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EFFECT OF NON-CONVENTIONAL INSECTICIDES, MINERAL OILS, BIO-AGENTS AND THEIR MIXTURES AGAINST COTTON THRIPS *Thrips tabaci* (LIND.) UNDER FIELD CONDITION

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ABSTRACT: *The experiments were carried out at Gemmeiza Agricultural Research Station Gharbia Governorate during 2010, 2011 under field conditions to evaluate the initial and residual effect of some mineral oils and bioinsecticides and their mixtures against cotton thrips, Thrips tabaci (Lind) during seedling period. All tested compounds were induced the highest reduction where the percentage in insect ranged between 43.62 to 67.43% and the initial effect of all tested compounds induced a moderate reduction giving 45.49 to 68.59% . The mineral oil (KZ) and Natrilo when combined with all the tested compounds induced high level of reductions as initial and residual effect. (KZ + Vabcomic) induced the highest initial and residual reduction values giving 73.49 and 74.02% respectively, while (Natrilo + Vabcomic) induced the highest initial and residual reduction giving 82.67 and 80.63 % against cotton thrips, respectively. Generally, it could be concluded that all mixtures had a high potency effects aganist thrips population (T. tabaci.) especially during seedling stage.*

Key words: *Thrips, mineral oil, Thrips tabaci , cotton.*

INTRODUCTION

Cotton (*Gossypium barbadense* L.) is considered the most important crop in the agricultural economy of Egypt. Cotton plants are liable to be attacked by several pests all over their life spans , i.e., during seedling period ,growing and flowering stages. 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 : Salams *et al.,* 1984 and Dent , 1991). They suck the sap of plant tissues, green leaves and young bolls and their saliva cause chemical disorders in plant tissues beside transmitting certain microbial diseases (Costa and Brown 1991). Cotton thrips, *Thrips tabaci* (Lind) is a polyphagous species attacking more than 200 plant species of field, vegetables , ornamentals and orchard crops (Best, 1968). Although primary damage to plants is physical (causing silver necroses), *Thrips tabaci* is also known to be a vector of several plant pathogens and thus causes substantial economic damage (Reddy, *et al.*, 1983 and North and Shelton, 1986).

The conventional or non-conventional insecticides were used against *T.tabaci* exhibited a high efficiency in controlling the insect pest Mousa and Taha (2001);Abdel-Aziz(2002) and Khattab *et. al.*, (2006).Also, the application with macro elements as potassium or micro elements as Zinc, Iron, Manganess or Born in the recommended concentrations gave a good results in reducing the population of the piercing-sucking insect pests as aphids, leafhoppers and thrips (Metwally and Gabr 1997; Goncalves *et al.,* 2004 and El- Shiriff 2009).

The main objective of this study is to test different compounds (Vabcomic ,CM006 , Evisect , Biofly and Mpade) either alone or combined with mineral oil (KZ and Natrilo) against *Thrips tabaci* infesting cotton on seedling stage .

MATERIALS AND METHODS

Field experiments were conducted according to Ministry of Agriculture protocol (1993) at Gemmeiza Agricultural Research Station Gharbia Governorate during 2010 and 2011 season to evaluate the efficiency of non- conventional insecticides (Minerals oil, and Bio-insecticides) and their Mixtures against cotton thrips, *Thrips tabaci* (Lind) during cotton –seedlings stage All tested

compound were sprayed at their recommended rate mentioned before using knapsack sprayer, 10 litre capacity (200 litre spray solution / fed.) on cotton plants infested with thrips . An area was divided to 32 blocks to test the seven compounds beside the control once, Seven treatments were distributed in complete randomized block design replicated four times . Infestation was assessed before spraying and after 1, 4, 7, 10 and 13 days of spraying on 100 cotton seedlings from each treatment and the untreated one then inspected using lens in the field early morning to determine the number of the thrips stages (nymphs and adults) . Percentages of reduction for the infestation of the target pest was estimated according to Henderson and Telton (1955) equation as follows :

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

Whereas:

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

Statistical analysis was mad to show

The chemical compounds were tested in the formulated form the of recommended rate except the biopesticide (biofly) which was calculated on the basis of number of conidial / ml.

The tested compounds were showed in Table (1):

1-Oils

(a)-KZ. oil (95% E.C.) formulated mineral oil supplied by Kafer El-Zayat pesticides and chemicals Company.

