

COMPARATIVE STUDIES BETWEEN PREDATORY MITES AND PESTICIDES IN CONTROLLING *Tetranychus urticae* KOCH ON STRAWBERRY PLANTS AT QALUBIA GOVERNORATE

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ABSTRACT

Seven treatments; *phytosiulus macropilis* Banks, *Amblyseius californicus*, Parok, Akkomic, Shilinger, Agromactin and Ortus were used to control *Tetranychus urticae* Koch on two strawberry cultivars, Sweet-Charlie and Camarosa in Qalubia Governorate. On Sweet-Charlie cultivar the results showing that the reduction percentage of movement stages was the highest when use Agromactin (80.55%) and Ortus (78.29%) for eggs; on the contrary it was the lowest when use Shilinger (54.72%) and Akkomic (68.95%) for movement and eggs, respectively. On Camarosa cultivar the reduction percentage was the highest when use parok (77.40% & 78.18%) for movement stages and eggs, respectively, while it was the lowest when used Shilinger (68.22%) and Ortus (69.07%) for movement stages and eggs, respectively.

keywords: *phytosiulus macropilis*, *Amblyseius californicus*, Parok, Akkomic, Shilinger, Agromactin Ortus, *Tetranychus .urticae*

INTRODUCTION

Strawberry is a high value crop in Egypt, attacked by several pests and many diseases; *T. urticae* considered one of the main pests which attack strawberry plants (Oatman and McMurty, 1966 and wyoski, 1985). Many problems caused by using chemical control against *Tetranychus urticae* and other pests on strawberry (Wysoki, 1985). To reduce these problems, it is necessary to minimize the chemical control. This work depends on the successful replacement of pesticides by releasing of predatory mites and using of biocides (Ochoa and Aguilar, 1989, Kunimoto, 2000 and El-Saiedy 2003). So this work aimed to reduce chemical compounds in controlling *T.urticae* .

MATERIALS AND METHODS

General experimental design:

Four experimental treatments were conducted to study the effect of biological and chemical control; each treatment was replicated three times. The replicate consisted of two raised beds 4m long × 1.2m width, each has four lines of strawberry plants. Total number of strawberry plants in each replicates was 128(16×4×2). The experimental design was fixed under the tunnel to isolate replicates. The experimental design was complete randomized block. Two cultivars of strawberry were chosen in this work, Sweet-Charlie and Camarosa. Experiments were carried out at Qalubia Governorate from February to May 2004.

Sampling Procedure:

Thirty compound leaves were taken weekly for the eight treatments

and the two cultivars. Ten leaves were randomly collected, kept into polyethylene bags, tightly closed with rubber bands, then kept in an ice box and transferred for examination in the laboratory.

A stereomicroscope was used for eggs, immature and adults of *T. urticae* and predatory mites examination.

Control Studies of *T. urticae*

To study the effect of different types of control agents seven treatments were used including chemical control by using five compounds; Parok, Shillinger, Akkomic, Agromactin and Ortus and the biological control by using two predaceous mites *p. macropilis* and *A. californicus* were carried out on two cultivars of strawberry. Since T1 & T2 represented *P. macropilis* and *A. californicus* respectively, while T3, T4, T5, T6, T7 AND T8 represented the chemical compounds i.e parok, shillinger, akkomic, agromatic, ortus and control respectively.

Rearing of *T. urticae*:

Rearing of *T. urticae* was carried on potted beans *phaseolus vulgaris* L. in an isolated compartment 1.5 × 2m in experimental glasshouse. The strain of *T. urticae* was originated from infested leaves of castor oil collected at Giza Governorate.

Rearing of the predatory mites:

The predatory mites *P. macropilis* and *A. californicus* were reared using methods modified from (McMurtry and Scriven 1965), large plastic boxes 26×15×10 cm were used, cotton pad were placed in the middle of each box, leaving a space provided with water as a barrier to prevent predatory mites from escaping. Excised bean leaves highly infested with *T. urticae* were provided every day as food sources. Plastic boxes were kept in an incubator at 25°C ± 2 and 70 ± 10% R.H.

