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INSECTICIDAL EFFICIENCY OF SOME CHEMICAL COMPOUNDS AGAINST SOME PIERCING-SUCKING INSECTS INFESTING SQUASH PLANTS AND ITS ASSOCIATED NATURAL ENEMIES USING THREE SPRAYING TOOLS

Atif A.A. Abd-Allah*, H.M.H. El-Shannaf, A.E. Ammar and H.E. Megahed

Plant Protection Research Institute, Agricultural Research Center, Dokki, Gizza, Egypt

ABSTRACT

Several problems in controlling pests as well as pollution have been risen from the intensive use of insecticides. Therefore, this work was carried out at Shiba village, Zagazig district during summer plantation of 2010 season to evaluate the initial and residual effects of five insecticides against tomato white fly, *Bemisia tabaci* (Genn.), cotton aphid, *Aphis gossypii* (Glov.) and onion thrips, *Thrips tabaci* (Lind.) infesting squash plants and their associated natural enemies, *Chrysoperla carnea* Steph., *Orius* sp., *Scyminus* sp., *Coccinella* sp., *Paederus alfierii* Koch, *Syrphus corollae* F., *Aphidoletus* sp. and mummies. The obtained results could be summarized as follows: MTI-446 had the highest effect against *B. tabaci* after the 1st spray and sumicidin after the 2nd spray by using ULV sprayer while chemisol was the least effective by using taral motor sprayer after the 2nd spray, but the same last tool with mospilan showed high % reduction at the 1st spray. MTI-446 after the 1st spray and jojoba after the 2nd spray by using ULV sprayer exhibited a high efficacy against *A. gossypii.* Also, jojoba at the 1st and sumicidin at the 2nd spray by using ULV sprayer against *T. tabaci* had a high efficacy. All the tested insecticides exhibited a moderate hazardous effect on *Scyminus* sp., *Orius* sp. and *Syrphus corollae* after the 1st & 2nd sprays and a high hazardous effect on *Paederus alfierii,* while mospilan, MTI-446 and jojoba proved to be the most safe compounds for predators and parasites. Thus, the usage of low

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* **Corresponding author:** Atif A.A. Abd-Allah , **Tel.:** +20123495958
E-mail address: atif138@yahoo.com

volume sprayers against the three piercing-sucking insects could lead to a good control for insects, safe refilling, time reduction, application costs and to reduce drastically soil contamination by insecticides. There was no significant difference between ULV sprayer and Taral sprayer with respect to the contamination of workers, while it was high by using conventional sprayer. In conclusion, ULV sprayer is more likely to be more efficient and advantageous than taral motor and knapsack sprayers, in case of using mospilan, MTI-446 and jojoba in control programs.

Keywords: Squash plants, piercing-sucking insects, predators and parasities, safe chemical insecticides, (initial and residual effects), spraying tools.

INTRODUCTION

Cucurbits are important vegetables grown in nili, winter and summer plantations in Egypt. squash plants, *Cucurbita pepo* L. are attacked by various insect and mite pests (Ahmed and Abd El-Wahab, 1995). During the past few years, control of white fly *B. tabaci* has been based on conventional insecticides such as O.P., carbamates and pyrethroids compounds. However, these compounds were not efficient in controlling the pest, probably because of development of resistance (Sharaf *et al.*, 2003). Control of white fly are difficult because the immature stages develop on the undersides of the leaves and applications are usually ineffective in delivering control agents to the leaf undersides and lower leaf surfaces. Also there are several generations of *B. tabaci* in a season and its population appears to build resistance to conventional insecticides quickly (Akey *et al.*, 1992). There is an urgent need, to find alternative less hazardous and cost such as mineral and natural oils, bioinsecticides and other cheaper means of pest control, to achieve safe, efficient and most effective pest control with minimal adverse side effects (Abo-Shola 2000). Insect pests attacking squash plants along the growth periods white fly, aphids, leafminer, thrips, lepidopterans and coleopterans were recorded (Albarrak 2009). The most abundant insect pest on cucurbit crops is the white fly *B. tabaci*, which in the case of its outbreak causes high yield losses (Muzamml-Sattar *et al.* 2005). White fly cause direct damage by sucking juice and indirect damage by execretion honey dew which interferes with the photosynthetic process reducing crop development and decreasing the yield (Amir *et al.*, 2007). But control measures of white fly are difficult because the immature stages develop on the undersides of the leaves and applications are usually ineffective in delivering control agents to the leaf undersides and leaf surfaces (Sharaf *et al.*, 2003). Therefore, pesticides which are recommended for the vegetable crops in the integrated pest management (IPM) program should have a quick effect and a low residual level to overcome problems of building up resistance which may be emerged through intensive use of pesticides. Residues which exceded the maximum level may also reduce the product quality and induce health hazards to humans (Kotb 2000). Also, effectiveness of insecticides is not only dependent on the material used, but also on other factors such as application technology, exact time of application, rate of application, the sound method which allows arrival of pesticides where the pest is present and weather conditions (Carlos *et al.*, 1995). Undoubtedly, appropriate application techniques can improve pesticide efficiency and reduce hazards particulary those caused by pesticide drift (Matthews, 1981). Thus for insecticide applications, spray droplet size is important for insect control, when small droplets are applied, drift potential increases, thereby increasing the possibility of adverse effects on surrounding plants and animals. Many efforts have been directed toward determining droplet size effect on insect control affecting raw crops (Salyani *et al.*, 1987). According to these informations, pesticides can be used selectivity to favor beneficial arthropods in the field through selection of active ingredient, chioce of concentration, careful timing and location of application (Grafton–Cardwell and Hoy, 1986). Fostering survival and population growth of natural enemy populations can provide economic benefit to growers, as natural enemies help to reduce pest populations (John and Glynn Tillman, 1999), where chrysopids are widely distributed predators attacking aphids and spider mites (El-Batran, 2003).

