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EFFECT OF CERTAIN PESTICIDES ON COMMON PHYTOPHAGOUS AND SOIL MITES SPECIES IN APPLE ORCHARD

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ABSTRACT

Field experiments were carried out to identify and estimate the abundance of soil mites underneath apple trees throughout June/Dec. 1997 at Kafer El-Dawar region, Beherra province. Results indicated the occurrence of different mite species of four suborders of Oribatida, Gamasida, Actineda and Acaridida. The mean total numbers from June to December on three replicate to were 1303, 246.2, 292.3 and 219.7, respectively. Oribatida was the highest abundant. Also, monthly variations among the mite species were noticed.

Twenty soil-mite species belonging to fifteen families were found underneath soil associated with apple trees, including parasitoids, predators and mites of uncertain feeding habits during the periods of investigation.

In addition, the comparative efficiency of neoron (Bromopropylate), cidial (Penthoate) and biofly (Beauvaria bussiana) on tested-either soil mites or mite species on the above phytophagous ones on apple leaves was studied. Results indicated that the test-material induced the highest reductions in Aculops malus (Zaher and Abou-Awad), Panonychus ulmi (Koch) and Tetranychus urticae (Koch) on leaves after 7 days as well as tested for long periods of 4 months after application. In addition there were sensitivity of soil mites to the test-pesticides after 7 days with higher sensitivity of Acaridida significant difference were noticed among inspection periods and average percent reductions in mite species on apple leaves and those in soil underneath trees.

INTRODUCTION

A reduction yield and quality of apple can be attributed to the result of increased pest populations as insects, pathogens, weeds, snails and mites. Mite species were found to be the highest abundance of different systems (El-Halawany *et al.*, 1989, Ehsan and Farrag 1997; and Farrag and Zakzouk 2002). Studies were conducted to investigate the abundance, species composition of soil mites and influence pesticides; Perdu and Crossley 1990; Al-Assuity and Khalid 1995; Lee Y.O. *et al.*, (1997); Mesbah *et al.*, 2000; and Mesbah *et al.*, 2001).

Many of soil mites are useful for feeding on types of prey, including: Collembola, larvae of diptera and immature stages of mites and nematodes (Sardar and Murphy (1987); Walter (1989) and Walter et al (1989)). Also, El-Assiuty (1991) mention that some oribated mites plays an important part as a predator of soil nematode melordogyne.

Multi-application of insecticides or acaricides has a significant negative effect on the abundance of mites especially predacious mites and caused contamination soil (Salminen and Sulkava 1996). Therefore, the aim of this work is to determine the comparative distribution of soil mite species

underneath apple trees at Kafer El-Dawar region. It addition, the efficacy of some chemical and biocide treatments are considered to be promising approaches for suppressing the population of certain mites against mite species on apple leaves and to soil mites as initial and residual effect tested compounds) moreover the long effect (from Sep till Dec) to be consider a data to express contamination of soil.

MATERIALS AND METHODS

Pesticides :

- Neoron 50% EC (Bromopropylate).
- Cidial 50% EC (Phenthoate).
- Biofly 100% L (Beauvaria bassiana, 3×10^7 sporest/cm^3).

The used rates were 0.04, 0.3 and 0.15 L/100L water from the above mentioned pesting, respectively. The survey and relative distribution of soil mites were carried out using three replicates each replicate 1000g. on apple trees (Pyrus malus, Roseceae) variety of Anna at growers orchards at Kafer El-Dawar region. The field experiments were continued throughout June/Dec 1997. Samples of soil about 1000g. were collected at monthly from untreated plots with three replicates each treatment. They were taken at depth of 0-20 cm, around 50 cm of tree trunk and immediately transferred to laboratory. Extraction of soil mite species was done as described by Zaki (1983).

The collected mites were identified by Krantz (1978) and Zaher (1986). The system of grouping of Davis (1962) and explained by Zaki (1983) was adopted, in which species were grouped into classes according to their dominance levels. The dominate levels were occasionally under 5%.

