J. Pest Cont. & Environ. Sci. 14(2): 333 - 349 (2006).

Some natural additives to profenofos for improving its efficacy against whitefly and aphid on squash leaves

Said S. M. Soliman and Mohamed G. T. Kazem
Central Agriculture Pesticides Laboratory

ABSTRACT

Three natural materials were used as additives (capsicum, garlic and boiled linseed oil) to profenofos for improving its efficiency aganist adult stage of whitefly, *Bemisia tabaci* and aphids, *Aphis gossypii* on leaves of squash plant under field conditions. Each additive was used alone at the concentrations of 1.5, 2.5 and 3.5 %. The concentration of 2.5 % of each additive was also applied in combination with the half recommended field rate of profenofos. All treatments were compared to profenofos at the recommended rate (750 ml in 200 liters of water / feddan) and its half rate as well as to the untreated check. Two experiments were carried out on August and November months (2005), with mentioned treatments. Data indicated that the combination of natural materials with profenofos concentration (2.5 %), their mixed with half recommended rate of profenofos, achieved excellent efficiency for controlling whitefly and aphids, and obtainable initial effect > 70 % and > 40 % as residual effect, respectively. On the other hand, their effectiveness achieved equal, slightly higher or less than the insecticide when used at the recommended rate. Repeated use of 1.5 % of capsicum or garlic offered valuable efficiency more than the half recommended rate of profenofos against the two tested insects. Generally, boiled linseed oil was less efficient and reachable < 70 % and < 40 % as initial and residual effect, respectively.

Keywords: Natural additives, profenofos, *Bemisia tabaci*, *Aphis gossypii*, squash.

INTRODUCTION

For a large percentage of the human population of our planet, vegetables are the major constituent of the diet, providing fibre, protein, minerals, vitamins and fluids. In countries with rapidly increasing populations, vegetables form a renewable source of protein, preferable to animal protein in term of efficiency of production. In more affluent countries, a recent trend toward a healthier life – style has stimulated a greater dietary use of

vegetables (Potter and Olthof, 1993). Squash (*Cucurbita maxima*) is one of significant vegetable crops of considerable value (Zeven and de Wet, 1982 and FAO, 1986). Whitefly, *Bemisia tabaci* (Gnnadius) is considered one of the key pest that attack vegetable crops. Moreover, it is also considered the most important Aleyrodid victor of plant viruses (Bird and Maramorosch, 1978), such as squash leaf curl and lettuce infection yellow viruses, which incite several diseases in lettuce and cucurbit crops (Cohn *et al.*, 1983; Brown and Nelson, 1986 and Duffus *et al.*, 1986) The whitefly has become resistant to most classes of insecticides currently registered for control (Prabhaker *et al.*, 1985). Among alternatives; plant oils are safe, low in cost and local in production. They are effective against some serious pests attacking legume and field crops such as whitefly and aphids (Kazem, 2004).

The aim of the present work could be illustrated to evaluate either some natural materials alone or in combination with the insecticide, profenofos for controlling *Bemisia tabaci* an *Aphis gossypii* on leaves of squash plant under field conditions.

MATERIALS AND METHODS

1. Materials used: The following materials used, their functions and supplement:

A) Capsicum and garlic were supplied from local markets.
B) Linseed boiled oil (botanical fixed oil), was extracted from linseed plants seeds using pressing method (Raw oil), commercial oil (Pure oil) and seeds were obtained from local markets.
C) Polyethylene Glycol (PEG), was used as surface-active agent, was provided by the Egyptian Company for Starch, Yeast and Detergents, Alexandria.
D) Xylene was used for improvement the emulsification, was provided by El-Nasr Co., for Manufacturing Coke and Chemicals, Egypt.

2. Natural materials preparations: One hundred grams of capsicum and garlic, each was added to 300 ml xylene, as stock solution. 11 ml from each stock was taken to 9 ml of (PEG). Addition of 15, 25, and 35 ml / l of water, represent concentrations of 1.5, 2.5 and 3.5 %, respectively. While the boiled linseed oil prepared by mixing 11 g of xylene, 9 ml of PEG and 80 ml of boiled linseed oil, where 15, 25 and 35 ml / l, represent 1.5, 2.5 and 3.5 % concentrations. On August experiment, water irrigation was used as

dilution water of spraying, but on November experiment, dilution water was (100 g of capsicum and garlic were boiled in 4.5 liters of water).

3. Natural materials applications: The insecticidal efficacies of local materials alone or additives combined with insecticide were determined against whitefly and present aphids infested squash leaves. Spraying different concentrations of plant oils alone or mixing with profenofos (Table 1), at highly infected squash leaves with adult stage of whitefly and aphids at Menia El-Kameh, Sharkia Governorate, Egypt. Squash plants

Table (1): The experimental oils and profenofos dilutions in knapsack sprayer calculated from the rate per feddan.

Material	Rate / Feddan in 200 liters water	The equivalent dilution in 1 liter
Capsicum and Garlic		
1.5%	3 kg	15 ml
2.5%	5 kg	25 ml
3.5%	7 kg	35 ml
Boiled linseed oil		
1.5%	3 kg	15 ml
2.5%	5 kg	25 ml
3.5%	7 kg	35 ml
Profenofos 72 % EC (field rate)	750 ml	3.75 ml
Profenofos 72 % EC (half of field rate)	380 ml	1.9 ml

cultivated in the first experiment on August 12, 2005, while the second was on October 25, 2005. Treatments were applied by knapsack sprayer furnished with one nozzle boom at 200 liters of water / feddan, 3 weeks after planting when the plants developed to the 3-6 leaves per plant. The spray was directed from each side of the plant parallel to the ground to obtain under leaf coverage, each leaf per plant was turn the upside down by hand and coverage the leaf with spray solution. Each Treatment was applied in 1 / 100 feddan, in three replications. The number of adults per plot was estimated before spraying and after the intervals of 1, 3, 5, 7 and 11 days from spraying. Whitefly (*Bemisia tabaci*) adults on plants in each treated

plot with the untreated one were counted on undersides of 25 leaves per plot. Leaves were chosen randomly in the morning before flight activity occurred. In all studies, adults were counted visually by gently turning over leaves and recording numbers of the undersides of leaves. Numbers of present aphids (*Aphis gossypii* Glover) estimated on squash leaves, which were tagged, and sprayed. One day later, the percent of surviving aphids estimated in the field.

