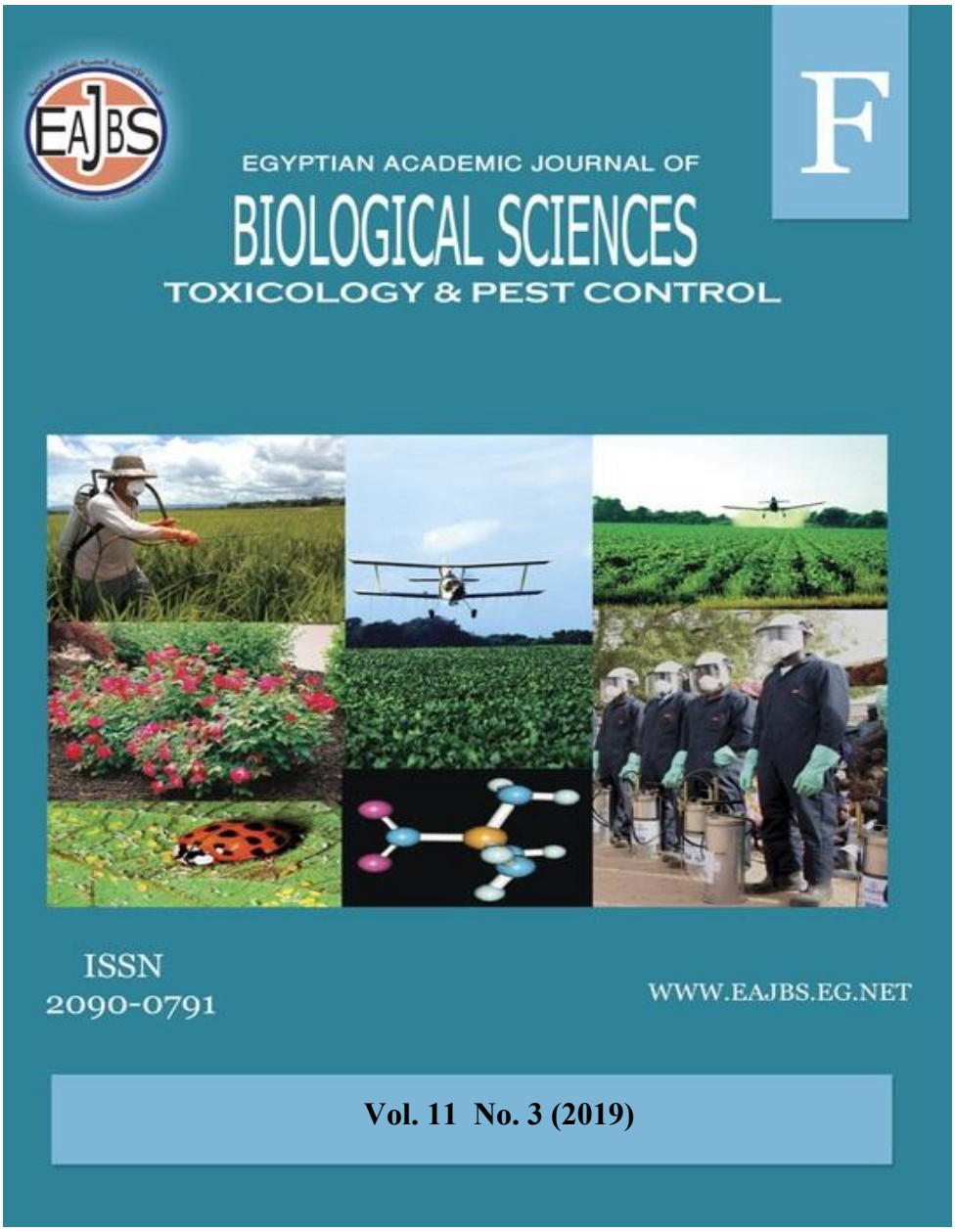

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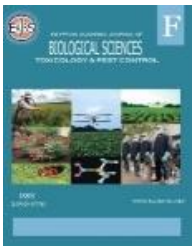

Residual Activity of Certain Insecticides Sprayed on Peach Orchard to Control Green Peach Aphid, *Myzus persicae* (Sulzer); by Using Certain Ground Equipment at Qualiubia Governorate.

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ABSTRACT

The present work was carried out to evaluate the spray quality produced by two hydraulic ground sprayers using rates of application 113 and 147 L/fed , respectively. Three insecticides were used Acetamiprid 20% SP. , using a dose rate of 25 gm /100 L. water, neutral Potassium detergent at a dose rate ½ kg / 100 L. water and plant extract Saponins solution at a dose rate one liter / 30 L. water against green peach aphid *Myzus persicae* (Sulzer) on Peach orchard. Data showed that droplet sizes induced by Matabi sprayer with manual pump were bigger than motorized Solo sprayer , however, more coverage homogeneity was obtained by Solo sprayer with a motor pump. Data, showed also that, spray coverage of upper and middle levels of Peach trees in all treatments reached homogeneity factor 2.5 for hydraulic nozzles according to FAO , but the lower levels of Peach trees which revealed not homogenous spray. The rate of Performance (fed / day) for Solo sprayer was 5 fed. / day, while was 3 fed./ day in case of Matabi sprayer.

Bioassay results indicated that all tested compounds induced negative significant influence on *Myzus persicae* (Sulzer) nymphs survival. Saponins gave promising results in controlling *Myzus persiace* nymphs on Peach trees with least hazard to emergence rate of natural enemy Parasitoid *Aphidius matricariae* (Haliday) larvae, while Acetamiprid gave the highest reduction in both of *Myzus persicae* and *Aphidius matricariae* larvae in case of two sprayers. Data also showed that replacement spray application form high volume spraying to low volume spraying (L/fed); decreases the total operating cost/fed / L. E. , saving spraying time i. e. the rate of performance of low volume equipment increases, and suitable spray coverage was obtained.

INTRODUCTION

Peach is one of the most promising fruit crops due to its high relative competitive privilege during April and May in the foreign markets where Egypt occupies the 19th level worldwide as the exports of Peach represent approximately 1.3% of the value of total exports of fresh Egyptian fruits. The productivity averages of one feddan in old lands are approximately 8.5 ton / fed. while in newly reclaimed lands is about 6.8 ton / fed. (Mohamed, H. N. and El-Sayed M.M. 2015).