In addition, the pesticides were sprayed on trunk and branches to estimate the biological performance on mites. The pesticide treatments were applied four times. Each treatments includes four trees. At randum 40 leaves were taken and investigative by using stereoscopic binocular microscopic.

On the other hand the effect pesticide on the mites inhabiting soil in the area of treatment was carried out at the same time of inspecting the leaves. Three sample were taken for this study. The sample per replicate was 1kg of soil was check for determing the soil contamination.

Percent reductions in numbers of mobile stages of mite species after indicated days of application were calculated by using Henderson-Tilton's formula (Henderson and Tilton, 1955).

The data were subjected to analysis of variance (ANOVA) and the means were compared by LSD test at 0.05 level.

RESULTS AND DISCUSSION

Survey and relative abundance of soil mite species

Data in table (I) and Fig. (1) indicate the mite species found in soil underneath apple trees through inspection period of June/Dec 1997. The following four suborders were identified, Oribatida, Gamasida and Acaridida.

Results showed monthly variations in the mean numbers of mite suborders. Moreover, it could be noticed that Oribatida mites had two peaks from Aug and Nov 1997, the 2nd suborder showed in the study that Gamasida with highest peak recorded in Oct and Actineda, where included two peaks in Sep and Dec. Mean while Acaridida include was recorded one species with one peak in Sep. Mesbah *et al.*, (2001) reported that Oribatida mites had the highest occurrence followed by Gamasida, Actined and Acaridida underneath trees of apple, pear and guava in Alexandria, Beherra and Monoufia governorates.

Table (I): Relative abundance of soil mite species under apple trees at Kafer El-Dawar region,1997.

Suborder and family of Acari	Mite species	Mean numbers of mite species/month									
		June	July	Aug	Sep	Oct	Nov	Dec	Total	%	Means
I- Oribatida											
Northroidae	*Nothrus sp*	10 3	21 0	39 7	10 0	25z.7	24 0	15 0	145.7	11 2	20 8
	Zygoribatula sayedi	0 7	5.3	31 7	30.3	10 0	18 3	9 3	105 6	8 1	15 1
	Siculobata sicula	58.7	73 3	103 3	71 3	91 0	191 0	151 3	740 0	56 7	105 7
Oppidae	*Oppia sticta*	3 3	2.3	9 3	21 0	0 0	5 3	10.7	52.0	4 0	7 4
	Multioppia wilsoni	4 7	5 0	10 0	2 3	19.0	10 3	4 3	55 6	4 3	8.0
	Oppiella aegyptica	0.0	2.3	0 7	6 0	1 7	0 7	8 3	19 7	1.5	2 8
Oribatulidae	*Euschelovibates sp.*	0 0	0 3	10.3	3 3	16.0	37 3	14 3	81 5	6 3	11 6
	Protoribates spp.	0.7	0.0	4.0	6.0	8.7	0 0	1.7	21 0	1 6	3 0
Galumnidae	*Allogalumna onfluens*	0.7	7.3	7 3	2 3	7 0	14 0	0.0	38 6	3 0	5 5
Euphthiracaridae	*Euphiracarus sp*	0 0	2.3	0 3	4 7	0 0	4 3	7 0	18 6	1 4	2 7
Epilohmannidae	*Epilohmannia cylindrics*	0.0	0.0	8 0	5 0	10 0	1 3	0 3	24 6	1 89	3 5
Total		79.1	119 3	224 6	162 2	189 1	30 6 5	222 2	1303		
%		6 1	9 2	17 2	12 4	14 5	23 5	17.1			
II- Gamasida											
Parholaspidae	Gamsholaspis variabilis	6 0	4 3	5 7	14 3	74 3	16 7	25 0	146 3	61	20 9
Phytosiidae	*Amblyseius messor*	0 3	0 7	0 0	6 0	12 0	20 3	15 7	55 0	23 0	7 9
Uropodidae	*Uropoda misella*	0 7	0 0	0 3	7 3	5.0	6.0	4 3	23 6	9 9	3 4
Macrochelidae	*Macrocheles monchaolska*	0 0	0 3	0 0	1 0	7 0	8 0	5 0	21 3	6 6	3 0
Total		7.0	5.3	6.0	28.6	98.3	51.0	50.0	246.2		
%		2.8	2.2	2.4	11.6	39.9	20.7	20.1			
III- Actinedae											
Pygmephoridae	*Bckerdonia sp*	7 3	7 0	41 7	87 0	15 3	90 3	137 7	356 3	78 5	55 2
Taronemidae	*Stenotarsone mus pallidus*	0.0	0 0	0.0	1.3	10 3	3 0	4 3	19 0	3 9	2 7
Cunaxidae	*Cunaxa setirotris*	0 7	0.0	4.3	7 7	28 7	11.0	5 7	58 0	11 8	8 3
Spinibdellidaes	*Spinibdella bifurcata*	0 3	0.0	1.0	3 0	9.0	8 3	7 3	28 9	5 6	4 1
Total		8.3	7.0	47.0	99.0	63.3	112.6	155.0	492.2		
%		1.7	1.4	9.5	20.1	12.9	22.9	31.5			
IV- Acrididae											
Acaridae	*Tyrophagous putrescentiae*	4.0	4 7	47 7	94 0	53 7	5 0	10 7	219 7	100	31 4
%		1.8	2.1	21.7	42.8	24.4	2.3	4.9			
Among total of suborders		98.1	136.3	325.3	383.8	404.4	475.1	237.9	2060.9		
%		4.8	6.6	15.8	18.6	19.6	23.1	11.5			