The pesticidal efficiency was calculated as a percent of reduction occurred in the population of each pest as a result of treatment according to Henderson and Tilton (1955).

$$\% \text{ of Reduction} = (1 - C_b / C_a \text{ X } T_a / T_b) \text{ X } 100 \text{ ---(1)}$$

Where C_b = mean alive number of pest / leaf in untreated before spraying.
C_a = mean alive number of pest / leaf in untreated after spraying.
T_b = mean alive number of pest / leaf in treatment before spraying.
T_a = mean alive number of pest / leaf in treatment after spraying.

The initial effect of treatments was calculated according to Abbott's formula as follows:

$$\text{Initial Effect} = 100 \text{ X } C_b - T_a / C_b \text{ ----------(2)}$$

Where C_b = mean alive number of pest / leaf in untreated before spraying.
T_a = mean alive number of pest / leaf in treatment after spraying.

Recording any colour change, curl or flamming on leaves inspected phytotoxicity on squash plants in field plots. Each experiment included eleven treatments (Table 1), in addition to untreated check. Application of each treatment was done as foliar spray on squash plants, 2 weeks after growing. A randomized complete block design with three replications was used, with a plot area of 20 m^2 (4 x 5 m). Residual effect expresses the calculation of reduction percentages for all days of insect counting after spraying except the first day (initial), while general effect was estimated for all days of insect counting after spraying (equation 1).

Statistical analysis: Data were subjected to analysis of variance procedures and Duncan's multiple range test ($p \leq 0.05$ level of significance) to separate the means (Duncan, 1955).

RESULTS

The purpose of two conducted experiments was to investigate the benefit of (spraying natural materials), insecticide and their mixture on the reduction percent of studied insects (whitefly and aphids). According to Ministry of Agriculture recommendations for evaluation of natural materials, the successful material should gave initial effect $\geq$ 70 % reduction and residual effect $\geq$ 40 % reduction. The plant oils are also considered natural materials; therefore the obtained results will be discuses according to this rule.

Capsicum, garlic and linseed boiled oil were used alone at concentrations of 1.5 %, 2.5 % and 3.5 % as well as the combination between the ½ rate of profenofos and 2.5 % of natural material. Those treatments applied to squash plant leaves for controlling whitefly adult stage and aphids, in compared to alone profenofos at the recommended rate and ½ rate in addition to the untreated check. The effect of the mixture and natural material alone, as well as the insecticide and their residual activities against whitefly and aphids in field are shown in Tables (2, 3, 4 and 5) and Fig. (1, 2, 3 and 4).

In respect to capsicum against whitefly on August (Table 2 and Fig. 1), data revealed that concentration (2.5 %) mixed with the ½ recommended rate gave more efficiency (94.8 % for initial effects) equaled the recommended rate, but more than the ½ rate (78.6 %). This treatment exceeded recommended (34.2 %) and ½ recommended rate (58.2 %) in their residual effect, it was 68.9 %. Three concentrations used alone are considered successful, where it gave initial effect more than 70 % reduction and residual effect (66.0, 47.0 and 68.9 %), therefore 1.5 % concentration considered the best in both initial and residual effect. On November, (2.5 % + ½ rate), recommended and ½ recommended rate offered 100 % initial effect and 94 % residual effect. Alone concentrations (1.5, 2.5 and 3.5 %) gave initial effect (95.4, 94.8 and 78.8 %) and residual effect (82, 73 and 35 %), respectively. So, concentration of 1.5 % was also the best (Table 4 and Fig. 3). For controlling aphids on August, (Table 3 & Fig. 2) showed that the treatment of combination of capsicum and profenofos presented initial

effect 100 % reduction, equaled to recommended and ½ recommended rate, and enhanced the residual effect 59 % reduction compared to 88 % for recommended rate and 6 % for the ½ recommended rate. About alone concentrations, it offered excellent control (75.3, 100 and 100 %) for initial effect and (83, 71 and 59 %) for residual effect, respectively, consequently concentration of 1.5 % still the most excellent. On November, all different treatments achieved the same initial effect (100 % reduction) and residual effect more than 85 % reduction. For that reason, the concentration of 1.5 % is the best evidently (Table 5 and Fig. 4). Concerning to the garlic as an additive for controlling whitefly on August, data in Table (2) and Fig. (1) indicated that the garlic 2.5 % + ½ rate of profenofos enhanced initial effect (86.8 %) reduction, more than the ½ rate (78.6 %). But, its residual effect decreased and reached 30.7 % less than 58.2 % of ½ rate alone, This effect similar to the recommended rate, which gave 100 and 34.2 % initial and residual effect. Regarding alone concentrations of garlic, the concentration of 1.5 % was not useful, but concentrations of 2.5 and 3.5 % were very effective, and gave (84.4 and 94.5 %) initial effect, and (70.9 and 83.9 %) residual effect. Hence concentration of 2.5 % considered is the best. On November, data from Table 4 and Fig. 3 proved that treatment of garlic 2.5 % + ½ rate of profenofos offered initial and residual effect (94.1 and 77 %) equaled to alone complete rate and better than alone ½ rate. While alone garlic concentrations failed in their residual effect except the concentration of 2.5 %. For controlling aphid on August (Table 3 and Fig. 2), all treatments gave maximum initial effect (100 % reduction). In respect to residual effect, all treatments gave more than 80 %, except the concentration of 1.5 % it offered 59 % reduction. Therefore, 2.5 % concentration was considered the best.

On November, data from Table 5 was the same with the result obtained on August experiment. Regarding to the boiled linseed oil against whitefly on August, treatment of boiled linseed oil 2.5 % + ½ rate of profenofos decreased initial effect (47.4 % reduction) as of alone ½ rate of profenofos (78.6 %). Boiled oil concentration of 3.5 % offered 85.9 and 90.3 % reduction in initial and residual effect, respectively (Table 2). On November, although the combined treatments was effective, but decreasing the initial and residual effects. All concentrations alone failed in both initial and residual effects, except the concentration of 1.5 % (Table 4). For controlling aphid on August, boiled oil at 2.5 % + the ½ rate of profenofos gave 100 % initial effect and equaled with alone recommended and ½

Table (2): The initial, residual and general effect of certain natural materials and profenofos alone and in combinations, against whitefly adult stage on squash plant leaves on August 2005.

