that which revealed that coragen and spinosad caused 100% mortality to *Tutaabsoluta* larvae [21]. The high toxicity of coragen may be due to its mode of action, as it block sodium channel in nerve axon and inhibit propagation of nerve potential in treated insect [22].

The tested insecticides could be arranged in descending order according to the percent of larval mortalities as follows: coragen, cyfluthrin, abamectin, phosfan, match, mospilan, biosect, amitraz, lambda, tamaron, silton and pestban.

Table 1: Mortality percent of *T. absoluta* larvae treated with different tested insecticides

Treatments	24 hrs			48 hrs			72 hrs			Means/20leaflets ± SE		%Cumulative larval mortality
	Larvae/20 leaflets		% Mortality	Larvae/20 leaflets		% Mortality	Larvae/20 leaflets		% Mortality			
	Alive	Dead		Alive	Dead		Alive	Dead		Alive	Dead	
Coragen	4.0	21.0	84.0 a	4.0	24.0	85.7a	1.5	24.0	92.3a	3.2±0.85	23.0±1.02	87.3a
Mospilan	17.0	18.0	51.4 c	20.3	14.3	41.2de	15.3	17.3	53.1cd	17.5±1.47	16.5±1.97	48.6e
Silton	31.3	4.8	13.3 h	30.8	6.5	17.4g	34.8	3.8	9.8h	32.3±1.26	5.0±0.79	13.5i
Lambda	29.8	10.0	25.1 f	23.3	14.5	38.4e	22.0	9.5	30.2f	25.0±2.41	11.3±1.59	31.2g
Biosect	21.5	13.0	37.7 e	21.5	16.5	43.4d	24.3	14.5	37.4e	22.4±0.93	14.5±1.01	39.5f
Abamein	18.5	16.8	47.6 c	14.3	23.3	62.0b	12.8	23.8	65.0b	15.2±1.71	21.3±2.25	58.2c
Phosfan	12.3	19.5	61.3 b	12.5	11.8	49.8c	10.5	17.8	62.9b	11.8±0.64	16.4±2.34	57.6c
Amitraz	19.0	14.3	42.9 d	23.5	2.8	29.4f	24.0	13.8	36.5e	22.2±1.55	12.6±1.42	36.3f
Tamaron	32.0	8.0	20.0 g	32.0	8.3	20.6g	36.0	16.8	22.2g	33.3±1.33	8.9±0.71	20.9h
cyfluthrin	7.3	32.0	81.4 a	14.8	22.3	60.1b	18.0	11.5	52.0d	13.4±3.17	24.6±3.79	64.5b
Match	16.3	23.8	59.4 b	18.3	17.3	48.6c	16.0	10.5	56.8c	16.9±0.72	20.7±1.88	54.9cd
Pestban	37.0	3.0	7.5 i	44.0	1.5	3.3h	42.0	17.0	5.2i	41.0±2.08	2.3±0.43	5.3j
Control	48.5	0.0	…..	51.7	0.0	…..	45.3	0.0	…..	48.5±3.23	0.0	…..

Data in Table (2) revealed that the number of tunnels caused by larvae ranged from 35.0 to 44.0 / 20 leaflets before application. After 24 hrsa negligible decrease of these tunnels were noticed (it's ranged from 34.8 to 43.3 / 20 leaflets) with reduction percent ranged from – 12.5 to 28.0 %. This trend was happening after 48 and 72 hrs, the numbers of tunnels were fluctuated (decreased or increased in some treatments). According to general mean of tunnels count and percent of reduction (Figure 2), pestban had the highest tunnels count (46.3 ± 1.53 / 20 leaflets) with a negative percent of reduction(-2.0 %), followed by tamaron (44.6 ± 1.45 tunnels / 20 leaflets with 0.3 % reduction). While, phosfan had the highest reduction percent, followed by coragen (38.7 and 27.6 % with 31.2 ± 1.91 and 33.9 ± 2.68 tunnel / 20 leaflets, respectively).These results are in agreement with those obtained by many investigators [16,23] who reported that *T. absoluta* larvae can damage tomato plants during all growth stages, producing large galleries in their leaves, burrowing stalks, apical buds, green and ripe fruits. Also, it can cause important yield loss in different production regions and under diverse production systems. In the same respect, the averages of percent reductions in tunnels count were 21.1, 49.7, 30.9 and 30.1 % in tomato plants treated by avaunt, coragen, aljambo and superlambda insecticides, respectively [17].

