ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor,
Vol. 44(4): 1905-1919, (2006).

STUDY THE USING OF BIOFERTILIZERS AND SOME ALTERNATIVE PESTICIDES ON THREE PESTS INFESTING SQUASH AND CANTALOUPE PLANTS BY

Violette Sh.G. Abd-El-Malak, and Magda A. Bachatly,
Plant Protection Research Institute, Agric. Res Center. Dokki, Giza, Egypt.

ABSTRACT

Field experiments were carried out at Kaha, Qalyoubia Governorate, to study the infestation of squash and cantaloupe plants by eggs, nymphal and adults of whitefly *Bemisia tabaci* Genn., the two-spotted spider mite, *Tetranychus urticae* Koch and aphids, *Aphis gossypii* Glov., and virus diseases. Two different biofertilizers for each crop were used and different alternative pesticides. Mineral oil (KZ) was the most effective against the three pests and diseases. For squash, the effect of plant oil jojoba was more expressive on the feeding stages and the neem extraction on eggs. for cantaloupe citronella oil was more effective on all the stages after the mineral oil KZ.

Key Words: Squash, cantaloupe, biofertilizer, alternative pesticides.

INTRODUCTION

Cucurbit vegetable crops especially squash and cantaloupe are important vegetables in Egypt for local consumption and export. For increasing the production, the use of large doses of chemical fertilizers and insecticides that cause environmental pollution. The positive interaction between plants and the rhizosphere microorganisms can improve plant nutrition, nitrogen fixation, plant tolerance to environmental stresses and biologically control pathogen. These could reduce the need for chemical fertilizers and pesticides, it is often assumed that entrancement of plant growth after inoculation is a direct response to the introduce of microorganism. This was studied by Abd El-Rahman (2000) and Abd-Allah *et al.* (2004). Improvement in seed germination, plant growth or yield after soil or seed inoculation have been attributed solely to N-fixation (Mishustin,1970). Also, the effect of biofertilizer on yield and infestation by insects was studied by El-Shimi *et al.* (2002) and Abd El-Malak (2006).

Many researchers are using alternative compounds as pesticides, for several decades ago, it is emphasized that the indiscriminate use of insecticides give rise to adverse consequence as so testifies that new approaches to insect control are urgently needed. One of the most promising approaches to the use of new alternatives, safe to environment. Different studies are set out by Bachatly (1992), Metwally *et al.* (1994), El-Duweini and Sedrak (1998) and Mahgoub (1998). Thus, this work was planned to study the effects of different biofertilizers and alternative pesticides on the infestation of squash and cantaloupe by *Bemisia tabaci* (genn.), *Tetranychus urticae* Koch and *Aphis gossypii* Glov.

MATERIALS AND METHODS

The experiment was conducted at Kaha Station, Horticultural Research Institute, Qalyoubia Governorate, for two successive summer seasons of 2004 and 2005. The squash, *Cucurbita pepo*_and cantaloupe, *Cimelo* var.*cantaloupensis* were planted at the beginning of April for each season. The experiment design used was split plots. The main plots were occupied by the fertilizers and the sub-plots by the alternatives. The plot area was [(4.5 m length x 0.95 m width) x 3 rows], replicated three times. To prevent contamination among treatments an empty row was left between each treatment.

For squash, there were eight applications of alternatives and insecticides with two biofertilizers [Rhizobacterin (A) and Phosphorin (B)]. For cantaloupe, the two biofertilizers were [Biogein (A) and Microbein (B)] with nine applications of alternatives and insecticides.

For both squash and cantaloupe there was the unfertilized treatment (C) without biofertilizer but all the treatments had the normal agricultural practices of mineral fertilizers (300 kg/fed.), ammonium sulfate 20.5 % N (150 kg/fed.), calcium superphosphate 15.5 % P_2O_5 (100 kg/fed.) and potassium sulfate 48 % P_2O.

The biofertilizers are locally produced under commercial name:

1- Rhizobacterin (Azospirillum + Azotobacter) live cells of efficient bacteria which is capable to nitrogen fixation inoculated soil.
2- Phosphorein: (*Bacillus megatorium*) live cells of efficient bacteria capable to convert tricalcium phosphate to monocalcium phosphate (PSB).
3- Biogein: (Azotobacter) live cells of bacteria capable to nitrogen fixation.
4- Microbein: live cells of efficient bacteria strains, for nitrogen fixation and phosphorus solubilizing bacteria (PSB).

The soil was inoculated with the biofertilizer at the begin of cultivar into the absorption zone of plant roots after 21 days, the biofertilizer was mixed with wet soft soil.

