

PARLATORIA OLEAE POPULATION ON OLIVE TREES AS AFFECTED WITH DIFFERENT GROUND SPRAY EQUIPMENT AND CERTAIN INSECTICIDES IN EGYPT

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Abstract

The present work was conducted to evaluate specific spray techniques (conventional motor sprayer, taral motor sprayer with three Tee-Jet nozzles D8-45 taral motor sprayer with three Tee-Jet nozzles D5-45 and taral motor sprayer aperture 2) for controlling plum scale insect, *Parlatoria oleae* on olive trees using super masrona oil at rate 1-5% alone or mixed with Sumithion (50%Ec) at rate of 0-15%. Percentages reduction of pre-adult, adult and gravid females were the highest in the unit spray taral motor sprayer with three Tee-Jet nozzles D8-45 using oil mixed with Sumithion showing 92.03, 89.55 and 97.75% , respectively , followed by tar.al motor sprayer with three Tee-Jet nozzles D5-45 which revealed 59.12 , 40.16 and 48.44% respectively. Results assured the superiority of taral motor sprayer with three Tee-Jet nozzles D5-45 over the other three tested sprayers.

INTRODUCTION

In Egypt, olive trees are attacked by several species of coccids, i.e. the soft scale insect, *Coccus heperidum* Linnaeus , the olive black scale, *Saissetia oleae* (Olivier), the red scale insect, *Aonidiella aurantii* (maskell), the black scale insect, *Chrysomphalus aonidum* (lin) , lantana scale insect, *Hemiberlesia latania* (signoret), olive scale insect, *leucaspis riccae* targioni-tozzetti and plum scale insect, *Parlatoria oleae* (Colveé) (Mohamed, 1999).

Parlatoria oleae (Colveé) Hemiptera: Diaspididae) is one of the most important scale insect pests inducing serious damage to olive trees in many parts of the world. *P. Oleae* attacks most parts of the trees. The infestation by this insect is mainly concentrated on the trunks, branches, twigs and fruits. This insect is a piercing sucking insect, which depend on sucking plant sap. This mechanism disturbs the plant physiology and result in tree Weaken, which become subject to secondary infestation by other insects such as wood borers. The iniury is caused by different stages of the insect except adult males. They suck plant sap and cause wilting of twigs, death of branches, defoliation, violet spots on fruit as well as fruit malformation and considerable qualitative and quantitative yield loss. The main method for controlling these pests under local conditions is spraying the trees with mineral oils and

organophosphorous insecticides, this method consumes excessive amounts of chemicals, water and time. Modern trends in this respect endeavour, mainly, minimizing the hazards to the environment by decreasing spray drift (Amberg and Butlen, 1970). The aim of this study is to evaluate specific spray techniques for controlling *P. oleae* using mineral oil alone or mixed with an organophosphorous pesticides. Evaluation parameters were bio-efficiency and spray volume factor.

MATERIALS AND METHODS

1- Field experiment

Four ground equipment were calibrated. The time required to cover a moderate sized olive tree with spray solution by sprayers under investigation until dripping sprayers was evaluated. Therefore, the spray volume per tree was determined for each used equipment as shown in Table 1

2- Insecticide used

2-1. Sumithion (fenitrothion 50% EC) using a rate of application 0.15% (recommended rate)

2-2. Super Masrona (mineral oil 94% EC) using a rate of application 1.5% recommended rate)

Each of the four equipment was tested either using Super Masrona oil at the rate of 1.5% or mixture of Super Masrona oil at the rate of 1% plus Sumithion at the rate of 0.15%

3- Experimental design

This experiment was carried out on olive trees (Picual cv.) orchard (20 years old) located at Green Revolution society situated 25km at Giza at the beginning of Alexandria desert road during mid of June 2004 to mid of September 2004, according to (El-Amir 2002). Average wind velocity was 2ml sec, temperature 32 C° and relative humidity 55% during execution of the treatments. Nine olive trees were selected for each treatment (eight treatments) and nine trees for control. All trees were homogeneous in their infestation with *Parlatoria oleae*. Olive trees were planted at 6 meter Spacing (about 116 trees / feddan).