The aim of this investigation is to compare the influence of different spray parameters of three sprayers on the biological efficacy of five insecticides against three insects infesting squash plants.

MATERIALS AND METHODS

The experiments were conducted during summer season of 2010 at Shiba village, Zagazig district, Sharkia Governorate, to determine the effects of three different spray tools on the efficiency of certain chemical treatments against some piercing-sucking insect pests {tomato white fly, *Bemisia tabaci*; cotton aphid, *Aphis gossypii* and onion thrips, *Thrips tabaci* (adults and nymphs) infesting squash plants and its associated natural enemies (*Chrysoperla carnea, Orius* sp., *Scyminus* sp., *Coccinella* sp., *Paederus alfierii, Syrphus corollae, Aphidoletus* sp. mummies. The field was cultivated with Eskandarani squash variety. The experimental area was 6 feddans, divided into plots with a barrier zone of at least one kerate between them to avoid contamination by drift. Four kerates were left without any chemical applications as untreated control area. The sampling line consists of 5 wire holders fixed in diagonal line inside each treatment to collect sprayed chemicals. Water sensitive cards were distributed on squash plants at distances of one meter at three directions (north, middle and south) to determine the actual spray coverage on the treated plants. Five plants were marked to count the insects before and after the application in each treatment. All cards were numbered, collected and transferred carefully to the laboratory for measurement and calculation of the deposited droplets. Numbers and size of spot droplets were measured by using strobin lens X 15 (Abo-Amer, 2005). Also, water sensitive cards were put on head and leg of the applicator to determine the contamination which happened in each treatment. The technical data and calibrations prameters were in Table 1.

The chemicals were sprayed twice by interval two weeks. Samples of 10 squash leaves were chosen randomly from the inner rows of each plot including the untreated chick and picked at the each of inspection date (before spray and 2nd, 5th, 8th, 11th and 14th days

Table 1. Technical specifications of the spraying techniques applied on squash plants

Spray parameters	Conve-ntional sprayer	ULV sprayer	Taral motor sprayer
Spraying volume (L./fed.)	200	15	34
Mean working speed (Km/h.)	2.4	2.4	2.4
Swath width (m.)	1.0	1.0	5
Mean spray height (m.)	0.5	0.5	0.75
Flow rate(L./m.)	1.905	0.143	1.619

after spraying) from the three levels of the plants. Leaves were carefully examined in the laboratory to assess the level of infestation of the undeveloped stages of the tested pests per leaf using lens to count the immature stages of pests. The upper and lower surfaces of the leaf were inspected. Percent of reduction in infestaion was estimated using Henderson and Tilton (1955) equation, to determine the initial effect (after 2 days of spraying) and the residual effect (after the next dates) of the tested compounds. The chemicals used and their rates of application were as follows:

1. Chemisol (mineral oil, KZ) used at 1.5 liter/100 L. water.
2. Mospilan 20% Sp. (acetamiprid) used at 25 gm/100 L. water.
3. Sumicidin 5% E.C. (fenvalerate) used at 600 ml./100 L. water.
4. MTI- 446 20% W.P. (nitomethelene, neonicotinoid, dinotrofuran) used at 100 gm/ 100 L. water.
5. Jojoba oil 96 % E.C. (Al-Kanz 2000) used at half liter/100 L. water.

Three ground machines were used as follows:

Knapsak Motor Sprayer Taral, 34.0 L./fed.

Taral sprayer pumps with hydraulic diaphragms are the products of advanced technology. They have been designed in a way to keep all moving parts submerged in lubricative oil. Closed housing minimizes losses due to friction and wear. The diaphragm pumps have a long working life because the oil activated system which moves fitted the pistons. Field crop spray booms come in lengths that vary from 6, 8, 10, 12, 14, 18 meters. The 12 and 14 meters models use a manually adjustable or hydraulic lifting system. The pesticide spray coverage can be increased to 16 meters by the attachment of additional nozzles.

ULV Sprayer, 15.0 L./ fed.

Economic micron ULV (variable pressure rotary sprayer). A hand–held spining sprayer (having 1 L. plastic bottle referred to as micron ULV (Bromyard, England) and provided with 4 new batteries was used. Cup speed was examined and checked with "'vibratack" device to be 6000 r.p.m.. Operation and spraying procedures (as a "drift" spray) were performed according to Matthews (1979) and as described by instructions of Ministry of Agriculture, Egypt. The bottle was filled with a specified amount of the diluted solution at the rate, 15 L./fed. and screwed onto the sprayer. The sprayer was held with the handle across the front of the down wind edge of the field and walked progressively upwind across the field through untreated plants. Flags were used to help in determination of swath width (5m.). At the end of each run, flags were transferred to new positions at vertical distances from the edge of formerly treated area. Normally, during spraying, the bottle must be inverted where the liquid is fed to the spining cup by gravity. If the operator stops for any reasons, or reached the end of the row, the sprayer should be turned over again to stop the flow of liquid and avoid overdosing.

