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Protection of tomato crop using Dill oil its nano against *Tuta absoluta* (Lepidoptera: Gelechiidae)

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Abstract: The autumn tomato variety F.N.8 were planted in two Egyptian governorate Giza and Menofia to control the tomato pin worm *Tuta absoluta*. under laboratory conditions, the effect of Dill (Anethum graveolens) and nano Dill (Anethum graveolens) on *T. absoluta* under laboratory conditions which revealed that larval mortality significantly decreased after oil treateatments.

After the target insect pest treated with the nano dill oil the mortality of *T. absoluta* larvae increased to 59 % after treated with 0.005% of nano dill oil as compared to zero in the control . also, the adult mortality significantly increased to 50% for the crossponding concentration as compared to 99.8% in the control the yield weight significantly increased to 3896± 49.49 and 3952± 96.10 kg/ feddan in plots treated with nano dill ol in Manawat(Giza) and Menofia Governorate), respectively as compared to 2521± 61.81and 2300± 16.60 kg feddan in the control in both two examination areas.

Key wards: Dill (Anethum graveolens) oil nano , nano. *Tuta absoluta*.*tomato.*

1. Introduction

The Egyptian tomato crop, *Lycopersicon esculentum* (Mill) is a considered among very important vegetable crop of the world. The tomato leafminer, *Tuta absoluta* Meyrick, (Lepidoptera : Gelechiidae) is one of a harmful serious pest of both the greenhouse, and field tomatoes. The harmful pest, *T. absoluta* considered among serious insect pests of the tomato crop. Tomatoes fruits lost by the tomato leaf minor in the field [1-3]. *Tuta absoluta* infect the leaves and soluneouses fruits which leads to drying the plant [4-7]. This insect pests migrate from tomato crop to any other solanouse crops which leads to damaging and loss of it [8-11]. The new pest of the tomato leaf minor have a serious threat to such efforts and needs to be kept in check as early as possible. During the past three years and while expanding eastward from Spain along the North African coast, *Tuta absoluta* have caused havoc in agricultural production , devastating crops in all countries on the way, elevating prices beyond the capability of average consumer. [1] controlled the tomato leaf miners by the microbial fungi and *Trichogramma evanesens.* Under laboratory condition the percentage eggs parasitoid of *T. evanesens* were significantly decreased after treatments with *M. anisopliae to 93.2% as* compare to 98.2 in the control. Under green house conditions the means number of infestation were significantly decreased [1] . Damage to fruit allows e.g. fungal diseases to enter, which leading to rotting fruit before or after harvest , [1,2] . In Egypt. tomato grown in green house and open field. *T. absoluta* are severely attack the tomato fruits which causing a lose of their commercial value. 50–100% losses have been reported on tomato [3,4]. [5, 6, 7] , used the Biocontrol agent bacteria or fungi for controlling the Tomato Pinworm *T. absoluta* (Meyrick) (Lepidoptera: Gelechiidae) in Egypt. [7,8] control the tomato insect pests by using isolated *Bacillus thuringiensis* and the entomopathogenic fungi. Nano pesticides, nano fungicides and nanoherbicides are being used efficiently in agriculture [9,10, 11, 12, 13].

The aim of this work to evaluate of chitosan and nno-chitosan against *T. absoluta* under laboratory, greenhouse effect and field.

2. Materials and Methods

2.1. Rearing insect pests:

The tomato pinworm were reared on tomato leaves under laboratory conditions 22±2Co and RH 60-70% *T. absoluta* used in the trials were obtained from laboratory cultures. The experiments were repeated 4 times. The percentages of mortality were calculated and corrected according to [14], while LC50 was calculated through probit analysis, [15]. The experiments were carried out under laboratory conditions 22 ± 2o C and 60-70% R.H. Twenty individuals of the third larvae of *T. absoluta* were put on them, covered with muslin. Control (untreated) was made by feeding the larvae on untreated leaves (sprayed by water only).

