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INTEGRATED PROGRAM FOR THE CONTROL OF CITRUS NEMATODS, TYLENCHULUS SEMIPENETRANS, INFESTING SEFI ORANGE IN RELATION TO BENEFICIAL AND UN-BENEFICIAL SOIL MITES

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ABSTRACT

The obtained results indicated that, Temik 10G plus Sincocin(AGTM) treatment was the best treatment in reducing citrus nematods stages in the roots and soil of Sefi orange.

The combination of Temik 10G and Sincocin (AGTM) gave the highest reduction percentage on the total soil mite as well as the four suborders. Temik 10G singly gave the highest increase in fruit yield (numbers and weight) > Sincocin(AGTM) singly > Sincocin(AGTM) plus Temik 10 G > the check.

The combination of Temik 10G and Sincocin (AGTM) gave high reductions on the total soil mites as well as the four mite suborders. Oribatida was the most susceptible suborder. This combination gave the least effect on gamasid soil mites.

Sincocin(AGTM) singly had no bad effect on the total soil mites during the six months of the experiment in comparison with Temik 10G.

INTRODUCTION

In the recent years, the integrated nematode management are directed into utilizing different biological aspects. Soil environmental factors , and chemical control for diminshing destructive plant parasitic nematodes.

The acari exhibt various associations with other organisms, from phytophagy, predation, and parasitism to intricate commensal and phortic relationships.

Since beneficial soil mite species,i.e.predators, must be conserved in the field to promote a more stabilized pest and natural enemy balance, it has been felt necessary to establish the level of toxicity to predatory mites of compounds intended for integrated pest management (IPM).

From these points of view, the present work was concerned to apply an integrated control program for controlling citrus nematode in relation to soil mite population density as beneficial and un-beneficial genera in a citrus orchard.

MATERIALS AND METHODS

The experiment was carried out in the Experimental Farm of the Faculty of Agriculture, Shebin El-Kom for six months from June, 1990 to November, 1990. Selected citrus trees, Citrus sinensis var. Sefi were of the same size, height and vegetation, and were naturally infected with citrus nematode, Tylenchulus semipenetrans. All agricultural practices were done as the normal system in citrus orchards. Treatments were replicated three times. The tested Compounds, Dosage and the methods of applications are recorded in Table 1.

Three composite soil and root samples from each treatment were taken monthly. Samples were collected in polyethylene bags and prepared in the same day for nematode extraction from soil by Baermann funnel for 72 hrs, then counted under stereomicroscope. Roots were washed carefully under running tap water in order to remove soil particles. A sample of 1 g. represented for not less than 24 hrs. Nematode stage were counted under a stereomicroscope.

Three composite soil samples from each treatment were collected, kept in polyethylene bags and transferred to the laboratory. A volume of 1000 cc of each replicate was kept in a modified Tullgren funnle for 72 hrs. Extracted mites were kept in 70% ethyl alcohol. Research microscope was used to identify and count all individuals of four soil mite suborders.

Yield was determined as number of fruits and weight in Kg. per tree for all treatments.

Data of nematodes and soil mites were subjected to the analysis of variance test (ANOVA) with mean separation at 5% level of significance by L.S.D. test (Snedecor and Cochran, 1967). Reduction percentages were calculated according to Abbott's formula (1925).

RESULTS AND DISCUSSION

1. Integrated control of citrus nematode in the soil and roots:

Data presented in Tables 2 and 3 show that Temik and Sincocin(AGTM) singly or in combination suppressed citrus nematode population in the soil and roots six months after application. Temik 10G singly was the least in reducing nematode population in the soil, but Temik 10G plus Sincocin(AGTM) treatment was the best in reduc- nematode stages attached to the roots.

Table 1: Trade name, formulation, chemical category, common name, chemical name, dosage and method of application of different treatments.

