Comparative Studies between Bio and Chemical Insecticides Sprayed with Three Tools of Application on Certain Vegetable Crops against Some Insects at Two Villages in Sharkia Governorate

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Abstract: Field experiments were conducted to activity evaluate the pirimiphos -methyl and *achook* efficiency against tomato whitefly *Bemisia tabaci* (Genn.), southern green stink bug (*Nezara viridula* L.), leafhopper *Empoasca lybica* (Bergevin) and common green leacwing *Crysoperla carnea* (Steph) as a high number of natural enemy in both locations,EL-Zarkia village, Zagazig district,and EL-Eslah 30 village, Facous distict,Sharkia Governorae during 2007 season . Operator exposure and drift problems of pirimiphos methyl as a chemical insecticide comparing with *achook* (azadirachtin) as a biocide when applied on cowpea (*Vigna unguiculata* L.), eggplant (*Solanum melongena* L.) and okra (*Abelmoschus esculentus* L.) fields using three sprays methods (i.e Knapsack sprayer (Solo *22* L/fed.), Conventional sprayer (200l/fed.) and knapsack motor sprayer (Arimitsu 25 L/ fed.) were studied . Results showed that coverage and control of the target insects by two insecticides sprays on three vegetable foliage achieved by Solo using 22 L./fed. and Arimitsu sprayer (25 L/fed.) only. Where the highest overall percentage reduction in the whitefly adult population ,pirimiphos- methyl occurred as mean of two sprays at EL-Eslah 30 village with Solo on cowpea(97.42 %) and Solo (97.58 %) Arimitsu(97.37%) on okra. But the effect of pirimiphos-methyle was clearer in both of three vegetable crops than the effect of bio-insecticide against green stink bugs. Also, Arimitsu on okra and solo sprayer on cowpea with pirimiphos- methyl were the highest efficacy against *E. lybica.* On the other hand, it's clearly evident to notice that two tested insecticides proved moderate hazardous for *C. carnea* especially with achook. The use of low volume sprayer using biocide may be recommended to reduce the time lost in filling and spraying to minimize the expenses and to prevent the soil pollution with insecticides.

Keywords: *Bemisia tabaci, Nezara viridula, Empoasca lybica, Crysoperla carnea,* Cowpea, Eggplant, Okra, primiphos-methyl, achook (azadirachtin)

INTRODUCTION

Cultivated area of cowpea, eggplant and okra plants rapidly, increased during the last few years. The success of pest control operation depends on certain factors including a good pesticides, an exact time for application and the sound method which allows arrival of pesticide to places where the pest is present El-Maghraby, (1979) Pirimiphos- methyl (Actellic) is widely used in Egypt to control economic pests on vegetables (Abd El-Baki *et al.,* (2000). Recently, Ministry of Agriculture in Egypt has developed a new strategy to increase the use of safe chemicals to overcome the problems resulted from intensive used of conventional pesticides El-Duwini and Sedrak (1997). The conservation of insect predatory can be an important component. Thus, compatibility of new insecticides with natural enemy populations in the field is critical for pest control, Rajakulendran and Plapp (1982). Thus bio-pesticides considered as part of an essential component of integrated pest management system and it's very promising. The compound responsible for neem seed extracts insecticidal properties is azadirachtin (a terpenoid), which acts as a feeding inhibitor and growth regulator Warthen (1979) and Rembold *et al.,* (1982). However, health problems due to exposure to these compounds were frequently reported e.g. cutaneous and burning sensatation in the face, transient itching, dispinea, hyperglycaemia and other biochemical disorders. (Ashour *et al.*, 1989 and Ghosh, 1993).

Undoubtedly, appropriate application techniques can improve pesticide efficiency and reduce hazards particularly those caused by pesticide drift .The most sprays applied to crops by traditional techniques and according to the pesticide manufacturer's recommendation produce a satisfactory biological result, a large proportion of the pesticides is not deposited on the target of whatever nature and is wasted Graham- Bryce (1977). Bjustad and Torgrimsen (1996) reported that, the use of hand-held spraying equipments created a significant exposure risk for the operator. Anyhow, knapsack sprayers remains the most widely equipment for applying pesticides on small farms. Therefore, the insecticidal efficiency and safety problems of pirimiphos methyl and azadirachtin applied on cowpea, eggplant and okra using three methods. The main purpose of this study is to investigate the effectiveness of meteorological conditions on spray deposition homogeneity in order to find out and reached to a suitable control of pests.

MATERIALS AND METHODS

The research was run at El-Zarkia and EL-Eslah 30 villages at Zagazig and Facous districts, Sharkia Governorate during summer season of 2007 on three vegetable crops namely, cowpea , eggplant and okra.

Field experiments

A total area of about one feddan growing with each vegetable crop, divided into 21 plots approximately 100m^2 with a barrier zone of at least three meters between every two plots as a belt to avoid pollution by drift. Three plots were left without any chemical application for each crop as untreated control area. The normal agricultural practices were given to the plants. The inspection was visually in filed and started after one month from transplanting or sowing .Ten plants were chosen at rundom a cross a diagonal transect of each plot to monitor the population density of whitefly adult (*B.tabaci*), green stink bug (*Nezara viridula*), Leafhopper (*Empoasca lybica*) and common green leacwing (*Crysoperla carnea*) treatment plots were arranged in randomized complete block design .

The insecticides tested and their rates

The insecticides were applied twice at recommended rate as follows

a- Pirimiphos methyl (Actellic 50% E.C.) at a rate of 325 ml /100 liters water (L.W.)

b- Achook it was proved by (neem seed extract) azadirachtin, at Godrej Agrovet ltd. rate 300 ml /fed. The insecticidal applications were synchronized with time of maximum abundance of the target pests. Two applications, into7 days interval were performed every region on June 9, 13 and 4,25 for EL-Zarkia and EL-Eslah 30 villages respectively.