Green peach aphid, *Myzus persicae* (Sulzer); is considered one of the most destructive Pests of Peach orchards in Egypt, especially those orchards which fertilized with excessive rates of nitrogen fertilizers. Severe infestation of this Pest causing viscous honeydew which reduces photosynthetic activity leading to defoliation and subtitle reduction in the fruit yield and quality. Insect Parasitoids play a central role in the natural regulation of Pest Populations and limitation of plant damage. Percent of Parasitism may exceed 90% of individuals Godfrayb (1994). However, Extensive usage of Pesticides drastically affects their beneficial action Croft (1990).

The common method for controlling the intended pest is using conventional ground motor spraying through washing the trees with recommended organophorous insecticides. This application method consumes huge amounts of pesticides, water, time, poor rate of performance of used equipment, environmental pollution and accessible resistance of the pest. To avoid aphid resistance phenomena; maintaining and calibration sprayers to achieve proper pesticide application and proper handling will reduce their harmful effects on human health and environment Dokic *et al*. (2018). The present investigation aims to evaluate the efficiency of the low-volume spraying techniques with alternative materials against aphids in the peach field as well as keeping the Agriculture environment in good balance condition. The present study also sheds additional light on the economics of Pest control operations.

MATERIALS AND METHODS

Compounds Used for Spraying Operations:

1- Watery Plant Extraction Solution (Saponins) produced by (Issa, S.S. Faculty of Agric., Ain Shams Univ.). The concentration dose rate was used as one part of Saponins (66.4 ppm.) added to 30 parts of water and sprayed on different treatments.

2- Neutral potassium detergent with the recommended rate dose ½ kg / 100.0 L. Water produced by the Ministry of Agriculture.

3- Insecticide Acetamiprid , (Mospilan®) 20% SP. methyl acetamidine; recommended rate dose 25.0 gm / 100 L. Water. Contain 200.0gm Active ingredient k.g.

[E] – N – (6 – chloro – 3 – pyridyl) methyl – N – 2 cyano – N –.

Experimental Design:

Two spraying equipment was applied on peach orchard at Qualiubia governorate, on April 16th 2019.

The percentage of green area to the total orchard area was about 65%. The distances of cultivation were 5*5 m. The mean height of peach trees ranged between 2.5 – 3 meters while the average diameter of trees was 1.5 meters. Two ground hydraulic sprayers were used with manual lever operated pump Matabi®sprayer 113 L/fed.; and Solo®, motorized hydraulic knapsack sprayer 147 L/fed. The Techno – operational data of two sprayers and calibration were listed in Table (1).

The experimental area was about one feddan infested with green peach aphid. The area was divided into 6 treatments and untreated treatment. Each area was about 600 m^2, which contains 24 Peach trees divided into three replicates, and untreated area was selected in an isolated place vies versa wind direction to avoid drift spraying. The numbers of peach aphid nymphs and its natural enemy larvae were counted prior to Binocular before and 2nd, 5th, and 7th days from spraying at five marked trees for each treatment. Numbers of natural enemies, *Aphidius matricariae* were recorded in treated and untreated areas by counting the numbers of parasitoid larvae emerged from mummies which were previously located inside closed glass Jars to determine the effect of the tested chemicals applied by different spraying equipment.

Calculation and Data Analysis:

1-Percentages of mortality for either aphid or the natural enemiey were calculated according to Hendrson and Tillton (1955).

2-Statistical analysis of results was done according to SAS (Anonymous, 2003) mean separation was conducted using LSD in the same statistical program.

Twelve water-sensitive paper (2*6 cm) from Novartis® Company were fixed on Peach leaves on the upper, middle, and lower levels of three trees in a diagonal line in every six treatments. The water-sensitive cards were mounted representing north, south, east, and west directions at three plant levels. Number's and sizes of droplets on sensitive papers were calculated and measured in the laboratory using Japanese monocular lens (Struben® lens) with a magnification power of 15X and an accuracy of ±50 micrometers. Necessary corrections and calculations of droplet averages were carried out on the basis of that given by Gabir (1993).

Table 1: Techno – operational data and calibration of certain ground equipment used for controlling Green peach aphid *Myzus persicae* (Sulzer); on peach trees under field conditions during season 2019.

Equipment / Parameters	Handheld hydraulic Matabi® sprayer	Motorized hydraulic Knapsack Solo® sprayer
Manufacture	Spain	Germany
Type of Atomization	Hydraulic (manual) pump	Hydraulic (mechanical) pump
No. and type of nozzle	One hollow cone nozzle (80°)**	Spray gun (2mm) *
Tank capacity (L.)	20.0	20.0
Spray volume (L / fed.)****	113	147
Pump type Operational speed km / h.	Piston – Manual lever operated 1.2 in all treatments	2 strock Piston pump (motor, directed)
Flow rate (L / min)	0.807	3.5
R.P.M*** motor	----	6000***
Effective swath width(m)	1.5	5.0
Productivity (fed / h.)	0.86	2.9
Rate of Performance (fed / day)	3.0	5.0
Type of spraying	Target spraying Technique in all treatments	
Metrological conditions	Temperature (C°) 26 Relative humidity 64% Average wind speed msec 1 – 3	

✻ The diameter of orifice of spry gun

✻✻ The angle of spray of hollow cone nozzle

✻✻✻ Revolution per minute for motor sprayer

✻✻✻✻Calibration tests of sprayers made by water.

Remarks:

(L.V.) low volume spraying L / fed 84 – 210

(H. V.) high volume spraying L fed > 420

The mean meteorological conditions during tests were for spraying according to Yates et al (1963), and Trayford et al (1977).