Treatments	Chemical category	Common name	Chemical name	Dose Kg. or lit./f.	Method appli-cation	Appli-cation time
1. Temik 10G	O.C.	Aldicarb	2-methyl-2-(methylthio) propionaldehyde-O-(methyl) carbamoyloxime	25 Kg.	A	May, 1990
2. Sincocin AGTM	Plant extract	Sincocin	Not available	0.5 lit.	B	May, 1990
3. Temik 10G + Sincocin AGTM	O.C. + Plant extract	Aldicarb + Sincocin		25 Kg. + 0.5 lit.	A + B	May, 1990
4. Check	-	-	-	-	-	May, 1990

O.C. = Organo-Carbamate
A = Broadcasted in a circle, 100 cm in diameter around the tree at 20 cm depth.
B = 3 ml./tree diluted with 4 lit. water and applied in a circle, 100 cm diameter around the tree, at 20 cm depth.

Statistical analysis of the data (Table 2) indicate that, there are significant differences in nematode population in the soil among months. Also, there are significant differences among Temik, Temik plus Sincocin, and the check.

Statistical analysis of the data (Table 3) show that, there are significant differences in nematode population in the roots among months. In addition, there are significant differences among all treatments and the check.

2. Reduction percentages of citrus nematode population in the soil and roots of Sefi orange trees:

Data presented in Table 4 show that all the treatments had a good control on citrus nematode and long residual effect six months after application.

Results in Table 5 indicate that the effect of all treatments on citrus nematode stages attached to the roots was lower than its effect in reducing citrus nematode stages in the roots. The effect of the treatments on egg-masses was lower than its effect on immature and mature stages in the roots.

It could be concluded that Sincocin(AGTM)as an aqueous extract of plant, singly gave satisfactory results as a biocontrol agent in reducing nematode populations.

The present results agree with those of Baines and Small (1969) who reported that Furadan, Mocab and Temik displayed a good control against T. semipenetrans. In addition, Frederick and Tarjan (1977) found that Aldicarb at 12 Kg. a.i./ha. reduced the number of T. semipenetrans by 83 - 88%.

Table 2: Effect of Temik 10G, Sincocin AGTM singly and in combination on citrus nematode in the soil of Sefi otange during June - November, 1990

Treatments	Average no. of T. semipenetrans larvae per 250 g. soil							
	June	July	Aug.	Sep.	Oct.	Nov.	Total	Mean
Temik 10G	9.2	14.2	30.0	67.8	92.8	61.1	275.0	44.3
Sincocin AGTM	18.1	18.6	57.8	114.9	195.0	229.1	633.5	105.5
Temik 10G+Sincocin AGTM	4.2	23.3	48.3	29.7	179.4	90.3	375.2	62.5
Check	32.2	26.4	121.1	201.4	383.9	750.0	1515.0	252.5

- L.S.D. at 5% level between months = 177.8 , between treatments = 145.1

Table 3: Effect of Temik 10G, Sincocin AGTM singly and in combination on citrus nematode stages attached to the roots of Sefi orange during June - November, 1990.

Treatments	Average numbers of citrus nematode, T. semipenetrans stages / lg. roots																									
	June, 1990				July				Aug.				Sep.				Oct.				Nov. 1990				Grand mean			
	I.	M.	T.	E.	I.	M.	T.	E.	I.	M.	T.	E.	I.	M.	T.	E.	I.	M.	T.	E.	I.	M.	T.	E.	I.	M.	T.	E.
Temik 10G	4.6	9.0	13.6	3.6	4.5	9.6	14.2	2.0	2.6	7.5	10.2	2.3	3.0	8.3	11.3	2.6	2.3	5.3	10.6	3.3	3.3	8.3	11.6	3.0	3.4	8.5	11.9	2.3
Sincocin AGTM	7.5	7.6	15.2	2.6	2.6	4.0	11.5	2.3	4.3	10.7	15.0	4.3	4.3	15.0	19.3	4.3	5.6	16.3	21.9	4.6	4.6	16.0	25.5	5.3	4.1	12.5	16.7	3.9
Temik 10G + Sincocin AGTM	2.3	5.6	7.9	2.0	1.3	5.3	7.9	2.0	4.3	8.3	12.0	3.3	2.3	9.0	11.3	3.0	2.6	9.3	12.0	2.6	1.6	8.3	9.9	2.5	2.3	7.8	10.1	2.4
Check	2.5	10.6	14.2	3.3	4.3	14.9	19.2	3.0	7.3	19.0	25.6	6.3	5.3	21.0	27.3	4.6	5.0	18.5	23.5	5.6	6.6	23.6	30.1	5.5	5.5	17.9	23.4	4.7

I = Immature stages.

