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Field Studies and the Efficiency of Different Insecticides against *Thrips tabaci* Lindeman on Onion Crops in Egypt

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Abstract: Onion thrips (*Thrips tabaci* Lindeman) ((Thysanoptera: Thripidae) is the major pest attacking onion crops on the Egyptian fields during seasons 2023 and 2024. The total average populations were 652.70 in the first season and 677.33 in the second season, the highest peak were recorded on the 4th week of April with average 110.48 and 99.53. Different insecticides were used to study its effectiveness on thrips as Dinotefuran, acetamiprid, abamectin + thiamethoxam, spirotetramat, spinosad, spintorame, chlorophanpyar, fenopethrin + etoxal and acetamiprid + bifenthrin. After 24 hours all compound recorded the highest reduction than after 3,7 and 10 days, the highest reduction was recorded with spintorame by 97.32±1.36and 96.93±0.96%. On the third day, Spirotetramat recorded the highest reduction by 95.21±1.22and 92.60±2.40%. On the seventh day, chlorophanpyar recorded the highest reduction by 83.52±1.74 and 81.62±2.60%. On the tenth day also chlorophanpyar recorded the highest reduction by 72.40±0.87 and 69.30±1.85%. Chlorophanpyar was recorded the highest overall average by 85.42±5.35and 82.79^a±4.60 %.

Key words: Onion, Thrips, *Thrips tabaci*, Insecticides, reductions rate.

1. Introduction

The onion thrips, *Thrips tabaci* Lindeman (Thripidae) is the major pest attacking onion crops (*Allium cepa* L) in Egypt (**Diaz-Montano et al., 2011; Azazy et al., 2018 and Allam et al., 2020**). Chemical insecticides were tested to study the efficiency of reducing thrips infestation (**Hendawy et al., 2011, Nadeem et al., 2022, Geremias et al., 2022 and Allam et al., 2023**). Abamectin + Thiamethoxam compound recorded high reduction ranged 94-98 % after 1, 3, 7, 14 days (**Mohamed and Ahmed, 2022 and Hassan et al., 2024**). On other side *T. tabaci* recorded a resistance to both compound (**Adesanya et al., 2020 and Geremias et al., 2022**). Bifenthrin and acetamiprid showed a significant effect on thrips population (**Ashghar et al., 2018 and Mohammad Falahzadah et al., 2021**). Dinotefuran affected on thrips population with total reduction ranged 69 to 74% (**Khozimy et al.,**

2021), also other investigations showed that thrips show a resistance to the compound(**Kliot et al., 2016**). Spirotetramat is one of the compound which showed a high reduction after 1 to 3-day treatment (**Nault et al., 2013 and Khaliq et al., 2014**). Spintorame is the most effective on thrips and used to suppress it (**Moretti et al. 2019 and Wakil et al. 2023**). Chlorfenpyar is one of compound with success effective in controlling thrips (**Ali et al., 2015 and Korai et al., 2024**). Spinosad finally consider as one of the biotic compound with a high reduction to thrips especially after treatment directly and in total reduction (**Wakil, et al., 2023**). This study was conducted to evaluate the extent of the effect of the previous compounds in reducing the thrips population during the 2023 and 2024 seasons.

2. Materials and methods

2.1. Thrips population

This study was conducted on the research farm at the Sakha Agricultural Research Station, Kafr Al sheikh governorate during the 2023 and 2024 seasons. The numerical density of *Thrips tabaci* Lindeman was counted weekly for 16 weeks in both seasons. The seedlings were transferred in the second week of December to The agricultural field for the experiment field (4000 square meters). The red onion variety Tantawi was used in this study. All agricultural operations were carried out, including irrigation and fertilization. With the beginning of the appearance of thrips individuals, thrips individuals were counted on 25 plants for four replicates. The plants were shaken on a piece of plastic and the individuals that had fallen were counted, then these plants were transferred to the laboratory to count the individuals present among the leaves that did not fall. Both methods were combined to calculate the average number of individuals per week.

2.2. Insecticides treatments

Under high population of *T. tabaci* during the 3rd week of April, the experiment was divided into nine equal areas (450 square meters/ treatment). The plants were examined and the thrips individuals were counted before treatment, then, eight pesticides were used to determine their ability to reduce thrips populations, after 24 hours, 3 days, 7 days and 10 days after treatment. Data in table (1) is containing the pesticides information.