Conventional Sprayer, 200 L./ fed.

A usual manual lever-operated knapsack sprayer of 20 L. capacity (cp_3, Cooper pegler Co. Ltd.) fitted with one hydrolic nozzle of conical spray pattern was used.The sprayer represents "target" spray system and was used at field dilution 200 L./fed.. Spraying was done in accordance with normal practice.

Appropriate analysis of variance on results of each experiment was performed (Costat Software, 1985). Comparisons among the means of different treatments were undertaken using the revised L.S.D. procedure at $p = 0.05$ level as illustrated by Smith (1978).

RESULTS AND DISCUSSION

The obtained results showed that, all the tested compounds reduced the three tested insects (tomato white fly, cotton aphid and onion thrips) numbers significantly in comparable with check treatment and increased yield up to that of untreated plots for squash plants. The results were as follows:

Effect of Treatments Against Target Insects

Data obtained from this study indicate the various insecticidal efficiency of tested insecticides on squash plants according to the chemical structure as well as used concentration and speceficity of sprayer used. Among the tested compounds chemisol, mospilan, sumicidin, MTI-446 and Jojoba showed satisfactory and better reductions in tested insects. Sumicidin occurred highest initial effect after two days from the 1st and the 2nd sprays against *B. tabaci* showing 86.59% and 85.65% reduction when applied with conventional and micron ULV sprayers, respectively (Table 2). The same efficiency obtained with *A. gossypii* where sumicidin recorded 91.24 and 85.14% reduction, respectively (Tabale 3). While sumicidin and MTI-446 indicated high efficacy against *T.tabaci* as initial effect showing 82.88 and 90.19 % reduction, respectively by used ULV sprayer (Table 4). These results agree with those obtained by Attia *et al.* (1990) who stated that sumicidin proved to be the most effective against *B. tabaci* and *A. gossypii* infesting cotton plants and seemed to be moderately safe for predators. Also, El-Hamady *et al.* (1997) found that the efficiency of sumicidin (and undoubtedly other pesticides) could be enhanced when applied by ULV that proved to be more advantageous than the conventional knapsack sprayer against *B. tabaci* infesting cotton plants.

On the other hand, the efficiency as mean residual effect, MTI-446 cleared highest effect by using ULV sprayer against *B.tabaci* after the 1st and the 2nd sprays revealing 86.76 and 83.96% reduction, respectively (Table 2). But MTI-446 and jojoba were the highest effective insecticides after the 1st and the 2nd sprays against *A. gossypii* where recorded 85.51 and 89.22% reduction, respectively by spraying with ULV sprayer (Table 3).

Regarding the mean residual effect of the five tested insecticides against *T.tabaci*, jojoba after the 1st spray and sumicidin after the 2nd spray by using micron ULV sprayer exhibited high effect 79.41 and 79.68% reduction, respectively (Table 4).

Therefore, the methods used for pesticide application play a vital role in obtaining effective pest control, meanwhile affect some potential hazards to health of applicators and hazards of pesticide drift into the surrounding environment.

Concerning the general effect, MTI-446 demonstrated high effect against *B. tabaci* at the 1st spray and sumicidin at the 2nd spray which recorde 86.07 and 83.39% reductions by using micron ulva sprayer while chemisol was the least effective compound by using taral motor sprayer at the 2nd spray showing 58.39% reduction but the same last tool with mospilan exhibited high % reduction at the 1st spray indecating 70.16% (Table 2). These results are in harmony with those of El-Mezayyen *et al.* (2003) who fond that sumicidin and mineral oil reduced the population densities of *B. tabaci*

Table 2. Mean numbers of tomato whitefly, *Bemisia tabaci* infesting squash leaves and % reductions in populations as initial, residual and general means during 2010 season

Mean % reduction of white fly nymphs and adults infesting squash

	Treatments	Rate /Fed.	Pre-count			Initial effect			Residual effect			General mean		
			*	**	***	*	**	***	*	**	***	*	**	***
First spray	**Chemisol**	1.5 L.	5.2	8.2	3.4	67.3d	73.37c	63.29c	70.18bc	82.86b	64.41bc	69.6b	80.96b	61.78c
	Mospilan	75g	4	9.4	5.8	82.45b	83.4a	78.48a	67.3cd	82.78b	68.08a	70.33b	82.9b	70.16a
	Sumicidin	1.8L.	6.2	8.5	4.2	86.59a	84.4a	70.29b	70.77b	77.64c	59.62c	73.93a	78.99a	61.75c
	MTI	300g	7.2	8.9	3.5	77.11c	83.35a	64.34c	75.92a	86.76a	63.78b	76.15a	86.07a	63.89bc
	Jojoba	1.5L.	8	4.5	5.4	70.75d	77.47b	69.67b	66.85d	79.39c	64.01b	67.63b	79.01b	65.14b
	L.S.D.0.$_{05}$					3.816	3.254	2.578	2.933	2.698	3.546	3.546	3.816	2.301
Second spray	**Chemisol**	1.5 L.	7.9	8.4	6.2	61.01c	76.95b	53.16e	65.37d	76.57c	59.7c	64.5c	76.64d	58.39d
	Mospilan	75g	8.2	7.8	7.8	68.74b	71.79c	62.77d	73.71ab	82.55ab	63.62b	72.72ab	80.4c	63.45c
	Sumicidin	1.8L.	9.1	9.2	7.8	76.79a	85.65a	70.67b	74.96a	82.83ab	63.46b	75.32ab	83.39a	64.9c
	MTI	300g	2.1	8	6.2	75.27a	76.9b	74.45a	71.85b	83.96a	68.03a	72.53ab	82.54ab	69.31a
	Jojoba	1.5L.	10.1	4.3	9.6	74.73a	83.63a	67c	69.22c	80.56b	67.28a	70.32a	81.17bc	67.22b
	L.S.D.0.$_{05}$					2.859	4.602	2.153	2.301	2.301	2.933	2.933	1.819	1.819