Type of spraying applications

Knapsack sprayer (Solo)

This sprayer is composed of a 20 L., tank capacity for pesticide and a solid cone nozzle (TX-4).A hand pump is used to give an operational pressure recommended application intensity is about 22 l./fed. .

Conventional sprayer

A light portable knapsack sprayer of ten liters tank capacity and one spray gun. The sprayer is furnished with a simple hand pump with no air chamber (200 L./fed.)

Knapsack motor sprayer (Arimitsu 25L./fed.)

Table (1) illustrated the technical data and spray parameters of the tested ground equipments.

Each treatment was replaced three times, thus comprising 63 plots. The inspection was made before and after spraying at 2, 5, 8, 11 and 14 days. Initial effect (I.E.) (2 days after spray, residual effect (R.E.) (means of 5,8,11 and 14 days) after spray, general mean for I.E. and R.E. at every spray (G.E.) and total mean of two sprays at every region (M.T.) were calculated according to Henderson and Tilton equation (1955).

Table (1): Technical specification of spraying techniques applied on cow pea, Eggplant and okra plants.

Item's	Conventional sprayer	Solo sprayer	Knapsack motor sprayer (Arimitsu)
Nozzle type	Hollow cone	Solid cone	0.0
Nozzle serial nr.	Local	(TX-4)	0.0
Rate of application (l/ fed..)	200	22	25
Working speed (km/h)	2.4	2.4	2.4
Swath width (m.)	0.75	1.0	1.0
Spraying height (m.)	0.50	all treatments	
Flow rate (l/min)	1.428	0.209	0.238
Productivity (fed. /day)	0.42	0.57	0.57
Performance (fed./day)	1.68	2.28	2.28

(Working hours 6 h)

Sampling and efficacy assays of sprayers

The sampling line at cowpea consisted of 6 wire holder fixed in diagonal line inside each treatment to collect sprayed chemicals. Sensitive cards were distributed on some plants of each crop at distances of one meter. In case of the other two crops, three cards were positioned on the top, middle and bottom levels of some plants. Water sensitive paper (*Ciba –geigy*) with the wire holders were fixed in " L, shap ". (On the top of the wire holder .All cards were collected and transferred carefully to the laboratory for measurement and calculation of the deposited droplets. Sensitive cards were fixed at the (head, thorax abdomen and legs measured contamination on applicator. However, data were subjected to analysis of variance (ANOVA) and the means were compared by L.S.D. test at 0.05% levels, according to technique described by *Snedecor* (1970).

RESULTS AND DISCUSSION

The initial effect (I.E.), residual effect (R.E.), general effect of spray (G.E.)and mean of two sprays (M.T.)of pirimiphos- methyl 50% E.C. and achook using three different methods of spraying tools against three insect pests and one nature enemy on three vegetable crops were showed in Tables 2 to7

The effects on whitefly (*B. tabaci*)

Data in Table (2) summarized the effects of tested compounds after 48 hours from spraying (I.E.). The results indicated that there were significant differences between bio and chemical insecticides expect achook on eggplant using solo sprayer after 1st spray at two regions, it's recorded 100% reduction in adult of whitefly population. Also this major effect was clearly showed between two tested insecticides as a (R.E.) after two sprays at two regions.

Concerning the general effect of two sprays (M.E.), the results revealed that, pirimiphos- methyl was more effective than achook at all three levels of spraying methods on the three vegetable crops. Pirimiphos - methyl on eggplant by Arimitsu motor sprayer appeared highest percent (% R.) in population of whitefly, but achook on okra by conventional sprayer was the least effective one. It's recorded, 92.77 and 68.19 %R. in infestation respectively at EL-Zarkia village, while at EL-Eslah 30 village as a (M.E.) the highest overall (% R.) in the whitefly adult population occurred with Solo (97.42 %). Conventional sprayer (98.84 %) on cowpea sprayed with pirimiphos- methyl and Solo (97.58 %), Arimitsu (97.37 %) using pirimiphos- methyl on okra, while achook on okra sprayed by Conventional sprayer showed the least reduction (80.56%).It may be clear that tested insecticides could be applied by the bio-insecticide (achook) using solo sprayer on three vegetable crops to diminish the hazards and accumulation in the environment to addition kept of natural enemy .Solo sprayer (22 l./fed.) recorded 82.51 and 92.37 % , 72.87 and 89.63%, 80.49 and 88.23 % R. as a (M.T.) at EL-Zarkia and EL-Eslah 30 villages on cowpea , eggplant and okra respectively .

These results are in agreement with those obtained by Abd Allah and Hashem (2003) found that, biofly as a biocide caused good effect which recorded 80.04%R in population of egg and nymphs of whitefly infestation after 2nd spray on eggplant. Abd-Allah (1999) illustrated that, azadirachtin (neemazal T/S 1 %) at 1.2 l./fed induced relatively high residual activity against whitefly infesting cucumber. El-Dahan *et al.*, (1997) and Ridgway *et al.,* (1996) who found that , the use of the bio-insecticides is a promising tool as a result of selection of specific insect pathogens and formulation. Ayad *et al.,* (1997) found that azadirachtin(neemazal) are quite effective and could be recommend for controlling the adults of the whitefly. El-Sayed *et al.,* (1997) cited that, controlling *B.tabaci* adults infesting eggplant plants depends mainly on the efficacy of the insecticide used.