M = Mature stages.

L.S.D. at 5% level between months = 1.6

L.S.D at 5% level between treatments = 1.3

Table 4: Reduction percentages of citrus nematode in the rhizosphere of Sefi orange treated with Temik 10G, Sincocin AGTM singly and in combination during June - November, 1990.

Treatments	*Reduction % of second stage larvae in soil						Grand mean
	June	July	Aug.	Sep.	Oct.	Nov.	
Temik 10G	71.4	46.2	75.2	66.3	75.8	91.9	71.1
Sincocin AGTM	43.8	29.5	52.3	42.9	49.2	69.5	47.9
Temik 10G + Sincocin AGTM	87.0	11.7	60.1	85.3	53.3	88.0	64.2

* Abbott's formula.

Table 5: Reduction percentages of citrus nematode stages attached to the roots of Sefi orange treated with Temik 10G, Sincocin AGTM singly and in combination during June-November, 1990.

Treatments	* Reduction percentages												Grand mean	
	June		July		Aug.		Sep.		Oct.		Nov.			
	T.**	E.**	T.	E.	T.	E.	T.	E.	T.	E.	T.	E.	E.	T.
Temik 10G	4.2	0.0	22.4	33.3	61.7	63.5	58.6	43.5	55.0	43.4	61.7	46.4	43.9	38.4
Sincocin AGTM	21.1	21.2	37.2	23.3	43.6	36.5	27.1	7.0	7.2	21.7	32.0	5.4	28.0	19.2
Temik 10G + Sincocin AGTM	44.4	39.4	56.8	33.3	54.9	63.5	59.7	30.2	49.1	53.6	67.3	53.6	55.4	45.6

* Abbott's formula.

** T.= Total immature and mature stages.

E.= Egg laying-female with egg-mass.

Abu-Elamayem et al.(1982) applied Aldicarb to control citrus nematode and found that Aldicarb decreased citrus nematode population. Also, Harris (1983) applied Fumazone, Nemacur as well as Temik to control citrus nematode on Citrus sinensis var. Valencia and found that all treatments reduced nematode populations.

Mani et al.(1986), Tiyagi et al.(1986),Paracer et al.(1987),El-Sherif(1989),Sweelam (1988) and Mousa et al.(1989) found that plant extracts were effective against nematodes.

3. Effect of Temik 10G, Sincocin(AGTM) singly and in combinations on beneficial and unbeneficial soil mites:

Data in Table 6 show the population density of total soil mites and four mite suborders.

Regarding to the effect of Temik 10G on the four soil mite suborders. However, data(Table 7) clearly indicate that all suborders were affected throughout the six months of investigation . Highly reduction rates were recorded on Gamasida, Actinedida, Acaridida and Oribatida.

Sincocin (AGTM) had no bad effect on the total soil mites during the six months of the experiment in comparison with Temik 10G, It had a good result in increasing soil mites.Moreover, data reveal that Sincocin (AGTM) gave activation effect on actinedid mites comparing with other three suborders. The combination of Temik 10G and Sincocin (AGTM) gave high reductions on the total soil mites as well as the four mite suborders. However, Oribatida was the most susceptible suborder, while this combination gave the least effect on gamasid mites.

Table 6: Effect of Temik 10G, Sincocin AGTM singly and in combination on the total soil mite population density including four suborders inhabiting the biotope of Sefi Orange during June - November, 1990.