* = Conventional sprayer 200 L./fed. ** = ULV sprayer 15 L./fed. *** = Knapsack motor sprayer Taral 34 L./fed.

Table 3. Mean numbers of cotton aphids, *Aphis gossypii* infesting squash leaves and % reductions in populations as initial, residual and general means during 2010 season

Mean % reduction of aphids infesting squash

	Treatments	Rate /Fed.	Pre-count			Initial effect			Residual effect			General mean		
			*	**	***	*	**	***	*	**	***	*	**	***
First spray	Chemisol	1.5 L.	30.7	34.4	29	66.02d	75.26b	43.72e	75.33b	81.62cd	69.52b	73.47c	79.86e	64.36c
	Mospilan	75g	29.6	33.3	50.5	64.54d	75.59b	67.81c	75.68b	82.55bc	66.6ac	73.45c	81.16d	66.68bc
	Sumicidin	1.8L.	55.5	21	36.5	91.24a	76.84b	61.07d	75.83a	83.89ab	70.91b	78.92a	82.41a	68.94b
	MTI	300g	21.2	33.2	40	74.34c	82.84a	70.72b	75.31b	85.51a	73.49a	75.12b	84.97c	72.93a
	Jojoba	1.5L.	64.5	45	21	79.56b	83.6a	75.01a	74.36b	79.36d	65.5c	75.4b	80.21b	67.4bc
	L.S.D.$0_{.05}$					2.153	3.254	1.819	1.461	2.153	2.301	1.527	1.527	1.724
Second spray	Chemisol	1.5 L.	17.6	22.2	28.6	64.13e	66.01	59.62d	72.07c	79.38d	68.69c	70.48c	76.71d	66.88c
	Mospilan	75g	27	18.8	15.4	69.77d	82.39	58.5d	76.77b	85.01b	69.37c	75.37b	84.49b	67.2c
	Sumicidin	1.8L.	46	11.4	36.1	84.6a	85.14	76.96a	79.16a	84.82b	74.06b	80.25a	84.88b	74.64b
	MTI	300g	22	18.6	44	73.4c	78.06	71.65c	70.44d	82.37c	66.56d	71.03c	81.5c	67.58c
	Jojoba	1.5L.	73	46.5	28	76.27b	82.12	74,7b	71.17d	89.22a	78.36a	72.19c	87.8a	77.63a
	L.S.D.$0_{.05}$					1.527	1.83	1.724	1.628	1.819	1.629	1.819	1.768	1.635

* = Conventional sprayer 200 L./fed. ** = ULV sprayer 15 L./fed. *** = Knapsack motor sprayer Taral 34 L./fed.

and *A. gossypii* infesting cotton plants after the 2nd spray and recorded 45.0, 71.64 and 68.43, 88.98% reduction and the side effect against predators indicated slightly.

Also, MTI-446 after the 1st spray and jojoba after the 2nd spray by using micron ULV revealed high efficacy against *A. gossypii* where recorded 84.97 and 87.8% reduction in populations were recorded, respectively (Table 3).

Finally, jojoba at the 1st and sumicidin at the 2nd sprays against *T.tabaci* by using micron ulva sprayer were occurred high efficacy and cleared 79.41 and 80.51% reduction, respectively (Table 4). These results are in agreement with those obtained by Amir *et al.* 2007 who found that mineral oil by used by knapsack sprayer equiped with one nozzle occurred poor effect where indicated 31.28 and 51.61% reduction in population of *B. tabaci* adult and nymph stages infesting squash variety Eskandrani, respectively.

Effect on Bio-control Agents

Fostering survival and population growth of natural enemy populations can provide economic benefit to growers, as natural enemies help to reduce pest populations. However, natural enemies alone are not always sufficient to restrain pest populations (Ruberson and Glynn Tillman, 1999).