The effects on green stink bug *(Nezara viridula)*

Efficiency of spraying process against *N.viridula* was evaluated by determing (I.E.) ,(R.E.)(G.E.) and (M.T.) at two regions were showed in Table(3) as follows:

Evaluation at EL-Zarkia village

After 1st spray, data showed that, no significant differences between two tested insecticides using all sprayer methods which gave (100 % R) except in case of conventional sprayer only by pirimiphos- methyl on cowpea which gaved (69.67 % R.) and Solo sprayer by achook (on eggplant which gave (91% R) as a(I.E.), while the obtained results in okra showed that significant differences between three tools with two tested insecticides. On the other hand, data showed that as a (R.E.), Arimitsu sprayer with pirimiphos- methyl which occurred highest reduction (98.87 %), while Conventional sprayer with achook gave the least reduction (27.45 %) on cowpea and the rest tools on other crops were cames intermediate between them. After 2nd spray, the effect of pirimiphos-s methyl was clearer in both of three vegetable crops than the effects of bio-insecticide.

Evaluation at EL-Eslah 30 village

The obtained data confirmed these for mentioned evidences. Finally the highest overall percentage reduction in the *N.viridula* population occurred with Arimitsu motor sprayer by pirimiphos- methyl on cowpea, eggplant and okra, where it's recorded as a mean of two sprays (M.T.) at EL-Zarkia village as follows :98.3%, 86.1% , 92.33% R. and recorded, 92.1%, 88.22 % ,93.72%R. at EL-Eslah 30 village , respectively. This may be attributed to the more acute toxicity of chemical insecticides tested and cability of fast flying insect from sprayed area to another without. These results are in agreement with that obtained by Verma *et al.,* (1990), who found that conventional insecticides for immediate mortality are not cost-effective and proper timing may reduce additional application and avoid environmental contamination. Attia *et al.,* (1990) reported that cyanophos as a O.p compound against *N. viridula* seemed to be the most efficient pesticide showing 97.3%R using Solo sprayer.

Effects on the leafhopper (*Empoasca lybica*)

Data in Table (4) show the percent reduction of adults and nymphs of *E. lybica* . Statistical analysis cleared that:

At EL-Zarkia village

Arimitsu motor sprayer showed the higher initial efficiency after two sprays which recorded 100% R. except after 1st spray with achook on eggplant (85.71% R.) and after 2nd spray with pirimiphos -methyl on cow pea (83.6%R.). Concerning R.E. after 1st spray, Arimitsu motor sprayer and Solo sprayer with pirimiphos -methyl on okra recorded highest efficacy 93.81% and 93. 3% R respectively. While at 2nd spray, Arimitsu with pirimiphos- methyl on cow pea was the first one (97.95% R) and it was the least one on okra by conventional sprayer (60.36% R). Due to the (M.T.) Arimitsu sprayer also on okra and solo sprayer on cow pea with pirimiphos -methyl were the highest efficacy. It's recorded (92.26%) and (91.06 % R) respectively.

At EL-Eslah 30 village

As a (I.E.) pirimiphos- methyl on three vegetable crops using three tools caused 100% R at two sprays, while achook caused % R. ranged between 87.5 on eggplant using Arimitsu sprayer to 33.33 on okra using Conventional sprayer at 1st spray, while at 2nd spray achook caused %R. ranged between 97.33 to 50%R using Solo sprayer on okra, respectively.

As a (R.E.), Solo sprayer was the best tool at 1st spray in both two tested insecticides (pirimiphos - methyl and achook) than the other two tested sprayers. It's caused % R. in population of jassid infesting cow pea (96.56, 83.13%), eggplant (93.21, 71.94%) and okra (97.78, 78.06%) respectively. Also, the same trend was showed due to the (M.T.), Solo and Arimitsu sprayers were the best tools against jassid, where caused 91.96% R,91.64 % R. using pirimiphos -methyl and 78.86% , 70.65 % R using achook on cow pea and the same trend

on the other two vegetable crops. These results are in agreement with that obtained by Attia *et al*, (1990) who reported that consequently, the chemical program of cotton pests must be mainly directed to achieve a high toxic effect to jassid.

The efficiency on common green lacewing (*Crysoperla carnea*)

Data in Table (5) indicate the side effect of tested insecticides on the population density of *C.carnea* existed in three vegetables field. Generally, the tested insecticdes significantly decreased the number of *C. carnea* in sprayed areas. The rate of reduction varied considerably according to the chemical nature of used insecticides and the species of exposed predator. *C.carnea* seemed to be the most tolernat species. It is clearly evident to notice that all tested insecticides proved moderate hazardous for *C.carnea.* Among the most effective insecticides on studied insect pest in cowpea was achook using Conventional sprayer , it's caused at EL-Zarkia village as a l.E. , R.E. and G.E. 71.19 49.2 and 53.6%R, on eggplant using Solo sprayer caused 58.88 , 37.39 and 41.67 % R and on okra using Conventional sprayer caused 62.5, 51.65 and 53.8% R. respectively. The results as M.T. at EL-Zarkia village were higher on okra then eggplant then cowpea when pirimiphos methyl sprayed using Arimitsu sprayer. It's recorded 78.05%, 75.97%, 71.64% reduction and at EL-Eslah 30 village recorded 86.8%, 87.79%, 92.95%reduction, respectively. It's important to point out that although toxicity effects are relevant to understanding how pesticides and natural enemies may complement one another, the full impact of pesticides on natural enemies in the field is dependent on cumulative effects of the pesticides on natural enemy populations (e.g., Stark and Wennergren (1995). These effects may be expressed as mortality (Croft 1990). Also, the results presented here are in agreement with the literature where as most of the conventional insecticides for chewing and sucking insects are highly toxic to *C. carnea* (Badawy and El-Arnaouty, 1999).