The application of alternatives and insecticides was as follows for both crops:

1- (N_1) plant water extract of 50 g, *Melia azedarach* / L water (1 L concentrate + 3 L water → 4 L solution) of rate 50 g/L neem.
2- (N_2) plant water extract of 75 g *Melia azedarach*/ L of water(1 L concentration + 0.665 L water) rate of 75 g/L neem.
3- (j_1) plant oil extract: *Simmondsia chinensis* (1 % jojoba oil) of rate 10 ml/L.
4- (j_2) plant oil extract: *Simmondsia chinensis* (1.5 % jojoba oil) of rate 15 ml/L.
5- (KZ_1) mineral oil KZ 1 % of rate 10 ml/L.
6- (KZ_2) mineral oil KZ 1.5 % of rate 15 ml/L.
7- (M) Malathion 57 % (1 L/400 L water) of rate 2.5 ml/L.
8- (C) control treatment without any application or biofertilizer.
9- (Ci) plant oil extract, citronella oil *Cymbopogon citratus* of rate 1 ml/L for cantaloupe only.

These applications were applied after six weeks from plantation and continued weekly (six applications) for controlling whitefly (eggs, nymphs and adults), Acari (eggs and moving stages) and aphids (apterous and alates). The samples were taken weekly of application (3 leaf per plot) before application of treatment. All the obtained data were statistically analyzed for variance according to Snedecor and Cochran (1967), the mean value was compared at 5 % level of least significant differences for each season and crop. The sample of squash was examined ind./sq^2 inch and for cantaloupe ind./leaf because the squash leaf is large while that of cantaloupe is small.

RESULTS AND DISCUSSION

I- Squash crop:

Data recorded in Tables (1, 2 & 3) showed that:

1- Effect of fertilizers:

The mean numbers of the three studied pests differed significantly among the three treatments of fertilizers during the two seasons. Rhizobacterin fertilizer treatment (A) was categorized as the first one of high population of the three pests followed by the unfertilized treatment (C) and phosphorein fertilizer treatment (B) was the least treatment infested, with exception, the whitefly eggs were of high numbers in treatment (B) than in (C). This result may be referred to that phosphorein fertilizer causing thickness of the leaf which make the feeding not easy to the pests.

1- Effect of insecticides and the alternatives:

Data showed that the eighteen applications differed significantly in eggs and feeding stages numbers of the pests during the two seasons.

a- Whitefly:

During both seasons, the most effective alternatives, the plant oil jojoba (j_2) as follows: (3.88 and 8.00 eggs/inch) and (9.66 and 21.80 ind./inch) for nymphs and adults followed by the mineral oil (KZ_2) for both stages and both seasons. In opposite, the highest population was malathion application (21.71 and 42.66 ind./inch) for nymphs and adults during 1st and 2nd seasons, respectively, and was of moderate numbers of eggs during the first season (6.22 eggs/inch).

b- Acari:

The plant oil jojoba (j_2) was generally the best application controlling eggs and moving stages through the two seasons. The mineral oil (KZ_2) application was the most effective on moving stages (8.33 and 10.22 ind./inch) for 1st and 2nd season, respectively. Also, the plant extract (N_2) application gave high influence on eggs (10.33 eggs/inch) through the second season. Malathion was of negative effect on them.

c- Aphids:

The least infested application during the two seasons was the plant extraction (N_2) and of low virus infection, the number recorded during the 1st and 2nd season was (3.77 and 7.55 ind./inch), respectively. Malathion was of moderate population during both seasons and low virus infestation in the 2nd season.

Table (1): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Bemisia tabaci* Genn. [eggs, nymphs and adults (eggs & ind./inch)] on squash plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Eggs				Nymphs and adults				Eggs				Nymphs and adults			
Fertilizers / Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Jojoba 1 %	30.00	5.00	6.00	13.66	13.33	10.33	27.66	17.11	57.00	11.00	13.00	27.17	26.33	22.33	55.00	34.55
Jojoba 1.5 %	3.33	4.33	4.00	3.88	13.30	14.33	1.66	9.66	6.33	9.33	8.33	8.00	29.66	27.33	6.00	21.80
KZ 1 %	18.00	3.00	3.33	8.11	19.00	13.33	14.33	15.55	34.00	6.33	7.33	15.89	39.66	26.66	30.33	32.21
KZ 1.5%	5.33	4.00	2.66	3.99	10.33	16.66	13.01	13.33	10.66	9.33	5.00	8.33	22.33	37.00	28.33	29.22
Neem 50 ml/L	4.00	20.00	5.00	9.66	21.00	18.33	13.00	17.44	15.66	13.66	7.66	15.66	44.00	38.33	29.00	37.11
Neem 75 ml/L	4.33	5.00	3.66	4.33	14.66	7.33	27.33	16.44	8.33	11.00	7.00	8.78	29.00	15.33	53.00	32.44
Malathion	8.33	6.66	3.66	6.22	24.66	20.00	20.66	21.71	6.66	45.00	10.66	20.77	47.66	39.66	40.66	42.66
Control	20.00	6.33	11.66	12.66	29.00	23.66	13.66	22.11	36.66	11.66	21.00	23.11	54.66	50.66	29.00	44.77
Mean	11.66	6.79	4.99		18.12	15.49	16.41		21.91	14.31	10.04		36.66	32.16	33.91	
	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	4.52		0.46		30.39		0.70		747.71		0.62		59.95		0.87	
Insecticides	206.48		0.81		87.96		1.28		456.62		1.04		321.96		1.27	
Fertilizers & insecticides	211.84		1.32		97.31		1.97		460.94		1.77		247.73		2.35	