Data in Table 5 indicated that the side effect of five tested insecticides on some predators and parasites existed in squash fields. Generally, the tested insecticides significantly decreased the number of predators and parasites in sprayed plots. The rate of reduction varied considerably according to chemical nature of used insecticides and the species of exposed predators. Mummies seemed to be the most tolerant parasite species followed by *Aphidoletus* sp. but *Coccinella* sp. and *Chrysoperla carnea* were the most susceptible to applied insecticides. It is evident to notice that all tested insecticides showed moderate hazard for *Scyminus* sp., *Syrphus corollae* and *Orius* sp. and high hazard for *Paedererus alfierii.* Among the most effective insecticides on the studied insect pests in squash fields, mospilan, MTI-446 and jojoba proved the safest compounds for predators and parasites. These results are in agreement with those obtained by Omar *et al.* (2001) who concluded that the relation between chemical insecticides against *A. gossypii* infesting squash plants and their associated natural enemies, mineral oil (super masrona) gave

Table 4. Mean numbers of cotton thrips, *Thrips tabaci* infesting squash leaves and % reductions in populations as initial, residual and general means during 2010 season

Mean % reduction of thrips nymphs and adults infesting squash

	Treatments	**Rate /Fed.**	**Pre-count**			**Initial effect**			**Residual effect**			**General mean**		
			*	**	***	*	**	***	*	**	***	*	**	***
First spray	**Chemisol**	1.5 L.	23	15.6	15.4	62.83d	72.6c	61.14b	72.28a	79.13a	70.7a	70.39a	77.82b	68.79a
	Mospilan	75g	10.7	14.5	16.8	69.81c	71.17c	58.16d	61.68c	75.25b	59.78c	63.3c	74.44c	59.46c
	Sumicidin	1.8L.	17	22.2	23.1	82.12a	82.88a	72.86a	62.92c	78.46a	62.43b	66.76b	79.34a	64.51b
	MTI	300g	18.8	18.2	17.7	77.77b	80.69b	62.97c	67.6b	76.52b	56.2e	69.63a	77.35b	57.56d
	Jojoba	1.5L.	7.2	9.7	9.4	68.33c	79.43b	65.64b	58.7d	79.41a	59.11d	60.63d	79.41a	60.42c
	L.S.D.0.$_{05}$					2.587	2.057	1.416	1.392	1.428	1.334	1.645	1.269	1.418
Second spray	**Chemisol**	1.5 L.	12.9	6.6	9.7	78.18c	82.36c	73c	74.91a	83.84b	61.84b	75.56a	83.55a	64.07b
	Mospilan	75g	6.7	7	9.4	75.39d	79.21d	75.23b	57.87e	72.18e	54.88d	61.37d	73.59c	58.95c
	Sumicidin	1.8L.	13.3	7.2	15.9	91.18a	83.83b	82.31a	60.25d	79.68c	67.5a	60.43b	80.51ab	70.46a
	MTI	300g	11.5	8.9	16.2	88.19b	90.19a	74.85b	71.26b	76.41d	62.51b	74.64a	79.16b	64.98b
	Jojoba	1.5L.	4.2	2.1	5	72.29e	76.91e	61.2d	61.71c	73.93a	58.13c	63.82c	74.52c	58.74c
	L.S.D.0.$_{05}$					1.179	1.449	1.444	1.641	2.178	2.698	1.483	3.902	2.574

* = Conventional sprayer 200 L./fed. ** = ULV sprayer 15 L./fed. *** = Knapsack motor sprayer Taral 34 L./fed.

Table 5. Records of total numbers at all time of inspections for natural enemies associated three tested insects infesting squash plants and yields during 2010 season

Natural enemies	No.	Chemisol			Mospilan			Sumicidin			MTI-446			Jojoba			Total No.			Un.	T	%
		*	**	***	*	**	***	*	**	***	*	**	***	*	**	***	*	**	***			
Chrysoperla carnea	1	1	3	-	1	1	-	-	-	-	-	8	1	-	6	-	2	18	1	12	79	10.57
	2	8	7	1	3	4	-	-	-	3	4	1	1	3	-	-	18	12	5	11		
Orius sp.	1	-	1	-	-	-	-	-	-	-	-	-	-	1	2	-	1	3	-	2	16	2.18
	2	1	1	1	-	-	-	-	1	2	-	-	-	-	1	-	1	3	3	3		
Aphidoletus sp.	1	-	9	5	5	18	8	-	3	5	3	9	18	10	24	12	18	63	48	22	188	25.58
	2	-	-	-	-	9	-	-	7	-	-	-	9	-	-	1	-	16	10	11		
Coccinella sp.	1	2	3	-	4	10	1	-	1	2	4	3	10	2	3	7	12	20	20	13	103	14.01
	2	-	1	2	2	-	1	1	1	-	1	-	2	2	1	3	6	3	8	21		
Paederus alfierii	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	11	1.5
	2	1	1	-	2	-	1	-	-	-	-	-	-	1	-	2	4	1	3	1		
Scyminus sp.	1	3	-	1	-	-	-	-	2	1	3	2	2	-	-	1	6	4	5	4	228	2.81
	2	2	-	-	2	-	1	1	-	-	-	-	-	-	-	1	5	-	2	2		
Syrphus corollae	1	1	-	-	-	-	3	-	-	1	5	-	-	1	1	-	7	1	4	11	25	3.4
	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1		
Mummies	1	2	4	7	6	39	7	9	34	20	3	22	10	16	6	15	46	105	59	47	285	38.78
	2	-	-	2	2	-	5	3	2	-	-	4	-	-	-	-	5	6	7	10		
Total no. for tool		22	30	19	37	81	27	14	51	34	23	49	53	37	44	42	133	255	175	172	735	100
Yield ton/fed.		6.0	6.52	6.30	7.6	8.2	8.1	7.2	7.4	7.3	7.2	7.4	7.9	7.7	7.6	7.5				5.1		
Yield/Treatment/Fed.			6273.3			7963.3			7278.3			7481.7			7406.7							
Total number			71			145			99			125			123							

