JSAES
Journal of Sustainable Agricultural and Environmental Sciences
Print ISSN:
Online ISSN:
Homepage: https://jsaes.journals.ekb.eg/

Research Article

Efficacy of Certain Insecticides against *Thrips Tabaci* Lind in Cotton Seedlings at El-Gharbia Governorate, Egypt

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Article info: -
- **Received:** 4 January 2025
- **Revised:** 20 January 2025
- **Accepted:** 22 January 2025
- **Published:** 27 January 2025

Keywords:

Cotton (*Gossypium barbadense* L), *Thrips tabaci*, m mineral oil, plant extract, Thiamethoxam

Abstract:

Cotton (*Gossypium barbadense* L) crop have an important role in the national income of Egypt. Field experiments were achieved during 2023 at El- Gharbia Governorate, Egypt under field condition to evaluate the initial and residual effect of certain insecticides, which applied singly and mixed with Mineral oil or plant extract against *Thrips tabaci* during Seedling stages. Results showed that all tested compounds used separately induced the highest residual reduction against thrips. In the case when insecticides are applied alone, the mean of reduction in insect population varies between 44.31 to 80.37, while the initial effect of all tested compounds causes a moderate reduction giving from 45.49 to 69.15 against cotton Thrips. Also, the results obtained indicated that mineral oil and plant extract, when mixed with all tested compounds, caused a high level of reduction in insect population as initial and residual effect. mineral oil + Thiamethoxam caused the highest initial and residual reduction giving 88.76 and 89.09 respectively, while plant extract + Thiamethoxam caused the highest initial and residual reduction giving 84.41 and 82.42 respectively to cotton thrips (control). Generally, we can say that all mixtures had potentiation effect which resulted in reducing thrips population (*T. tabaci*) during seedling stage.

1. Introduction

Cotton (*Gossypium barbadense* L) crop have an important role in the national income of Egypt. Cotton is used to produce textiles and clothing, edible oil, soap, and animal feed; it also provides income for hundreds of millions of people (Alemu et al., 2021; Brandenburg et al., 2022). Cotton plants are infested with many pests all over their life spans, i.e. early in the season, during seedling-stages, mid- season and in the season during fruiting stage which causes a reduction in cotton yield and quality (Din et al., 2016). In recent years cotton pests such as cotton aphids, Jassids, whitefly, thrips and spider mites, cause severe damage to cotton plants (Holling, 1961; El Nawawy et al., 1980: Salama et al., 1984 and Dent, 1991). They are sucking plant juice of green leaves and young bolls and their saliva cause chemical disorders in plant tissues beside transmitting certain viral diseases (Costa and Brown, 1991). Cotton thrips, *Thrips tabaci* is a polyphagous species attacking more than 200 plant species of field, ornamentals, vegetables and garden crops (Best, 1968 and Cheo et al., 1986). Although primary damage to plants is physical (causing silver necroses), *Thrips tabaci* is also known to be a vector which transmitting virus disease to several plant and thus causes substantial economic damage (Reddy et al., 1983; North and Shelton, 1986).

Conventional or unconventional insecticides used against *T. tabaci* have shown great effectiveness in controlling this harmful insect. (Abdel-Aziz, 2002; Khattab et al., 2006; Malin-ga and Laing 2021 and Allam et al., 2023). In addition, microbial insecticides and mineral oils have long attracted attention as alternatives to chemical agents for thrip control (Poveda, 2021).

The main objective of this study is the initial and residual effects of the tested compounds either alone at the recommended rate or in combination with two compounds (mineral oil (Kz) or plant extract) against Thrips tabaci infesting cotton seedling stage under field conditions.

2. Materials and Methods

2.1. Experimental design

Field experiment was carried out at El-Gharbia Governorate during 2023 season to evaluate the efficiency of conventional & non- conventional insecticides (Mineral oil, plant extract and Bio-insecticides) and their mixtures against *Thrips tabaci* during cotton–seedlings stage. All tested compounds were sprayed at their recommended rate mentioned before using knapsack sprayer, 10 litre capacity (200 litre spray solution / feddan) on cotton plants with thrips. All treatments were distributed in com-

plete randomized block design replicated three times each of 42m2. Giza 94 varieties was sown on 15 April in 2023 season and all agricultural practices were followed except chemical control. Infestation was assessed before spraying and after 1, 4, 7, 10 and 15 days of spraying by collecting 10 cotton seedlings from each treatment and the untreated one then inspected the collected seedling using lens in the field early morning from top, middle and bottom leaves randomly to determine the number of the thrips stages (nymphs and adults).The insecticides were applied at their recommended doses in 5th week when the peak incidence of thrips was observed (Bashir et al. 2020).