Table (2): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Tetranychus urticae* Koch [eggs and moving stages (eggs & ind./inch)] on squash plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Eggs				Nymphs and adults				Eggs				Nymphs and adults			
Fertilizers / Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Jojoba 1 %	5.66	13.00	15.66	14.77	13.66	6.33	13.66	11.22	20.33	17.33	20.00	19.22	17.00	7.33	18.33	14.21
Jojoba 1.5 %	11.66	5.33	4.00	6.99	5.33	14.00	12.33	10.55	23.66	8.66	7.00	13.11	7.33	16.66	16.66	13.55
KZ 1 %	13.33	18.33	11.66	14.44	10.00	26.00	12.00	16.00	26.00	10.00	18.33	18.11	13.33	27.33	15.00	18.55
KZ 1.5%	20.33	6.00	14.00	13.44	12.66	3.66	8.66	8.33	17.00	21.00	10.00	17.00	14.66	6.00	10.00	10.22
Neem 50 ml/L	7.00	12.33	27.00	15.44	18.66	21.33	28.00	22.65	12.66	17.00	30.66	20.11	25.00	28.00	29.66	27.55
Neem 75 ml/L	1.66	4.33	18.33	8.11	13.33	13.33	17.00	14.55	4.00	6.66	20.33	10.33	16.00	17.33	19.66	17.66
Malathion	47.66	30.66	10.66	29.66	29.00	29.00	14.66	24.44	39.33	43.00	14.00	32.11	32.66	30.66	16.33	26.55
Control	52.00	49.00	38.33	48.44	126.66	57.33	88.33	90.77	60.00	54.33	42.66	52.33	132.33	60.66	93.33	95.44
Mean	21.16	17.37	17.45		28.66	21.45	24.30		25.37	18.62	20.75		32.29	24.25	27.37	
	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	30.38		1.74		61.43		1.32		95.44		0.64		281.73		0.64	
Insecticides	1148.18		1.17		1092.13		2.49		3114.49		0.73		1633.13		0.66	
Fertilizers & insecticides	74.24		3.15		113.62		3.73		188.25		1.95		424.48		1.95	

Table (3): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Aphis gossypii* Glov. (apterous and alates ind./inch) on squash plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Aphids				Diseases				Aphids				Diseases			
Fertilizers / Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Jojoba 1 %	6.33	1.66	4.33	4.11	36.00	36.66	33.33	35.33	11.66	2.66	10.66	8.32	36.66	8.22	33.33	35.55
Jojoba 1.5 %	5.33	1.33	5.00	3.88	36.66	36.66	26.66	33.33	13.00	3.00	8.66	8.22	43.33	40.00	26.00	36.44
KZ 1 %	13.33	3.66	2.00	6.33	26.66	16.66	43.33	28.88	27.00	7.66	4.66	13.11	30.00	20.00	43.00	31.00
KZ 1.5%	7.33	1.33	6.66	5.11	30.00	23.33	23.33	25.55	16.66	2.33	13.00	10.66	30.00	26.66	26.66	27.77
Neem 50 ml/L	12.00	5.66	9.66	9.11	43.33	26.66	23.33	31.11	23.33	12.33	19.66	18.43	36.66	26.66	26.66	30.00
Neem 75 ml/L	5.66	3.66	2.00	5.77	26.66	33.33	20.00	26.66	11.66	6.66	4.33	7.55	30.00	30.00	26.66	28.88
Malathion	6.33	3.00	5.33	4.88	43.00	40.00	40.00	41.05	13.33	7.00	11.33	10.55	45.453	26.66	23.33	31.17
Control	32.00	22.33	24.00	25.11	43.33	26.66	36.66	35.55	47.00	36.00	41.33	41.44	43.33	26.66	40.00	36.66
Mean	11.04	5.33	7.37		35.70	29.99	30.83		20.45	9.70	14.20		36.69	28.75	31.12	
	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	255.29		0.52		7.95		3.25		816.53		0.57		11.76		3.40	
Insecticides	4526.00		1.02		7.35		5.80		880.20		1.23		7.68		3.89	
Fertilizers & Insecticides	22.48		1.49		6.25		9.12		69.97		1.75		4.13		9.62	

2- The interaction between fertilizers and alternatives:

Statistical analysis showed a significant difference between the average number of pests due to the interaction between the 3 fertilizer treatments and the eight applications.

a- Whitefly:

The high concentration of the alternatives was of least population as (j_2) (9.66 and 21.80 ind./inch) for 1st and 2nd season, respectively. The same alternative was for eggs, followed by the two mineral oil concentrations (KZ_2 and KZ_1) for both seasons when fertilized with rizobacterin (A).