RESULTS

Qualitative Determination of Spray Converge:

1-Distribution Droplets of Hand-held Matabi® Sprayer on Peach trees:

Data in Table (2a) found that droplets deposited on water sensitive cards hanged on Peach trees were sufficient in droplets number and suitable in droplets sizes to control

green peach aphid *Myzus persice* (Sulzer) by Maitabi® Sprayer. The mean number / size of droplets (N/cm^2/ VMD) in the case of Saponins treatments were (52/169µm), (58 / 242µm), and (86 / 413µm) on the surfaces of the upper, middle and lower card, respectively. But in case of Neutral Potassium detergent treatment, the mean number / size of droplets (N/cm^2/ VMD) were (52 / 174 µm), (45 / 179 µm) and (79 / 412 µm), respectively while, in case of Acetamiprid treatments the mean number / size of droplets (N/cm^2/ VMD) were (79 / 207 µm), (56 / 253 µm) and (79 / 368 µm) respectively. On the lower levels, there was great tendency to catch bigger droplets sizes and numbers all over the treatments than the upper levels. Percentages of reduction of upper levels in comparison with lower levels were 40.9, 42.2 and 56.2 in Saponins, Neutral Potassium detergent and Acetamiprid, respectively. The coefficient of variation (C.V %) of droplet numbers distribution on Saponins, Potassium detergent and Acetamiprid 33.3, 36.8 and 31.6%, respectively. It was worthy to note that, the rate doses which used in all treatment have not appeared to predispose to phytotoxicity problems . From data in Table (2b),it was noticed that the unhomoginety factor of Matabi sprayer on the lower part of peach tree for three tests insecticides Saponins, Potassium detergent and Acetamiprid insecticide were 4.2, 5.3, 4.3, respectively but the homogeneity factor of spraying on upper levels of Peach trees, were 2.6, 2.8, 2.6 for the three treatments, respectively.

Table 2a: Droplets distribution of hand-held Matabi® sprayer on peach trees for controlling green peach aphid *Myzus persicae* (Sulzer) by using certain insecticides during season (2019).

Insecticides used	Card position	Average Trees Levels								
		Upper			Middle			Lower		
		N /cm^{2**}	% N /cm^2	VMD * µm	N /cm^2	% N /cm^2	VMD µm	N /cm^2	% N /cm^2	VMD µm
Saponins one liter / 30 L water	North	66	25.3	155	65	24.0	180	70	20.3	300
	south	64	24.6	170	63	13.1	175	75	21.7	350
	Eeast	50	19.2	200	44	16.1	162	100	29.0	300
	West	80	30.7	150	100	36.7	450	100	29.0	500
	Average	52		169	58		242	86		413
Neutral Potassium detergent ½ kg/100L.	North	60	14.6	175	45	25	180	100	32.8	500
	south	45	22	150	40	22	170	80	26.2	400
	Eeast	65	26.6	220	46	25.4	166	60	19.7	350
	West	76	36.8	150	50	27.6	200	65	21.3	400
	Average	52		174	45		179	76		412
Mospilan 20% SP 25gm / 100 L water	North	46	14.5	176	50	22.4	175	100	31.6	500
	south	79	24.9	150	40	17.9	170	79	25	400
	Eeast	92	29.0	200	33	14.8	168	68	12.4	450
	West	100	31.6	300	100	45	500	99	31.3	120
	Average	79		207	56		253	79		368

*VMD: volume mean diameter.

** N /cm^2: number mean diameter.

This phenomenon could be attributed to the smaller droplet sizes with large numbers deposited on upper levels. Moreover narrow distance of spraying operations at lower levels creates large droplet sizes and numbers with a high pressure casing excess of flow rate solutions and washing the sensitive cards by about 20 – 30% from the total cards of lower levels of Peach trees .Data in Tables (3a&b) show the droplet distribution by motorized knapsack hydraulic sprayer (Solo) on Peach trees to control green Peach Aphid. The mean number / size of droplets (N/cm^2 / VMD)on the upper, middle and lower cards surfaces, were in Saponins treatments(65 / 148µm), (64 / 145µm) and (96 / 430µm) respectively .But, the mean number / size of droplets (N/cm^2 / VMD) at three levels cards surfaces were Potassium detergent were (35 / 116 µm), (62 / 205 µm) and (91 / 400 µm) respectively. While in Acetamiprid treatments the mean number / size of droplets (N/cm^2 / VMD) were (74 / 114µm), (76 / 165µm) and (94 / 388µm),

respectively.It was noticed that, the coefficient of variation (C.V%) of Saponins, Potassium detergent and Acetamiprid were (24.8%), (24.9%), (25%) respectively. The homogeneity factor of (Solo®) knapsack motor sprayer were (2.9, 3.6, 2.4) for Saponins, Potassium and Acetamiprid respectively. Both of upper and middle levels of peach tree homogeneity spray was more standard than the lower level of Peach tree. Generally, homogeneity factor of motorized knapsack sprayer was better in droplet homogeneity distribution than Matabi manual pump sprayer.

Table 2b: Homogeneity factor of hand-held Matabi® sprayer on peach trees for controlling green peach aphid *Myzus persicae* (Sulzer) by using certain insecticides during season (2019).

Insecticides used	Card position	Average Trees Levels		
		Upper	Middle	Lower
		* VMDµm **N /cm^2	VMDµm N /cm^2	VMDµm N /cm^2
Saponins one liter / 30 L water	North	2.3	2.7	4.2
	south	2.6	2.7	4.6
	Eeast	4.0	3.6	3.0
	West	1.8	4.5	5.0
	Average	**2.6**	**3.3**	**4.2**
Neutral Potassium detergent ½ kg/100L.	North	2.9	4.0	5.0
	south	3.3	4.25	5.0
	Eeast	3.3	3.6	5.3
	West	1.9	4.0	6.1
	Average	**2.8**	**3.9**	**5.3**
Mospilan 20% SP 25gm / 100 L water	North	3.8	3.5	5.0
	south	1.8	4.2	5.0
	Eeast	2.1	5.0	6.6
	West	3.0	5.0	0.8
	Average	**2.6**	**4.3**	**4.3**

*VMD: volume mean diameter.
** N /cm^2: number mean diameter.

Table 3a: Droplets distribution of hydraulic motorized knapsack sprayer Solo®on peach trees for controlling green peach aphid *Myzus persicae* (Sulzer) by using certain insecticides during season (2019).