Treatment	Befor Spraying			After 1 day			After 3 day			After 5 day			After 7 day			Initial	Residual	General
	Av Aph.		R.P.	Av.a.		R.P.	Av.a.		R.P.	Av.a.		R.P.	Av.a.		R.P.	effect	effect	effect
Control	9	a	—	2.7	a	—	3.6	a	—	6.4	ab	—	7.3	ab	—	—	—	—
1.5% Capsicum	11.2	a	—	1	b	70.2%	2.6	ab	42.0%	1.4	bc	82.4%	2.4	abc	73.6%	70.2%	66.0%	67.1%
2.5% Capsicum	7	a	—	0.6	b	71.4%	1.2	bcd	57.1%	1.4	bc	71.9%	5	abc	11.9%	71.4%	47.0%	53.1%
3.5% Capsicum	9.8	a	—	0.8	b	72.8%	1.8	bcd	54.1%	1.5	bc	78.5%	6.8	abc	14.5%	72.8%	49.0%	55.0%
2.5% Cap. + 1/2 profenofos	12.9	a	—	0.2	b	94.8%	0.8	bcd	84.5%	3.1	abc	66.2%	4.6	abc	56.0%	94.8%	68.9%	75.4%
profenofos (Full dose)	10.8	a	—	0	b	100%	1.2	bcd	72.2%	7.5	a	2.3%	6.3	abc	28.1%	100%	34.2%	50.7%
½ profenofos	14	a	—	0.9	b	78.6%	1.9	bcd	66.1%	3.5	abc	64.8%	6.4	abc	43.6%	78.6%	58.2%	63.3%
1.5% Garlic	8.1	a	—	1	b	58.8%	2.3	abc	29.0%	4.4	abc	23.6%	8.5	a	0.0%	58.8%	17.5%	27.9%
2.5% Garlic	10.7	a	—	0.5	b	84.4%	0.5	cd	88.3%	3.9	abc	48.7%	2.1	abc	75.8%	84.4%	70.9%	74.3%
3.5% Garlic	6.1	a	—	0.1	b	94.5%	0.4	d	83.6%	0.6	bc	86.2%	0.9	bc	81.8%	94.5%	83.9%	86.5%
2.5% Garl. + 1/2 profenofos	7.6	a	—	0.3	b	86.8%	1.2	bcd	60.5%	3.7	abc	31.5%	8	a	0.0%	86.8%	30.7%	44.7%
1.5% Boiled oil	9.2	a	—	0.9	b	67.4%	1.2	bcd	67.4%	2.5	abc	61.8%	1.6	abc	78.6%	67.4%	69.3%	68.8%
2.5% Boiled oil	8.1	a	—	0.8	b	67.1%	1	bcd	69.1%	2.3	abc	60.1%	3	abc	54.3%	67.1%	61.2%	62.7%
3.5% Boiled oil	7.1	a	—	0.3	b	85.9%	0.5	cd	82.4%	0.4	c	92.1%	0.2	c	96.5%	85.9%	90.3%	89.2%
2.5% Boil. + 1/2 profenofos	5.7	a	—	0.9	b	47.4%	2.5	ab	0.0%	6.1	abc	97.5%	5.8	abc	0.0%	47.4%	32.5%	36.2%
LSD 0.05	9.8			0.97			1.56			5			5.86					

Insect : Cotton Whitefly (Adult stage *Bemisia tabaci*) Means followed by the same letter are not significantly different ($P \leq 0.05$)

Host : Leaves of squash plant Date of growing : 12 / 7 / 2005 Date of sprinkling : 2 / 8 / 2005

Place of experiment: Azbet Samaan – Tanaya – El Saadyein - Menia El Kameh – Sharkya Governorate profenofos "recommended rate"= 3.75 ml /L