(b)-Natrilo (97% blend of vegetable oil, emulsifies and antioxidant)

2- Bio insecticides:

a- Biofly SC 50% = *Beauvaria bassiana* as a liquid microbial pesticide containing 3 x 10^7 conidia / ml.

b- CM006 1 % (Milbemectin) natural produced by soil microorganism. *Streptomyces hygroscopicus*

c –Vabcomic (Abamectin) 1.8% EC natural produced by soil microorganism *Streptomyce avermitits*

3- Chemical compounds :

a -Evisect 50% wp N, N- dimethyl 1,2,3, trithiane- 5- yl-amine hydrogenoxalate

b - M-pade 49% potassium salts of fatty acid

Table (1) : Tested compounds and mixtures in the field application recommended rates on cotton thrips, *Thrips tabaci*

Compounds		Mixtures			
Name	rate of application/fed.	Name	rate of application /fed.	Name	rate of application /fed.
KZ Oil	3.5 litre	KZ oil + Natrilo	3.5 litre + 2 litre	Natrilo+ KZ Oil	2 litre +3.5 litre
Natrilo	2 litre	KZ Oil+ Vabcomic	3.5 litre +80 m3	Natrilo+ Vabcomic	2 litre + 80 cm3
Vabcomic	80 cm3	KZ Oil+ CM006	3.5 litre +150 cm3	Natrilo+ CM006	2 litre+150 cm3
CM006	150 cm3	KZ Oil+ M-pade	3.5 litre +1.5litre	Natrilo+ M-pade	2 litre +1.5 litre
M-pade	1.5litre	KZ Oil+ Biofly	3.5 litre +300 cm3	Natrilo+ Biofly	2litre+ 300 cm3
Biofly	300 cm3	KZ Oil+ Evisect	3.5 litre +500 cm3	Natrilo+ Evisect	2 litre+500 cm3
Evisect	500 cm3				

RESULTS AND DISCUSSION

Initial and residual activity of the tested compounds and their mixtures with oils (KZ and Natrilo) against *Thrips tabaci* infesting cotton seedling stage under field conditions were studied.

1-The initial and residual effect by individually compounds :

The Ministry of Agriculture recommended to use the natural products and safe materials in controlling pests, effectively should believing initial effect not less than 70% reduction and residual effect not less than 40%, (Mousa and El-Sisi 2001).

The residual effect was calculated as a mean of total effect after 4, 7, 10 and 13 days from spraying. Results indicated that most tested compound individually gave high residual effect agree with the Ministry of Agriculture recommendations except in case of initial effect while 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) were the highest percentage caused by CM006 (68.59% and 66.73%) followed by Vabcomic (65.01% - 66.76%). While, the M-pade exhibited the lowest initial and residual reduction (45.49% - 43.62%).

2-The initial and residual effect of combined compounds:

Data presented in Table (3,4) indicated that, all the tested compounds showed a pronounced reductions in the numbers of the cotton thrips after application , and the tested compounds mixtures of mineral oil and Natrilo gave high initial and residual effects which agree with the Ministry of Agriculture recommendations expect in case of KZ + biofly and KZ + M-pade which showed high residual effect and low initial effect less than that of recommendations. Data in Table (4) revealed that Natrilo when mixed with all the tested compound induced high initial and residual effect agree with the Ministry of Agriculture recommendations while (KZ + Natrilo) which showed high residual effect and low initial effect less than that of recommendations. It is clearly that the KZ and Natrilo compound increased the residual mortality when added to all tested compound of (KZ oil +Vabcomic) , (KZ oil + CM006), (KZ oil + M-pade) , (KZ oil +Biofly) and (KZ oil + Evisect) which caused 74.02 , 71.40 , 60.01 , 58.60 and 72.32 % reduction respectively for mixing with KZ oil , while Natrilo added to all tested compounds(Natrilo +Vabcomic) , (Natrilo + CM006), (Natrilo + M-pade) , (Natrilo +Biofly) and (Natrilo + Evisect) gave 80.63 , 80.70 , 72.79 , 65.89 and 79.01 % reduction respectively against *Thrips tabaci* infesting cotton seedling stage as residual effect.

Also data presented in Tables (3,4) revealed excellent results due to the use of mixture consisting of Natrilo and different tested compounds compared with using the compounds individually against cotton thrips. These results were also observed in the initial and residual effect against cotton thrips, as it gave the highest initial and residual effect for KZ + Vabcomic giving 73.49 and 74.40% respectively, while Natrilo + Vabcomic giving 82.68 and 80.63 against cotton Thrips respectively. These results are in agreement with those of Mousa and El-Sisi (2001), Abd El-Aziz (2002), Abdel-Wahab *et al,* (2001) and Al- Fawaeer and Abu- Abeid (2002). Mousa (2003), El-Hamid and Ghatwary (2006), Khattab *et al.,* (2006), Al-Mazraawi (2007), Awadalla *et al.*, (2011) and Abd-Allah, (2011).

The general means of the reduction percentages revealed that vabcomic + Natrilo was the most toxic compound against cotton thrips, the mean values were 82.67 for initial effect and 80.63 for residual effect followed by CM006 + Natrilo with 77.79 and 80.70% respectively, while KZ + Vabcomic induced a the highest initial and residual reduction giving 73.49 and 74.02% respectively.