Treatments	Avergae number of soil mites /1000 CC soil																															Total	Mean
	June (1990)					July					August					September					October					November (1990)						
	A*	B*	C*	D*	T*	A	B	C	D	T	A	B	C	D	T	A	B	C	D	T	A	B	C	D	T	A	B	C	D	T		
Temik 10G	3	2	6	4	15	6	5	5	13	29	6	6	3	6	21	5	2	3	6	16	6	2	3	9	20	4	2	3	7	16	119	19.8
Sincocin AGTM	19	2	19	18	58	7	6	5	14	32	8	4	8	13	33	6	5	6	11	28	9	5	6	12	32	6	4	6	10	26	309	51.5
Temik 10G Sincocin AGTM	5	3	3	2	13	6	2	3	5	16	4	2	3	5	14	4	2	3	5	14	4	2	3	7	16	3	2	4	5	14	87	14.5
Check	20	7	14	19	60	16	8	10	22	56	11	7	9	13	40	11	7	8	16	42	11	6	8	21	46	10	6	9	16	41	285	47.5

* A= suborder = Gamasida.
B= suborder : Actinedida.
C= suborder: Acaridida.
D= Suborder : Oribatida.
T= Total of four suborders of soil mites.

L.S.D. at 5% level between treatments = 1.4
L.S.D. at 5% level between suborders = 1.4
L.S.D. at 5% level between Months = 1.8

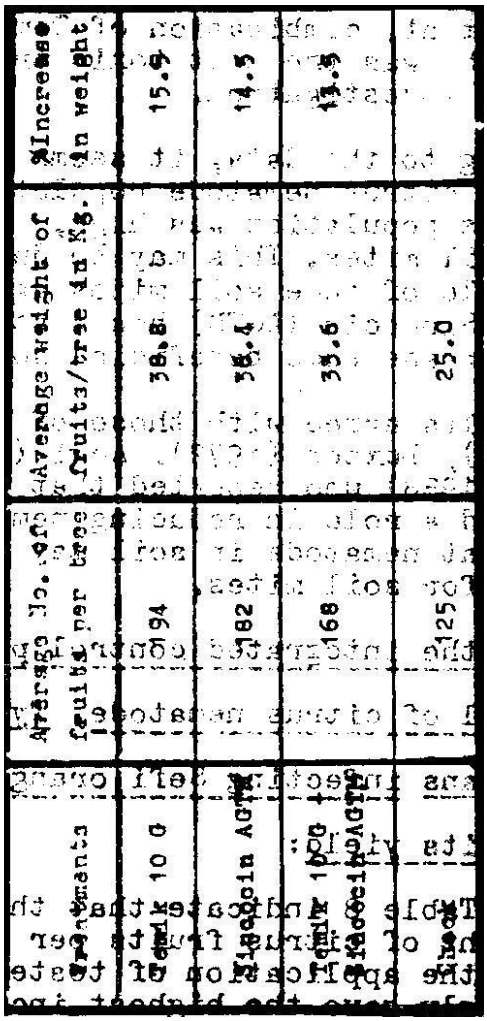
Table 7: Reduction percentages of the total soil mite and four mite suborders inhabiting soil of Sefi orange treated with Temik 10G, Sincocin AGTM singly and in combination during June - November, 1990.

Months	Gamasida			Actinedida			Acaridida			Oribatida			% total mite		
	T.*	S.*	T+S*	T.	S.	T+S	T.	S.	T+S	T.	S.	T+S	T.	S.	T+S.
June, 1990	85.0	5.0	75.0	71.4	71.4	57.1	57.1	00.0	78.6	78.9	5.3	89.5	75.0	3.3	87.3
July.	62.5	56.3	62.5	37.5	25.0	75.0	50.0	50.0	70.0	40.9	36.3	77.3	48.2	42.9	71.4
August	45.5	27.3	63.6	14.9	42.9	71.4	66.7	11.7	66.7	53.8	00.0	61.5	47.5	17.5	65.0
September	54.5	45.5	63.6	71.4	28.6	71.4	62.5	25.0	68.8	50.0	31.3	66.7	57.1	33.3	66.6
October	45.5	18.2	63.6	66.7	16.7	66.7	62.5	25.0	62.5	57.1	42.9	66.7	56.5	30.4	65.2
November 1990	60.0	40.0	70.0	66.7	33.3	66.7	66.7	33.3	55.6	56.3	37.5	68.8	60.9	36.5	65.9

T* = Temik 10 G.