2.2. Insecticide used

The materials used consisted of five chemistry synthetic insecticides, one bio insecticide and one plant extract in addition to mineral oil. In the latter, all insecticides were applied mixed with Mineral oil or plant extract. in Table (1) the assessment insecticide at these experiments is recorded and their doses used According to the Ministry of Agriculture's recommendations.

2.3. Plant extract

To study the influence of garlic (*Allium sativum* L.: Liliaceae), extract on *Thrips tabaci* in cotton–seedlings stage. The extract was prepared as follows; 250 gm. of fresh garlic bulbs were crushed then the bulbs were soaked in one liter of distilled water for one hour, and then the mixing was filtered through filter paper. The stock solution was stored in a bottle container and was kept in refrigerator for use.

2.4. Statistical analysis

Percentages of reduction for the infestation of the target pest were estimated according to Henderson and Telton (1955) equation as follows:

Reduction % = [1 – (a / b) x (c / d)] x 100

Where:

a = No. of individuals in treatment after spraying

b = No. of individuals in treatment before spraying

c = No. of individuals in (control) before spraying

d = No. of individuals in (control) after spraying

Data were analyzed by subjected to analysis of variance (ANOVA). Means were determined for significance at 0.05 using LSD test.

Table 1. Tested compounds in the field application, formulations and recommended doses on cotton thrips, *Thrips tabaci*.

Common name	Trade name	Formulation	Rate of application/fedan
1- Mineral oil	**Kz Oil**	**EC**	**7 L**
2- *Beauvaria bassiana*	**Biosect**	**32 x 10^6 conidia / ml WP**	**800 gm**
3- *Allium sativum*	**Garlic extract**	**-------**	**40 ml**
4- Abamectin	**Orgamactin**	**1.8%EC**	**200 ml**
5- Emamectin benzoate	**Excellent**	**1.9%EC**	**200 ml**
6- Lambda-cyhalothrin	**Magnock**	**5%EC**	**500 ml**
7- Imidacloprid	**Magnock**	**Wg 70%**	**140 gm**
8-Thiamethoxam	**Actara**	**25% WG**	**80 gm**

3. Results

Evaluation of tested compounds on *Thrips tabaci* under field conditions. The initial and residual effects of the tested compounds either alone at the recommended rate or in combination with two compounds (mineral oil (Kz) or *Allium sativum* extract) against *Thrips tabaci* infesting cotton seedling stage could be discussed as follows:

3.1. Efficacy of certain insecticide used only against *T. tabaci* in cotton field.

According to the Ministry of Agriculture's recommendations for the use of natural products and safe materials to control pests, effective materials must provide an initial reduction effect of at least 70% and a residual reduction effect of at least 40 %. Ministry of Agriculture (1993). The residual effect was calculated as an average of the total effect after 4, 7, 10 and 15 days after spraying. Ac-cording to this recommendation, results in table (2) and fig. (1) which show the effect of tested compounds against cotton thrips, *Thrips tabaci* indicated that most tested compound individually gave high residual effect agree with the Ministry of Agriculture recommendations except in case of initial effect which showed low initial effect less than that of recommendations. The obtained data in table (2) indicated that the initial and residual reduction (one day after treatment and mean of total effect) was the highest percentage caused by Thiamethoxam (69.15% and 80.37%) followed by Imidacloprid (67.17% - 74.46%). While the *Allium sativum* extract exhibited the lowest initial and residual reduction (45.49% - 44.31%).

Table 2. Reduction percentages of the tested compounds at recommended rate on *Thrips tabaci* on seedling cotton under field conditions.