Results in Table (3,4) indicated generally that mineral oil (KZ) and Natrilo when combined with all the tested compounds reduced the mean numbers of cotton thrips *Thrips tabaci* (Lind) during seedling stage and induced high level of reduction of insect population as initial and residual effect.

Table (2): Reduction percentages of the tested compounds at recommended rate on *Thrips tabaci* populations on cotton seedlings during 2010 -2011 seasons .

Treatment	Mean no. of Thrips per 100 seedlings											Mean R%
	Before spray	Initial effect after1 day		Days after spray (Residual effect)								
				4day		7 day		10 day		13 day		
		No.	R%	No.	R%	No.	R%	No.	R%	No.	R%	
Kz Oil	1585	630 ^{ab}	64.36	590 ^{a}	73.30	650 ^{a}	72.27	750 ^{a}	66.05	845 ^{a}	58.11	67.43
Natrilo	1640	940 ^{ch}	48.60	980 ^{b}	57.13	1025 ^{b}	57.74	1110 ^{b}	51.44	1210^{bc}	42.03	52.09
Vabcomic	1640	640 ^{ac}	65.01	596 ^{a}	73.93	675 ^{a}	72.17	800 ^{a}	65.01	920 ^{ab}	55.92	66.76
CM006	1610	564 ^{a}	68.59	610 ^{a}	72.82	690 ^{a}	71.02	768 ^{a}	65.78	875 ^{a}	57.30	66.73
M-pade	1530	930 ^{cf}	45.49	1045 ^{bf}	51.01	1150^{fb}	49.17	1230 ^{c}	42.33	1325 ^{cf}	31.96	43.62
Biofly	1720	860 ^{bd}	55.16	1010 ^{bc}	57.87	1145^{db}	54.98	1250 ^{cf}	47.86	1340^{cg}	38.79	49.88
Evisect	1530	590 ^{a}	65.42	620 ^{a}	70.93	640 ^{a}	71.71	745 ^{a}	65.07	840 ^{a}	56.86	66.14
Untreated area	1650	1840	--	2300 ^{dh}		2440^{hf}		2300 ^{fh}		2100 ^{fi}		--
L.S.D	--	40.55		51.86		65.74		81.55		59.63		

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

Table (3): Reduction percentages of the tested compounds at recommended rate on *Thrips* populations on cotton seedlings during 2010 -2011 seasons .

Treatment	Mean no. of Thrips per 100 seedlings											Mean R%
	Before spray	Initial effect after 1 day		Days after spray(Residual effect)								
				4 day		7 day		10 day		13 day		
		No.	R%	No.	R%	No.	R%	No.	R%	No.	R%	
Kz Oil	1585	630 ^{ce}	64.36	590 ^{cd}	73.30	650 ^{gf}	72.27	750 ^{cf}	66.05	845 ^{cf}	58.11	67.43
Kz Oil +Vabcomic	1910	550 ^{bc}	73.49	470 ^{ab}	78.73	514 ^{b}	77.67	614 ^{b}	71.95	650 ^{b}	67.71	74.02
Kz Oil +CM006	1870	610 ^{cd}	69.98	530 ^{bc}	75.50	570 ^{cd}	74.71	640 ^{bc}	70.13	685 ^{bc}	65.25	71.40
Kz Oil + M-pade	1900	765 ^{gf}	62.94	805 ^{fg}	63.37	815 ^{fh}	64.41	905 ^{dh}	58.43	925 ^{dh}	53.81	60.01
Kz Oil + Biofly	1740	690 ^{fe}	63.50	715 ^{df}	64.48	790 ^{fg}	62.33	875 ^{dg}	56.12	890 ^{dg}	51.47	58.60
Kz Oil + Evisect	1580	500 ^{a}	70.87	430 ^{a}	76.47	450 ^{a}	76.37	520 ^{a}	71.28	580 ^{a}	65.17	72.32
Untreated area	1850	2010 ^{hg}		2140 ^{gh}		2230 ^{gi}		2230 ^{fi}		2100 ^{fi}		--
L.S.D	--	27.64		23.32		29.37		40.26		35.13		

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

Table (4): Reduction percentages of the tested compounds at recommended rate on *Thrips tabaci* populations on cotton seedling during 2010 -2011 seasons .