Insecticides used	Card position	Average Trees Levels								
		Upper			Middle			Lower		
		N /cm^{2**}	% N /cm^2	VMD* µm	N /cm^2	% N /cm^2	VMD µm	N /cm^2	% N /cm^2	VMD µm
Saponins one liter / 30 L water	North	70	27.1	120	75	29.2	115	100	26.0	500
	south	55	21	130	53	20.7	140	90	24	300
	Eeast	50	19.2	220	54	21.0	225	85	22.0	400
	West	185	32.7	120	75	29.1	100	100	26.0	420
	Average	65		148	64		145	96		430
Neutral Potassium detergent ½ kg/100 L.	North	29	20.8	113	33	13.3	120	100	27.4	500
	south	44	31.6	120	70	28	350	80	22	400
	Eeast	30	21.6	110	71	28.5	182	85	23.2	300
	West	36	25.9	120	75	30.2	166	100	27.4	350
	Average	35		116	62		205	91		400
Mospilan 20% SP	North	83	28	120	73	24	163	90	24	300
	south	70	23.6	115	70	23	150	100	27	350
	Eeast	78	26.2	100	75	24.8	166	99	26.3	450
	West	66	22.2	120	85	28.2	180	85	22.7	300
	Average	74		114	76		165	94		388

* VMD: volume mean diameter.
** N /cm^2: number mean diameter

Table 3b: Homogeneity factor of motorized knapsack sprayer Solo® on peach trees for controlling green peach aphid *Myzus persicae* (Sulzer) by using certain insecticides during season (2019).

Insecticides used	Card position	Average Trees Levels		
		Upper	Middle	Lower
		VMDµm N /cm²	VMDµm N /cm²	VMDµm N /cm²
Saponins one liter / 30 L water	North	1.7	1.5	5.0
	south	2.3	2.6	3.0
	Eeast	4.4	4.1	4.7
	West	1.4	1.3	4.2
	Average	**2.4**	**2.3**	**4.2**
Neutral Potassium detergent ½ kg/100L.	North	3.8	3.6	5.0
	south	2.7	5.0	5.0
	Eeast	3.6	2.5	3.5
	West	3.3	2.2	3.5
	Average	**3.3**	**3.3**	**4.2**
Mospilan 20% SP 25gm / 100 L water	North	1.4	2.2	3.3
	south	1.6	2.1	3.5
	Eeast	1.2	2.2	4.5
	West	1.8	2.1	3.5
	Average	**1.5**	**2.1**	**3.7**

Bio Residual Activity Of Acetamiprid, Saponins And Neutral Potassium Detergent controlling M*yzus Persicae* nymphs on Peach:

The efficiency of Acetamiprid on either *M. Pericae* or *A. matricariae* represented as mortality percentages 48 hours, 5 and 7 days after spraying is presented in Tables (4 & 5) respectively. The highest reduction in the population of *M. Persicae* nymphs was occurred by Motorized knapsack sprayer (Solo®) where volume spraying was (147 L / fed.), the average droplet sizes (VMD) was 222 µm; and average N/cm2 was 81. The mean mortality percentages two days after treatment in season (2019) were 70 and 65% for recommended dose sprayed with Motorized Knapsack sprayer (Solo®) and Hand-held Hydraulic sprayer (Matabi®). The general means reduction percentages were 88 and 83 for residual sprayed with Motorized Knapsack sprayer (Solo) and Hand-held Hydraulic sprayer (Matabi), respectively. The highest reductions in the population of *A. matricariae* larvae were obtained by Motorized Knapsack sprayer (Solo). The mean mortality percentages of *A. matricariae* larvae two days after treatment using Acetamiprid formulation were 80 and 75% while after 7 days the general mean reductions were 93 and 91 when Motorized Knapsack and hand-held sprayer (Matabi) were used, respectively. All tested compounds applied with Motorized Knapsack sprayer (solo) showed a higher significant effect on *M. persicae* nymphs when compared with Matabi sprayer. Also, there significant differences in reduction percentages of *M. persicae* nymphs among the three tested compounds (Acetamiprid, Saponins, and Neutral Potassium. Mean reduction percentages in *M. persicae* nymphs treated with Acetamiprid were (88 and 83%) when applied using Motorized knapsack sprayer and Matabi sprayer, respectively, while these values were (72 and 66%) and (60 and 61%) in case of Saponins and neutral potassium detergent, respectively. Solo sprayer revealed more reduction percentages averages after spraying than Matabi sprayer. This could be attributed due to the homogeneous spraying of Solo sprayer with a mechanical pump, than Matabi sprayer with a manual pump.

Table 4: Reduction Percentages in *Myzus persicae* nymphs affected by certain insecticides sprayed with certain ground equipment during the season (2019).

Equipment / Treatments	Counted nymphs before treatments		% Reduction in days after spraying																LSD between treatments 1.75
			2nd				5th				7th				General mean				
			(Solo)		(Matabi)		(Solo)		(Matabi)		(Solo)		(Matabi)		(Solo)		(Matabi)		
	Motorized Knapsack (Solo) sprayer (147 L / fed.)	Hydraulic sprayer (Matabi) (113 L / Fed.)	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	
Acetampirid (100 gm) / fed.	100	105	30	70.0	68	65.0	5	95	15	85	0.0	100	0.0	100	12	88	27	83	
Saponins diluted 1/30 concentrate (66.4ppm)	115	108	58	50.0	59	45.0	34	70.0	37	65.0	5	96	13	88.0	32	72.0	36	66.0	
Neutral Potassium detergent 0.5 L / 100 L water	110	106	60	45.0	63	40	37	65	44	60.0	11	90	17	84.0	36	66	41	61.0	
Untreated control	104	112	104	-	112	-	102	-	110	-	102	-	110	-	١٠٣	-	١١١	-	
LSD between sprayers 1.43																			

R= % reduction of nymphs. C = Count of life nymphs after treatment.

Table 5: Reduction Percentages in *Aphidius matricariae* Larvae affected by certain insecticides sprayed with certain ground equipment during the season (2019).