No.= Number of spray T = Total number in treated plots + control Un.= Untreated check

* = Conventional sprayer 200 L./fed. ** = ULV sprayer 15 L./fed. *** = Knapsack motor sprayer Tarai 34 L./fed.

good control and high safe for associated natural enemies (*C. undicempunctata, C. carnea* and *Orious* sp.). Also, Burgio *et al.* (1997) who reported that wild predators (*Coccinellids* and *Chrysoperla carnea*) were essential for full aphid control in cucumber while Emara *et al.* (1999) found that mineral oil provided moderate control of the *B. tabaci* and had low toxic effect to the natural enemies.

The role of the predacous insects in suppressing the population of the squash piercing-sucking pests has been reported by several investigators (Metwally *et al.*, 1993 and El-Mezayyen *et al.*, 2003).

Effect of Spraying Tools

Qualitative distribution of five insecticides deposits on squash plants and artificial targets as produced by three spraying machines against peircing and sucking insects

Data presented in Table 6 showed a comparison between deposition on different targets, produced by conventional sprayer (200 L./fed.), micron ULV sprayer (15 L./fed.), and knapsack motor sprayer taral (34 L./fed.). Five insecticides used with recommended rates for each treatment. It was noticed that the mentioned insecticides induced reduction in number of droplets/cm^2 with big droplet sizes that formed and deposited by using high volum spray with conventional sprayer. The range of droplets number and size deposited on squash plants using taral motor sprayer and ULV sprayer were (197-238) and (137-163 µm); (43-102) and (141 – 180 µm), respectively. The spray lost between treated plants was increased clearly in case of conventional sprayer in comparison with motor sprayer taral and ULV sprayer. Our results agreed with those of El-Sayed *et al.* (1997), who cited that high volume sprayers were nearly equal to the low volume ones according to the percentage of reduction in population of *B. tabaci* stages. Conventional motor, conventional knapsack, solo and knapsack motor sprayer were nearly equal in their efficacies and performance.

Contamination of workers

Data in Table 6 showed no significant difference between ULV sprayer and motor sprayer taral on applicator contaminations, but a drastic contamination was happened on the applicator in case of conventional sprayer 200L./fed.. Therefore, it is recommended to

Table 6. Spray coverage of five insecticides on squash plants and wire holder, targets as produced by three certain sprayers against peircing-sucking insects

Insecticides	Equipments	Conventional Sprayer			ULV Sprayer			Knapsack motor sprayer		
	Spray volun(L./fed.)	200			15			34		
	Droplet spectrum Target & position	VMD μ	N/cm^2	%N.	VMD μ	N/cm^2	%N.	VMD μ	N/cm^2	%N.
Chemisol	Squash plants	625	8	42.1	178	67	79.8	139	198	82.8
	Wire holder	650	7	36.8	189	14	16.6	153	35	14.6
	Contamination of applicator	655	4	21.1	117	3	3.6	102	6	2.6
Mospilan	Squash plants	615	7	46.8	156	78	78.8	137	219	80.2
	Wire holder	635	4	26.6	163	16	16.1	143	35	12.8
	Contamination of applicator	650	4	12.6	130	5	5.1	120	19	7
Sumicidin	Squash plants	630	9	50	141	102	12.3	153	238	73.4
	Wire holder	645	6	33.3	145	33	23.4	167	57	17
	Contamination of applicator	615	3	16.7	135	6	4.3	143	29	9
MTI 446	Squash plants	623	17	58.6	173	59	78.7	163	207	76.4
	Wire holder	635	9	31	176	13	11.5	172	37	13.6
	Contamination of applicator	630	8	10.4	166	11	9.8	153	27	10
Jojoba	Squash plants	675	11	55	180	43	69.9	163	197	73.5
	Wire holder	675	6	30	185	22	16.5	165	43	16
	Contamination of applicator	650	3	15	153	18	13.6	153	28	10.5

VMD = Volume mean diameter. N/cm^2= Number of droplets per centimeter square.

use low volume spraying instead of high volume application (ULV) for the safe of working applicator. These results agree with those obtained by El-Hamady *et al.* (1997), who reported that sumicidin spray on cotton foliage achieved by ULV was better than that of knapsack sprayer. However, no significant differences were detected in the insecticidal activity between the two application methods.

The Yield

In regard to the total yield (ton/feddan), it is clear that all treatments by ULV and sprayer motor" taral" gave the highest yield of squash plants, while those of conventional sprayer exhibited the lowest yield. Mospilan, MTI-446 and jojoba compounds indicated 8.2, 7.4 and 7.6 ton/feddan by using micron ULV sprayer, respectively while chemisol by using conventional sprayer was occurred least yield where recorded 6 ton/feddan (Table 5).