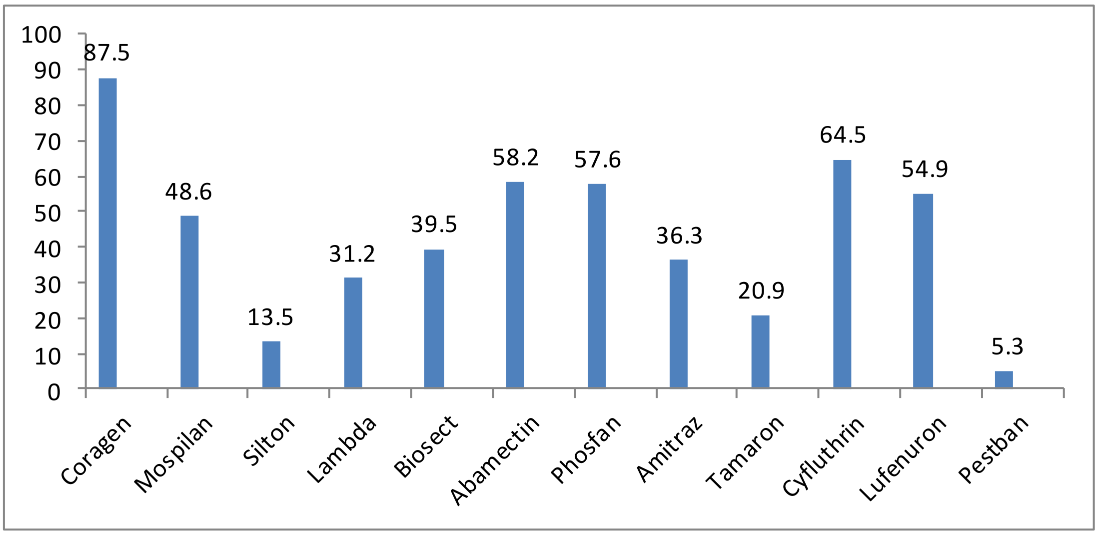

Figure 1: General means of mortality percentages of *T. absoluta*larvae due totested insecticides

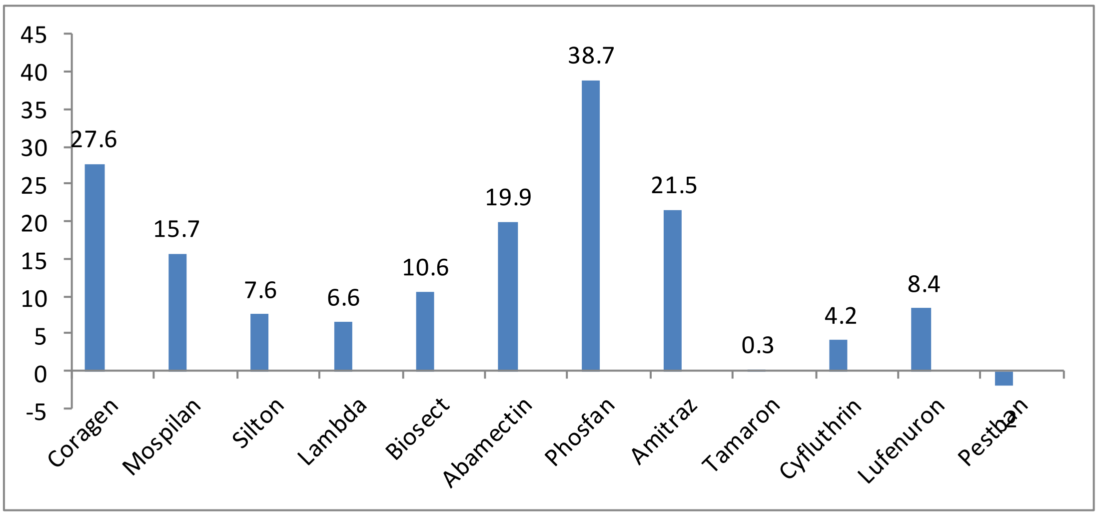

Figure 2.General means of percent reduction in the number of tunnels due to tested insecticides