Results showed that suborder Oribatida mite species was representatively Nothrus sp.; Z.sayedi and S.sicula, O.sticta, M.wilsoni and

O.aegytica, Euscheleloribates sp. Protoribates spp., A.confluens, Euphiracarus sp. and E.cylindrics. It was obvious that, S.sicula was abundant, mites represent the highly (56.7% followed by Nothrus sp. with 11.2% of Oribatida Table I).

In case of suborder Gamasida, the following mite species were identified G.variabilis (Parholaspidae), A.messor (Phytosiidae), M.monchaolska (Macrocholidae) and U.misella (Uropodidae). The highest percentage of abundance was noticed in G.variabilies indicating 61.1% of Gamasidae (Table I). On the other hand concerning the four soil mite species suborder Actineda, was *Bakerdania sp.* (Pygmephoridae), *S.pallidus* (Tarsonemidae), *C.setirostis* (Cunaxidae) and *S.bifurcata* (Spinibdellae) as indicated in Table (I). Bakerdania sp. was the highest existing sp. Which reached 78.5% followed by *C.setirostris* with 11.8% of Actineda.

Conceming suborder Acaridida, it was found that was the only *T.putrescentiae* was the alone species with a total number of 219.7 through Jun/Dec. In 1990, Perdue and Crossley reported that the most soil mites were found in the 0-5 on zone, in which a highest moisture content occurred and was the zone of maximum root biomass and microbial activity.

Data in Table I WAS indicated that the total numbers of Oribatida, Actineda, Gamasida and Acaridida were 1303, 492.3, 246.3 and 219.7 individuals, respectively. In addition the differences in number of mites were noticed during the period of investigation. Al-Assuity *et al.*, (1993) reported that the monthly variation of Oribatida depending on vegetational types, time and sites, while no significant differences were showed with other Acari.