Conclusion

Reviewing the above mentioned results, it could be concluded that piercing-sucking insects control depends mainly on the efficacy of the used insecticide, mode of its action and the used spraying technique. The traditional high volume sprayers gave close rates of insect reduction in comparison to low volume sprayers which appear superior in coverage of treated plant leaves and penetrating the majority of horizontal and vertical parts of the plants without rolling the droplets. These results agree with the results obtained by Negm and El-Sayed (2000) and Hindy *et al.* (1997).

REFERENCES

Abo-Amer, A.M.A. (2005). Effectiveness of meteorological conditions on droplets distribution homogencity of drift spraying technique. Egypt. J. Agric., Res., 83 (1): 211–223.

Abo-Shola, M.K. (2000). Efficiency of some alternative materials for controling pink bollworm and associated certain sap suckers as non-target pests in cotton plants. J. Agric. Sci., Mansoura Univ., 25 (10) : 653 - 654.

Ahmed A. and H. H. Abd El-Wahab (1995). Infestation intensity of whitefly and spider mite on three vegetables as affected by some fertilizers. Egypt J. Appl. Sci., 10 (1) : 88-100.

Akey, D.H., C.D. Cbu and T.J. Henneberry (1992). Efficacy of the insect growth regulator buprofezin and the insecticide, amitraz against sweet potato whitefly on cotton at Maricopa. Az. 1991. Cotton A. Univ. of Arizona.

Albarrak, A.S. (2009). Occurrence and distribution of insect pests attacking some vegetable plants at five localities of El-Qassem. Pak. Entomol., 31 (2) :148-154.

Amir, M.M.I., A.A. El-Feshawy, E.I. Mourad and M.F. El-Esawy (2007). Control of the whitefly *Bemisia tabaci* Genn. on squash plants. Zagazig J. Agric. Res., 34 (6) : 1145 - 1163.

Attia, H.B.A., N. M. Hussein and M.A. El-Hamaky (1990). Effect of certain insecticides on the population of some piercing sucking insects and associated biocontrol agents in cotton fields. Minufia J. Agric. Res., 15 (2) : 1963 - 1971.

Burgio, G., R. Ferrari and G. Nicoli (1997). Biological and integrated control of *Aphis gossypii* Glover (Hom., Aphididae) in protected cucumber and melon. Bllettino dell, Instituto di Entomolpgia Guido Grandi, della Universita degli Studi di. logna, (51):171-178.

Carlos, J.P., M.S. Anthony and C.D. Richard (1995). Effect of application technology and *Bacillus thuringensis* subspecies on management of *B. thuringensis* subspecies *Kwstaki*-resistant, diamondback moth (Lepidoptera: Plutellidae). J. Econ. Entomol., 85 (5) : 1113 - 1119.

Costat Software (1985). User's Manual versin 3 Cohort Tusson, Arizona USA.

EL-Batran, L.A.(2003). Predacious efficiency of adults of three predators on *Coccus hesperidum* L. under laboratory and field conditions. J. Agric. Sci. Mansoura Univ., 28 (5) : 4013 - 4019.

EL-Hamady, Sh.E.E., M.K.A. Abo-Shola and R.B. Abou-Arab (1997). Insecticidal efficiency, applicator exposure and drift hazards of fenvalerate as influnced by two methods of application on cotton fields. J. Agric. Sci., Mansoura Univ., 22 (11) : 3987-4006.

El-Mezayyen, B.A., A.M.A. Nassef and I.I. El-Fakharany (2003). Effect of certain alternative compounds and their combinations with fenvalerate on some cotton insect pests and their associated predators. J. Agric. Sci., Mansoura Univ., 28 (4): 3061-3069.

Emara, S.A., A.M. Taha, M.Z. Dawood and K.K. El-Rafie

(1999). Studied the effect of oils, insecticides and the entomopathogenic fungus, *Beauveria bassiana* on the cotton whitefly *Bemisia tabaci* Genn. and it is natural enemies on cotton plants in Minufia Governorate. Egypt. J. Appl. Sci., 14 (8) : 282-295.

EL-Sayed, A.M., F.E. Adl, M.A. Samy, S.M. Ibrahim and M.A. Hindy (1997). Performance of differenent sprayers in relation to insecticidal activity against whitefly infesting eggplants in Egypt. Annals of Agric. Sc., Moshtohor, 35 (3) : 1727-1740.

Grafton-Cardwell, E.E. and M.A. Hoy (1986). Genetic improvement of common green lacewing *Chrysoperla carnea* (Neuroptera: Chrysopidae): selection for carbaryl resistance. Environmental Entomology, 5: 1130-1136.

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

Hindy, M.A., A.M. El-Sayed, S.M. Abd El-Salam and M.A. Samy (1997). Qualitative assessment of certain insecticides applied by different ground sprayers against whitefly *B. tabaci* (Genn.) on eggplant. J. Agric. Res., 75 (3) : 665-677.

John, R. Ruberson and P. Glynn Tillman (1999). Effect of selected insecticides on natural enemies in cotton laboratory studies. Prceedings of the Beltwide Cotton Conference, 12: 1210-1213.

Kotb F. K. (2000). Seasonal abundance and chemical control of pests attacking some potato cultivars in Sabbahia and Nubbaria regions. Adv. Agric. Res., 5 (1) : 1247-1261.

Matthews, G.A. (1979). Pesticide application methods. Lonman, London and New York.