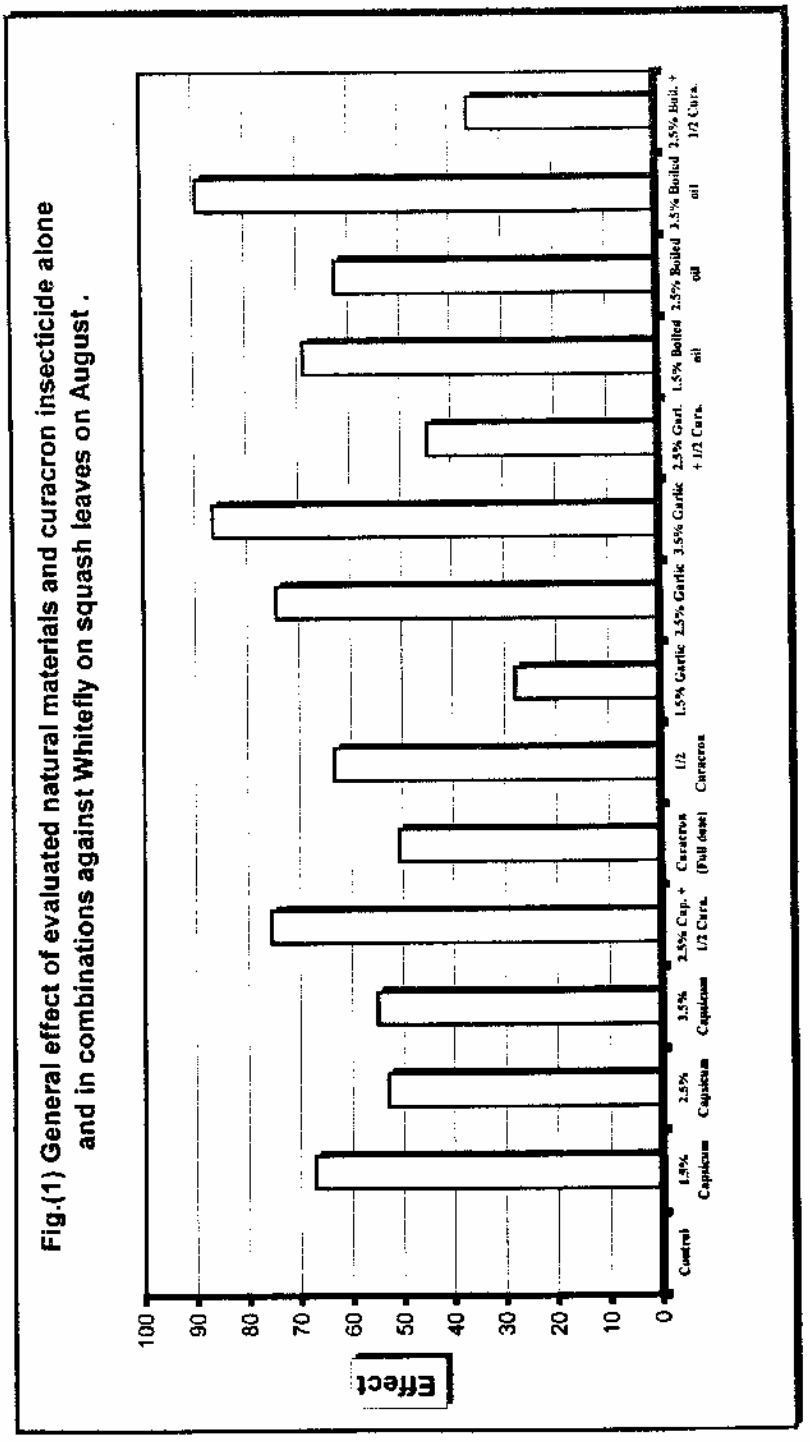

Fig.(1) General effect of evaluated natural materials and curacron insecticide alone and in combinations against Whitefly on squash leaves on August .

Table (3): Average of Aphid numbers and reduction percentage on leaf of squash plant, and (initial, residual and general effect) of evaluated natural materials and profenofos insecticide alone and in combinations.

Treatment	Befor Spraying			After 1 day			After 3 day			After 5day			After 7 day			Initial	Residual	General
	Av.Aphid		R.P	Av.Ap.		R.P.	Av.Ap.		R.P.	Av Ap.		R.P.	Av.Ap.		R.P.	effect	effect	effect
Control	3.3	a	___	0.9	a	___	0.9	a	___	0.4	a	___	0.5	a	___	___	___	___
1.5% Capsicum	10.4	a	___	0.7	a	75.3%	0.6	ab	78.8%	0.2	a	84.1%	0.2	ab	87.3%	75.3%	83%	0%
2.5% Capsicum	6.2	a	___	0	a	100%	0.1	cd	94.1%	0.2	a	73.4%	0.5	a	46.8%	100%	71%	0%
3.5% Capsicum	7	a	___	0	a	100%	0.3	bcd	84.3%	0.5	a	41.1%	0.5	ab	52.9%	100%	59%	0%
2.5% Cap. + 1/2 profenofos	4.3	a	___	0	a	100%	0	d	100%	0.4	a	23.3%	0.3	ab	54%	100%	59%	0%
profenofos (Full dose)	10.2	a	___	0	a	100%	0	d	100%	0.3	a	75.7%	0.2	ab	87%	100%	88%	0%
1/2 profenofos	1.6	a	___	0	a	100%	0.6	abc	0.0%	0.4	a	0.0%	0.2	ab	17.5%	100%	6%	0%
1.5% Garlic	9.7	a	___	0.1	a	92%	0.5	abc	81.1%	0.3	a	74.5%	0.2	ab	86.4%	92%	81%	0%
2.5% Garlic	5	a	___	0	a	100%	0.4	bcd	70.7%	0.4	a	34.0%	0.2	ab	73.6%	100%	59%	0%
3.5% Garlic	4.2	a	___	0	a	100%	0.2	bcd	82.5%	0.2	a	60.7%	0	b	100%	100%	81%	0%
2.5% Garl. + 1/2 profenofos	6.1	a		0	a	100%	0.2	bcd	88.0%	0.3	a	59.4%	0	b	100%	100%	82%	0%
1.5% Boiled oil	7.4	a	___	0	a	100%	0.4	abcd	80.2%	0.3	a	66.6%	0	b	100%	100%	82%	0%
2.5% Boiled oil	11.5	a	___	0	a	71.3%	0.3	bcd	90.4%	0.2	a	85.7%	0	b	100%	71.3%	92%	0%
3.5% Boiled oil	3	a	___	0	a	75.6%	0.2	bcd	75.6%	0.3	a	17.5%	0	b	100%	75.6%	64%	0%
2.5% Boil. + 1/2 profenofos	10.9	a	___	0	a	100%	0.3	bcd	89.9%	0.3	a	77.3%	0	b	100%	100%	89%	0%
LSD 0.05		10.1			0.78			0.39						0.39				

Insect : Cotton aphid (*Aphis gossypii* Banks) Means followed by the same letter are not significantly different ($P \leq 0.05$)

Host : Leaves of squash plant Date of growing : 12 / 7 / 2005 Date of sprinkling : 2 / 8 / 2005

Place of experiment : Azbet Samaan - Tanaya El Saadyein - Menia El Kameh - Sharkya Governorate