4- Sampling methods and assessment

Samples were picked up bimonthly throughout the three months of study (from Jun 15 th, 2004 until sep.15 th 2004). Sample size was ten terminal branches 10 cm in length and about 6-8 mm in diameter for each treatment.

Table. 1. Techno-operational data of different spray units tested to control *Parlatoria oleae* on olive trees

Item	Value / Specification			
Spray unit	Conventional motor	Taral motor 518**		
Nozzle type	Spray gun: hollow cone	(Hydraulic) Three nozzles D5-45	(Pneumatic) Aperture 2	(Pneumatic) Three nozzles D8-45
Mean flow rate (L./min)	15	2	2	3.3
Time of spray (min/tree)	40 sec.	2.5	2.5	2
Spraying volume (L/tree)	10	5	5	6.6
Spraying volume (L/feddan)	860	430	430	568
Operational pressure	20 (kg / cm ²)			
No. of nozzles	one	Three nozzles D5-45	One	Three nozzles D5-45
Insecticide used rate	Sumithion 0.15%, S. Masr. 1.5% or Sumi. 0.15% + S. Masr. 1%			

* Average working speed around the tree was 20 m/min in all treatments.

** Taral motor 518 provided with poster pump in all treatments.

Samples were picked up randomly from each labeled tree. The Samples were packed and transferred to the laboratory directly for examination by using stereoscopic microscope binocular.

All alive insects found on each Sample were assorted and recorded as preadults, adult females and ovipositing females (gravid females).

Efficiency of tested insecticides

The equation of Henderson and Tilton (1955) was used to calculate the efficiency of the tested insecticides.

Statistical analysis

Data as percentages of mortality were transformed to arcin before statistical analysis. These data were subject to statistical analysis by using ANOVA (Analysis of variance) and REGRESSION procedures in SAS (SAS Institute 1998) Mean Separations were conducted by using Duncan's multiple range test in SAS.

RESULTS AND DISCUSSION

1- Evaluation of used spray equipment and mean counts of living insects for different treatments

Bi-weekly mean counts (pre-and post-count) of alive insects per sample (10 cm terminal branch) were calculated over the period of 15/6/04 to 15/9/04 as pre-adult, adult and gravid females Tables 2 and 3.

Mean counts of pre-adult, adult and gravid females were the highest in the control insects (12.94,10.18 and 9.12 respectively. Taral motor sprayer with three Tee-Jet nozzles D5-45 revealed the lowest population counts regardless using oil alone or mixed with Sumithion (5.64,4.79 and 5.09 for oil alone and 0.48,0.52 and 0.78 for oil mixed with Sumithion, respectively). Using total counts per sample indicated lower counts for oil mixed with Sumithion compared with the control insects. Mean total count for the control was 32.24 individuals, while it was 24.75 for oil alone and 11.90 for oil mixed with Sumithion. When Taral motor sprayer with aperture 2,D5-45 and D8-45 were used to apply different spray volumes, it showed to be less in spray volume than the conventional motor sprayer. It can be concluded that taral motor sprayer with three Tee-Jet nozzles D5-45 proved to be the superiority in controlling *P.oleae* with the least minimum limits of pollution.

Table. 2. Mean population count of *P. oleae* on olive trees due to applying different ground sprayers using Super Masrona oil 1.5%

		Treatments														
Spraying volume L./feddan		430			430			568			860					
Sampling Dates	Control			Taral motor sprayer									Conventional motor			
				Taral aperture			(D5-45)			(D8-45)						
	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	
15-6-04*	20.53	8.2	2.3	22.53	11.5	12.97	16.97	4.17	2.4	11.87	5.33	2.63	26.53	3.4	2.67	
30-6	15.67	7.73	12.7	22.87	5.2	5.97	0.77	0.83	1.63	19.83	2.97	4.53	3.3	1.87	1.73	
15-7	19.2	17	9.73	14.97	7.3	4.53	0.1	0.97	1.3	15.53	1.5	5.83	3.37	2.87	5	
30-7	13.3	8.83	12.1	10.77	7.3	7.43	0.63	2.07	1.73	11.53	4.43	6.07	5.87	4.43	4.5	
15-8	8.33	8.1	4.77	6.87	8.3	9.83	2.07	3.53	2.93	8	7.2	6.67	8.63	5.83	4.63	
30-8	10.43	9.3	7	8.2	12.4	7.27	10.53	8.40	8.77	13.2	8.73	7.3	8.67	7.63	3.53	
15-9	10.73	10.1	8.43	9.53	17	4.63	19.73	12.93	14.2	17.67	10.3	8.4	8.3	10.97	4.43	
Average**	12.94	10.18	9.12	12.20	9.58	6.61	5.64	4.79	5.09	14.29	5.86	6.47	6.36	5.60	3.97	