Table (1). Ingredients, trade name, manufacture and Application rate of the insecticides treatments

NO	Ingredients	Trade name	Manufacture	Application rate /100 L
1	Abamectin + Thiamethoxam	Agri Flex 18.56 %	Syngenta, Egypt	40cm
2	Acetamiprid + bifenthrin	Rubek 50%wp	Shoura, Egypt	25gm
3	Acetamiprid	Mospilan20%Sp	Shoura, Egypt	25gm
4	Dinotefuran	Oshin20%sc	Shoura, Egypt	125gm
5	Spirotetramat	Movento10%sc	Bayar, Germany	75cm
6	Spintorame	Radiant 120sc	Dow Agro Sciences, UK	60cm
7	Chlorfenpyar	Challenger Super 24% SC	BASF ,Egypt	60cm
8	Spinosad	Tracer 240SC	Dow Agro Sciences, USA	30cm

Data were analyzed by using Statically Analysis (SPSS 2016) and (ANOVA) analysis also constructed to test the significant differences between the compounds. Efficacy rate were calculated by using the formulas as following

$$\text{Efficacy (\%)} = \frac{\text{Pre spray count} - \text{Post spray count}}{\text{Pre spray count}} \times 100$$

3. Results and Discussion

Data in Table (2) indicated the population of *Thrips tabaci* during 2023 season and 2024. The populations start to appear in the 3rd week of January, the highest peak was recorded in the 4th week of April by 99.53 and 110.48 individual. The total average recorded 652.70 and 677.33 individual.

Table (2). Population of *Thrips tabaci* Lindeman on onion plants during season 2023 and 2024

Month	week	Season 2023	Season 2024
		Means $\pm$ SE /plant	Means $\pm$ SE /plant
January	3	10.05	8.92
	4	16.31	12.90
February	1	12.97	24.03
	2	22.73	31.30
	3	22.5	34.25
	4	25.72	41.27
March	1	39.09	43.30
	2	43.2	45.30
	3	51.32	49.30
	4	57.49	61.55
April	1	72.32	65.73
	2	71.36	73.72
	3	97.16	86.23
	4	110.48	99.53
May	1	97.45	91.30
	2	100.61	80.23
Total	16	652.70	677.33