This result differs with phosphorein fertilizer (B) where the plant extraction (N_2) was of least population of nymphs and adults (7.33 and 15.33 ind./inch) for 1st and 2nd season, respectively, followed by (j_1) and (j_2) 15.33 ind./inch) for 1st and 2nd season, respectively, followed by (j_1) and (j_2) for both seasons and the mineral oil (KZ_1) during the two seasons for eggs.

While the unfertilized treatment (C), the least number was detected with plant oil jojoba (j_2) (1.66 and 6.00 ind./inch) for 1st and 2nd seasons, respectively. The control treatment (C) was of moderate infestation through the both seasons. The high infestation was observed with (j_1) and (N_2). The low number of eggs was recorded using (KZ_2) during the two seasons and the high number was in the control treatment.

b- Acari:

Data showed that the control treatment (C) in both seasons was of high average number for both eggs and moving stages with the three fertilizer treatments, followed by Malathion application. The least infestation by the moving stages was detected with (j_2) (5.33 and 7.33 ind./inch) for 1st and 2nd seasons, respectively, when using rhizobacterin fertilizer (A) and (KZ_2) during the two seasons with phosphorein (B) and unfertilized (C) treatments, while for eggs, the least number was in (N_2) application for both rhizobacterin (A) and phosphobacterin (B) fertilizer for both seasons but it was (j_2) application for the unfertilized treatment (C).

c- Aphids:

The least number of aphid using rhizobacterin (A) was with the plant oil (j_2) for both seasons (5.33 and 11.66 ind./inch), while when using phosphorein (B) the least infestation was with the mineral oil (KZ_2) for both seasons (1.33 and 2.33 ind./inch), followed by (J_2). The plant extraction (N_2) was of low population under the unfertilized treatment (C) recording (2.00 and 4.33 ind./inch) for 1st and 2nd seasons, respectively, followed by the mineral oil (KZ_2). The Malathion application showed moderate population, while the control one was of high population for both seasons. The disease was more detected with Malathion application.

II- Cantaloupe crop:

Data recorded in Tables (4, 5 & 6) showed that:

1- Effect of fertilizers:

The statistical analysis showed significant difference between the number of pests due to the fertilizer treatments.

Table (4): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Bemisia tabaci* Genn. [eggs, nymphs and adults (eggs & ind./leaf)] on cantaloupe plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Eggs				Nymphs and adults				Eggs				Nymphs and adults			
Fertilizers / Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Citronella 1ml/L	3.99	7.89	9.22	7.03	31.33	44.89	39.78	38.65	5.00	9.33	10.67	8.33	32.67	47.22	42.11	40.66
Jojoba 1 %	8.67	11.00	7.33	9.00	51.44	42.89	32.56	42.30	7.00	2.56	21.33	10.23	53.33	44.55	35.44	44.44
Jojoba 1.5 %	5.33	1.22	19.78	8.78	41.34	29.22	35.45	35.30	9.67	3.73	8.78	7.39	43.00	30.67	37.89	37.18
KZ 1 %	9.11	4.89	8.11	7.37	30.11	43.67	34.44	30.67	10.56	6.33	9.67	8.85	31.78	45.33	36.57	37.89
KZ 1.5%	5.56	3.00	3.33	3.96	26.67	29.67	41.44	32.07	7.00	4.44	3.00	4.81	28.67	31.60	42.89	34.19
Neem 50 ml/L	16.44	10.33	4.44	10.07	49.89	40.22	36.78	42.30	18.00	11.56	6.00	11.85	52.00	42.56	38.67	44.41
Neem 75 ml/L	7.89	5.56	14.00	9.15	36.67	14.45	29.22	26.78	9.00	6.67	15.33	10.33	39.11	17.56	30.57	29.08
Malathion	13.22	6.89	15.33	11.81	34.89	42.33	33.78	37.00	14.56	8.33	16.78	13.22	36.33	44.00	35.11	38.48
Control	23.22	13.78	7.67	14.89	39.33	48.22	49.33	45.62	24.67	15.00	9.00	16.22	42.45	49.78	57.33	47.85
	10.38	7.17	9.91		37.96	37.28	36.98		11.72	7.55	11.17		39.93	39.21	38.95	
Mean	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	1321.50		0.385		22.83		5.402		327.17		0.385		21.46		5.589	
Insecticides	253.37		0.268		-		-		1024.08		0.275		-		-	
Fertilizers & insecticides	1037.25		0.465		-		-		126.78		0.46		-		-	