Mass rearing of the predatory mites

For mass rearing *p. vulgaris* was served as host plant which reared in a small glasshouse divided into three isolated parts (a) clean bean plants, (b) clean plants at stage of 12 leaves infested with *T. urticae* (c) bean plants infested of five gravid females of the predatory mites for every plant (El-saiedy 2003) temperature in the glasshouse ranged about 18-25°C and relative humidity from 50-60%.

Releasing of the predatory mites

Releasing was started as the population density of *T. urticae* build up on strawberry. Samples averages from 2-5 individuals/ compound leaf. The ratio between predator and prey ranged between 1: 10 to 1: 7, respectively. The required population size of the predatory mite individuals were calculated according to the following formula.

$$\text{Released number} = \frac{\text{Total number of } T. \text{ urticae/ Experimental area}}{\text{Proposed predator / Prey Percentage.}}$$

Bean leaves with predators mite were transferred in ice-box (10 ± 3°C) to strawberry fields. Distribution was carried out on infested strawberry plants. Repetition of releasing was occurring according to the population of *T. urticae*. After releasing, samples were taken weekly, *T. urticae* stages were calculated as well as the predatory mites.

Statistical analysis

- The obtained data of mite numbers and yield quantity were subjected to the analysis of variance test (ANOVA) with mean separation at 5% level of significance according to the method of (Snedecor and Cochran 1967).
- Percentages of reduction of the mite population were calculated according to the equation of Henderson and Tilton (Fleming and Retnakaran, 1985).
- Reduction = $1 - \frac{\text{Treatment after} \times \text{control before}}{\text{Treatment before} \times \text{control after}} \times 100$

RESULTS AND DISCUSSION

This work was aimed to test seven different treatments against *T. urticae* on two cultivars of strawberry; Sweet-Charlie and Camarosa. The pretreatment number of *T. urticae* ranged from 14.56 to 18.46 individuals and 57.15 to 43.46 Eggs, on the cultivar Sweet-Charlie, on the other hand this number ranged from 37.14 to 39.14 individual and 110.52 to 120.6 eggs on Camarosa. The mean number of *T. urticae* on Sweet. Charlie cultivar was 8.06, 12.45, 5.30, 9.38, 6.41, 6.19, 9.16 and 49.7 individuals and 12.21, 20.20, 11.45, 15.48, 14.50, 10.11, 15.48 and 77.06 eggs for *P.macropilis*, *A. californicus*, parok, Akkomic, shilinger Agromactin, Ortus and control; respectively. While those for Camarosa cultivar were 11.87, 11.46, 10.12, 8.72, 12.52, 11.76, 9.17 and 135.63 individuals and 25.95, 28.21, 18.56, 19.98, 21.43, 21.17, 21.13 and 177.9 eggs for *P.macropilis*, *A.californicus*, parok, Akkomic shilinger, Agromactin, Ortus and control; respectively. Tables (1&2)

After using different treatments the reduction percentage was differed. The mean of the reduction percentage of movement stages were 65.74, 74.37, 75.20, 70.6, 54.72, 80.55 and 78.03% and for eggs was 71.39, 70.07, 71.85, 68.95, 75.55, 73.26 and 78.29% on Sweet-Charlie, on the other hand, the cultivar Camarosa, the reduction percentage of movement stages were 75.45, 75.78, 77.4, 75.41, 68.22, 76.06 and 70.08% and they were 77.83, 76.27, 78.18, 71.01, 69.34, 78.08 and 69.07 for eggs on *P. macropilis*, *A.californicus*, parok, Akkomic, Shilinger, Agromactin and Ortus; respectively .Tables (3&4)

Oatman and McMurtry (1966) used *A. californicus* (McGregor) against *T.urticae* on strawberry; they found that 5-10 predators per plant gave good results. Wyskoki (1985) used *P. macropilis* to control *T. urticae* at the rate of predator to 16 prey, and he found that the best management strategy was integrating biological control with soil treatment, fertilization and selection of plants. Heikale *et al* (1999) released *P.macropilis* for 2,4 and 6 times at a rate of 10 individuals to control *T. urticae* on strawberry at Qalubia, the reduction percentage averaged 41,48 and 35% in the first pest-count, but reached 92, 95 and 97% in the last inception in treatments that received two, four and six releases, respectively. Heikal and Ibrahim (2001) reported that the predatory mite *P.macropilis*, was released in a strawberry field at Ismalia Governorate to control *T. urticae*. They stated that the early release proved to be effective sufficiently than the one in late season in controlling spider mite, the reduction in mite population ranged between 60-90% after 3-7 weeks of releasing.