Equipment / Treatments	Counted nymphs before treatments		% Reduction in days after spraying																LSD between treatments 2.22
			2nd				5th				7th				General mean				
	Motorised Knapsack (Solo) sprayer (147 L\fed.)	Hydraulic sprayer (Matabi) (113 L/Fed.)	(Solo)		(Matabi)		(Solo)		(Matabi)		(Solo)		(Matabi)		(Solo)		(Matabi)		
Treatments			C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	
Acetampirid (25gm)/100Lwater	150	145	30	80	36	75	0	100	0	100	0.0	0.0	0.0	0.0	10	90	12	87	
Saponinsdiluted 1\30 L water	148	146	137	7	138	5	134	9	135	7	134	9	135	7	135	8	136	6	
Neutral Potassium detergent 0,5 kg \100L water	152	144	133	12	129	10	129	15	126	12	129	15	126	12	130	14	127	11	
Untreated control	150	140	150	_	140	_	148	_	138	_	148	_	138	-	148	_	138	_	
LSD between sprayers used 1.82																			

R = % Reduction of Larvae. C = Count of life Larvae after treatment.

Effect of Acetamiprid, Saponins and Neutral Potassium Detergent on The Parasitoid *Aphidius matricariae* Larvae on Peach:

Effect of the three tested compounds when applied by a motorized knapsack sprayer (Solo®) and hand-held hydraulic sprayer (Matabi®) on the peach aphid parasitoid, *A. matricariae* larvae was shown in Table 5. Data revealed that there was a significant difference between percent reduction of *A. matricariae* larvae and type of used spray equipment mean reduction percentages were (93 , 91%) in case of Acetamiprid, while they were (8 , 6%) and (14 , 11%) in case of Saponins and neutral Potassium detergent when applied with Solo and Matabi sprayers, respectively. A significant difference effect on mean reduction percentages of *A. matricariae* larvae was noticed among tested compounds. Acetamiprid induced mean moralities of (90 and 87%), while in the case of Saponins and neutral Potassium detergent were (8 and 6%) and (14 and 11%) when applied by Solo and Matabi sprayers respectively.

From statistical analysis the descending order of harmful the *A. matricariae* larvae was Acetamiprid, Potassium detergent and the lowest harmful was Saponins.

Operational Cost Analysis of Insecticide Sprayed by Certain Ground Equipment controlling Green Peach Aphid at Qulaliuobia Governorate During Season (2019):

Small portable equipment is a need in areas that are too small around buildings or uneven terrain. Portable equipment must be sufficiently durable so that frequent repairs are not needed like Matabi hand hydraulic sprayer (113L/ fed.). The more expensive

knapsack hydraulic (Solo) sprayer (147L / fed) with motorized pump are needed, particularly if the spray has to be projected into trees or bushes. The range of droplet sizes produced was more homogenous than portable sprayers with a manual pump, as well as the motorized sprayer easy in starting, ease of operation and the rate of performances fed. / day was more than normal portable sprayers. While the conventional ground motor sprayer (600 L / fed) is common in all the villages to spray also orchards but consumes more quantities of water, insecticides excess labourers in operations there for a simple operational cost of chemicals sprayed by certain ground equipment against green peach aphid on Peach trees during season 2019. Data in Table 6 showed that, decreasing the sprayer volume L / fed. from 600 to 147 L / fed. saved the water / fed. and quantity of Acetamiprid about 75.5% while in case of Matabi spray the spray volume with ground motor sprayer from 600 to 113 L / fed. saved the water / fed and quantity of Acetamiprid about 81.2% respectively.

Data also showed that no. significant differences between Acetamiprid and Neutral potassium in all the treatment as cost / fed. with L.E. but from another hand significant cost / fed. with L.E. in all treatments with about, 19.8% due to the ratio of Saponins 1 part to 30-part water (66.4 ppm Saponins).

Table 6: Operational cost analysis of insecticides sprayed by certain ground spraying equipment against peach aphid at Qualiubia Governorate during season (2019).

Insecticides used + Rate dose 1 fed. + cots prices L.E. / Ground equipment + spray volumes L./ fed			Acetamiprid 25 gm / 100 L water		Neu. Pot. Det. ½ kg /100 L water		Saponins sol. 1L/30L water (66.4 ppm)		Rate of performance fed./day	No. of labors	Laboure salary L.E.	Rent sprayer per day L.E
			Quantity per fed gm.	Price L.E.	Quantity per fed kg.	Price L.E.	Quantity per fed liter	Price L.E.				
Conventional ground motor	H. V. L / fed	600	150.0	117.0	3.0	120	20.0	600	2.0	3	360	250*
Solo sprayer	L. V. L. / fed	147	37.0	29.0	0.735	29.4	4.9	147	5.0	2	240	150*
Matabi sprayer		113	28.0	22.0	0.565	22.6	3.7	111	3.0	2	240	60

Remarks:

- One tank / fed. for ground motor spryer.
- 7.4 Tank's / fed. for Solo sprayer.
- 5.7 Tank's / fed. for Matabi sprayer.
- * Rent with fuel for tow equipment.
- No. of Peach trees / fed. 168.
- Calculation of operational cost analysis based, on spraying one fed. for each product.

Data in Table (7) and Figure (1) illustrated that the percentages of costs / fed. / L. E. was more of conventional ground motor 600 L/ fed. than Solo (147 L / fed.),24.2, 25.3 and 24.9% for Acetamiprid, Potassium, and Saponins respectively. From another side also the percentages of total operating costs/fed / L. E. were more of conventional ground motor 600 L / fed. than Matabi (113 L. / fed.), with about 28.9, 28.8 and 23.3%) for Acetamiprid, Potassium detergent, and Saponins. From the data decreasing spray application from high volume spraying to low volume spraying (L. / fed.) decreases the total operating costs / fed., saving spraying time, increasing the rate of performance of the equipment and obtained on suitable spray coverage.

On using the Plant extract of Saponins it saved the peach trees and the biological processes of the plant as it affected the insect upon contacting its surface , saving the parasitoid inside the aphid bodies which helps in keeping life cycle completion and controlling the insect harms with the least possible cost, with L. V. spraying .

Table 7: Operating costs / fed. for certain ground equipment on Peach trees controlling *M. prasicae* (Actual prices of equipment, insecticides, and labour will depend on local conditions) during season 2019 at Qualioubia Governorate.