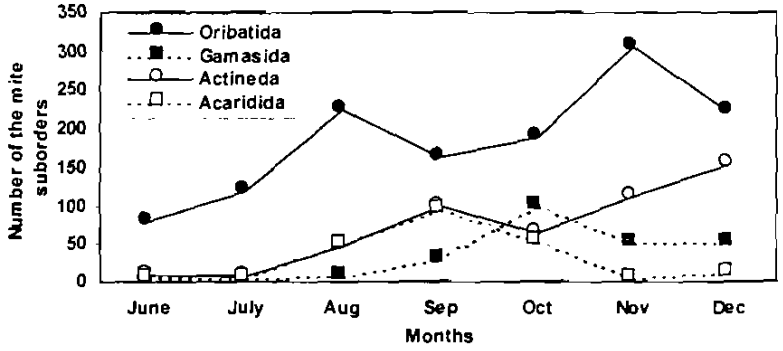

Fig. (1): Monthly variation and population densities of mite suborders inhibiting soil under apple trees in Kafr El Dawar, 1997.

The biological performance of pesticides against the mite species on apple leaves was shown in Table II. Application of bromopropylate (neoron), phenthoate (Cidial) and *B.bassiana* (Biofly) induced 60.9%, 70.0% and 81.3% reduction in apple rust mite *A.malus*, respectively after one day from application.

Table (II): Efficacy of chemicals and biocide treatments as a percent reduction of some mite species on apple leaves at Kafer El-Dawar region

Mite species	Treatment	Percent reduction (% R) after days and months of application							Average		Grand average	
		1d.	3d.	7d.	14d.	21d.	28d.	35d.	Sept	Oct	Nov		
A malus	Bromopropylate	60 9 d	89 9 bc	93.5 bd	96 6 ab	99 1 ab	99 9 ab	99 9 ab	100 0 a	98.3 ab	100 0 a	93 8 AB	
	Phenthoate	70.0 c	71 1 cd	78.9 cd	86.3 bc	98.1 ab	78.2 c	88.8 bc	98.0 ab	20 3 f	100 0 a	78.9 D	89 7 A
	B bassiana	81 3 cd	90.8 bc	93.8 bc	99.1 bc	99 7 ab	99 8 ab	99 7 ab	100 0 a	100.0 a	100 0 a	96 4 A	
P ulmi	Bromopropylate	30.0 ef	61 4 d	75.9 cd	88.2 bc	96.4 ab	98 5 ab	99 9 ab	100 0 a	100.0 a	100.0 a	85 0 C	
	Phenthoate	68 7 c	88 2 bc	75 0 ab	96.8 ab	98 8 ab	78 3 cd	87 5 bc	59 6 d	75.7 cd	55.1 de	80.4 D	84 0 B
	B bassiana	48 4 de	67 4 cd	78.9 bc	85.6 bc	91 5 ab	97 8 ab	96. ab	99 0 ab	100.0 a	100 0 a	86 5 BC	
T urticae	Bromopropylate	51.6 de	62 2 d	90 1 bc	95 9 ab	99.7 ab	100.0 a	99 7 ab	99.0 ab	96.5 ab	100.0 a	89 5 AB	
	Phenthoate	56.8 de	69.1 cd	77.9 cd	91 7 bc	97.3 ab	94.4 ab	99 6 ab	100 0 a	96.2 ab	93.5 bc	87.6 C	85 9 AB
	B bassiana	39.7 e	51.2 de	63 1 d	86 5 bc	83.2 bc	88 0 bc	98 8 ab	93.8 b	100.0 a	100 0 a	80.4 D	
Grand average		65.4 F	72.4 E	83.0 D	91.9 C	95.9 AB	92.8 ABC	96.7 A	94.4 A	87.5 BC	87.5 BC	94.3 AB	

Means followed by the same letter are not significantly different at 0.05 level by LSD test