Table 2: Efficiency of tested insecticides on the number of tunnels / 20 leaflets of tomato plants infested by *T. absoluta*

Treatments	Pre - treatment	24 hrs		48 hrs		72 hrs		General mean of tunnels count	General mean of %R
		Tunnels	%R	Tunnels	%R	Tunnels	% R		
Coragen	38.0	38.8	12.9	33.0	30.5	29.8	39.4	33.9+2.68	27.6
Mospilan	40.3	37.5	10.8	37.5	16.2	37.0	20.0	37.3+0.17	15.7
Silton	42.0	38.0	5.7	40.0	6.9	40.0	10.1	39.3+0.67	7.6
Lambda	42.5	42.5	- 6.7	39.8	6.2	35.0	20.4	39.1+2.19	6.6
Biosect	39.0	38.3	11.8	42.3	8.6	42.8	10.7	41.1+1.42	10.4
Abamectin	37.6	36.8	18.3	39.0	18.7	38.5	22.6	38.1+0.67	19.9
Phosfan	35.0	34.8	28.1	28.3	45.1	30.5	42.9	31.2+1.91	38.7
Amitraz	37.0	37.5	17.0	36.0	26.2	39.8	21.2	37.8+1.11	21.5
Tamaron	40.0	43.0	- 1.6	43.3	4.0	47.5	- 1.6	44.6+1.45	0.3
Cyfluthrin	42.0	41.8	- 3.7	40.3	5.1	39.5	11.3	40.5+0.67	4.2
Match	40.0	42.8	- 1.1	39.5	12.4	40.3	13.8	40.9+0.99	8.4
Pestban	44.0	43.3	- 12.5	48.3	17.8	47.3	- 11.3	46.3+1.53	-2.0
Control	41.0	41.3	....	44.0	....	45.6	....	41.3+3.76	....

% R means percentage reduction in the number of tunnels

Efficiency of the tested insecticides against eggs:

Data presented in Table (3) showed that the number of eggs ranged from 6.7 to 16.0 / 20 leaflets before insecticides spray. After 24 hrs of application eggs number were decreased in all treatments (it's ranged from 4.5 to 14.5 / 20 leaflets), in the same time, the percent of reduction was negative in some treatments (silton, biosect, tamaron and pestban, its reduction percent were -5.7, -38.2, -34.0 and -40.1 %, respectively). In this context, after 48 and 72 hrs the percent reduction was increased in all treatments and reached its peak in case of coragen (92.5 %) followed by abamectin then phosfan (84.7 and 75.0 %, respectively). According to general mean of reduction (Figure 3), abamectin was the most effective insecticide against eggs of *T. absoluta* (82.7 %) followed by phosfan, mospilan and coragen (68.4, 67.3 and 67.0 %, respectively). While pestban had the lowest effect on this stage (-23.4 %) followed by biosect and tamaron (-17.9 and -15.5 %, respectively). Obtained data agreement with that of another research where coragen and aljambo insecticides affected strongly on the number of eggs laid by *T. absoluta* females, while avaunt and superlambda had less toxicity against eggs [17]. Also, the eggs and larvae significantly reduced during 2-3 weeks after application, repeat application of coragen provide coverage of new growth (where *T. absolute* moths normally lay their eggs) [24].

Table 3: Efficiency of tested insecticides against *T. absolut*eggs / 20 leaflets of infested tomato plants