Table (5): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Bemisia tabaci* Genn. [eggs, nymphs and adults (eggs & ind./leaf)] on cantaloupe plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Eggs				Moving stages				Eggs				Moving stages			
Fertilizers / Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Citronella 1ml/L	48.78	22.44	38.78	36.67	94.22	77.48	53.78	75.15	50.78	24.33	40.67	38.59	95.33	78.67	55.22	76.41
Jojoba 1 %	53.00	49.00	68.00	56.67	108.11	70.89	106.22	95.07	54.67	51.00	69.67	58.45	109.33	72.67	108.00	96.67
Jojoba 1.5 %	43.67	28.89	45.00	39.18	89.77	83.66	82.11	85.18	43.00	31.00	46.67	40.22	91.78	86.00	83.67	87.15
KZ 1 %	61.67	56.33	46.67	54.89	67.00	76.11	67.89	70.33	63.33	58.33	48.67	56.77	68.56	77.67	70.22	72.15
KZ 1.5%	48.00	32.44	58.67	46.37	49.00	72.56	68.22	63.26	50.00	34.33	60.89	48.41	49.56	74.11	69.78	64.48
Neem 50 ml/L	50.67	56.89	59.00	55.52	95.11	79.00	70.44	81.51	52.67	58.45	61.11	57.41	96.89	80.89	72.78	83.52
Neem 75 ml/L	62.89	61.67	39.11	54.56	86.33	71.11	65.88	75.44	64.67	63.67	41.00	46.45	88.00	76.33	67.89	77.41
Malathion	59.56	70.11	50.11	59.93	100.89	116.00	83.78	100.22	61.67	71.67	52.00	61.78	103.00	118.67	85.33	102.33
Control	51.44	105.33	55.00	60.92	127.66	113.33	117.11	119.36	53.00	107.00	56.33	72.11	129.11	114.56	118.33	120.67
	53.30	53.03	51.15		90.89	84.46	79.49		54.86	55.53	53.00		92.39	86.62	81.25	
Mean	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	2724.75		0.456		67.145		9.59		962.26		1.52		70.14		9.363	
Insecticides	69.78		0.403		9.55		16.21		51.58		0.471		9.306		16.380	
Fertilizers & Insecticides	3705.16		0.697		1.717		-		2714.87		0.815		0.35		-	

Table (6): Effect of 3 fertilizer treatments and alternative pesticides on the mean number of *Aphis gossypii* Glov. (apterous and alates ind./leaf) on cantaloupe plant during 1st and 2nd seasons (2004) and (2005).

Seasons	1st season								2nd season							
	Aphids				Diseases				Aphids				Diseases			
Fertilizers Insecticides	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean	A	B	C	Mean
Citronella 1ml/L	4.78	1.33	2.33	2.81	10.00	10.00	10.00	10.00	6.44	2.55	3.33	4.11	15.00	10.00	6.66	10.55
Jojoba 1 %	5.22	6.33	3.78	5.11	10.00	10.00	10.00	10.00	6.22	7.22	4.89	6.11	13.33	11.66	10.00	11.66
Jojoba 1.5 %	3.33	3.99	6.67	2.66	10.00	10.00	13.33	11.11	4.55	4.78	1.89	3.74	10.00	11.66	13.33	11.66
KZ 1 %	5.76	5.10	1.00	3.95	13.33	10.00	10.00	11.11	6.89	5.89	2.33	5.04	13.33	11.66	11.66	12.22
KZ 1.5%	0.86	2.22	2.44	1.84	10.00	13.33	10.00	11.11	1.89	3.00	3.45	2.78	11.66	13.33	11.66	12.22
Neem 50 ml/L	5.22	4.55	4.11	4.63	10.00	10.00	16.66	12.22	6.56	5.45	4.89	5.63	11.66	11.66	15.00	12.77
Neem 75 ml/L	5.00	1.77	2.67	3.15	10.00	16.66	10.00	12.22	5.89	2.78	3.33	4.00	10.00	13.33	10.00	11.11
Malathion	3.67	2.67	4.67	3.67	13.33	10.00	10.00	11.11	4.44	3.67	5.56	4.56	10.00	10.00	10.00	10.00
Control	5.67	5.33	9.22	6.74	10.00	10.00	10.00	10.00	6.33	6.22	10.00	7.52	10.00	10.00	10.00	10.00
Mean	39.51	33.29	30.89		10.74	11.11	11.11		49.21	41.56	39.67		11.66	11.48	10.92	
	F		L.S.D.		F		L.S.D.		F		L.S.D.		F		L.S.D.	
Fertilizers	66401.63		0.837		0.49		-		367.11		1.065		2.04		-	
Insecticides	5.73		1.793		0.03		-		53.88		0.805		0.08		-	
Fertilizers & Insecticides	2.27		3.106		1.49		-		1.48		1.39		0.93		-	

Biogein fertilizer (A) was characterized by the high population of pests followed by microbein fertilizer (B) and the unfertilized treatment was of low population. These results were for nymphs and adults, while for eggs of whitefly the biogein treatment (A) was followed by the unfertilized treatment (C) and phosphorein treatment (B) was for eggs of Acari followed by biogein treatment (A).