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دراسات مقارنة بين الأكاروسات المفترسة و المبيدات في مكافحة التترانيكس يورتيكا علي نباتات الفراولة في محافظة القليوبية

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استخدم في هذه الدراسة سبع انواع من المعاملات المختلفة, فتوسبولس مكروبيلس وامبلسيس كاليفورنيكس ومبيد الباروك واكوميك وشالنجر واجروماكتين والاورتس في مكافحة العنكبوت الاحمر علي نباتات الفراولة في محافظة القليوبية علي نوعين مختلفين من سلالات الفراولة هما سويت شارل و كاماروزا.

ولقد اثبت مبيد الاجروماكتين فاعلية في زيادة نسبة معدل الخفض للاطوار المتحركة ٨٠,٥٥% في حين اثبت الاورتس فاعلية ضد البيض ٧٨,٢٩% وذلك في حالة السلالة سويت شارل اما في حالة السلالة كاماروزا فكانت اكثر المعاملات فاعلية هي الباروك ٧٧,١٨% لكل من الاطوار المتحركة والبيض بالترتيب.

Table (1): The number of *T. urticae* stages/leaf on infested strawberry cultivar" Sweet-Charlie "when use seven treatments

Mean number of <i>T.urticae</i> stages /leaf																	
		Movement stages								Eggs							
Treatment	Sampling Date	T1	T2	T3	T4	T5	T6	T7	T8	T1	T2	T3	T4	T5	T6	T7	T8
Treatment date	11.2.2004	17.2	16.54	18.46	17.53	14.56	16.53	17.1	16.14	38.14	37.15	43.46	40.30	37.50	38.40	39.8	40.26
	18	0.7	1.8	1.5	1.3	0.6	1.9	2.8	15.2	1.3	10.4	4.9	2.5	3.7	5.8	11.9	38.4
	25	3.4	10.3	9.85	5.85	4.95	6.95	13.5	21.65	10.65	28.9	26.5	18.65	13.0	14.75	17.5	66.65
	4.3.2004	6.1	18.8	18.2	10.4	27.3	18	44.2	28.1	20	47.4	48.1	34.8	66.4	23.7	103.1	94.9
++	11	6.6	8.1	2.8	5	2.0	0.5	6.7	55.5	5.8	31.1	3.6	8.7	5.7	0.9	5.4	138.5
	18	18.8	21.9	0.0	6.2	0.0	4.7	1.98	66.4	21.9	18.1	0.0	3.8	0.0	6.8	1.2	128.2
	24	6.1	10.9	2.7	4.8	0.0	0.5	2.1	99.6	13.9	26.2	7.9	12.9	0.0	1.9	5.5	179.8
	31	21.7	36.1	0.0	26.4	16.9	3.8	3.3	82.5	30	52.8	0.0	42.8	36.7	9.2	5.9	114.2
++	7.4.2004	29.9	62.1	15.6	48.6	19.6	31.2	32.4	120.4	39.7	50.3	21.8	53.9	39.8	37.9	35.9	149.7
	14	15.8	12.2	3.1	8.7	22.2	3.6	6.1	79.7	11.40	19.7	13.1	13.3	12.4	8.5	5.4	127.8
	21	1.9	1.1	5.7	7.3	3.8	4.6	10.53	146.42	1.5	1.3	3.8	5.3	7.6	4.8	9.92	91.65
	28	0.8	0.0	5	5.6	6.2	5.9	5.2	51.6	1.1	0.0	8.6	8.3	6.6	7.1	5.7	46.8
+++	4.5.2004	0.0	0.0	*1.9	*2.4	*2.4	*0.9	*0.8	10.1	0.0	0.0	*1.5	*2.5	*1.6	*2.1	*0.6	12.1
	11	0.0	0.0	0.0	0.0	1.05	0.0	0.0	2.07	0.0	0.0	0.0	0.0	1.05	0.0	0.0	2.07
	18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.98
	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	8.06	12.45	5.30	9.38	6.41	6.19	9.16	49.7	12.21	20.20	11.45	15.48	14.50	10.11	15.48	77.06