2.2.Green house trials:

The summer tomato variety F.N. was planted in the green house in 40 plots in each artificial infestation was made by spraying the plant with the bioinsecticides chitosan at the concentrations of and 30ppm. Control samples were sprayed by water only. The plants were examined every two days, the percentage of infestation was calculated until the end of the experiment. Each treatment was replicated 4 times. The percent mortality was counted and corrected according to [14]; while Lc50s were calculated through probit analysis after [15].

2.3.Field trials.

summer tomato variety F.N. Our field experiments were conducted at Manawat(Giza) and Menofia Governorate), Egypt during the seasons 2016 to study the effectiveness of the tested Dill (Anethum graveolens) and Nano-Dill (Anethum graveolens) oil on *T. absoluta*, (summer tomato variety F.N.8) was planted at the end of May during two successive seasons in an area of about half feddan. The tested, Dill (Anethum graveolens) were applied as single treatments in randomize plots. 5g for Dill (Anethum graveolens) . Regular agricultural practices were performed and no chemical control was used during our study period. The weeds were removed by hand. Five plots of corn were sprayed with water as control treatments. Samples from each treatment were collected weekly and transferred to the laboratory in order to investigate. The Percentages of infection were calculated.

2.8. Yield Assessment:

Yield data in treated and untreated plots in the corn harvest seasons (2014and 2015), represented by weight in Kg were determined. The Yield loss was estimated according to the following equation:

$$\text{Yield loss} = \frac{\text{Potential yield} - \text{Actual yield}}{\text{Potential yield}}$$

Potential yield was *Nano*- Dill (Anethum graveolens) treatment (the best result among the tested pathogens) was considered the standard for comparison with the other ones.

2.4.Bioassays

The insecticidal efficacy of **Dill (Anethum graveolens)** and nano- **Dill (Anethum graveolens)** were tested at three dose rates 10, 25, 50 ppm against the 3rd instar larvae of *T. bsoluta* . For each case, four glass jars as replicates were used. Each replicate was treated individually with the respective nano- chitosan quantity and then shaken manually for one minute to achieve equal distribution of the chitosan and nano chitosan Subsequently, ten 3rd instar larvae of the two tested species were introduced into each glass jar and covered with muslin for sufficient ventilation. Twelve replicates glass jars containing untreated wheat served as control. Mortality was assessed after 7 d of exposure in the treated and untreated jars. Mortality was corrected according to [13]. All tests were conducted at 27 ± 2 °C and 65 ± 5% relative humidity (RH). All the experiments were repeated three times.

2.5. Nanoencapsulation

The Nanoencapsulation is a process through which a chemical is slowly but efficiently released to the particular host for insect pests control. Release mechanisms include dissolution, biodegradation, diffusion and osmotic pressure with specific pH [26]. Encapsulated of the tested bioinsecticides nano- Dill (Anethum graveolens) , nano-emulsion is prepared by high-pressure homogenization of 2.5% surfactant and 100% glycerol, to create stable droplets which that that increase the retention of the oil and cause a slow release of the nano materials . The release rate depends upon the protection time; consequently a decrease in release rate can prolong insect pests protection time [27].

3. Results

After the target insect pest treated with the nano dill oil the mortality of *T. absoluta* larvae increased to 59 % after treated with 0.005% of nano dill oil as compared to zero in the control . also, the adult mortality significantly increased to 50% for the crossponding concentration as compared to 99.8% in the control (Table 2).

Under semi field conditions the larval mortality significantly increased to 69 % after tomato plots treated with 5% of nano dill oil as compared to zero in the control (Table 3).The means number of infestaions significantly decreased in thplots treated with dill an nano dill. Table 4 show that the yield weight significantly increased to 3896± 49.49 and 3952± 96.10 kg/ feddan afin plots treated with nano dill ol in Manawat(Giza) and Menofia Governorate), respectively as compared to 2521± 61.81and 2300± 16.60 kg feddan in the control in both two examination areas (Table5).