2- Effect of insecticide and alternatives:

Data showed that the nineteen applications differed significantly in the number of eggs, nymphs and adults of the three pests during the two seasons.

a- Whitefly:

The most effective application for nymphs and adults was the plant extraction (N_2) (26.78 and 29.08 ind./leaf) for 1st and 2nd seasons, respectively; followed by the high concentration of the mineral oil (KZ_2) and plant oil (j_2) for both seasons, the high population was observed for the control treatment(C) and Malathion (M) was of moderate population for both seasons. The most active application on eggs for the two seasons was (KZ_2) (3.96 and 4.81 eggs/leaf). Also, citronella oil was of great effect on the eggs number (7.03 and 8.33 eggs/leaf) for 1st and 2nd seasons, respectively. But for both control and Malathion applications a high number of eggs was recorded for the two seasons.

b- Acari:

The low population of the moving stages was detected with the two mineral oil concentrations (KZ_1 and KZ_2) for both seasons (63.26 and 70.33 ind./leaf) for (KZ_1) and (64.48 and 72.15 ind./leaf) for (KZ_2). The result was followed by citronella oil (ci), It was also the most effective on the eggs (36.67 and 38.39 eggs/leaf) for 1st and 2nd season, respectively. The both alternative (j_2) and (KZ_2) were of great effect to decrease the egg numbers, while the control and Malathion applications were of high number of eggs and moving stages through the two seasons.

c- Aphids:

The most harmful alternative to aphids was (KZ_2) followed by the two plant oils (j_2) and (ci). The control treatment was of high population, while Malathion was of moderate infestation.

3- The interaction between fertilizers and alternatives:

Statistical analysis showed significant differences between the average number eggs of whitefly and Acari in addition to aphids.

a- Whitefly:

The two concentrations of the mineral oil (KZ) were effective on the nymphs and adults followed by citronella oil (ci) (31.33 and 32.67 ind./leaf) for both seasons. Also, citronella oil (ci) was of high effect for decreasing the egg numbers (3.99 and 5.00 eggs/leaf) for 1st and 2nd seasons, respectively; followed by (j_2) and (KZ_2) for both seasons when using biogein fertilizer (A), the use of microbein fertilizer (B), the second concentration of alternatives was of high influence to reduce the whitefly population (N_2, j_2 and KZ_2) for both seasons, but it differs for eggs where (j_2, KZ_1 and KZ_2) (1.22, 3.00 and 4.89 eggs/leaf) for the 1st season and for the 2nd

season was (j_1, j_2 and KZ_2) (2.56, 3.73 and 4.44 eggs/leaf), respectively; while for both nymphs and eggs, Malathion (M) application was of moderate population and the control treatment was of high population for both seasons. In the unfertilized treatment, there was a difference for the nymphs and adults, (N_2) was the alternative causing reduction in whitefly but for eggs it was (N_1); also (KZ_2) was of least egg numbers in contrary for nymphs and adults was the highest population after the control treatment for the both seasons.

b- Acari:

The same result of that of whitefly under biogein treatment (A), where the two concentrations of the mineral oil (KZ_2 and KZ_1) were of high reduction of moving stages followed by (N_2) for both seasons. While for eggs (j_2) was the least alternative of eggs number (43.67 and 43.00 eggs/leaf) for 1st and 2nd seasons, respectively, followed by (KZ_2) and citronella oil (ci).

In the microbein treatment (B), the most effective alternative was (j_1) for the moving stages (70.89 and 72.67 ind./leaf) and citronella was for eggs (22.44 and 24.33 eggs/leaf) for 1st and 2nd seasons, respectively. Also, the two concentrations of (KZ) were of high influence to decrease the number of moving and egg stages during the two seasons. As usual, both the control and Malathion applications were of high numbers for both stages and for both seasons.

The plant oil citronella (ci) was the best alternative applied for both stages followed by (N_2) through the two seasons in the unfertilized treatment (C). But the control and Malathion applications were of moderate number of eggs.

c- Aphids:

When biogein fertilizer (A) was used, there was a distinct contrast between the two concentrations of the mineral oil, where (KZ_2) was the least population of aphid recorded in both seasons, while (KZ_1) was of the highest population of aphid in both seasons, followed by (j_2) (3.33 and 4.55 ind./leaf) for 1st and 2nd season, respectively. Malathion application was of slight effectiveness on aphid's population in case of biogein (A) and microbein (B) fertilizers. Also, for microbein (B) treatment, the plant oil citronella (ci) was the most effective alternative on the aphid numbers (1.33 and 2.55 ind./leaf) for 1st and 2nd seasons, respectively, followed by (N_2) and (KZ_2).