* Precount

** Precount is not included in the average

Table. 3. Mean population count of *P. oleae* on olive trees due to applying different ground sprayers using Super Masrona oil 1% + Sumithion 0.15%

		Treatments														
Spraying volume L./feddan		430			430			568			860					
Sampling Dates	Control			Tara! motor sprayer									Conventional motor			
	Pre-adult	Adult	Gravid	Tara! aperture 2			(D5-45)			(D8-45)			Pre-adult	Adult	Gravid	
Pre-adult				Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid					
15-6-04*	20.53	8.2	2.3	19.17	3.97	4.4	14.07	8.3	2.3	18.3	5.2	8.97	17.4	4.23	4.67	
30-6	15.67	7.73	12.7	3.53	2.3	2.17	0	0.1	0.1	0.83	1.17	0.73	0	0	0	
15-7	19.2	17	9.73	0.73	0.63	2.87	0	0	0	0.53	0.43	2.07	0	0.2	0	
30-7	13.3	8.83	12.1	3.2	2.1	2.1	0	0	0	0.4	0.1	0.97	0.2	0	0.1	
15-8	8.33	8.1	4.77	5.63	3.33	1.97	0.1	0.1	0.1	0.63	0.2	0.2	0.43	0.2	0.43	
30-8	10.43	9.3	7	3.4	3.97	1.4	0.87	0.97	1.5	1.3	0.53	0.3	1.2	1.5	1.07	
15-9	10.73	10.1	8.43	2.1	4.87	0.5	1.93	1.97	2.97	1.2	0.97	0.2	1.5	2.63	1.5	
Average**	12.94	10.18	9.12	3.10	2.87	1.84	0.4000008	0.52	0.78	0.82	0.57	0.75	0.23	0.76	0.52	

* Precount

** Precount is not included in the average

2- Efficiency on rate of mortality

Efficiency of different treatments on insect mortality percentages of alive insects (pre-adult, adults and gravid females) per sample were calculated over the same period (Tables 4 and 5). Percentages of pre-adult, adult and gravid females population were the highest by the unit spray taral motor sprayer with three Tee-Jet nozzles D8-45 using oil mixed with Sumithion showing mortality rate of 92.03, 89.55 and 97.75% respectively. On the other hand taral motor sprayer with three Tee-Jet nozzles D5-45, revealed the highest mortality regardless using oil alone inducing (59.12, 40.16 and 48.44% mortality, respectively). Percentage mortality of total count was 38.83 for oil alone and 85.19 for oil mixed with Sumithion,

The obtained results, are agree with Stafford (1946) who found that addition of toxicants (rotten one) to the petroleum spray oils increased the effectiveness of light summer oil in controlling the olive scale insect (*Parlatoria oleae colvée*). Using Sumithion 50% EC at the rate of 0.15% mixed with 1% mineal oil resulted in higher efficiency for best control regardless the used spray unit and that is agree with Grout and Richards (1992) who concluded that the combination of organo phosphorous insecticides with amineral oil resulted in better control of *Aonidiella aurantii* collected from an orange orchard in the Eastern cape province of south Africa than if the mineral oil was applied alone. Using total counts per sample indicated lower mortality when using oil alone.