S* = Sincocin AGTM.

T*+S* = Temik 10G plus Sincocin AGTM.



Statistical analysis of the data indicated that there were significant differences in mites population among months and among treatments.

Generally, from the mentioned data, it could be concluded that, combination of Temik 10G plus Sincocin (AGTM) was the most toxic treatment in all months of investigation.

Regarding to the data, it seems that in the periods where citrus nematode population was low, the soil mites population was high, especially predacious soil mites. This may be due to the beneficial role of some soil mites against nematodes. Also, Sincocin (AGTM) has a stimulating effect to increase some beneficial soil mites.

Our results agree with those of Wallwork (1967), (1970), Luxton (1972), Acki (1973) and Osman et al. (1988) who reported that predacious soil mites had a role in reducing nematode population and that nematode in soil may be available as food for soil mites.

4. Effect of the integrated control program on the control of citrus nematode, Tylenchulus semipenetrans infecting Sefi orange in relation to its yield:

Data in Table 8 indicate that the mean numbers and weight of citrus fruits per tree six months after the application of tested materials. Temik 10G singly gave the highest increase in fruits numbers and weight, followed by Sincocin (AGTM) singly and Sincocin (AGTM) plus Temik 10G in comparison with the check. The increasing in weight fruits in comparison with the check were 15.5%, 14.5% and 13.5% for Temik 10G, Sincocin (AGTM) and Temik plus Sincocin, respectively.

The present data are in harmony with those of Salem et al.(1981) who found that the average numbers of citrus fruits and yield in Kg./tree were higher with treatment of Vydate than Fumazone than the check.

Abu-Elamayem et al.(1982) tested in a field trial the effectiveness of five nematicides for the control of citrus nematode. The nematicides gave significant increases in the number of fruits, where it was 59 in control and 85 - 223 for tested nematicides. No significant differences was observed in the weights of fruits .

Rabeh and Sweelam (1990) found that the yield was increased after the application of the nematicide, Vydate , where it was 82.1 and 68.4 Kg./tree for the two rates of 50 and 75 ml/tree, respectively.

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برنامج مكافحة متكاملة لنيماتودا المولح وعلاقة ذلك بحلم التربة النافع والفطار

تهدف هذه الدراسة الى معرفة تأثير المبيد النيماتودى التميك ١٠ ٪ محبب Temik 10G وكذلك المادة البيولوجية السنكوسين Sincocin AGTM على سلوك كل من نيماتودا المولح وأكاروسات التربة بالاضافة الى دراسة تأثير الخلط بين مبيد التميك ١٠ ٪ محبب والسنكوسين على مجتمع نيماتودا المولح وأكاروسات التربة والممثلة بأربعة تحت رتب مختلفة .

ولقد تمت هذه الدراسة بمزرعة كلية الزراعة بشبين الكوم على أشجار برتقال صيفى حيث تم تطبيق التجربة وأخذت عينات شهرية من كل من التربة والجذور بعد التطبيق لاستخلاص نيماتودا المولح وحلم التربة المختلفة وذلك لمدة ستة شهور وتم تقدير المحصول فى نهاية التجربة .

وقد أسفر البحث عن ان التميك + السنكوسين سجل أفضل نتائج فى خفض أعداد نيماتودا المولح فى منطقة الريزوسفير وجذور البرتقال الصيفى كما كان لها تأثير واضح فى خفض المجتمع بالمقارنة بالمعاملات الاخرى كان للمادة البيولوجية السنكوسين دورا هاما فى زيادة أعداد حلم التربة وخاصة المفترسة فى تربة البرتقال الصيفى. كما حدث زيادة فى وزن وعدد الثمار فى المعاملات المختلفة .

مما سبق يتضح أن استخدام المادة البيولوجية السنكوسين والتى تؤدى الى زيادة أعداد حلم التربة وخاصة المفترسة التابعة لتحت رتبة Gamasida بالاضافة الى استخدام المبيد النيماتودى التميك ١٠ ٪ محبب تلعب دورا هاما وفعالا فى برامج المكافحة المتكاملة لنيماتودا المولح .