The two plant oil (j_2) and (ci) had effectiveness on aphid numbers when cantaloupe was not offer the biofertilizers and the mineral oil (KZ_1) (1.00 and 2.33 ind./leaf) for 1st and 2nd season, respectively. But, Malathion here was of high population.

From the previous results, the populations of whiteflies, Acari and aphids were high in the treatment of high N_2 concentration as in case of rhizobacterin fertilizer for squash and biogein for cantaloupe. There were confirmed by El-Shimi *et al.* (2002) and Abd El-Malak (2006), where biofertilizer increase the infestation by pests due to the efficient of bacteria for nitrogen fixation. In the case of phloem sucking insects, mineral and natural oils might be used in alternation with other

effective compounds for preserving the natural enemies. The results obtained after using the alternative of pesticides showed that the mineral oil (KZ) of both concentrations was the best alternative could be applied with the three pests studied. Bachatly *et al.* (1995) found that KZ during autumn squash season, reduces the whitefly and aphids population and virus diseases, also Hayder *et al.* (1996) detected that KZ oil was most potent for Aphis than Malathion on cucumber; also El-Dabi (1999) concluded that KZ was effective on aphids and whitefly for squash. Other study showed that, in general, mineral oil was of great effect as Hesler and Plapp (1986), Mohamed (1996) and Metwally *et al.* (1999). The plant oil had a distinct role for controlling the pests, as citronella oil (ci) was effective for egg stages of whitefly and Acari; also studies by Amer *et al.* (2001). Jojoba oil (j) act vigorously on the three pests infesting squash while for cantaloupe on aphids and eggs of whitefly and Acari only. Also, El-Bessony (1998) on tomato, El-Duweini and Sedrak (1998) on cotton, Habashy (2000) on leguminous crops and Bachatly *et al.* (2001) on tomato all studied the effect of jojoba. While for the neem extraction (N) was of moderate efficiency on the whitefly (nymphs, adults and eggs) and Acari moving stages for both plants, but it was more effective for eggs of Acari on squash and eggs of whitefly on cantaloupe, the result was nearly to that found by Dimetry *et al.* (1996), Bachatly *et al.* (2001), El-Arnaouty *et al.* (2003) and Kelany (2005) deduced that neem was strongly repellent and reduce the egg laying.

REFERENCES

Abd-Allah, S.A.M.; Mansour, S.M.A. and Wahba, Rawia M. (2004): Effect of bio- and nitrogen fertilizer on okra. Egypt. J. Agric. Res., 82 (2): 173-185.

Abd El-Malak, Violette Sh.G. (2006): Role of bio- and chemical fertilizers on the population of four arthropods infesting two Jerusalem artichoke cultivars. Egypt. J. Agric. Res. (In press).

Abd El-Rahman, M.M. (2000): Effect of bio- and mineral phosphate fertilization on growth and productivity of cantaloupe *Cucumis melo* var. *cantalouopensis*. J. Agric. Sci., Mansoura Univ., 25 (3): 1753-1765.

Amer, S.A.; Saber, A. and Momen, F.M. (2001): A comparative study of the effect of some mineral and plant oils on the two-spottd spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae). Rev. Agric. Entomol., 89 (12): 10773.

Bachatly, M.A. (1992): Infestation levels and control of aphids and whiteflies on squash, cucumber and melon and incidence of associated viral diseases. Ph.D. Thesis, Fac. Agric, Fayoum, Cairo Univ., 211 pp.

Bachatly, M.A.; Hegab, M.F.A.H.; Hussain, A.E. and Shaheen, H.A.A. (1995): Control of cotton whitefly, *Bemisia tabaci* (Genn.), aphids and associated virus diseases on squash plant by row covers, a pyrethroids and a mineral oil referring to the yield. Al-Azhar J. Agric. Res., 22: 197-216.

Bachatly, M.A.; Hady, S.A. and Hegab, M.F.A.H. (2001): The infestation of tomato hybrids by the tomato whitefly, *Bemisia tabaci* Gennadius and its control. Annals Agric. Sci., Moshtohor, 39 (1): 673-683.

Dimetri, N.Z.; Gomaa, R.A.; Salem, A.A. and Abd El-Moneim, A.S.H. (1996): Bio-activity of some formulations of neem extracts against the whitefly, *Bemisia tabaci* Genn. Rev. Appl. Entomol., 85 (1): 658.