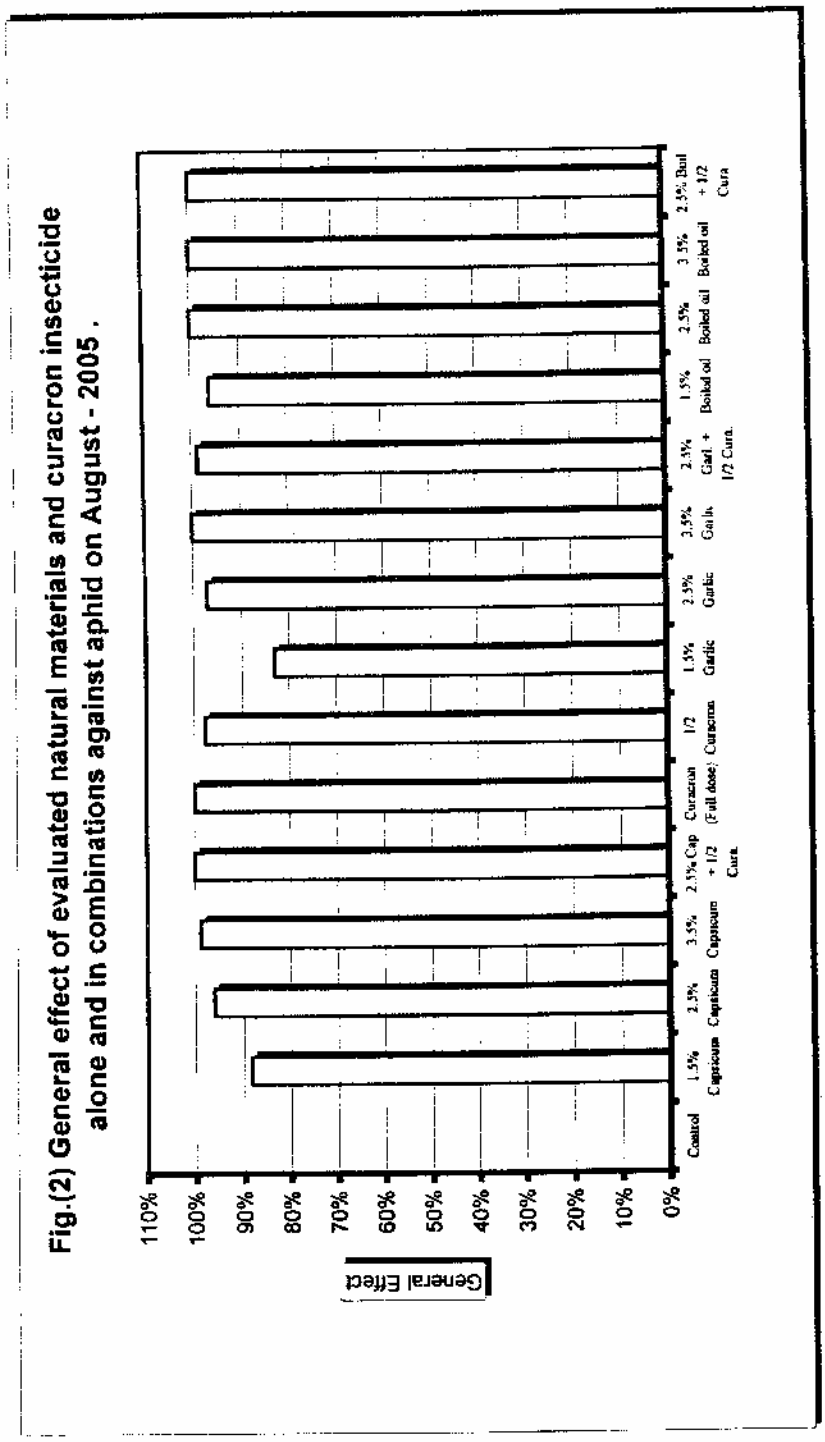
Fig.(2) General effect of evaluated natural materials and curacron insecticide alone and in combinations against aphid on August - 2005 .
General Effect
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Control
1.5% Capsicum
2.5% Capsicum
3.5% Capsicum
2.5% Cap + 1/2 Cura.
Curacron (Full dose)
1/2 Curacron
1.5% Garlic
2.5% Garlic
3.5% Garlic
2.5% Garl + 1/2 Cura.
1.5% Boiled oil
2.5% Boiled oil
3.5% Boiled oil
2.5% Boil + 1/2 Cura

Table (4): The initial, residual and general effect of certain natural materials and profenofos alone and in combinations, against whitefly adult stage on squash plant leaves on November.

Treatment	Befor Spraying			After 1 day			After 3 day			After 7 day			After 11 day			Initial	Residual	General
	Av.whi.		R.P.	Av.w		R.P.	Av.w		R.P.	Av.w.		R.P.	Av w.		R.P.	effect	effect	effect
Control	22.7	ab	___	8.5	a	___	11.7	ab	___	16.1	a	___	19.4	a	___	___	___	___
1.5% Capsicum	11.7	bc	___	0.2	ef	95.4%	1.6	d	73.5%	2.7	ef	67.5%	5.5	ef	45%	95.4%	62%	70.4%
2.5% Capsicum	15.3	abc	___	0.3	ef	94.8%	2	d	74.6%	2.3	ef	78.8%	4.4	ef	66.3%	94.8%	73%	78.6%
3.5% Capsicum	8.8	bc	___	0.7	ef	78.8%	2.7	d	40.5%	3.4	def	45.5%	6.2	def	17.6%	78.8%	35%	45.6%
2.5% Cap. + 1/2 profenofos	5.5	c	___	0	f	100%	0.1	d	96.5%	0.2	f	94.9%	0.4	f	91.5%	100%	94%	95.7%
profenofos (Full dose)	13	bc	___	0.2	ef	96%	0.2	d	97%	0.2	f	97.8%	1.1	f	90.1%	96%	95%	95.2%
1/2 profenofos	19.4	abc	___	0.7	ef	90.4%	2.5	d	75%	2.7	ef	80.4%	7.1	cdef	57.2%	90.4%	71%	75.8%
1.5% Garlic	14.8	abc	___	6.6	ab	0.0%	12.3	a	0.0%	10.7	b	0.0%	19.3	a	0.0%	0.0%	0%	0.0%
2.5% Garlic	28.7	a	___	3	cde	72.1%	7.9	bc	46.6%	10.9	b	46.5%	17.8	ab	27.4%	72.1%	40%	48.2%
3.5% Garlic	21.8	ab	___	1.9	def	76.7%	7.3	c	35%	9.8	bc	36.6%	15.5	ab	16.8%	76.7%	29%	41.3%
2.5% Garl. + 1/2 profenofos	9.1	bc	___	0.2	ef	94.1%	0.5	d	89.3%	1.2	ef	81.4%	3	ef	61.4%	94.1%	77%	81.6%
1.5% Boiled oil	16	abc	___	2.2	def	63.3%	4.5	cd	45.4%	4.4	de	61.2%	10.4	bcde	23.9%	63.3%	44%	48.5%
2.5% Boiled oil	11.8	bc	___	3.9	cd	11.7%	8.1	bc	0.0%	8.3	bc	0.8%	13.5	abcd	0.0%	11.7%	0%	3.1%
3.5% Boiled oil	21	ab	___	5	bc	36.4%	8.5	abc	21.5%	10	bc	32.9%	19.7	a	0.0%	36.4%	18%	22.7%
2.5% Boil. + 1/2 profenofos	18.2	abc	___	1.1	def	83.9%	2.3	d	75.5%	6.7	cd	48.1%	14.4	abc	7.4%	83.9%	44%	53.7%
LSD 0.05	12.9			2.55			3.9			3.5			7.1					