Table. 4. Reduction percentages of *P. oleae* population due to applying different ground sprayers using Super Masrona oil 1.5% on olive trees at Giza

Sampling Dates	Treatments											
	Taral motor sprayer									Conventional motor		
	Taral aperture 2			(D5-45)			(D8-45)					
	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid
30-6-04	0	48.99	88.71	92.61	79.88	86	0	39.44	56.40	83.38	39.43	89.08
15-7	28.75	67.53	90.73	99.21	88.07	82.51	0	85.85	38.26	85.74	60.08	54.84
30-7	26.07	39.25	87.32	93.63	50.34	83.74	0	22.13	49.4	65.43	0	66.63
15-8	24.88	24.89	56.56	69.26	22.65	31.58	0	0	4.09	18.97	0	18.95
30-8	28.34	9.28	78.74	0	0	6.78	0	0	18.21	35.32	0	55.28
15-9	19.03	0	89.12	0	0	0	0	0	20.94	39.75	0	53.64
Average	21.18	31.66	81.86	59.12	40.16	48.44	0.00	24.57	31.22	54.77	16.59	56.40

Table. 5. Reduction percentages of *P. oleae* population due to applying different ground sprayers using Super Masrona oil 1% + Sumithion 0.15% on olive trees at Giza

Sampling Dates	Treatments											
	Taral motor sprayer									Conventional motor		
	Taral aperture 2			(D5-45)			(D8-45)					
	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid	Pre-adult	Adult	Gravid
30-6-04	75.85	37.69	91.01	100	98.55	99.43	93.91	74.48	97.96	100	100	100
15-7	95.92	92.53	83.5	100	100	100	96.76	96.68	93.95	100	97.92	100
30-7	74.23	51.48	90.89	100	100	100	96.56	98.53	97.67	98.34	100	99.52
15-8	27.69	24.38	78.16	98.52	98.61	98.54	91.41	96.18	98.99	94.18	92.21	95.17
30-8	65	11.67	89.19	87.85	89.35	76.12	86.01	89.59	98.82	86.53	64.07	92.42
15-9	78.97	6.11	96.75	72.27	80.02	60.87	87.52	81.86	99.09	83.43	64.9	90.89
Average	69.61	37.31	88.25	93.11	94.42	89.16	92.03	89.55	97.75	93.75	83.52	96.33

On the contrary, El Amir (2002) reported that oil alone or mixed with other materials held superior category all over the time especially after three month of application – three ground sprayer (total motor sprayer with three Tee-Jet nozzles D5-45 motor sprayer with three Tee-Jet nozzles D8-45 and conventional motor sprayer caused satisfactory mortality. Taral motor sprayer aperture 2 gave lower efficiency compared with the other spray units.

3- Significant differences between average percentages reductions of *P.oleae* population.

Statistical analysis of the arcin of mean percentages of reduction is shown in table (6). These results indicted that using oil and Sumithion resulted insignificant differences between the last three spray equipment used (taral motor sprayer with three Tee-Jet nozzles D8-45, conventional motor sprayer and taral motor sprayer with three Tee-Jet nozzles D5-45) where they showed 93.11,94.2 and 89.16% reduction as mean for the three considered stages, respectively. Taral motor sprayer aperture 2 gave generally lower reduction values compare with other tested sprayers (Table, 6) using oil alone revealed insignificant differences between Taral motor sprayer aperture 2, conventional motor sprayer and taral motor sprayer with three Tee-Jet nozzles D5-45, showing 44.90, 42.37 and 49.24% reduction, respectively. Taral motor sprayer with three Tee-Jet nozzles D8-45 revealed the lowest total reduction as 18.6%. In this respect pre-adult. gave 0% reduction in population.

Table. 6. Significant differences between average percentage reductions of *P. oleae* population using different ground sprayers and treatments

Spray equipment	Treatment	Pre-adult	Adult	Gravid	Total
Taral motor aperture 2	Super Masrona	21.18 c	31.66 bc	81.86 c	44.90 c
	S. Masrona + Sumithion	69.61 b	37.31 b	88.25 bc	65.06 b
Taral motor D5-45	Super Masrona	59.12 b	40.16 b	48.44 d	49.24 c
	S. Masrona + Sumithion	93.11 a	94.42 a	89.16 a	92.21 a
Taral motor D8-45	Super Masrona	0.0 d	24.57 cd	31.22 e	18.6 d
	S. Masrona + Sumithion	92.03 a	89.55 a	97.75 a	93.11 a
Conventional motor	Super Masrona	54.77 b	16.59 d	56.40 d	42.37 c
	S. Masrona + Sumithion	83.52 a	96.33 a	91.20 a	91.2 a

Means in the same column not followed by the same letter is significantly different ($p < 0.05$) using Duncan multiple range test in SAS.