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L.S.D= (5.96immature stages and 8.22 eggs) (++) re-released and re sprayed (+++) resprayed

Table (2): The number of *T. urticae* stages/leaf on infested strawberry cultivar "Camarosa" when use seven treatments

Mean number of <i>T.urticae</i> stages /leaf																	
treatment	Movement stages									Eggs							
	Date	T1	T2	T3	T4	T5	T6	T7	T8	T1	T2	T3	T4	T5	T6	T7	T8
Treatment date	11.2.2004	37.76	38	38.15	37.15	39.14	37.14	38.6	37.20	113.15	115.36	110.52	117.65	120	118.63	120.6	111.53
	18	11.7	15.5	2.20	4.60	5.2	5.50	4.4	62.6	51.9	110.4	7.1	20.60	29.4	21.1	24.9	195.3
	25	12.15	13.46	19.35	19.05	30.8	17.35	15.15	73.95	39.6	65.27	33.55	43.67	49.6	25.15	46.12	150.7
	4.3.2004	12.6	11.42	36.5	33.5	56.4	29.2	25.63	85.3	27.3	20.14	60	68.3	69.8	57.4	67.3	106.1
++	11	8.64	9.3	1.74	0.9	3.0	12.0	0.9	169.3	16.2	14.4	2.3	1.8	3.2	11.6	2.4	182.9
	18	16.8	17.1	3.10	1.3	0.6	2.20	0.1	165.18	24.18	20.9	4.3	1.4	0.0	1.5	0.3	193.14
	24	10.5	5.7	0.8	0.0	0.0	0.5	1.7	184.4	17.4	18.9	0.6	0.0	0.0	2.1	3.8	324.3
	31	16.5	16.9	0.0	8.9	9.3	8.4	4.8	230	18.0	10.3	0.0	8.9	10.3	13.5	8.9	327.8
++	7.4.2004	52.0	49.8	32.2	17.2	17.2	40.7	11.9	400.2	9.5	68.3	48.6	21.1	19.3	48.7	16.1	440.5
	14	6.5	5.5	3.9	3.2	5.6	4.1	5.5	255.6	9.0	6.0	3.0	2.9	4.9	3.7	4.87	274.1
	21	3.8	0.7	17.1	8.9	25.7	21.1	27.4	387.8	2.7	1.5	16.4	22.3	24.7	25.2	30.2	408.4
	28	0.7	0.0	5.4	3.87	6.9	9.1	8.6	100.5	0.6	0.0	9.2	10.5	10.4	8.2	11.3	116.40
+++	4.5.2004	0.3	0.0	*1.5	*1.1	*1.1	*1.0	*2.1	14.4	0.7	0.0	*1.5	*0.7	*1.3	*1.1	*1.4	12.8
	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.05
	18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Mean	11.87	11.46	10.12	8.72	12.52	11.76	9.17	135.63	25.95	28.21	18.56	19.98	21.43	21.17	21.13	177.9
		b	b	b	b	b	b	b	a	b	b	b	b	b	b	b	a

L.S.D= (14.74 immature stages and 18.35 eggs) (++) re-released and re sprayed (+++) re sprayed

Table (3): The reduction percentage of *T.urticae* number when use seven different treatments on the cultivar Sweet – Charlie of strawberry.