Finally, the utilization of natural plant extracts is receiving a considerable attention in year to avoid differ disadvantages of insecticides use. At the last recent to decades the investigation have direct their attention to wards plant extract, which would be non hazardous easy to used and specific in these action. Therefore, today it can be conclude that achook could be included as useful toxic in some vegetable crops management program through used suitable sprayer tool.

Data obtained after 2nd spray revealed that the same trend which resulted after the 1st spray. Data showed thatas (M.T.), Arimitsu motor sprayer was the highest effective one (78.05%R.) then Solo sprayer came the second (74.98 %) when used with pirimiphos- methyl on okra plants, while the best results on *C. carnea* were obtained when achook sprayed on cowpea with Solo sprayer (57.79 % R.) , achook with Arimitsu on both of eggplant (49% R) and on okra (51.71 % R.), respectively .

Also, data obtained as a (M.T.) at EL-Eslah 30 village revealed that, achook proved the safest effects on *C.carnea.* The %R. in the population of the three tools with achook ranged between 52.37 to 71.5 % R. on okra plants. These results are in agreement with that obtained by El-Zen *et al.,* (1998) who found that *C. Carnea* was relative more susceptible to various insecticides. Attia *et. al.,* (1990) reported that cyanophos caused 43.3 % R. in *Crysopa vulgaris* on cotton plant when sprayed with a knapsack sprayer. Also, Omar *et al.*, (1999), who found that, the natural insecticides, bio-neem at the recommended rate was as good as the tested insecticides.

Qualitative evaluation of spraying techniques used

Due to the specific localization of the targeted insects on three vegetable plants, where the lower surface of leaves seems to be the preferable habitat , it becomes essential to concentrate majority of spray bull onto such target and consequently to evaluate the tested sprayers according to their performances in this respect , as a first priority.

Table (6) showed the distribution of pirimiphos - methyl and achook deposits on cowpea , eggplant and okra plants using recommended rates and three spraying techniques, namely, Solo sprayer (22 L./fed.), Conventional sprayer (200 L/fed.) and Knapsack motor sprayer (Arimitsu) (25L./fed.) against some insect pests.

The droplet spectrum deposited on eggplant plant proved to be sufficient in number and suitable in size , with all tested techniques. The mean number per cm^2 with pirimiphos-methyl applied with Solo, Conventional and (Arimitsu) sprayer at EL-Eslah 30 village were 45,20and 93 droplets, having droplet size 194, 630 and 182 µm, respectively. The same trend was found with achook which caused 46% reduction in mean droplets number/cm^2. The results agreed with those obtained by Ammar (2003) who recorded that little number of droplets on wire holder , having small diameters of 66,121 and 646 µm with the use Arimitsu,Solo and Conventional sprayers , respectively , Abo-Amer (2005) found that the Knapsack sprayer (Solo) (22 L/fed) produced number of droplets as (N/Cm^2) 42 at upper level of plant.

The resulted influence of the rate factor on coverage was expected where increasing of the rate caused a slight reduction in droplet size a compared with a drastic magnification in its numbers. These results are in agreement volume versus droplets number and vice versa with its sizes as obtained by Osman and El-Attal, (1987) and Hindy *et al.* (1997) , who found that the droplet size distribution of the spray played an important role in this respect.

Data in Table (7) show clearly that a higher level of spray losses was occurred when applying Conventional sprayer on cow pea plants. The percentage of loss of pirimiphos methyl sprayed on the vacant side area of soil between cow pea plants was 25.9% but when sprayed with Solo sprayer was 11.1% at EL-Zarkia village. Also, both Solo and Arimitsu sprayer gave the lowest contamination on application when used with pirimiphos methyl on cowpea plants at EL-Eslah 30 village which gave zero and 10.2% respectively. This confirms the positive relationship between rate of application and spray lost on ground between the plants treated and on applicator.

Table (2): Effects of bio and chemical insecticides as % reduction in population density of whitefly (*B.tabaci*) attacking three vegetable crops by some spraying techniques at El-Zarkia and EL-Eslah 30 villages