Insect : Cotton Whitefly (Adult stage *Bemisia tabaci*) Means followed by the same letter are not significantly different (LSD, $P \leq 0.05$)

Host : Leaves of squash plant Date of growing : 25 / 10 / 2005 Date of sprinkling : 15 / 11 / 2005

Place of experiment: Azbet Samaan – Tanaya – El Saadyein - Menia El Kameh – Sharkya Governorate Curacron "recommended rate" = 3.75 ml / L

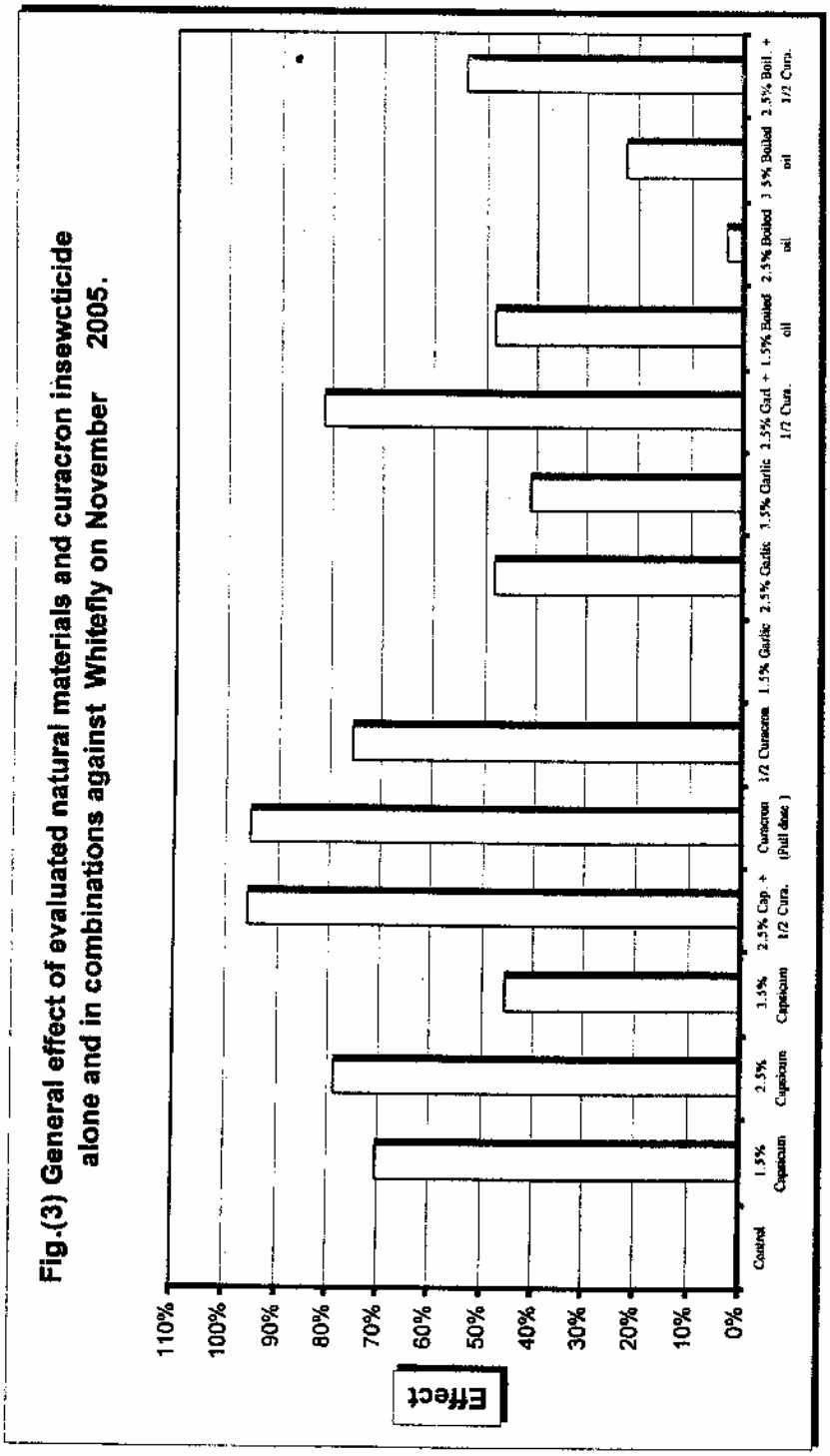
Fig.(3) General effect of evaluated natural materials and curacron insewcticide alone and in combinations against Whitefly on November 2005.
Effect
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Control
1.5% Capsicum
2.5% Capsicum
3.5% Capsicum
2.5% Cap. + 1/2 Cura.
Curacron (Full dose)
1/2 Curacron
1.5% Garlic
2.5% Garlic
3.5% Garlic
3.5% Garl. + 1/2 Cura.
1.5% Boiled oil
2.5% Boiled oil
3.5% Boiled oil
2.5% Boil. + 1/2 Cura.

Table (5): Average of Aphid numbers and reduction percentage on leaf of squash plant ,and (initial, residual and general effect) of evaluated natural materials and profenofos alone and in combinations.