El-Arnaouty, S.A.; Ewies, E.A. and Marei, S.S. (2003): Biochemical and toxicological studies on the efficacy of certain mineral oils, neem extract and primicarb against *Aphis craccivora* Koch and their side effects on the natural enemy *Chrysoperla carnea* Steph. Bull. Fac. Agric., Cairo Univ., 54: 127-140.

El-Bessony, M.A.E. (1998): Effect of natural oil (jojoba oil) on reduction of different stages of whitefly, *Bemisia tabaci* Genn. And virus symptoms on tomato plant. J. Agric. Sci., Mansoura Univ., 23 (7): 3375-3380.

El-Dabi, R.M.A. (1999): Population and control studies on three sap sucking insects on different plantations of squash and cucumber in Giza Governorate. M.Sc. Thesis, Fac. Agric., Cairo Univ., 90 pp.

El-Duweini, F.K. and Sedrak, R.A. (1998): Evaluation of jojoba oil for control of spider mite in Egypt cotton insect. Res. & Cotton Conf., Beltwide, U.S.A., pp. 1060-1063.

El-Shimi, Amal A.; Mansour, Safaa A.A. and Abdel-Malak, Violette Sh.G. (2002): Response of two strawberry cultivars to bio- and chemical fertilizers and their effect on pests infestation. J. Agric. Sci., Mansoura Univ., 27 (12): 9305-9326.

Hayder, M.F.; Dawood, M.Z. and Ibrahim, S.M. (1996): The efficiency of mineral oils, some insecticides and their mixtures against *Aphis gossypii* Glover. J. Agric. Sci., Mansoura Univ., 21 (6): 2343-2346.

Habashy, N.H. (2000): Using alternatives to pesticides for the control of mites infesting some vegetable plants. Ph.D. Thesis, Inst. Environ. Studies and Res., Ain Shams Univ., 183 pp.

Hesler, L.S. and Plapp, F.W. (1986): Uses of oils in insect control. South Western Entomol., 11: 1-8.

Kelany, B.M. (2005): Study on some plant extracts and their formulation as save alternative and bio-control measures for certain insect pests. Egypt. J. Agric. Res., 83 (3): 949-960.

Mahgoub, M.M.H. (1998): Effect of vegetale oil, mineral oil and admire on cotton whitefly, *Bemisia tabaci* (Genn.) and tomato yellow leaf virus into tomato fields. Egypt. J. Appl. Sci., 13 (6): 274-281.

Metwally, S.A.G.; Hegab, M.F.A.H. and Abdel-Megeed, H.A. (1994): Effect of some protective treatment on *Aphis gossypii* attacking squash plants and its predators with reference to yield in Qualyubia Governorate. Egypt. J. Appl. Sci., 9 (3): 813-821.

Metwally, S.A.G.; Ibrahim, S.M. and Gabr, A.M. (1999): Studies on the effect of certain substances on the population density of whitefly *Bemisia tabaci* (Genn.) and cotton aphids *Aphis gossypii* Glover, attacking squah crop. J. Agric. Sci., Mansoura Univ., 24 (5): 2629-2634.

Mishustin, E.N. (1970): The importance of non-symbiotic nitrogen fixing microorganism in agricultural soil. Plant & Soil, 32: 545-554.

Mohamed, M.A.H. (1996): Effect of insecticide treatment on some pests of vegetables and their associated predators. M.Sc. Thesis, Fac. Sci., Ain Shams Univ., Egypt.

Snedecor, G.W. and Cochran, G.W. (1967): Statistical Methods. The Iowa State Univ. Press, Ames, 544 pp.

دراسة استخدام الأسمدة الحيوية وبعض بدائل المبيدات على ثلاثة آفات تصيب نباتات الكوسة والكنتالوب

فيوليت شكرى جرجس عبد الملاك، مجدا أنيس بشتلى
معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقى – الجيزة، مصر.

أجريت التجارب الحقلية بقها بمحافظة القليوبية، لدراسة إصابة نباتات الكوسة والكنتالوب ببيض وحوريات والحشرات الكاملة للذبابة البيضاء *Bemisia tabaci* (Genn.) والعنكبوت الأحمر ذو البقعتين *Tetranychus urticae* Koch وحشرة المن *Aphis gossypii* Glov. والأمراض الفيروسية. أستخدم نوعان من السماد الحيوى لكل نبات وكذلك تم إستخدام بدائل مبيدات مختلفة. وكان الزيت المعدنى KZ الأكثر كفاءة على الافات الثلاث وكذلك الأمراض الفيروسية. وعلى نباتات الكوسة كان الزيت النباتى جوجوبا الأكثر تأثيرا على الأطوار المتغذية، ومستخلص النيم أكثر تأثيرا على البيض، بينما كان زيت السترونيلا الأكثر كفاءة على جميع الأطوار بعد الزيت المعدنى KZ بالنسبة للكنتالوب.