Crop	Insecticides	Machines	El-Zarkia village							EL-Eslah 30 village						
			First spray			Second spray				First spray			Second spray			
			I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.	I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.
Cow pea	Actellic	*	100a	89.5b	91.6b	76.14fg	92.96bc	89. 66cd	90.63abc	100a	95.77bc	96.62bc	100a	97.76ab	98.21a	97.42ab
		**	100a	88.19bc	90.55bc	66.67h	97.36a	91.22bc	90.89abc	100a	98.18a	98.54a	100a	98.92a	99.14a	98.84ab
		***	100a	86.25d	89.cd	83.71d	89.75cd	88.54cd	88.77c	100a	94.62cd	95.7c	100a	96.63bc	97.3ab	96.5b
	Achook	*	75.14f	81.75e	80.43f	78.75ef	86.05de	84.59e	82.51de	89.97c	93.88d	93.1d	86.36b	92.95e	91.63e	92.37c
		**	88.14f	69.95i	72.04i	57.14i	83.45ef	78.19fg	75.12g	94.76b	85.44g	87.3f	86.67b	81.17i	82.27hi	84.79g
		***	80.67e	73.67g	75.07h	66h	80.23f	76.18gh	75.63g	81.23e	86.98fg	85.83f	74.07ef	87.69g	84.96g	85.4g
Egg plant	Actellic	*	100a	80.56e	84.45e	93.13b	95.77ab	95.24a	89.85bc	100a	94.37cd	95.5c	100a	95cd	96bc	95.75b
		**	100a	60.55j	68.44j	87.13c	90.36c	89.71cd	79.08f	100a	94.3cd	95.44c	100a	97.97ab	98.37a	96.91b
		***	100a	89.82b	91.85b	88.56c	95.09ab	93.69ab	92.77a	100a	97.3ab	97.84ab	100a	92.53e	94.03d	95.94b
	Achook	*	100a	72.06gh	77.65g	58.04i	70.59h	68.08i	72.87h	100a	90.19e	92.15d	82.96c	88.15fg	87.11f	89.63d
		**	94.59b	72.78g	77.14g	65.67h	63.77i	64.15j	70.61i	94.61b	88.47f	89.7e	72.56f	82.86i	80.8i	85.25fg
		***	93.87b	77.02f	80.39f	77.93ef	86.32de	84.64e	82.52de	96.13b	91.83e	92.69d	75.5e	81.63i	80.4i	86.55ef
Okra	Actellic	*	100a	96.08a	96.86a	100a	83.25ef	86.6de	9173ab	100a	97.2ab	97.76ab	100a	96.73bc	97.39ab	97.58ab
		**	100a	96.15a	96.9a	100a	76.1g	80.88f	88.89c	100a	98a	98.4a	100a	93.42de	94.73cd	95.91b
		***	100a	70.75hi	76.6gh	76g	95.29ab	91.43bc	84.02d	100a	98.23a	98.59a	100a	95.19cd	96.15bc	97.37ab
	Achook	*	82.8d	87.23cd	86.34d	83.2d	72.5gh	74.64h	80.49ef	90.46c	93.93d	93.23d	72.78f	85.83h	83.22gh	88.23de
		**	57h	70.06hi	67.45gh	58i	71.66h	68.93i	68.19j	88.61c	82.37h	83.62g	74.21ef	78.13j	77.35j	80.56h
		***	61.78j	59.95k	60.31 l	79 .84e	80.84f	80.64f	70.48i	83.97d	91.83e	90.26e	78.22d	89.81f	87.49f	88.88d
L.S.D.$_{0.05\%}$			1.044	1.657	1.657	2.76	3.784	3.082	2.074	1.787	1.656	1.611	1.912	1.803	1.789	1.654

* Solo Sprayer ** Conventional Sprayer *** Arimitsu motor Sprayer I.E. =Initial effect (effect after 2 days) R.E. =Mean of residual G.E.= General mean M.T. = Mean of two sprayers

Table (3): Effect of bio and chemical insecticides as % reduction in population density of Green stink bug (*Nezara viridula*) attacking vegetable crops by some spraying techniques at El-Zarkia and EL-Eslah 30 villages

Crop	Insecticides	Machines	El-Zarkia village							EL-Eslah 30 village						
			First spray			Second spray				First spray			Second spray			
			I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.	I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.
Cow pea	Actellic	*	100.a	87.13 b	89.7ab	77.78g	92.53b	89.58e	89.14b	100a	58.75j	67.0f	100a	93.33a	94.67a	80.84f
		**	69.67e	85.54be	37e	84.62f	93.27b	92.12cd	85.24c	100a	52.5k	62h	100a	91.25b	93ab	77.5g
		***	100a	98.87a	93.49a	87.5e	94.5b	93.10bc	98.3a	100a	67.5h	94a	100a	87.75e	90.2cd	92.1bc
	Achook	*	100a	79.25b	83.4c	58.33j	72.77g	69.88i	76.64f	75b	50l	60i	66.63d	49.56l	52.98 1	56.49k
		**	100a	27.45j	41.96k	79.17g	64.15i	67.15j	54.56j	100a	40m	52j	73.25b	39.19m	38m	45l
		***	100a	46.3i	57.04i	77.78g	76.06f	76.4h	66.72h	75b	58.75j	67f	55.5e	68.31g	56.75i	61.88j
Egg plant	Actellic	*	100a	62.95jh	70.36fg	94.72b	93.89b	94.06b	82.21e	100a	91.67b	83.6e	100a	89.75b	91.8bc	92.57bc
		**	100a	78.72e	82.97c	92.69cd	89.71cd	90.31de	86.64c	100a	79.5e	87.7d	100a	78.63f	82.9e	83.25e
		***	100a	81.41de	85.13c	90.95d	78.6c	87.07f	86.1cd	100a	84.63d	64.64f	100a	85.92d	88.73d	88.22d
	Achook	*	91c	65.48g	70. 58fg	73.79b	70.42h	71.09i	70.84g	60c	80.8e	64.8g	40.67g	63.67j	55.83k	61.86j
		**	100a	66.63g	73.31ef	55.29k	65.99i	56.65k	64.98i	25d	74.75f	87.1d	70.33c	52.21k	74.2f	60.36j
		***	100a	71.17f	76.93de	70.31i	81.86e	79.55g	78.24f	75b	90.13b	95a	33.25i	84.44de	94.6a	80.65f
Okra	Actellic	*	90.6c	86.54bc	87.35bc	100a	90.2c	92.16cd	89.76b	100a	93.75a	90c	100a	93.25a	91.9bc	94.8a
		**	95.05b	82.9cd	85.33c	100a	93.75b	95b	90.17b	100a	87.5e	95.53a	100a	89.88b	91.9bc	90.95c
		***	100a	82.76cd	86.13bc	94.35bc	98.04a	98.43a	92.33a	100a	94.42a	66.87f	100a	89.88b	60.44i	93.72bc
	Achook	*	89.56c	82.86cd	84.2c	94.67b	87.72d	89.11ef	86.66c	73.33b	65.25i	60.25i	37.5b	66.18h	67.5h	63.66HI
		**	82.1d	72.26h	66.23h	75.33j	27.31j	33.31L	49.74K	60C	60.25J	60.25I	50F	38.88M	67.5H	63.88I
		***	100a	61.3h	69.04gh	52l	68.73H	65.38J	67.44H	20E	70.75G	60.I	25J	33.13E	71.5G	65.8H
L.S.D.$_{0.05\%}$			2.559	3.534	3.923	1.872	2.208	2.138	1.656	1.872	1.625	1.656	1.884	1.656	1.746	1.786