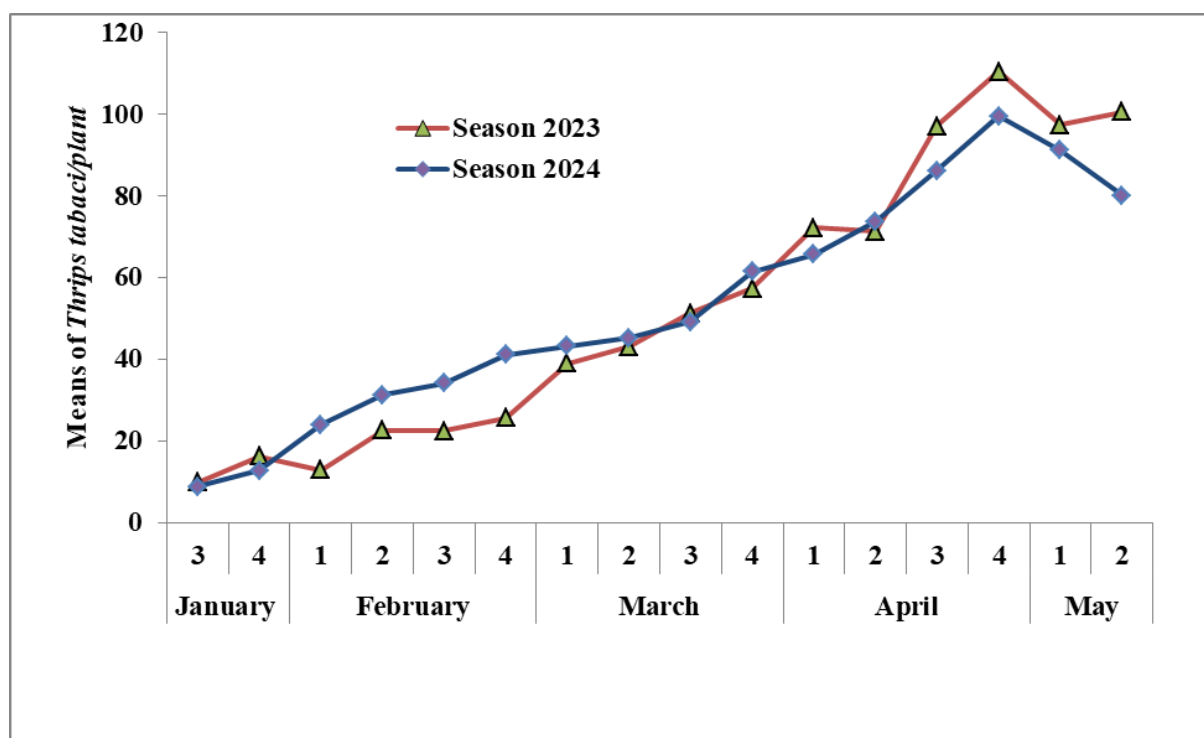


Fig.(1). Population of *Thrips tabaci lindeman* on onion plants during season 2023 and 2024

Data in figure (1) resulted that the population of *T.tabaci* during 2023 season and 2024 started in the 3rd week of January and increased to reach to highest numbers in the 2nd week of April to the 2nd week of May (harvesting time). The highest peak recorded during season 2023 in the 4th week of April.

As conclusion the population of *T. tabaci* starts to increase by the 1st week of January and reach to the highest peak by the end of April during season 2023 and 2024 which were agree with (Ullah et al., 2010; Darwish, 2015 and Allam et al., 2023). Also the density number affected by thrips attacking from wheat in April.

The results shown in Table (3) indicated the means reduction of thrips population resulting from the use of compounds in the 2023 season. After 24 hours the highest reduction were recorded by Spintorame followed by Dinotefuran, Spirotetramat, Spinosad and Chlorophanpyar with significant between them by 97.32 ± 1.36 , 96.78 ± 0.78 , 95.84 ± 1.30 , and 93.91 ± 0.92 and $92.64 \pm 1.37\%$, respectively. Meanwhile, Abamectin +bifenthrin recorded the lowest reduction by 76.93. After the 3rd day the highest reduction was recorded by Spinosad followed by Spirotetramat and Chlorophanpyar recorded the highest reductions by 95.71 ± 1.00 , 95.21 ± 1.22 and 93.12 ± 1.02 , respectively. After the 7th day the reduction rate decreased, the highest reduction recorded with chlorophanpyar followed by Spirotetramat, Spintorame and Spinosad by 83.52 ± 1.74 , 80.59 ± 1.29 , 80.52 ± 2.82 and 80.40 ± 2.32 respectively. After the 10th day, all compounds reduction was decreased, the highest reduction recorded by Chlorophanpyar by 72.40 ± 0.87 . The overall average reduction recorded the highest reduction with using Chlorophanpyar followed by Spinosad, Spirotetramat and Spintorame by 85.42 ± 5.35 , 84.54 ± 4.46 , 83.43 ± 8.19 and 80.87 ± 10.18 respectively.

Table (4). Means reductions rate of different compounds against *Thrips tabaci* Lindeman on onion in Kafr El-Sheikh region during season 2023

Compound	Pretreatment/25plant	Means Reduction $\pm$ SE %after				Overall average
		24 hours	3Day	7day	10 day	
Abamectin +bifenthrin	1675	76.93 ^g ± 0.32	80.85 ^f ± 0.89	67.90 ^f ± 0.98	47.13 ^f ± 2.31	68.20 ^h ± 7.69
Abamectin +Thiamethoxam	1975	83.54 ^f ± 0.88	88.32 ^c ± 2.65	69.85 ^e ± 2.12	54.07 ^e ± 1.15	73.94 ^f ± 10.06
Acetamiprid	1875	87.12 ^e ± 0.59	84.28 ^e ± 0.6	77.03 ^c ± 3.27	45.88 ^g ± 0.58	73.58 ^g ± 11.65
Chlorophanpyar	1500	92.64 ^d ± 1.37	93.12 ^b ± 1.02	83.52 ^a ± 1.74	72.40 ^a ± 0.87	85.42 ^a ± 5.35
Dinotefuran	2200	96.78 ^{ab} ± 0.78	84.33 ^e ± 0.86	72.35 ^d ± 1.44	44.10 ^h ± 2.58	74.39 ^e ± 5.75
Spinosad	1450	93.91 ^c ± 0.92	95.71 ^a ± 1.00	80.40 ^b ± 2.32	68.12 ^b ± 0.82	84.54 ^b ± 4.46
Spintorame	1825	97.32 ^a ± 1.36	86.34 ^d ± 2.04	80.52 ^b ± 2.82	59.31 ^d ± 2.03	80.87 ^d ± 10.18
Spirotetramat	1575	95.84 ^b ± 1.30	95.21 ^a ± 1.22	80.59 ^b ± 1.29	62.07 ^c ± 0.58	83.43 ^c ± 8.19
Control	1925					