Costs / fed. L. E.	Conventional ground motor H. V.*			Hydraulic motor sprayer (Solo) L. V. **			Hand held hydraulic Matabi sprayer L. V.		
	Mospilan	Neutral Pot. Det.	Saponins sol.	Mospilan	Neutral Pot. Det.	Saponins sol.	Mospilan	Neutral Pot. Det.	Saponins sol.
Labour costs / fed. L. E.	180	180	180	48	48	48	80	80	80
Rent sprayer / fed. L. E	125	125	125	30	30	30	20	20	20
Insecticide price / fed. L. E.	117	120	600	29	29.4	147	22	22.6	111
Total cost / fed L. E.	422	425	905	107	107.4	225	122	122.6	211

List price of tested compounds:
*Acetampride Kg. 780 L.E
*Neu. Potassium det. 2 kg 80 L. E
*Saponins solution L. 30 L. E.

H. V. High volume spray from > 420 L. / fed.
M. V. medium volume sprayer from 210 – 420 L/fed.
Low volume spray from 84 – 210 L/fed. for orchards.

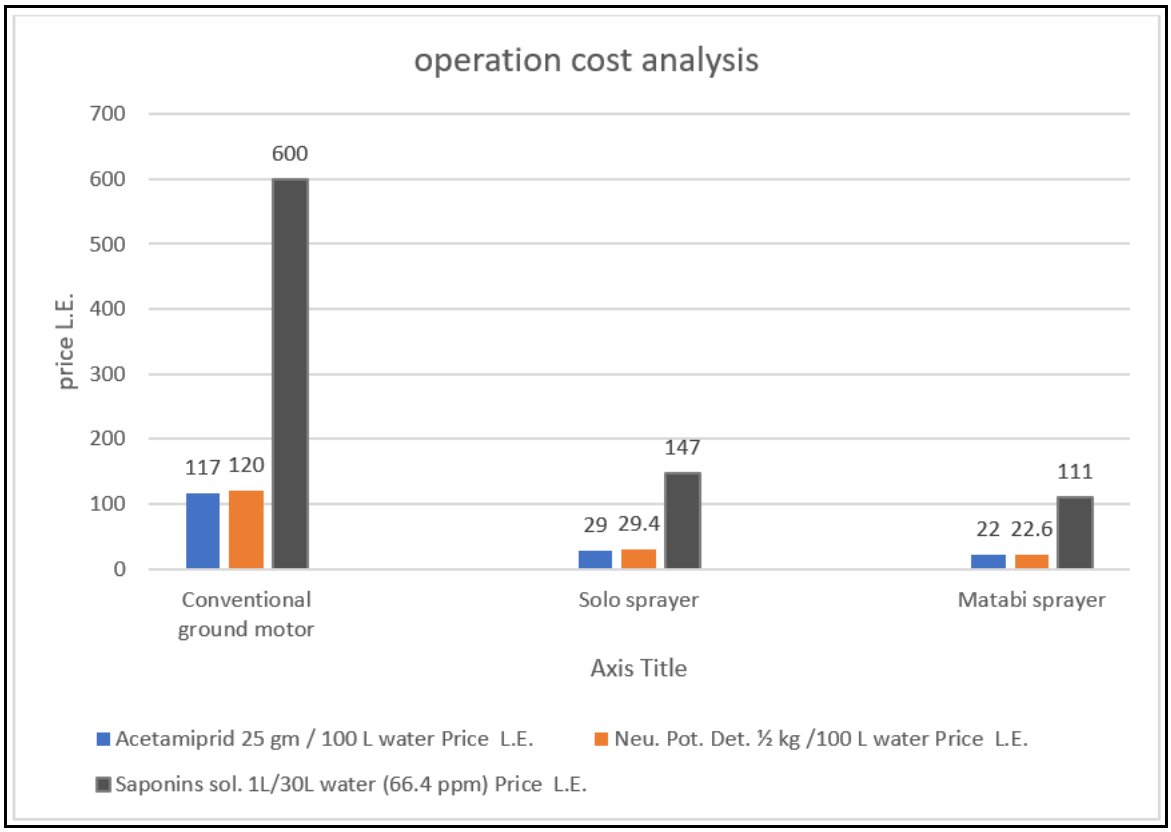

Fig. 1: Operational cost analysis of insecticides sprayed by certain ground spraying equipment controlling peach aphid at Qualiubia Governorate during season (2019).

DISCUSSION

The field experiment was carried out at infested Peach orchard with green Peach aphid *M. persicae* nymphs and its natural enemy, *A. matricariae* larvae. For evaluation the field performance of low – volume spraying equipment; hydraulic Motorized Knapsack (Solo) sprayer (147 L / fed.) and hand- held hydraulic sprayer (Matabi) (113 L / fed.); to spray Acetamiprid, Saponins solution and Neutral Potassium detergent with recommended doses. It noticed that droplet size (VMD) decreased gradually and the number of droplets increased consequently, in connection with the increase of spray

height and pressure there for Solo sprayer was more homogeneous in spraying than Matabi sprayer this results agreed with Byass and Charlton (1968), Gabir (1974), Gabir (1982) and Abd – El Moati (1981). Hydraulic sprayers produce dispersions with VMD from 114 – 500 μm used for spraying orchards and shade trees for the control of pests and fungi. These droplets spectrum obtained in the field experiments agreed with Ripper (1955) and Himel (1969). The best-obtained results were (Solo) sprayer with 147 L / fed. as spray volumes (VMD) and droplets / cm^2 of both of Acetamiprid, Potassium detergent and Saponins solution were (222 μm, 81), (240μm, 81) and (241 μm, 75), respectively. These results agreed with Himel *et al.* (1969) in the optimum droplet size by low volume ground equipment. But it noticed, that with the high volume; however, the droplet size rungs from 600 – 1000 μm; which lead to runoff problems and drastic loss of chemicals more than 65% from spraying. Moreover, the sprayed liquid is too diluted to cause effective control of the pest. These results agreed with Carman (1975) and Gabir *et al*. (1981). Acetamiprid revealed successful results followed Saponins solution and neutral Potassium detergent results with motorized Knapsack (Solo) sprayer (147 L / fed.) and these results agreed with Hindy *et al*. (2004), Genidy *et al*. (2005) which recommended KZ oil and Pyriproxyfen followed by Agrein when using Low – volume spraying because of reducing the time lost in the process of filling the equipment, improve the homogeneity of the spray coverage of the trees and reducing the last spray on the ground these results also in agreement with Bakr *et al*. (2014) recommendation by using profenofos followed by pyriproxyfen and Spinosad with Agromondo Motorized knapsack sprayer. Morsy *et al*. (2015), recommended using Carbosolvan, Acetamiprid, and Deltamethrin with low volume spray. Dar (2019) and Dar *et al* .(2019) whom achieved best control results with a high rate of performance (fed. / day) with motorized Knapsack sprayer and concluded that, using Thiamethoxam and Acetamiprid followed by other compounds with Low volume (L.V.) ground spraying equipment by using recommended doses which revealed successful management against piercing and sucking insects on cotton and made lesser harm to natural enemies to protect the natural equilibrium of the environment. Data also found that results of Low volume spraying for pricing sucking insects have agreed with Hindy *et al*. (1997), who mentioned that, there was a positive correlation relationship between the rate of application and lost spray on ground. Finally, the ultimate criterion in selecting equipment is whether the pest can be controlled economically. One of the most inefficient processes practiced (Himel and Moore, 1967; Graham Bryce, 1975) .