Treatments	Pre - treatment	24 hrs		48 hrs		72 hrs		General mean of tunnels count	General mean of R %
		Eggs	R %	Eggs	R %	Eggs	R %		
Coragen	11.0	8.8	37.4	6.0	67.1	1.5	92.5	5.4±2.17	65.7
Mospilan	9.7	6.8	60.1	6.3	69.5	6.3	72.2	6.5±0.17	67.3
Silton	14.0	12.5	- 6.7	12.0	16.2	14.3	8.8	12.9±0.70	6.1
Lambda	15.0	9.3	15.8	9.5	28.9	9.3	36.5	9.4±0.07	27.1
Biosect	16.0	14.3	- 3.6	15.3	- 22.2	12.8	6.7	14.1±0.73	-6.4
Abamectin	6.7	4.5	81.8	5.5	81.6	5.0	84.7	5.0±0.29	82.7
Phosfan	8.7	6.0	68.5	8.8	73.7	6.3	75.0	7.0±0.89	72.4
Amitraz	10.0	8.5	48.7	6.8	66.1	11.3	48.5	8.9±1.31	54.4
Tamaron	15.3	14.5	- 34.0	12.5	4.6	16.8	- 17.0	14.6±1.24	-15.5
Cyfluthrin	8.6	6.3	67.3	8.8	62.2	11.5	55.0	8.8±1.50	61.5
Match	11.0	10.0	33.6	9.8	46.2	10.5	47.4	10.1±0.21	42.4
Pestban	16.0	14.5	- 40.1	13.3	- 6.2	17.0	- 23.9	14.9±1.09	-23.4
Control	12.0	13.8	....	16.7	....	18.3	....	13.8±3.09	....

% R means percentage reduction in the number of laid eggs

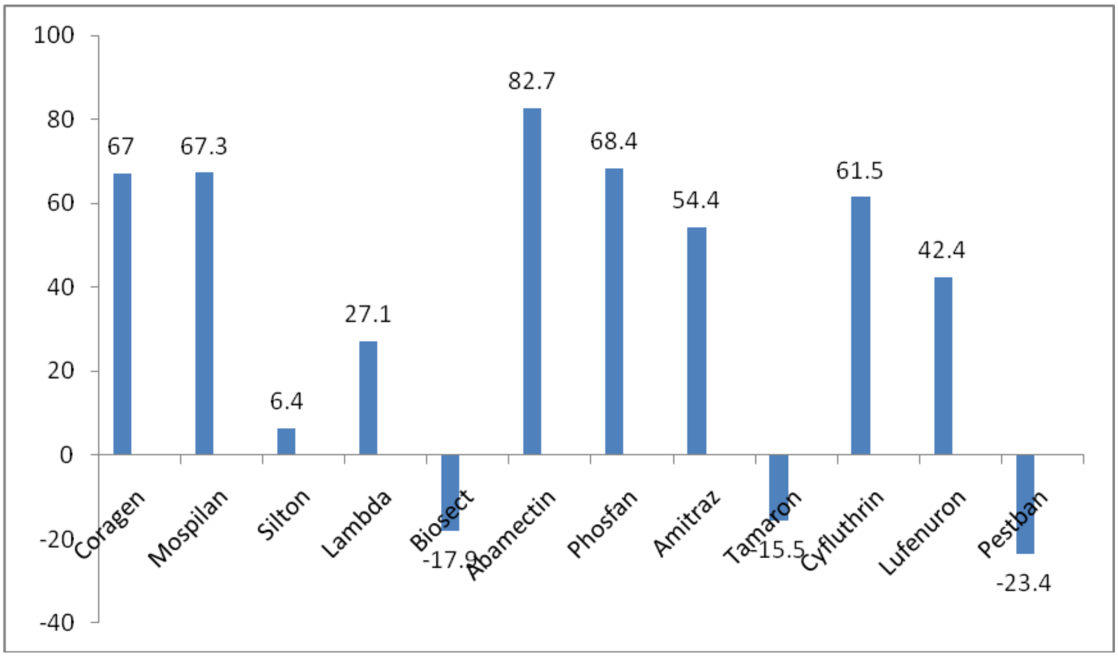

Figure 3: General means of percent reduction in the number of eggs laid by*T. absoluta*due to tested insecticide

CONCLUSION

Generally, according to the obtained results, coragen had a high toxic effect against larvae of *Tutaabsoluta* followed by cyfluthrin (87.3 and 64.5 % mortality, respectively). While abamectin was the most effective insecticide against eggs followed by phosfan (82.7 and 68.4 %, reduction eggs number). On the other hand, pestban, tamaron and siliton was the lowest effective against study insect, while bioinsecticide, biosect gave moderate efficiency against larvae (39.5 % mortality), but it had bad effect against eggs (-6.4 % reduction). So, we concluded that it can use coragen, abamectin, cyfluthrin and phosfan in IPM program for control *T. absoluta* on tomato plants.

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