Treatment	%R (Initial effect) after 1 day	Reduction% after (Residual effect)				Mean %R
		4 Days	7 Days	10 Days	15 Days	
Mineral oil	61.40	73.21	72.18	65.94	58.22	66.61b
Beauvaria bassiana	33.93	43.33	51.32	53.39	46.30	45.92c
***Allium sativum* extract**	45.49	51.23	49.17	42.32	32.21	44.31c
Abamectin	65.0	74.19	72.37	65.0	55.92	66.82b
Emamectin benzoate	68.80	72.81	71.01	66.13	57.54	67. 42b
Lambda-cyhalothr	65.00	77.25	80.20	73.31	65.98	72. 87ab
Imidacloprid	67.17	79.36	81.43	74.68	67.13	74.46ab
Thiamethoxam	69.15	89.94	81.47	79.89	78.98	80.37a

* Mean followed by the same letter in each column are not significantly different according to the LSD 0.05.

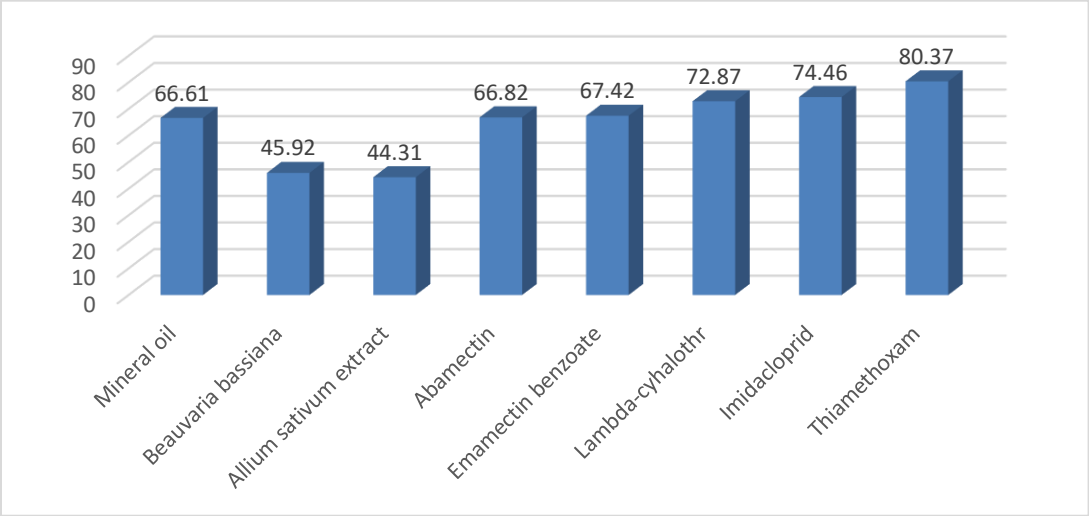

Figure 1. Mean of reduction of the tested compounds at recommended rate on *Thrips tabaci* on seedling cotton under field conditions.

3.2. Efficacy of certain insecticide used only against *T. tabaci* in cotton field

The data mentioned in table (3) indicated that, all the tested compounds produced a pronounced reductions in the numbers of the cotton thrips after application and show all tested compounds mixtures with mineral oil against *Thrips tabaci* infesting cotton seedling stage gave high initial and residual effect except case of mineral oil + *Beauvaria bassiana* which gave low initial effect less than that of recommendations with reduction percentage 67.73.

Table 3. Reduction percentages of the tested compounds mixed with Mineral on *Thrips tabaci* on seedling cotton under field conditions.

Treatment	%R (Initial effect) after 1 day	Reduction% after (Residual effect)				Mean %R
		4 Days	7 Days	10 Days	15 Days	
Mineral oil	65.63	69.90	68.49	62.72	55.39	64.46e
Mineral oil + *Beauvaria bassiana*	67.73	75.65	69.96	67.10	63.40	68.72de
Mineral oil + Abamectin	73.49	78.72	77.84	73.50	70.01	74.76cd
Mineral oil + Emamectin benzoate	73.42	75.49	74.71	71.60	67.96	72.65cde
Mineral oil + Lambdacyhalothrin	81.10	80.43	80.78	76.85	79.13	79.63bc
Mineral oil + Imidacloprid	82.52	87.41	86.87	83.19	78.81	83.81ab
Mineral oil + Thiamethoxam	88.76	95.47	89.38	86.97	84.63	89.05a

* Mean followed by the same letter in each column are not significantly different according to the LSD 0.05.