Efficiency can be achieved only if the biological target is defined in relation to the behaviour of the pest and deposition on a specific target obtained with the optimum droplet size. This requires selecting the optimal pesticide formulation and choosing the correct nozzle and delivery systems to minimize loss of chemical and ensure that the correct dose is transferred to the target. The homogeneity factor standard for hydraulic nozzles was 2.5 According to Dubson (2001).

Conclusion

It could be concluded that, using saponins extract and Neutral Potassium detergent followed Acetamiprid with low volume (LV) ground spraying equipment by using recommended doses which revealed successful management against piercing and sucking insects by hydraulic Motorized Knapsack (Solo) sprayer (147L/ fed.) was the best equipment to control Peach aphid on Peach under our local conditions and make lesser harm to natural enemies to protect the natural equilibrium of environment farther investigation must be used 3\4 or 1\2 recommended doses in order to keep the development of natural enemies in their natural counts.

There was a negative complete correlation between (VMD) and the mean residual

of mortality of *Myzus persice* nymphs and *Aphidius matricariae* larvae while there was a positive complete correlate between N/cm² and the mean residual of mortality of Myzus persice and *Aphidius matricariae* in all treatments. Also, data showed that hydraulic Motorized knapsack Solo sprayer was more surpassing in homogeneity spraying, and more productivity Fed / h. than hand held hydraulic Matabi sprayer.

REFERENCES

Abd – El Moati, M.I. (1981): Evaluation of the present ground spraying techniques used for controlling certain cotton pests in Egypt. M.sc. Thesis, fac. Agric., Ain shams univ., Egypt, 71 pp.

Anonymous (2003): SAS Statistics and graphics guide, release 9.1. SAS Institute, Cary, North Carolina 27513, USA.

Bakr, R. F.; Hindy, M.A., Ahmed, N. S., Genidy, N. A. and Dar, R. A. (2014): Field comparison between droplets distribution and the bioresidual activity of different insecticides against *Spodoptera littoralis* (Boisd) by using certain ground spraying equipment on cotton plants. J. Egypt. Acad. Soc. Biolo. Sci. 7(1):187-193.

Byass, J- and Charlton, G. K. (1968): "Equipment and methods for orchard spray application research," J. agric. Engng Res., 13, 280 – 9.

Carman, G. E. (1975): Spraying Procedures for best control on citrus Ciba-Geigy Agrochemicals technical Monog. No. 4., 28 -34, Basle.

Croft, B. A. (1990). Arthropod biological control agents and pesticides. New York, NY: Wiley and Sons: 24pp.

Dar,R.A. (2019):The effect of droplets distribution of insecticides on bioresidual activity of piercing sucking insects (Hemiptera) infesting eggplant by using ground spraying equipment. Egypt. J. Plant Prot. Res. Inst., 2 (2): 278 – 290.

Dar,R.A.;Moustafa,H.Z. and Salem,M.S. (2019):Field studies of different insecticides on cotton seedling pests and their natural enemies by using certain ground spraying equipment at qalyubia governorate. I. J. of Entomol. Res..,4 (4): 132-140.

Dobson, H. M. (2001): Desert Locust Guide lines, Food and Agricultural organization of the united Nations (FAO), Rome, 2nd edition, part 4, control: 85 pp.

Dokic,D.; Stanisavljevic , R.; Marckvic, J.; Milenkovic ,J ; Terzic ,D. ; Vasic and Barac ,S. (2018): Performance testing of field crop sprayers in the Rasina District. Acta Agri. Serbica, 23 (45): 27-36.

Gabir, I. (1974): Studies on Spraying technology using ground equipment for controlling Colorado potato beetle *Leptinotarsa decemlineata* (say) in Poland. Doctor's. Thesis, fac. Agric. Engng., Acad. Agric., Lublin, Poland, 18 pp.

Gabir, I.; Z. H.Zidan, M.A. Hindy (1981): Qualitative estimation of the influence of atomization rate of application, and flight altitude on the performance of aerial spraying of Sumicidin in cotton fields. Bull. Ent. Soc. Egypt, Econ. Ser.; 12: 215 – 26.

Gabir, I.; Z. H.Zidan; E. Ahallah and M.A. Hindy (1982): Calibration and evaluation of the performance of certain hydraulic nozzle types under laboratory conditions Res. Bull. Fac. Agric., Ain Shams univ., Egypt. 1738: 1-17.

Gabir, I. and M.A. Hindy. (1993): The use of helicopter for controlling weeds of sugar cane. J. Aric. Res. Egypt, 72(1): 409 – 17.

Genidy, N.A.; Bakr, R. F.; Hindy, M. A. and Dar, R. A. (2005): Bioresidual activity certain insecticides against *Spodoptera littoralis* (Boisd) by using low volume ground spraying equipment on cotton plants. J. Egypt. Acad. Soc. Enviro. Develop., (A-Entomology), 6(1): 1-21.

Godfray, H. C. J. (1994). Parasitoids—behavioral and devolutionary evolutionary ecology. Princeton, NJ, USA: Princeton University Press.