% reduction percentage															
Movement stages									Eggs						
Treatment	Date	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
	18.2.2004	95.67	88.44	91.37	92.12	95.62	87.79	82.61	96.42	70.64	88.17	93.49	89.65	84.16	68.65
	25	85.26	53.57	60.22	75.12	74.65	68.65	41.14	83.13	53.09	63.16	72.04	79.05	76.79	73.43
	4.3.2004	79.62	34.71	43.33	65.92	0.0	37.45	0.0	77.75	45.87	53.04	63.36	24.88	73.81	0.0
Re-treatment	11	45.21	78.18	92.21	75.65	95.17	95.59	92.32	80.12	55.02	94.87	82.87	94.11	97.39	96.41
	18	0.0	50.70	100	74.77	100	88.94	98.10	18.94	71.73	100	91.91	100	78.76	99.13
	24	71.78	83.64	95.81	86.97	100	99.21	98.02	63.31	70.82	91.33	80.43	100	95.76	97.18
	31	0.0	34.59	100	13.52	78.91	79.18	97.45	0.0	7.43	100	0.0	54.06	67.74	95.24
Re-treatment	7.4.2004	0.0	22.90	79.99	0.0	83.24	59.54	82.89	0.0	26.69	71.26	1.81	62.02	0.0	77.92
	14	20.17	70.32	69.98	72.95	38.04	82.56	71.55	66.36	54.12	29.66	71.09	63.50	73.72	82.38
	21	94.77	98.54	69.95	87.64	84.05	87.87	73.27	93.74	95.77	71.52	83.93	68.80	79.31	54.86
	28	93.75	100	25.21	73.11	26.19	55.87	62.55	91.13	100	0.0	50.74	46.95	40.07	49.21
Re-treatment	4.5.2004	100	100	0.0	41.13	0.0	65.61	70.56	100	100	14.87	42.61	50.26	31.44	79.32
	11	100	100	100	100	0.0	100	100	100	100	100	100	100	100	100
	18	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	25	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Mean	65.74	74.37	75.20	70.6	54.72	80.55	78.03	71.39	70.07	71.85	68.95	75.55	73.26	78.29

Table (4): The reduction of *T.urticae* number when use seven different treatments on the cultivar "Camarosa" of strawberry percentage.

% reduction percentage															
Movement stages									Eggs						
treatment	Date	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7
	18.2.2004	81.58	75.76	96.57	92.64	92.10	91.19	93.22	73.80	45.34	96.33	90.8	86.80	89.84	88.20
	25	83.81	82.18	74.48	74.20	60.41	76.50	80.43	74.09	58.12	77.53	72.52	69.44	84.29	71.69
	4.3.2004	85.44	86.89	57.15	60.67	37.15	65.71	71.09	74.63	81.64	42.93	38.97	38.85	49.13	41.30
Retreatment	11	73.44	58.96	97.59	98.64	97.32	79.29	98.23	65.57	58.52	97.77	98.47	97.34	88.27	97.93
	18	31.14	22.67	95.61	97.99	100	96.10	99.79	51.34	42.99	96.06	98.87	100	98.96	99.75
	24	61.45	76.91	98.98	100	100	99.20	96.93	79.37	69.29	99.67	100	100	98.80	98.15
	31	51.43	45.11	100	90.14	93.88	89.33	93.05	78.65	83.44	100	95.78	95.22	92.38	92.72
Retreatment	7.4.2004	12.03	7.05	81.19	89.05	93.49	70.29	90.10	16.18	21.28	80.49	92.55	93.34	79.56	94.24
	14	80.42	82.70	81.03	70.87	49.02	84.22	27.34	84.77	85.88	90.07	77.91	59.19	87.79	52.08
	21	92.45	98.54	45.19	46.60	0.0	46.49	0.0	96.93	97.63	63.60	0.0	0.0	44.18	0.0
	28	94.63	100	33.21	10.40	0.0	10.96	0.0	97.60	100	28.36	0.0	0.0	36.27	0.0
Retreatment	4.5.2004	83.96	100	0.0	0.0	0.0	31.71	0.0	74.64	100	0.0	0.0	0.0	22.26	0.0
	18	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	11	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	25	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Mean	75.45	75.78	77.4	75.41	68.22	76.06	70.08	77.83	76.27	78.18	71.01	69.34	78.08	69.07

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