* Solo Sprayer ** Conventional Sprayer *** Arimitsu motor Sprayer I.E. =Initial effect (effect after 2 days) R.E. =Mean of residual G.E.= General mean M.T. = Mean of two sprayers

Table (4): Effect of a bio and chemical insecticides as % reduction in population density of leafhopper (*Empoasca lybica*) attacking vegetable crops by some spraying techniques at El-Zarkia and EL-Eslah 30 villages

Crop	Insecticides	Machines	El-Zarkia village							EL-Eslah 30 village						
			First spray			Second spray				First spray			Second spray			
			I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.	I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.
Cow pea	Actellic	*	100a	85.45b	88.36b	100a	99.22c	93.76ab	91.06ab	100a	96.56ab	97.24ab	100a	83.33cd	86.67c	91.96ab
		**	100a	77.13e	81.7e	100a	87.ef	89.6d	85.65e	100a	92.55c	94.04c	100a	81.25e	85d	89.52c
		***	100a	81.04b	84.83cd	83.6c	97.95a	95.08a	89.96bc	100a	95.22b	96.18b	100a	89.56c	87.65c	91.64abc
	Achook	*	81.56c	54.22i	59.69h	100a	82.36e	85.89e	72.79h	65.41d	83.13e	79.62f	97.33b	77.78f	78.09f	78.86e
		**	100a	34.39k	47.51i	90.89b	84.64f	85.89e	66.7j	72c	63.29k	65.03i	96c	61.23j	62.78i	63.91j
		***	100a	82.04cd	85.63c	100a	88.93de	91.14cd	88.39f	65.22d	84.16e	80.83f	96c	85.33ka	60.47j	70.65h
Egg plant	Actellic	*	80c	83.55bcd	82.84be	75.5e	92.61bc	89.09d	85.97e	100a	93.21c	94.57c	100a	87.81b	90.25b	92.41a
		**	85.71b	81.32d	82.2e	100a	93.46b	94.74eb	88.49ed	100a	87.78b	90.22d	100a	93.15a	94.52a	92.37a
		***	100a	84.3bc	87.44bc	100a	90.75cd	92.6bc	90.02bc	100a	91.43c	93.14c	100a	88.19b	90.55b	91.85ab
	Achook	*	66.67d	65.19g	65.48g	7778de	70.95h	72.31h	68.9i	75c	71.94h	72.55g	65.5e	82.88de	79.4f	76.13f
		**	68.75e	40.11j	45.64i	91.3b	80.87g	82.95f	94.44k	66.67d	54.33l	56.8k	60.57f	61.07j	60.97j	58.89k
		***	85.71b	58.88h	64.25j	100a	89.66de	91.24cd	77.73g	87.5b	69.28i	72.93j	63.2e	63.45i	63.4hi	68.17i
Okra	Actellic	*	100a	93.3a	94.42a	100a	87.38ef	89.9d	92.6a	100a	97.78a	98.23a	100a	77.0f	81.6e	89.92bc
		**	100a	76.78e	81.42e	100a	60.36i	72.05h	76.74j	100a	84.54e	78.63e	100a	74.13j	79.3f	83.47de
		***	100a	93.81a	95.05a	100a	87.58ef	90.07d	92.26a	100a	95.82b	96.65ab	100a	88.5b	90.8b	93.73a
	Achook	*	100a	73.17f	78.53f	82.cd	88.13e	86.9e	82.72f	50e	78.06f	72.45j	55j	72.6j	69.8g	70.77h
		**	58.55e	29.88l	35.6j	100a	80.93g	84.74ef	60.17l	33.33g	66.79j	60.1j	50h	68.46h	64.77h	62.44j
		***	100a	77.66e	82.13e	100a	92.25bc	93.8ab	87.97d	40f	75.5g	68.12h	62.5ef	82.45de	78.7f	73.41g
L.S.D.$_{0.05\%}$			3.242	2.559	2.287	4.58	2.211	2.102	1.789	1.621	1.789	1.656	2.075	1.656	1.716	2.028

* Solo Sprayer ** Conventional Sprayer *** Arimitsu motor Sprayer I.E. =Initial effect (effect after 2 days) R.E. =Mean of residual G.E.= General mean M.T. = Mean of two sprayers

Table (5): Effect of bio and chemical insecticides as % reduction in population density of common green as leacwing (*Crysoperlla carnea*) on vegetable crops by some spraying techniques at El-Zarkia and EL-Eslah 30 villages