While, the reductions in *P.ulmi* were 30.0, 68.7 and 48.4%, respectively. The corresponding figures were 51.6, 56.8 and 39.7%, respectively in *T.urticae*. Significant differences were noticed among pesticides used and mite species. After 7 days, the test-materials gave higher reductions in the above-mentioned mite species. On the other hand the data showed that neoron gave 99.9, 99.9 and 99.7% gave reduction against *A.malus*, *P.ulmi* and *T.urticae* species, respectively after 35 days. Mean while the percent reduction for cidial against the same species of mites gave 88.7, 87.5 and 99.6% receptively. The same trend was observed with the biofly (*B.bassiana*), who shows 99.7, 96.6 and 98.8% reduction respectively in the same three mite species In 1997, Zakzouk and Farrag mentioned that Neoron 50% and Tridex 80% (Mancozed) decreased significantly numbers of the citrus rust mite, *Phyllocoptruta oleivora* (Ashmead) and the citrus flat mite, *Brevipalpus obovatus* (Ponnadieu) on novel orange trees at Sabahia, Alexandria.

Aggregation of soil mite species underneath apple trees was estimated in relation to the influence of pesticide (Table III). Biofly, Cidial and Neoron showed lowest the effects on suborders of Oribatida, Gamasida, Actineda and Acaridida after 1 day. The percent reductions was ranged from 1.5 to 30.8. Acaridida appeared to be pesticides-sensitive species and percent reductions were 67.2, 75.7 and 94.4% for Neoron, Cidial and Biofly, respectively after 7 days. On the contrary, Gamasida was the highest resist suborder which showed 13.7-58.6% reduction with the pesticides used after 35 days. These treatments induced higher reduction reached 92% on Oribatida, Actineda and Acaridida suborders.Mean while the results was 51.5%, 5.54% and 100.0% for Biofly, Neoron and Cidial on Gamasida suborder.

Table (III): Efficacy of chemicals and biocide treatments as a percent reduction of some mite species in soil under apple trees at Kafer El-Dawar region

Suborder of acari	Treatment	Percent reduction (% R) after days and months of application								Average		Grand average	
		1d.	3d.	7d.	14d.	21d.	28d.	35d.	Sept	Oct	Nov		
Oribatida	Bromopropylate	20 8 ij	21 1 ij	63.5 f	64.0 f	72.1 ef	75 4 e	92 5 c	95 9 bc	93 8 c	93.2 c	69 2 F	
	Phenthoate	25 0 ij	40 5 gh	71.7 de	66 6 ef	72 0 ef	98 7 ab	99.5 ab	98 6 b	97 5 b	79.5d e	74 9 ABC	69 1 C
	B bassiana	23 4 ij	33 7 gh	79 3 de	79 7 de	88 2 cd	81 6 de	92 9 c	95 1 bc	31 7 hi	24 5 ij	63 0 G	
Gamasida	Bromopropylate	30 7 hi	21.6 j	58.6 fg	47 1 gh	49.7 g	22 7 ij	54 1 fg	72.7 ef	76 3 de	60.3 fg	94 4 H	
	Phenthoate	16 4 j	53.8 fg	13.7 jk	26 9 I	61 3 f	100 0 a	100.0 a	100.0 a	100 0 a	100 0 a	67 2 CD	56 1 D
	B bassiana	9 4 jk	24 4 j	52 6 ij	67 9 e	44 4 gh	27 0 I	51 5 fg	66 7 e	90 7 c	82 9 de	51 7 H	
Actineda	Bromopropylate	4 1h	42 2 gh	71 8 ef	77 4 de	84 7 d	83 5 de	97 0 ab	100 0 a	100 0 a	100 0 a	76 1 AB	
	Phenthoate	26 2 hi	39 6 gh	76 5 de	72 9 ef	73 1 ef	99 2 ab	100 0 a	100 0 a	100 0 a	77 3 de	76 5 A	74 7 A
	B.bassiana	1 5I	38 9 h	77 6 de	63 5 f	81 8 de	95 6 bc	98.9 a	100.0 a	100.0 a	57 9 fg	71.6 DE	
Acaridia	Bromopropylate	7 6 .	34.3 hi	67 2 ef	64 9 f	68 4 ef	100 0 a	100.0 a	100 0 a	100.0 a	100 0 a	74 2 A	
	Phenthoate	30 8 hi	41 3 gh	75 7 e	73 7 ef	78.8 cd	79 9 bc	97 4 bc	91 4 b	91 4 c	70 1 e	76 5 BCD	73 1 B
	B bassiana	30 1 hi	98 2 ab	94 4 be	100 0 a	48 0 gh	27 8 I	92 0 c	56 2 fg	56 2 fg	46 6 gh	68 6 EF	
Grand average		18.8 G	70.8 F	66.9 E	67.1 E	69.3 E	75.8 C	89.7 A	93.3 A	86.5 B	74.4 D		