Figures 1 and 2 showed that, the infestations of the target insect pests of *T. absoluta* not only significantly decreased when treated with chitosan solution but also highly significantly decreased when treated with nano-Dill (Anethum graveolens) under semifield and field conditions treatments (figre, 1 & 2).

4. Discussion

Auther found that the bio insecticide control many vegetables pests [15 ,16, 17].The same results obtained [17, 18, 19,20, 21,22] who found that the nano microbial insecticide decrease

the amount of insecticides used. . [23] found the insecticidal activity the nano-chitosan (CS-g-PAA) showed highest effect against the three insect of soybean. [24, 25, 26, 27] reported that the means number of eggs deposited /female were significantly decreased. Under laboratory and semifield condition, *Aphis gossypii* were significantly decreased to 20.9±9.1 and 28.9±9.2 eggs/female respectively as compared to 97.3±4.9 and 90.3±4.9 eggs/female in the control, respectively. The same trends were also observed against *Callosobruchus maculatus* .

[28,29,30,31] found that the nano insecticides of Imidacloprid and fungi strains cases a higher mortality for insect infestations. Our results agree with [32,33,34,35,36] who find that the nano pesticide decrease the infestation percentage of different pests.

[26-29] agree with our results and control a lot of pests with nano materials. [30-41] have the same results obtained and show that the nano pesticides is a perfect for controlling mny pests and diseases . [40-45] found the insecticidal activity the nano-chitosan (CS-g-PAA) showed highest effect against the three insect of soybean. as the means number of eggs deposited /female were significantly decreased. Under laboratory and semifield condition, *Aphis gossypii* were significantly decreased to 20.9±9.1 and 28.9±9.2 eggs/female respectively as compared to 97.3±4.9 and 90.3±4.9 eggs/female in the control, respectively. The same trends were also observed against *Callosobruchus maculatus* . [28, 29, 30, 331, 32, 33] found that the nano insecticides of Imidacloprid and fungi strains cases a higher mortality for insect infestations. Our results agree with [34,35, 36, 41,42] who find that the nano pesticide decrease the infestation percentage of different pests. Our results matched with those [43,44]

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Table 1.Effect of Dill (Anethum graveolens) oil against the different stages of *T. absoluta* under laboratory conditions .

Concentrations	% of larval mortality	% of adult mortality
5	**45**	**40**
2.5	**33**	**31**
0.5	**22**	**17**
0.05	**10**	**11**
Control	**0**	**0**
LSD5%	**16.4**	**15.9**

Table 1 show that, the larval mortality significantly decrease to 45, 33,22,10 after treated with5. 2.5, 0.5 and 0.05% of dill oil, also the adult mortality significantly decreased to 11% after treated with 0.05% of dill oil as compared to zero % in the control (Table 1).

Table 2.Effect of nano Dill (Anethum graveolens) oil against the different stages of *T. absoluta* under laboratory conditions.

Concentrations	% of larval mortality	% of adult mortality
0.1	**77**	**77**
0.5	**79**	**72**
0.05	**67**	**60**
0.005	**59**	**60**
Control	**0**	**99.8**
LSD 5%	**17.1**	**11.9**

Table 3.Effect of Dill (Anethum graveolens) oil against the different stages of *T. absoluta* under semifield conditions.

Concentrations	% of larval mortality	% of adult mortality
5	69	65
2.5	59	59
0.5	48	42
0.05	23	22
Control	0	0
LSD5%	13.2	14.7

Table (4): Weight of harvested tomato into two Egyptian regions after Dill (Anethum graveolens) and nano-Dill (Anethum graveolens) oil treatment against *T. absoluta* during seasons 2015.