Hagvar, E. B., &Hofsvang, T. (1991). Aphid parasitoids: 20 pp.

Graham – Bryce, I. J. (1975): The Future of Pesticides technology: Opportunities for research. Proc. 8th Br. Insectic. Fungic. Conf., 3,901 – 14.

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

Himel, C. M. and Moore, A. D. (1967): Spruce budworm mortality as a function of aerial spray droplet size. Science, 156, 1250 – 1.

Himel, C.M. (1969): The optimum size for insecticide spray droplets. J. Econ. Entomol., 62 (4): 919-925.

Himel, C.M. and Moore, A.D. (1969): Spray droplet size in the control of Spruce. Bud worm, Boll weevil, Bollworm and Cabbage looper. J. Econ. Entomol., 62 (4): 916-918.

Hindy, M.A. (1992): Qualitative distribution of watery dyed spray produced by certain ground sprayers in cotton. Bull. Ent. Soc., Egypt 19:221-7.

Hindy, M.A.; El-Sayed, A.M.; Abd El-Salam, S.M. and Samy, M.A. (1997): Qualitative Assessment of certain insecticides applied by different ground sprayers against whitefly, *Bemicia tabaci* (Geen.) on eggplant. Egypt. J. Agric. Res., 75 (3): 565-577.

Hindy, M.A.;Bakr, R.F.; Genidy, N.A. and Dar, R.A. (2004) :Qualitative distribution of certain insecticides deposits and artificial targets on the cotton leafworm larvae by using certain ground spraying equipment on cotton plants .J. Egypt . Acad.Soc.Environ. Develop. (A. Entomology), 5(2): 91-112.

Magdoline, A.S.; Mohamed,K.E. and Safwat,H.Y.(1992):Less soil contamination with pesticides through modification and implemention of ground application techniques.Egypt.J.Appl.Sci.,7(7):157-170.

Matthews,G.A.(1992):Pesticide application methods.2nd edition, Longman Harlow Publ.,U.K.,405 PP.

Mohamed, H. N., El-Sayed, M.M. (2015): The competitive Situation of the Egyptian Fresh Peach Exports in the Foreign Markets. Agric. Economics Res. Instit; ARC, Dokki.

Morsy,A.R., Dar,R.A.A.,and Hiekel N.S.A.(2015):Field comparison between the bioresidual activity and droplets distiribution of different insecticides against some piercing and sucking insects infesting tomato seedling by certain ground spraying equipment. Journal of American Science 25: 1-7.

Ripper, W.E(1955): Application methods for crop protection chemicals. Ann. Appl. Biol., 42: 288 – 324.

Tray ford, R.S and L.W. Weclch. (1977): Aerial spraying. A simulation of factors in flouncing the distribution and recovery of liquid droplets. J. Agric. Engng. Res. 22(1): 183 – 96.

Yates, W.E. and N.B. Akesson. (1963): Equipment and application techniques in relation to pesticide drift and residues. Agric. Engng. Dept., Univ. of California: 1 – 14.

ARABIC SAMMARY

نشاط الأثر الباقى لبعض المبيدات الحشرية التي تم رشها على بستان خوخ لمكافحة من الخوخ الأخضر باستخدام آلات الرش أرضية معينة في محافظة القليوبية

مرفت عبد المنعم الجنيدى ومحمد عبد العزيزهندى ورحاب عبد المطلب عبد المقصود دار
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تم تنفيذ العمل الحالي لتقييم جودة الرش التي تنتجها رشاشتان أرضيتان هيدروليكيتان باستخدام معدلات التطبيق ١١٣ و ١٤٧ لتر / فدان. على التوالي وتم رش ثلاثة مبيدات حشرية مستخدمة هي آسيتامبريد % 20 مسحوق قابل للذوبان فى الماء ، ومعدل الجرعة ٢٥ جم / ١٠٠ لتر ، ومعدل جرعة منظف البوتاسيوم المحايد ٢/١ كجم / ١٠٠ لتر. معدل جرعة مستحضر مائى من الصابونين بمعدل لتر واحد / ٣٠ لتر ماء لمكافحة من الخوخ الاخضر فى بستان الخوخ. أظهرت البيانات أن الرشاشة ميتابى المزودة بمضخة يدوية انتجت أحجام قطرات أكبر في جميع المعاملات أكثر من الرشاشة صولو ذات مضخة بمحرك والتي كشفت أيضا عن تغطية أكثر تجانسا من رشاشة ميتابى . أظهرت البيانات أيضًا أن غطاء الرش في جميع المعاملات في كل من المستويين العلوي والمتوسط من أشجار الخوخ قد حصل على تجانس مطابقا البشابيرالهيدروليكية وكان متوسط ٢,٥ وفقًا للخطوط التوجيهية لمنظمة الأغذية والزراعة الفاو (٢٠٠١) ، باستثناء المستويات السفلى من أشجار الخوخ كان الرش غير متحانس وكان معدل الاداء (فدان / يوم) للرشاشة صولو بمحرك ٥ فدان / اليوم ، ولكن الرشاشة ميتابى تغطى٣ (فدان / يوم).أشارت نتائج الفحص الحيوي إلى أن جميع المركبات التي تم اختبارها أحدثت سالبًا كبيرًا في تأثر بقاء حوريات من الخوخ على قيد الحياة .أعطى مستخلص الصابونين نتائج واعدة في السيطرة على حوريات من الخوخ التي تصيب أشجار الخوخ بأقل خطر على ظهور يرقات الطفيل آفيديس ماتريبسى العدو الطبيعى لهذه الافة مع الحفاظ على البيئة الزراعية ولكن المبيد الحشري آسيتامبريد أعطى أكبر انخفاض في كل من الافة والطفيل الحيوى في حالة وجود الرشاشين واوضحت النتائج الاقتصادية انه لا يوجد فرق معنوى بين تكاليف رش الفدان بالجنيه بين مادتى آسيتامبريد والمنظف البوتاسى فى كل المعاملات بينما زادت تكاليف رش الفدان بالجنية فى حالة رش مستخلص الصابونين بمقدار ١٩,٨ % ويرجع ذلك لمعدل التخفيف له بالمياه ١ : ٣٠ لتر ماء فقط .