In a Colum, means followed by the same letter are not significantly at 5%

The results shown in Table (4) indicated the means reduction of thrips population resulting from the use of compounds in the 2024 season. After 24 hours the highest reductions were recorded by dinotefuran spintorame followed by spintorame, spirotetramat, spinosad and chlorophanpyar with a significant between them by 97.03 ± 1.12 , 96.93 ± 0.96 , 95.84 ± 0.82 , and 93.91 ± 1.62 and $92.64 \pm 1.00\%$, respectively. Meanwhile, abamectin +bifenthrin recorded the lowest reduction by 74.93 ± 0.92 , respectively. After the 3rd day spirotetramat followed by spintorame and spinosad recorded the highest reductions by 92.60 ± 2.40 , 89.45 ± 1.28 and 89.15 ± 1.00 , respectively. After the 7th day the reduction rates decreased with all compound, the highest reduction recorded with chlorophanpyar followed by Spintorame and dinotefuran by 81.62 ± 2.60 , 81.43 ± 2.30 and 78.08 ± 2.30 respectively. After the 10th day, all compounds reduction was decreased, the highest reduction recorded by chlorophanpyar by 69.30 ± 1.85 . The overall average reduction resulted that the highest reduction recorded with using chlorophanpyar followed by spintorame, dinotefuran and spirotetramat by 82.79 ± 4.60 , 82.24 ± 7.60 , 79.59 ± 7.54 and 77.15 ± 7.20 , respectively.

As conclusion data in table (3 and 4) indicated that all compounds affected on *T. tabaci* and recorded a high reduction after 24 hour treatment, then the reduction rate decreased after 3 days and recorded the lowest reduction after 10 days treatment which agree with (Khozimy et al., 2021; Allam et al., 2023 and Hassan et al., 2024). Also spintorame and Chlorophanpyar recorded the highest reduction after 24 hours, 3, 7, 10 and total reduction treatment as agree with (Moretti et al. 2019, Wakil et al. 2023 and Korai et al., 2024). *T. tabaci* recorded a resistance towards abamectin, dinotefuran, acetamiprid and bifenthrin after 7 to 10 days' treatment which agree with (Asghar et al., 2018; Adesanya et al., 2020 and Mohammad Falahzadah et al., 2021).

Table (3). Means reductions rate of compounds against *Thrips tabaci* Lindeman on onion in Kafr El-Sheikh region during season 2024

Compound	Pretreat ment/25 plant	Means Reduction $\pm$ SE %after				Overall average
		24 hours	3day	7day	10 day	
Abamectin + Thiamethoxam	2075	83.54 ^g ± 1.08	88.32 ^d ± 0.76	77.86 ^b ± 1.12	54.76 ^{ab} ± 3.10	76.12 ^e ± 6.30
Abamectin1.3%+ bifenthrin8.8%	2225	74.93 ^h ± 0.92	73.88 ^f ± 1.98	67.83 ^f ± 1.85	36.56 ^b ± 3.40	63.30 ^g ± 8.52
Acetamiprid	2110	89.01 ^f ± 1.25	83.08 ^e ± 1.14	75.27 ^e ± 1.40	41.40 ^b ± 2.64	72.19 ^f ± 5.34
Chlorophanpyar	2175	92.64 ^e ± 1.00	87.61 ^d ± 0.82	81.62 ^a ± 2.60	69.30 ^a ± 1.85	82.79 ^a ± 4.60
Dinotefuran	2250	97.03 ^a ± 1.12	87.57 ^d ± 2.10	78.08 ^b ± 2.30	55.67 ^{ab} ± 2.98	79.59 ^c ± 7.54
Spinosad	2425	93.91 ^d ± 1.62	89.15 ^c ± 1.00	75.83 ^d ± 1.93	40.06 ^b ± 6.2	74.74 ^e ± 5.10
Spintorame	2325	96.93 ^b ± 0.96	89.45 ^b ± 1.28	81.43 ^a ± 2.30	61.13 ^a ± 3.21	82.24 ^b ± 7.60
Spirotetramat	1975	95.84 ^c ± 0.82	92.60 ^a ± 2.40	77.95 ^c ± 2.45	42.22 ^b ± 2.98	77.15 ^d ± 7.20
Control	1875					

In a Colum, means followed by the same letter are not significantly at 5%

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