Treatment	Befor Spraying			After 1 day			After 3 day			After 7 day			After 11 day			Initial	Residual	General
	Av.Aphid		R.P.	Av.Ap.		R.P.	Av.Ap.		R.P.	Av.Ap.		R.P.	Av.Ap.		R.P.	effect	effect	effect
Control	1.2	ab	___	0.9	a	___	0.3	a	___	0.8	A	___	1.3	a	___	100%	___	___
1.5% Capsicum	0.4	b	___	0	b	100%	0	b	100%	0	B	100%	0.2	ab	53.8%	100%	85%	0%
2.5% Capsicum	0.6	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	84.6%	100%	95%	0%
3.5% Capsicum	2.2	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	95.8%	100%	99%	0%
2.5% Cap. + 1/2 profenofos	1.7	ab	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%	100%	100%	0%
profenofos (Full dose)	1.9	ab	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%	100%	100%	0%
1/2 profenofos	1	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	90.8%	92%	97%	0%
1.5% Garlic	1.7	ab	___	0.1	b	92%	0	b	100%	0	B	100%	1.1	ab	40.3%	100%	80%	0%
2.5% Garlic	0.8	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	88.5%	100%	96%	0%
3.5% Garlic	0.8	ab	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%	100%	100%	0%
2.5% Garl. + 1/2 profenofos	1.8	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	94.9%	100%	98%	0%
1.5% Boiled oil	0.6	ab	___	0	b	100%	0	b	100%	0	B	100%	0.1	ab	84.6%	100%	95%	0%
2.5% Boiled oil	0.5	b	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%	100%	100%	0%
3.5% Boiled oil	1	ab	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%	100%	100%	0%
2.5% Boil. + 1/2 profenofos	3.4	ab	___	0	b	100%	0	b	100%	0	B	100%	0	b	100%		100%	0%
LSD 0.05		2.3			0.4			0.2			0.6			1.1				

Insect : Cotton aphid (*Aphis gossypii* Banks) Means followed by the same letter are not significantly different ($P \leq 0.05$)

Host : Leaves of squash plant Date of growing : 25 / 10 / 2005 Date of sprinkling : 15 / 11 / 2005

Place of experiment: Azbet Samaan – Tanaya – El Saadyein - Menia El Kameh – Sharkya Governorate

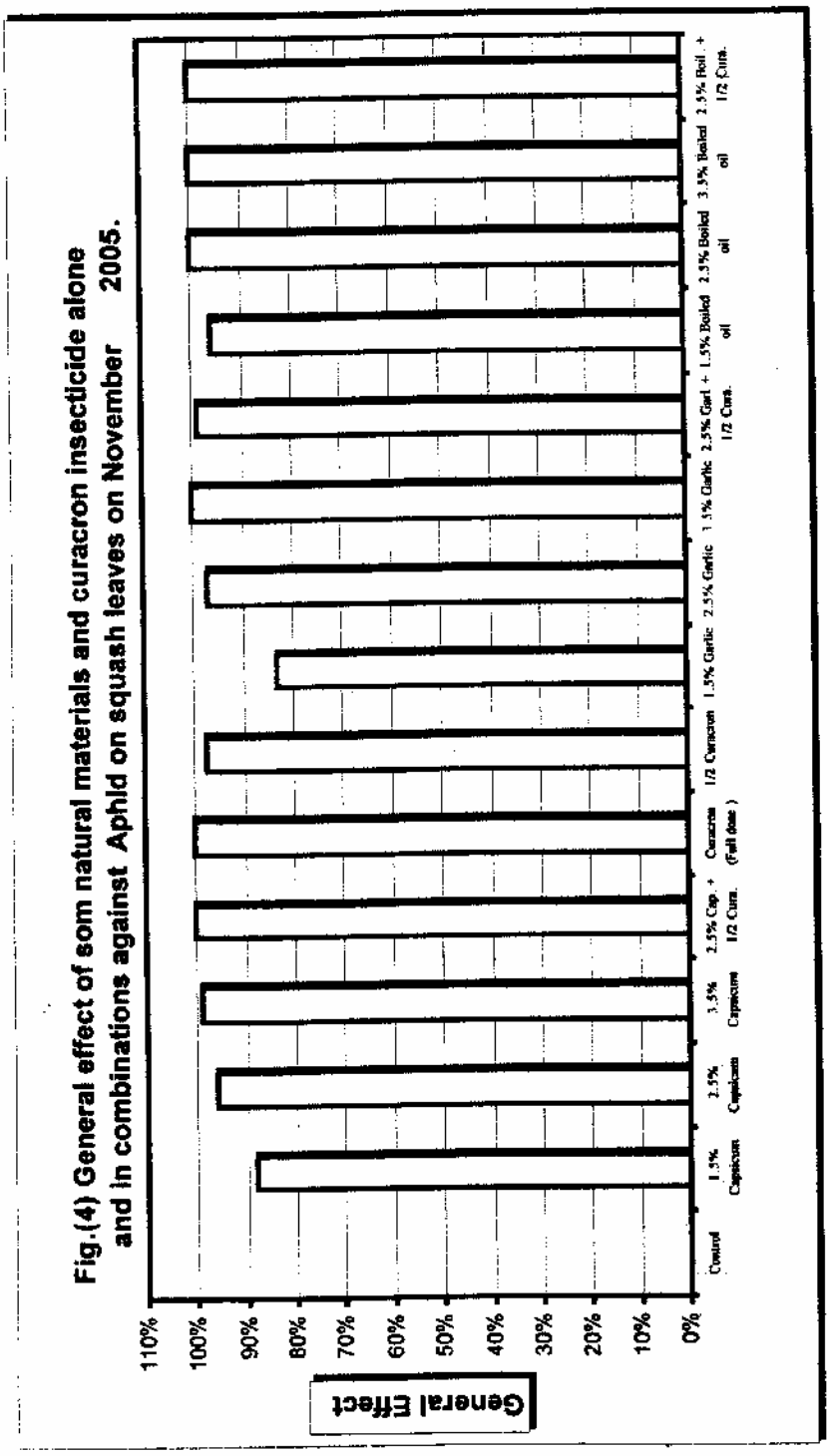
Fig.(4) General effect of som natural materials and curacron insecticide alone and in combinations against Aphid on squash leaves on November 2005.
General Effect
110%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Control
1.5% Capsicum
2.5% Capsicum
3.5% Capsicum
2.5% Cap. + 1/2 Cinn.
Curacron (Full dose)
1/2 Curacron
1.5% Garlic
2.5% Garlic
1.5% Garl + 1/2 Cinn.
2.5% Garl + 1/2 Cinn.
1.5% Boiled oil
2.5% Boiled oil
3.5% Boiled oil
2.5% Boil + 1/2 Cinn.

recommended rate, and concentration of 1.5 % alone, and gave 89 % residual effect more than that of profenofos alone (½ recommended rate). Concentration of 2.5 % was considered the optimum (Table 2). On November, all treatments offered 100 % reduction for initial and residual effect.