3.3. Efficacy of certain insecticide mixed with *Allium sativum* extract on *T. tabaci* in cotton field.

Data presented in table (4) revealed excellent results due to the use of the mixture of *Allium sativum* extract with tested compounds compared with using the compounds individually against cotton thrips. These results gave the highest initial and residual effect. Generally, that *Allium sativum* extract when combined with all the tested compounds induced high initial and residual effect agrees with the Ministry of Agriculture recommendations. Furthermore, the general means of reduction percentages revealed that *Allium sativum* extract + Thiamethoxam extract was the most toxic compound against cotton thrips, the mean values were 84.41 for initial effect and 82.42 for residual effect followed by *Allium sativum* extract + Imidacloprid with 78.45 and 78.84 respectively

Table 4. Reduction percentages of the tested compounds mixed with *Allium sativum* extract on *Thrips tabaci* on seedling cotton under field conditions.

Treatment	% R (Initial effect) after 1 day	Reduction% after (Residual effect)				Mean %R
		4 Days	7 Days	10 Days	15 Days	
***Allium sativum* extract**	50.87	48.30	46.04	40.45	34.11	44.07d
***Allium sativum* extract + Mineral oil**	70.52	76.69	76.17	71.53	53.22	69.92bc
Allium sativum* extract + *Beauvaria bassiana	70.34	73.04	69.67	61.97	51.24	65.46c
***Allium sativum* extract + Abamectin**	74.23	80.01	80.13	65.178	65.35	73.15abc
***Allium sativum* extract + Emamectin benzoate**	72.39	77.45	76.78	71.01	52.57	70.34bc
***Allium sativum* extract + Lambdacyhalothrin**	77.17	83.28	79.38	69.86	69.90	76.03ab
***Allium sativum* extract + Imidacloprid**	78.45	83.02	85.10	81.80	64.46	78.84ab
***Allium sativum* extract + Thiamethoxam**	84.41	83.55	86.47	80.52	76.59	82.42a

* Mean followed by the same letter in each column are not significantly different according to the LSD 0.05.

Mean followed by the same letter in each column are not significantly at 5% level.

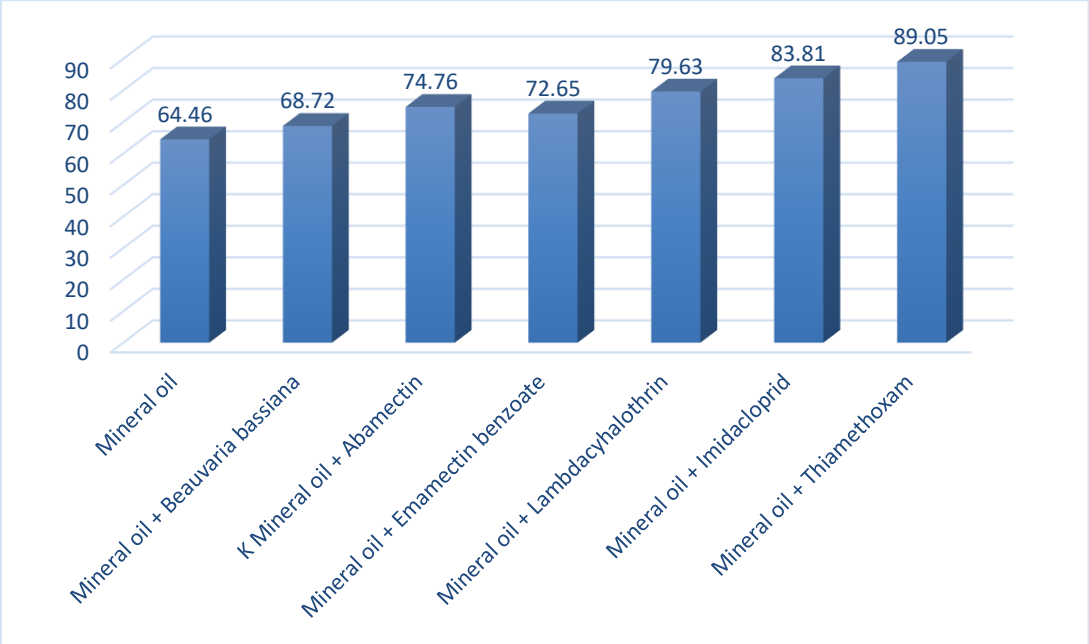

Figure 2. Mean of reduction of the tested compounds mixed with Mineral on *Thrips tabaci* on seedling cotton.