Crop	Insecticides	Machines	El-Zarkia village							EL-Eslah 30 village						
			First spray			Second spray				First spray			Second spray			
			I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.	I.E.	R.E.	G.E	I.E.	R.E.	G.E.	M.T.
Cow pea	Actellic	*	82.74ah	65.7b	6911ab	78.79de	13.7e	72.85ef	70.98d	100a	88.72c	90.79c	100a	84.12e	87.29d	89.4bc
		**	82.88ab	63.19bc	67.13b	76.94e	65.94f	68.14gh	67.64e	100a	91.25b	93b	100a	67.38g	81.1f	87.05c
		***	84.15a	70.63a	73.34a	81.55cd	66.91f	6994fg	71.64cd	100a	94.02a	95.21a	100a	88.35c	90.68c	92.95a
	Achook	*	73.25cde	51.32e	5.7de	69.25f	57.72gh	59.87i	57.79h	71.06g	62.87hi	64.5h	71.34c	68.53hi	69.09i	66.8f
		**	71.19de	49.2ef	53.6e	68.26fg	66.05f	66.49h	60.05g	78.22e	68.44j	70.72g	43.9g	68.52hi	63.6 l	67.16f
		***	74.32cd	49.ef	54.0e	71.06f	75.55d	74.68e	64.37f	73.29f	67.95g	69.01j	65.22d	65.73j	65.63k	67.32f
Eggplant	Actellic	*	71.39de	70.29a	70.51ab	81.63cd	68.88ef	71.41f	70.96d	70.91j	77.98d	76.57e	100a	81.25f	85e	80.79d
		**	72.53cde	57.92d	60.84c	84.25c	60.26g	65.06h	62.95f	79.66e	73.13e	74.44f	100a	86.52d	89.22c	81.83d
		***	82.61ab	66.6cd	69.8ab	81.63cd	82.27d	82.14b	75.97b	83.02c	77.63d	78.7d	100a	96.1a	96.88a	87.79c
	Achook	*	58.88h	37.39h	41.67gh	82.8cd	51.65j	57.76i	49.42j	61.54i	58.4j	59.09j	100a	69.2h	75.36h	67.23f
		**	67.65efg	38.39h	44.24fgh	70.6f	54.78hi	57.94i	51.09i	55.56j	51.64k	52.42k	67d	52.41k	55.33m	53.88h
		***	63.21fgh	43.21g	47.21f	65.7g	47.06k	50.79j	49j	67.86h	61.27i	62.59i	67d	69.84ig	67.38 j	64.99f
Okra	Actellic	*	85.a	57.16d	62..73c	95.69b	85.12c	87.23c	74.98b	86b	91.48b	90.39c	100a	87.18c	89.73 c	90.06b
		**	81.25ab	47.48f	54.23e	100a	89.48b	91.59b	72.91c	81.63b	72.36ef	74.21f	100a	81.17c	89.73c	81.97d
		***	86.21ab	52.32e	59.1cd	94.88b	97.53a	97a	78.05a	84.92b	79.28d	80.41d	100a	91.47b	93.18b	86.8c
	Achook	*	68.18ef	33.59i	40.81h	91.64b	76.46d	79.5d	60.16g	71.05g	64.27h	65.63h	75.55b	77.84 j	77.37j	71.5e
		**	62.5gh	51.65e	53.8e	71.02f	55.77hi	58.82i	56.32h	57.13j	4858l	50.29I	60.8e	52.84 l	54.44m	52.37h
		***	77.78bc	36.88hi	45.06fg	83.44cd	52.08ij	58.35i	51.71j	79.99de	71.13f	72.88f	48.67f	46.6 l	47.01n	59.55g
L.S.D.$_{0.05\%}$			4.983	3.534	4.149	3.88a	2.859	2.998	1..625	1.745	1.762	1.789	1.799	1.625	1.656	2.138

* Solo Sprayer ** Conventional Sprayer *** Arimitsu motor Sprayer I.E. =Initial effect (effect after 2 days) R.E. =Mean of residual G.E.= General mean M.T. = Mean of two sprayers

Table (6): Spray coverage on (cow pea ,eggplant and Okra) , land and contamination of applicator, targets as produced under different spraying volumes and two insecticides against some insects at El-Zarkia and EL-Eslah 30 villages.

Insecticides	Machines	Droplets	Targets	season	Cow pea			Eggplant			Okra		
					On plant	On land	On application	On plant	On land	On application	On plant	On land	On application
Actellic	Solo Sprayer 22 l/fed.		VMD	*	170	185	198	189	190	190	183	184	187
			N/CM^2		32	4	0.0	39	2	2	38	5	3
			VMD	**	179	191	197	194	198	199	186	188	188
			N/CM^2		37	6	0.0	45	5	3	47	6	2
	Conventional. Sprayer 200 l/fed.		VMD	*	605	620	550	620	625	540	617	623	539
			N/CM^2		15	7	5	17	6	9	19	6	8
			VMD	**	608	624	558	630	633	564	625	630	548
			N/CM^2		19	8	7	20	7	10	23	8	11
	Arimitsu motor Sprayer 25 l/fed.		VMD	*	164	170	160	183	186	170	177	179	176
			N/CM^2		87	15	12	88	19	19	85	18	13
			VMD	**	167	171	163	182	184	169	179	179	178
			N/CM^2		99	16	13	93	20	18	87	15	10
Achook	Solo Sprayer 22 l/fed.		VMD	*	178	189	195	192	192	191	187	190	189
			N/CM^2		31	5		35	3	3	33	4	3
			VMD	**	183	192	197	195	197	193	191	193	192
			N/CM^2		43	7		46	8	4	48	6	6
	Conventional. Sprayer 200 l/fed.		VMD	*	635	650	650	650	655	650	642	647	630
			N/CM^2		14	6	4	16	5	8	17	6	7
			VMD	**	645	659	661	654	659	665	648	654	645
			N/CM^2		17	7	5	19	7	7	21	7	8
	Arimitsu motor Sprayer 25 l/fed.		VMD	*	167	179	173	187	190	172	182	184	180
			N/CM^2		83	17	13	86	20	11	80	19	15
			VMD	**	174	180	181	188	190	173	185	186	182
			N/CM^2		97	22	21	93	21	14	87	21	18

VMD= volume mean diameter N/cm^2 = Number of droplet/cm^2 .

* El-Zarkia ** EL-Eslah 30.