DISCUSSION

For integrated pest management, capsicum, garlic and the boiled linseed oil were used to evaluate their efficiency against *B. tabaci* and *A. gossypii* by calculation their percent reduction in population density at different post treatment times, and to protect both the environment and natural enemies when the squash plant became resistant to the insects.

Data indicated that the mixture of natural materials (each at 2.5 %), with ½ recommended rate of profenofos, were achieved superior efficiency in controlling whitefly and aphids, and obtainable initial effect > 70 % and > 40 as residual effect. Also, achieved equal, slightly higher or less than the insecticide alone when used at the recommended rate. There are many reports supported our findings, Abo-Sholoa (2000) who found that most alternative materials (mineral oil, jojoba oil, detergent, sulpher, Vertemic, Evisect, Bio-fly, Ecotech, MVP11) were failed to control pink bollworm except natural oil 97 %: is a blend of vegetable oil, emulsifiers and antioxidant, at rate of 2 liter / fed., which gave acceptable effect on *P. gosspiella* comparing with half the recommended dose of conventional insecticides. Also, Mourad *et al.* (1994) noted that the combinations of modified vegetable oil with malathion, primiphos-methyl, lambada-cyhalothrin and carbosulfan as well as the combination between Tar oil and carbosulfan at half the recommended concentrations produced above 90 % mortality. The mortality was further improved when modified vegetable oil was mixed with carbosulfan at the lower concentration (97.5 %). In addition, Nassef, (1999) reported that the plant – derived oils were used at concentration of 50 ml / L (cotton seed oil, sunflower oil, corn oil and linseed oil), are considered to be new promising approaches for suppressing the population of whitefly in cotton fields. Moreover, Butler *et al.* (1993) who found that number of living green peach aphids on cotton plants were significantly reduced for 7 days following application of 5 % cotton seed oil alone, 5 % cotton seed oil plus 2 % safner. Numbers of aphids on collard plants treated with raw cotton seed oil sprays were reduced 86 % on day 16 after application, which was better than any of the other treatments.

Concentration of 1.5 % alone of capsicum or garlic offered valuable efficiency more than the profenofos alone at the ½ recommended rate against the two tested insects. Generally, boiled linseed oil failed and reachable < 70 % and < 40 % as initial and residual effect, respectively.

REFERENCES

Abo-Sholoa, M. K. (2000). Efficiency of some alternative materials for controlling pink bollworm and associated certain sapsuckers as non-target pests in cotton plants. J. Agric. Sci. Mansoura Univ., 25: 6533 – 6542.

Bird, J. and K. Mramorosch (1978). Viruses and Virus diseases associated with white flies. Adv. Virus Res., 22: 55 – 110.

Brown, J. K. and M. R. Nelson (1986). Whitefly-borne viruses of melons and lettuce in Arizona.Phytopathology,76: 236 – 239.

Butler, G. D. J.; T. J. Henneberry; P. A. Stansly; D. J. Schuster (1993). Insecticidal effects of selected soaps, oils and detergents on the sweet potato whitefly: (Homoptera:Aleyrodidae).USDA, Agricultural Research Service, Western Cotton Research Laboratory, Phoenix, AZ 85040,USA.Florida-Entomologist, 76: 161 – 167.;9ref.

Cohn, S. J.; E. Duffus; R. C. Larsen; H. Y. Lui and R. A. Flxk (1983). Purification, serology and vector relationships of squash leaf curly viruses, a whitefly – transmitted Gemini virus. Phytopathol., 73: 1660 – 1673.

Duffus, J. E.; R. C. Larsen and H. Y. Liu (1986). Lettuce infectious yellows viruses – a new type of whitefly-transmitted virus. Phytopathol., 76: 97 – 100.

Duncan, D. B. (1955). Multiple range and multiple F tests. Biometrics, 11: 1– 42.

FAO (1986). Production Year Book, Food and Agricultural Organization Vol. 40, 107 – 108, 130 – 155.

Henderson, C. F. and E. W. Tilton (1955). Tests with acaricides against the brown wheat mite. J. Econ. Entomol., 48: 157-161.

Kazem, M. G. T. (2004). Formulation and evaluation of some local natural products against some pests. PhD Thesis, Plant Protection Department, Faculty of Agriculture. Al-Azhar University. Pp 224.

Mourad E. L.; M. E. Keddis; M. S. Osman; F. A. Ayad and M. A. El-Guindy (1994). Suitability of some natural and mineral oils as pesticidal synergists against *Aphis gossypii*. Egypt, J.Agric Res., 72: 739 – 744.

Nassef, M. A. (1999). Juvenile hormone mimic and plant-derived oils as control agents against whitefly,Bemisia tabaci (Genn.), on cotton. Egypt J. Agric. Res., 77: 691 – 699.

Potter, J. W. and T. H. A. Olthof (1993). Nematode pests of vegetable crops. Chapter 5 In: Plant Parasitic Nematode in Temperate Agriculture (ed.) by Evans, K , D.L. Trudgil and J.M.Webster. UK. University Press, Cambridge

Prodbhaker, N.; D. L.Coudriet and D. E. Meyerdirk (1985). Insecticide resistance in the sweet-potato whitefly, *Bemisia tabaci* (Homoptera :Aleyroididae). J. Econ. Entomol., 78: 748 – 752.

Zeven, A. C. and J. M. J. Wet (1982). .Dictionary of cultivated Plants and their Regions of Diversity: Excluding most Ornamentals,Forest Trees and Lower Plants. Centre for Agricultural Publishing and Documentation, Wageningen.