Treatments	Manawat(Giza) Weight tomatoes (Kg/feddan)	Menofia Weight tomatoes (Kg/feddan
Control	2521± 61.81	2300± 16.60
Dill)	2899± 86.60	3001± 26.40
Nano-Dill	3896± 49.49	3952± 96.10
F –test	33.0	
LSD 5%	17.1	

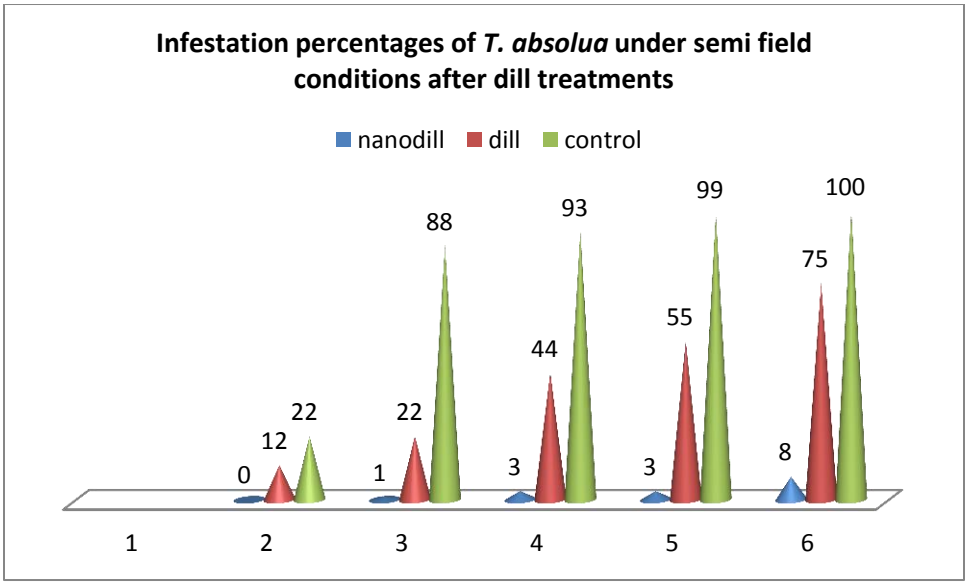

Fig1. Infestation percentages of *T. absolua* under semi field conditions after dill treatments

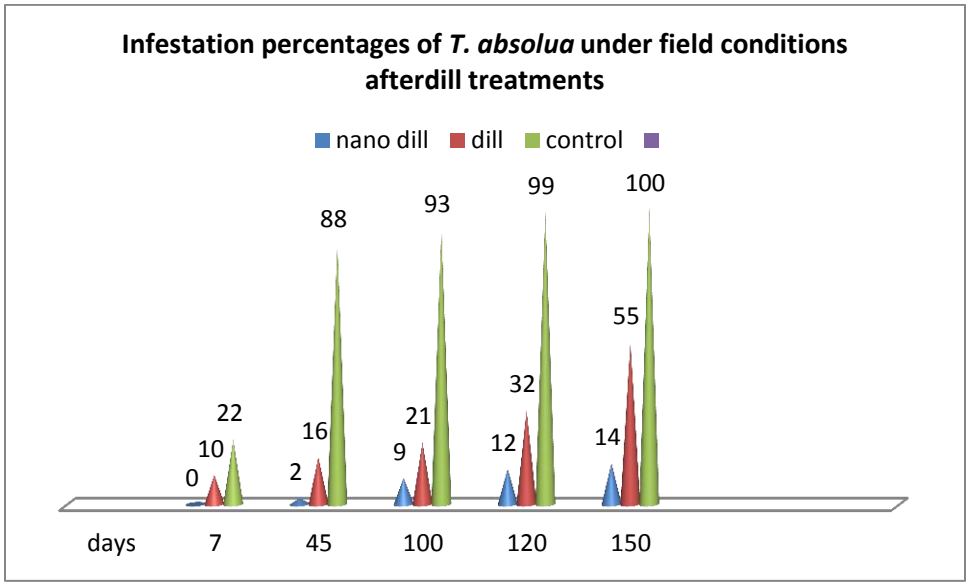

Fig2. Infestation percentages of *T. absolua* under field conditions afterdill treatments

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