Treatment	Mean no. of Thrips per 100 seedlings											Mean R%
	Before spray	Initial effect after 1 day		Days after spray(Residual effect)								
				4 day		7 day		10 day		13 day		
		No.	R%	No	R%	No.	R%	No	R%	No	R %	
Natrilo	1640	940 ^{gi}	48.60	980 ^{fh}	57.13	025^{hl}	57.74	1110 ^{gh}	51.44	1210 ^{fg}	42.03	52.09
Natrilo + Kz Oil	1850	590 ^{cf}	62.66	465 ^{b}	79.35	390 ^{a}	83.38	450 ^{a}	79.87	560 ^{a}	72.97	78.88
Natrilo+ Vabcomic	1830	370 ^{a}	82.67	375 ^{a}	84.78	325 ^{c}	85.99	447 ^{a}	79.79	575 ^{a}	71.94	80.63
Natrilo + CM006	1910	495 ^{bc}	77.79	370 ^{a}	83.90	340 ^{a}	85.96	640 ^{bc}	80.07	585 ^{a}	72.88	80.70
Natrilo + M-pade	1845	575 ^{cd}	73.29	480 ^{bc}	78.38	520 ^{d}	77.78	625 ^{b}	71.96	940 ^{c}	63.02	72.79
Natrilo + Biofly	1905	650 ^{dh}	70.75	640 ^{df}	72.08	705 ^{f}	70.82	812 ^{cd}	64.72	964 ^{cd}	55.93	65.89
Natrilo + Evisect	1775	485 ^{b}	76.68	395 ^{a}	81.50	365 ^{b}	83.78	425 ^{a}	80.18	764 ^{b}	70.57	79.01
Untreated area	1920	2240 ^{hk}		2310^{gi}		2435 ^{ij}		2320 ^{hi}		2150 ^{hi}		
L.S.D	--	23.62		27.37		24.03		26.78		36.06		

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

Also data presented in Tables (3,4) revealed excellent results due to the use of mixture consisting of Natrilo and different tested compounds compared with using the compounds individually against cotton thrips. These results were also observed in the initial and residual effect against cotton thrips, as it gave the highest initial and residual effect for KZ + Vabcomic giving 73.49 and 74.40 respectively, while Natrilo + Vabcomic qgiving 82.68 and 80.63 against cotton Thrips respectely. These results are in agreement with those of Mousa and El-Sisi (2001),Abd El-Aziz (2002), Abdel-Wahab *et al*,,(2001) and Al- Fawaeer and Abu- Abeid (2002). Mousa (2003), El-Hamid and Ghatwary (2006), Khattab *et al.*, (2006), Al-Mazraawi (2007),El-Fakharany (2008) Awadalla *et al.*, (2011) and Abd-Allah, (2011).

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Results in Table (3,4) indicated generally that mineral oil (KZ) and Natrilo when combined with all the tested compounds reduced the mean numbers of cotton thrips *Thrips tabaci* (Lind) during seedling stage and induced high level of reduction of insect population as initial and residual effect.

Generally effect of the tested compounds when mixed with the mineral oil (KZ) and Natrilo exceeded pronouncedly that induced when used singly against *T tabaci* infesting cotton seedling stage.

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تأثير المبيدات الغير تقليدية ومخاليطها ضد حشرة التربس التى تصيب نباتات القطن تحت الظروف الحقلية

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الملخص العربى

أجريت التجارب بمحطة البحوث الزراعية بالجميزة – غربية خلال موسم ٢٠١٠، ٢٠١١ م تحت الظروف الحقلية وذلك لتقييم التأثيرالابادى الفورى والتأثير المتبقى لبعض الزيوت المعدنية والطبيعية وبعض المبيدات الحيوية ومخاليطها على حشرة تربس القطن أثناء مرحلة البادرة .وأوضحت النتائج : كل المركبات المختبرة والمستخدمة فرديا أحدثت أعلى نسبة خفض فى التأثير المتبقى على التربس وكانت نسبة الانخفاض فى تعداد الافة تراوحت ما بين ٦٢,٤٣ ٪ الى ٤٣,٦٧٪ بينما التأثيرالابادى الفورى لكل المركبات المختبرةأحدث نسبة انخفاض متوسطة تراوحت من٤٩,٤٥ ٪ الى ٥٩,٦٨٪ على تربس القطن .

وأيضا أوضحت النتائج المتحصل عليها أن كل من الزيت المعدنى والزيت النباتى عندما يخلط بالمركبات المختبرة يسبب مستوى عالى من الانخفاض فى تعداد الحشرات كتأثيرابادى فورى وتأثير متبقى. المخلوط كزد+ فباكوميك أحدث أعلى نسبة انخفاض فى التأثيرالابادى الفورى والتأثير المتبقى حيث أعطى ٧٣,٤٩٪ و ٧٤,٠٢٪على الترتيب. بينما المخلوط ناتيرلو+ فباكوميك أحدث أعلى نسنة انخفاض فى التأثيرالابادى الفورى والتأثير المتبقى حيث أعطى٨٢,٦٧ ٪ و ٨٠,٦٣ ٪ على الترتيب .

وعموما يمكن القول أن كل المخاليط المستخدمة أعطت تأثير منشط والذى تسبب فى انخفاض فى تعداد التربس اثناء مرحلة البادرة للقطن.