Means followed by the same letter are not significantly different at 0.05 level by LSD test

In Nov, biofly snowed 24.5, 46.6, 57.9 and 82.9% reduction in Oribatida, Acaridid, Actineda and Gamasida, respectively. Using chemical pesticides, it was obvious that the highest effect was obtain on Neoron. Moldenke and Thies 1996 recorded that the species compositions of treated soil with chloropicrin fumigation affected the predaceous mites, oribatied mites and endostigmatid mites. Salminen and Sulkave (1996) reported that Sodium pentachlorophenate decreased microbial biomass in humus. Nassef (1999) mentioned that pyripoxyfen, primbet, derived oil had moderate to low effect against whitefly.

Also, data in table (II & III) clarified that significant differences were observed among inspection periods and average percent reduction in mite species on apple leaves and soil mite species from the according to the finding results. Moreover the efficacy against apple mite species, was lasting for long period.

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تأثير بعض المبيدات على الأنواع الشائعة من أكاروسات الأوراق والتربة في بساتين التفاح

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معهد بحوث وقاية النباتات ومركز البحوث الزراعية – الصحية – الإسكندرية

إستهدف البحث حصر وتقدير الإنتشار النسبى لأكاروسات التربة فى بساتين التفاح خلال الفترة (يونيه/ديسمبر ١٩٩٧) فى منطقة كما استهدف البحث حصر الكفاءة النسبية للمبيدات التالية: نيرون (بروموبروبيليت)، سيديال (فينويت)، بيوفلاى (بيوفاريا باسيانا) على كلا من أكاروسات الأوراق وأكاروسات التربة خلال نفس الفترة من العام.

ونقد أظهرت التجارب:

- تواجد العديد من أنواع أكاروسات التربة (٢١ نوع) متطفلة ومفترسة وغير معروف تغذيتها تنتمى إلى أربع مجاميع لتحت الرتب المختلفة الأورباتى، الجاماسيدى، الأكتيندى الأكاريدى. وكانت الأعداد الكلية لتلك الأكاروسات خلال تلك الفترة: ١٣,٣، ٢٤٦,٣، ٤٩٢,٣، ٢١٩,٧ على التوالى: ويلاحظ أن أكبر تعداد نسبى كان لتحت رتبة الأروباتى كما أظهرت الإختلاف الشهرى فى تعداد تلك الأكاروسات.
- كما أظهرت النتائج الكفاءة العالية لتلك المبيدات على أكاروسات الأوراق بعد سبعة أيام من التطبيق وزادت فعاليتها بعد ٣٥ يوم كما إمتدت فعاليتها أيضا لمدة طويلة نحو أربع أشهر من المعاملة. كذلك أظهرت النتائج إختلاف حساسية أكاروسات التربة لتلك المبيدات بعد سبعة أيام من التطبيق ولكن مع وجود الحساسية العالية نسبيا لتحت رتبة الأكاريدى.

وعموما أظهرت النتائج إختلافات معنوية بين فترات الفحص، معدلات النسة المئوية لإنخفاض كلا من أكاروسات الأوراق والتربة فى بساتين التفاح.