Means were subject to are sine transformation before conducting the analysis.

Considering the relation between spray volume and occurred drift , it was clear that there was positive relationship between the used spray volume and the occurred drift. Conventional motor sprayer using the highest sprayer volume resulted in the highest drift. Taral motor sprayer with three Tee-Jet nozzles D8-45 which used a medium spray volume resulted in second percentage for drift followed by taral motor sprayer with three Tee-Jet nozzles D5-45 which relatively caused the lowest drift keeping the highest efficiency.

REFERENCES

1. Amberg, A.A. and B.J. Butler. 1970. High speed photography as a tool for spray droplet analysis trans. Am. Soc. Agric. Engrs, 13(5): 541-6.
2. El-Amir, M.S. 2002. Environmentally safe approaches for controlling some insects in festing olive trees in new reclaimed areas. M. Sc. Thesis, Institute of Env. Studies and Res., Ain shams Univ. Egypt. 84 pp.
3. Grout, T.G. and G.I. Richards. 1992. Organophosphate resistance in California red scale, (Homoptera: Diaspididae) on citrus in the eastern cape and the effect of oil as an organophosphate synergist. J. Ent. Soc. S. Africa, 55: 1,1-7.
4. Hendersson, C.F. and E.W. Tilton. 1955. Tests with acaricides against the brown wheat mite. J-Econ. Entomol., 48: 157-161.
5. Mohamed G.D.(1999): studies on the Scale insects infesting olive trees in Egypt. Ph.D. thesis, Fac. Agric., AL-Azhar Uni. Egypt. 234p p.
6. SAS Instituti. 1998. User's Guid, Statistica. Casy, N.C. USA
7. Stafford, E.M. 1946. the application of measured amounts of petroleum spray oils to individual olive scales.J.Econ.Ent., 39(4): 499-503.

مجاميع حشره الزيتون القشريه على أشجار الزيتون وتأثيرها باستخدام معدات رش أرضيه مختلفه ومبيدات معينه فى مصر

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تهدف هذه الدراسه الى تقييم طرق رش متخصصه (موتور الرش التقليدى وموتور ظهري تارال مع ثلاث بشاير دى ٨-٤٥ من انتاج شركه تى جيت وموتور ظهري تارال مع ثلاث بشاير دى ٥-٤٥ من انتاج شركه تى جيت. وموتور ظهري تارال على فتحه رش رقم ٢ وذلك لمكافحه حشره الزيتون القشريه على اشجار الزيتون باستخدام زيت معدنى سوپر ماسرونا بمعدل ١,٥% بمفرده أو مخلوط مع مبيد سيميثون ٥٠% مستحلب بمعدل ٠,١٥%. اعتمدت مؤشرات التقييم على تحديد الفاعليه البيولوجيه من خلال النسب المتويه للخفض والاباده للاطوار غير البالغه والاناث البالغه والاناث الواضعه للبيض وكانت اعلى نسبة خفض باستخدام وحده موتور الرش الظهري تارال مع ثلاث بشاير دى ٨-٤٥ عند اضافة زيت معدنى مخلوط مع مبيد السوميثيون ٩٢,٠٣ ، ٨٩,٥٥ ، ٩٧,٧٥% على التوالي. ويلي ذلك الموتور الظهري تارال مع ثلاث بشاير دى ٥-٤٥ حيث حقق اعلى نسبة اباده بدون استخدام الزيت منفردا (٥٩,١٢ ، ٤٠,١٦ ، ٤٨,٤٤%) على التوالي. اكدت النتائج تفوق الموتور الظهري تارال مع البشاير دى ٥-٤٥ مقارنة بالثلاثة رشاشات الأخرى.