Matthews, G.A. (1981). Improved systems of pesticide application. Philosophicaly Transactions. Royal Society, London B, 529 : 163-173.

Metwally S.A.G., M.F.A.H. Hegab and H.A. Abd El-Mageed (1993). Evaluation of some treatments in control of whitefly *Bemisia tabaci* infesting squash plants and it is related by yield. AL-Azhar J. Agric. Res., 18 (1) : 218-224.

Muzamml-Sattar, Mohammed Sarwar and Ghulam-Hussain (2005). Impact of pH, nitrogen and protein contents in some cucurbits on the population build up of whitefly *Bemisia tabaci* (Homoptera: Aleyrodidae. Pakistan J. of Zool., 37 (4) : 275-279.

Negm, M.F. and A.M. El-Syed (2000). Qualitative and biological assessment of certain insecticides applied by different ground sprayers against *Aphis gossypii* on eggplant. Egypt J. Agric. Res., 78 (5) : 1863-1876.

Omar, B.A.A., M.A. Zedan and M.K. El-Ansary (2001). The relation between aphids and predators in squash field and it is affected by insecticides. J. Agric. Sci., Mansoura Univ., 26 (4) : 2364-2372.

Ruberson and Glynn Tillman (1999). Effect of selected insecticides on natural enemies studies in cotton. Proceedings of the Beltwide Cotton Conference, 2 : 1210-1213.

Sharaf F. H., S. El-Basyonni and A.M. Hamid (2003). Insecticidal efficiency of some chemical compounds on the white fly, *Bemisia tabaci* (Genn.) infesting cotton plants and its associated natural enemies. J. Agric. Sci. Mansoura Univ., 28 (2) : 1419-1423.

Smith, C.W. (1978). Bayes least significant difference. A review and comparison. Agron. J., 70 : 123-127.

تقييم فاعلية بعض المبيدات الحشرية ضد بعض الحشرات الثاقبة الماصة التي تصيب نباتات الكوسة وأعدائها الحيوية باستخدام ثلاث آلات رش

عاطف عبدالفتاح أحمد عبدالله - حاتم محمد حاتم الشناف
عبدالمجيد السيد عمار - حمدي السعيد مجاهد

معهد بحوث وقاية النباتات- مركز البحوث الزراعية - دقي - جيزة - مصر

نتجم عديد من المشاكل عن مكافحة الآفات منها التلوث الناتج عن الاستخدام المكثف للمبيدات الحشرية ولتلافي ذلك تمت هذه الدراسة بقرية شيبة التابعة لمركز الزقازيق أثناء الموسم الصيفي ٢٠١٠ لتقييم التأثير الفوري والمتبقي لخمس مبيدات حشرية باستخدام ثلاث آلات رش ضد ذبابة الطماطم البيضاء ومن القطن وتربس البصل وما يرتبط بهم من أعداء حيويه وكانت النتائج كالتالي: سجل المركب **MTI-446** أعلى تأثير ضد ذبابة الطماطم البيضاء بعد الرشة الأولى، سيموسيدين بعد الرشة الثانية بإستحدام الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر بينما كان المركب كيميسول أقل المركبات فاعلية بإستخدام موتور الرش تارال بعد الرشة الثانية، لكن باستخدام الموتور تارال حقق المركب موسبيلان أعلى نسبة مئوية للانخفاض في التعداد عند الرشة الأولى، كما حقق المركب **MTI-446** بعد الرشة الأولى والمركب جوجوبا بعد الرشة الثانية باستخدام الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر أعلى فاعلية على حشرة من القطن. أيضا حقق جوجوبا بعد الرشة الأولى وسيموسيدين بعد الرشة الثانية أعلى فاعلية على حشرة تربس البصل باستخدام الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر. كانت كل المركبات المختبرة ذات تأثير متوسط على مفترسات أبي العيد إسكمنس، بقة الأوريس وذبابة السيرفس كما كانت ذات خطورة عالية على الحشرة الرواغة بينما كانت المركبات المختبرة كلها آمنة على المومياوات وطفيل أفيدوليتس ولذلك فإن استخدام الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر جيدة في مكافحة الآفات الثاقبة الماصة لتوفيرها وقت التعبئة والفاقد على الأرض الملوث للتربة. لا توجد فروق معنوية بين الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر وموتور الرش تارال على تلوث العامل القائم بعملية الرش بينما حدث تلوث بدرجة عالية على العامل عند استخدامه الرشاشة التقليدية. حققت المركبات موسبيلان، **MTI-446** وجوجوبا أكبر كمية محصول وذلك من خلال استخدام آلات الرش ميكرون أولفا ذات القطرات المتناهية في الصغر، وموتور الرش تارال على التوالي بينما سجلت الرشاشة التقليدية أقل إنتاجية على مستوى المركبات المختبرة جميعا. بناء على ذلك فإن الرشاشة ميكرون أولفا ذات القطرات المتناهية في الصغر تكون مفضلة لزيادة فاعليتها عن الرشاشة التقليدية وموتور الرش تارال ولذا يمكن التوصية بإستخدامها في رش كل من مركبات موسبيلان، **MTI-446** وجوجوبا ضمن برامج المكافحة المتكاملة للآفات الثاقبة الماصة على الكوسة.