Table (7): Percentage of deposit spray on cow pea ,eggplant and okra plants losses on land and contamination of applicator by different spraying volumes and two insecticides at El-Zarkia and EL-Eslah 30 villages

insecticide	Targets: Machines / Droplets	season	Cowpea: % on plant	Cowpea: % Losses on land	Cowpea: % on application	Eggplant: % on plant	Eggplant: % Losses on land	Eggplant: % on application	Okra: % on plant	Okra: % Losses on land	Okra: % on application
Actellic	Solo	*	88.9	11.1	0.0	90.8	4.6	4.6	82.6	10.9	6.5
	Sprayer 22 l./fed.	**	86.0	14.0	0.0	84.9	9.4	5.7	85.5	10.9	3.6
	Conventional.	*	55.6	25.9	18.5	53.1	18.8	28.1	57.6	18.2	24.2
	Sprayer 200 l../fed.	**	55.9	23.5	20.6	54.1	18.9	27.0	54.8	19	26.2
	Arimitsu motor	*	76.3	13.2	10.5	69.8	15.1	15.1	73.3	15.5	11.2
	Sprayer 25 l./fed.	**	77.3	12.5	10.2	71	15.3	13.7	77.7	13.4	8.9
Achook	Solo	*	86.1	13.9	0.0	85.4	7.3	7.3	82.5	10.0	7.5
	Sprayer 22 l./fed.	**	86	14	0.0	79.3	13.8	6.9	80	10	10
	Conventional.	*	58.3	25	16.7	55.2	17.2	27.6	56.7	20.0	23.3
	Sprayer 200 l./fed.	**	58.6	24.1	17.3	57.6	21.2	21.2	58.3	19.4	22.3
	Arimitsu motor	*	73.5	15	11.5	73.5	17.1	9.4	70.2	16.7	13.1
	Sprayer 25 l./fed.	**	69.3	15.7	15	72.7	16.4	10.9	69.0	16.7	14.3

* El-Zarkia ** EL-Eslah 30.

Therefore, it is recommended to reduced the dosage for low volume treatments in order to estimate correlation between droplet distribution and the reduction percentage. This phenomena agreed with Abd-Allah and Ammar (2005) and Thomas and Alvin (1997).

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دراسة نسبية بين مبيد حيوي وآخر كيماوي تم رشهما بثلاث آلات رش مختلفة على بعض محاصيل الخضر ضد بعض الحشرات في قريتان بمحافظة الشرقية

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أجريت تجربتان حقليتان لتقييم فاعلية المركبين بيريميفوس ميثيل وأشوك ضد ذبابة الطماطم البيضاء والبقة الخضراء والجاسيد وأسد المن الأكثر عددا كعدو حيوى .. وذلك خلال موسم ٢٠٠٧ م بقرية الزرقية – مركز الزقازيق و قرية الأصلاح ٣٠– محافظة الشرقية وقد درس مدى تأثير المبيد الحيوى أشوك فى خفض النسبة المئوية لتعداد الحشرات الأربعة تحت الدراسة من خلال استخدام ثلاث آلات رش وذلك مقارنة بالمبيد الكيماوى بيريميفوس ميثيل (أكتيلك) ..هذا بالإضافة إلى مدى تعرض العامل القائم بالرش للتلوث ومشاكل فقد المبيد الكيماوى بيريميفوس ميثيل مقارنة بالمبيد الحيوى أشوك على التربة وذلك على كل من اللوبيا والباذنجان والباميا و الآت الرش هى :

١- الرشاشة صولو بمعدل رش ٢٢ لتر/ فدان
٢- الرشاشة التقليدية بمعدل ٢٠٠ لتر / فدان
٣- موتور الرش الظهرى اريمتسيو بمعدل رش ٢٥ لتر /فدان

وتهدف الدراسة إلى الحصول على أفضل مكافحة للآفات الحشرية المستهدفة باستخدام مادة آمنة غير ملوثة للبيئية من خلال أختيار انسب آلة رش توفر تغطية مناسبة ومتجانسة لسائل الرش وقد أشارت النتائج إلى :

* تغطية سائل الرش لكل المركبين على النباتات الثلاثة كانت جيدة
* أدى استخدام الرشاشة صولو (٢٢ لتر /فدان) وموتور الرش الظهرى اريمتسيو (٢٥ لتر/فدان) إلى مكافحة جيدة للآفات المستهدفة حيث سجل المبيد الكيمياوى بيريميفوس ميثيل باستخدام الرشاشة صولو أعلى نسبة منوية للخفض فى تعداد الحشرات الكاملة للذبابة البيضاء فكانت على اللوبيا (٩٧,٤٢%) وعلى الباذنجان (٩٥,٥٨%) وعلى الباميا (٩٧,٥٨%) كمتوسط عام لمجموع رشتين فى قرية الأصلاح ٣٠ بينما سجل نفس المبيد باستخدام الموتور اريمتسيو ٩٦,٥% و ٩٥,٩٤% و ٩٧,٣٧% على المحاصيل السابقة على التوالى .
* تأثير بيريميفوس ميثيل ضد البقة الخضراء على المحاصيل الثلاثة كان أكثر وضوحاً عن المركب الحيوى أشوك.
* الرش بالمركب بيريميفوس ميثيل باستخدام موتور الرش الظهرى اريمتسيو على الباميا واستخدام الرشاشة صولو على اللوبيا لمكافحة الجاسيد كان عالى الفعالية .
*وجد أن كلا المركبين تحت الأختبار قدما تأثيرا ضارا بدرجة متوسطة على المفترس أسد المن خاصة المبيد الحيوى أشوك.
* أستخدام الحجم الصغير من محلول الرش بواسطة موتور الرش الظهرى اريمتسيو باستخدام المبيد الحيوى بالتركيز الموصى به أدى إلى الحصول على نسبة مكافحة مقبولة للآفات مع قلة الوقت اللازم لعملية الرش وقلة التكلفة والمحافظة على البيئة.