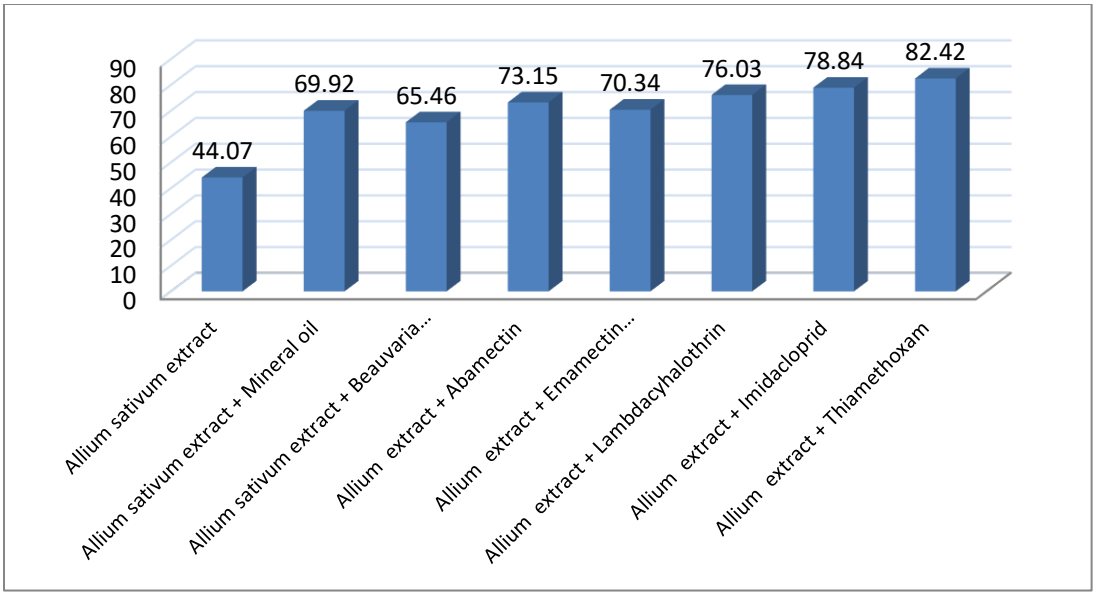

Figure 3. Mean of reduction of the tested compounds mixed with *Allium sativum* extract *Thrips tabaci* on seedling cotton.

As shown in figure (2 and 3) the Mineral oil and *Allium sativum* extract adjuvant clearly increased the residual mortality when added to all compounds tested of *Beauvaria bassiana*, Abamectin, Emamectin benzoate, Lambdacyhalothrin, Imidacloprid and Thiamethoxam which caused 68.72%, 74.76%, 72.65%, 79.63, 83.81% and 89.05% reduction for Mineral oil respectively and 65.46% ,73.15%, 70.34%, 76.03%, 78.84% and 82.42% reduction for *Allium sativum* extract against *Thrips tabaci* infesting cotton seedling stage as residual effect, respectively.

4. Discussion

Many investigators studied the control of *Thrips tabaci* by plant extracts as effectives materials (Allam et al., 2022; Qari et al., 2020; Ihsan et al., 2022 and Allam et al., 2023). In addition (Din et al., 2015; Fakeer and Ahmed, 2022) where they found that, Imidacloprid and Thiamethoxam were very successful against thrips.

For bio pesticides (Wawdhane et al., 2020) found that, *Beauvaria bassiana* was moderately effective 52.53 % against *T. tabaci*. Also (Ain et al., 2021) reported that, *B. bassiana* had a high toxic effect against production of the *T. tabaci* under field conditions.

Generally, the effect of the tested compounds when mixed exceeded pronouncedly that induced when used singly against *T tabaci* infesting cotton seedling stage. These results agree with those of (Khattab et al., 2006; Hassan 2017; Ali et al., 2023).

5. Conclusion.

The thrips is major pest on cotton plant which create a big problem at the early stages of crop. During the present study the mineral oil and *Allium sativum* extract when combined with all the tested compounds reduced the mean numbers of cotton thrips *Thrips tabaci* during seedling stage and induced high level of reduction of insect population as initial and residual effect.

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