

**CHEMI-CULTURAL PROGRAMMES FOR
CONTROLLING *Leucaspis riccae* Targ.
(HOMOPTERA, DIASPIDIDAE)
ON OLIVE TREES**

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ABSTRACT: Eleven control programmes were tested during the seasons of 2004/2005 and 2005/2006 to control scale insects on olive trees at El-Fayoum Governorate. The treatments used in these programmes were pruning followed by burning the pruned branches or pruning and leaving the branches under the trees for two weeks (to let parasites & predators emigrate again to the trees). Spraying with Malathion 57% EC at a rate of 0.15%, spraying with mineral oil (KZ oil 95% EC) at a rate of 1.5% and spraying with oil then Malathion at the same rates were also tested. These treatments were used alternately once or twice in the tested programmes. Comparison among these programmes was done on basis of mortalities% of the main scale insect (*Leucaspis riccae*) and parasitism% of *Aphytis libanicus* on this pest as well as the cost of each programme (in L.E.). In the first season 2004/2005, the most successful programme was pruning in the late of November and leaving the pruned by-products under the trees followed by spraying with mineral oil in the late of May. This treatment resulted in high mortality of *L. riccae* (87%), high parasitism (13.06%) of *A. libanicus* and unexpensive costs (322 L.E. per feddan). This programme was considered the best of them at all. In the second season, the programme of pruning twice in the late of both November and February and leaving the pruned branches under the trees for two weeks was considered also the successful programme recording 83.9% mortality of *L. riccae*, 12.07% parasitism of *A. libanicus* and low cost of 300 L.E. per feddan.

Key words: *Leucaspis riccae*, pruning, mineral oils, Malathion, *Aphytis libanicus*.

INTRODUCTION

Olive is considered one of the most important fruit trees in many countries of the world. Many insect pests such as diaspidid and non-diaspidid scale insects [*Paralatoria oleae* Colv., *Leucaspis riccae* Targ., *Hemiberlasia lataniae* (Sign.), *Aspidiotus nerii* Bch., *Siassetia oleae* (Oliv.) and others] attack olive trees causing severe damage and reduce both quantity and quality of olives (Argyriou and Kourmadas, 1981; Moursi and Mesbah, 1985 and Hassanein *et al.*, 2000). Many researchers tried to control scale insects on olive trees using some chemicals such as mineral oils and malathion or other insecticides (Fernandez and Velasco, 1973; Gokmen and Seekin, 1980; Argyriou and Kourmadas, 1981 and Martino and Benfatto, 1981). Other investigators studied the effect of some cultural methods as irrigation or pruning on the population of scale insects (Shoemaker *et al.*, 1979; Lopez-Villata, 1985; Zurita, 1985; El-Hakim and Kishk, 1988; Sekeroglu *et al.*, 1989 and Hassanein *et al.*, 2004).

This work aims to evaluate the effect of both chemical and cultural control methods in an

intergrated programmes against the population of oyster shell olive scale, *Leucaspis riccae* which considered one of the most important scale insects on olive trees at El-Fayoum Governorate.

MATERIALS AND METHODS

The experiments were conducted on olive trees (nearly 15 years old) that heavily infested with *L. riccae* at Ebshway district, El-Fayoum Governorate during the two successive seasons of 2004/2005 and 2005/2006. The tested control programmes depend on the combination between both horticultural and chemical methods including pruning in winter and spraying with mineral oil or Malathion as follows:

In the first season of 2004/ 2005:

- I- Pruning on the 26th of November with displacing and burning the pruned by-products as well as spraying with mineral oil once on the 31st of May.
- II- Pruning on the 26th of November with leaving the pruned branches under trees for 2 weeks and spraying with mineral oil once on the 31st of May.

- III- Pruning on the 26th of November with displacing and burning the pruned branches as well as twice spraying with mineral oil on the 26th of December and the 31st of May.
- IV- Twice spraying with mineral oil on the 26th of December and the 31st of May.
- V- Twice spraying with Malathion on the 26th of December and 31st of May.
- V- Twice pruning in November and February and spraying with mineral oil on the 17th of May.
- VI- Twice pruning in November and February as well as twice spraying with both Malathion on the 9th of May and mineral oil on the 17th of June.

In the second season of 2005/2006:

- I- Pruning once on the 28th of February with leaving the pruned by-products under trees for two weeks.
- II- Pruning on the 28th of February with leaving the pruned branches under trees for two weeks as well as spraying with mineral oil once on the 17th of June.
- III- Pruning on the 28th of February with leaving the pruned branches under trees for two weeks and spraying with both Malathion on the 9th of May and mineral oil on the 17th of June.
- IV- Twice pruning on the 25th November and the 28th of February.

Forty trees (8 trees x 5 rows) were chosen for each treatment. The pruning was practiced for dry and heavy infested or combined branches as well as suckers by using the pruning shears. The tested insecticides were Malathion 57% EC and KZ oil 95% EC which sprayed at the rates of 0.15 and 1.5%, respectively, using a large sprayer of 600 litre in capacity. Also, forty trees were left untreated as control.

Twenty five twigs of 15-20 cm for each per tree representing the different directions and strata of the tree were randomly collected every two weeks. Samples of each treatment were collected from 5 trees as replicates and kept in fine polyethylene bags. The twig samples were inspected as five leaves/twig (that randomly chosen) at the same day. All alive and dead individuals of *L. riccae* were counted to estimate the mortality percentage of each programme.

Also, all alive individuals of *L. riccae* were dissected to estimate the percentage of parasitism with the parasitoid that were identified as *Aphytis libanicus* Traboulsi (Hassanein *et al.*, 2004).

The obtained data were statistically analyzed with analysis of variance (F. test) according to Fisher (1950) and Snedecor & Cochran (1972). The tested programmes were compared for both mortality and parasitism percentages as well as the control cost per feddan.

RESULTS AND DISCUSSION

Efficacy of the Tested Programmes on *L. riccae*

Data in Tables 1 and 2 indicate the mortality percentage of *L. riccae* on olive trees for the tested programmes during the two successive seasons of 2004/ 2005 and 2005/2006. The results showed that there were highly significant differences between the averages of % mortalities of the tested chemi-cultural programmes and that of the untreated control, but the differences between the tested programmes were statistically insignificant during the two seasons. The averages of % mortality of *L. riccae* on olive trees for the tested chemi-cultural

programmes ranged between 77.84–87.00 and 81.18–89.17 compared to 41.50 and 40.13 (for the untreated control) during the two successive years of 2004/2005 and 2005/2006, successively. In the first year, the 2nd programme (pruning in the end of November with placing the pruned by-products for 2 weeks under trees and spraying with mineral oil in the end of May) recorded the highest % mortality of 87.00, whereas the 4th programme (twice spraying with mineral oil in the end of both December and May had the lowest value of % mortality (77.84).

In the second season, the 5th program (twice pruning in the end of both November and February as well as spraying with mineral oil in the mid of June) was the most effective programme showing the highest value of % mortality of 89.17. These data are in harmony with those obtained by Fernandez and Velasco (1973) who found that spray with 0.2% Malathion on 27th – 28th July reduced the numbers of *Siassetia oleae* (Ol.) nymphs on olive trees by 95.3%. Gokmen and Seckin (1980) reported, in Turkey, that 2 applications of 1.5% mineral oil (97% a.i.) should be made for the control of *S. oleae* on olive trees. Martino and Benfatto (1981)

Table 1. Mortality percentages of *L. riccae* on olive trees as influenced by the tested programmes during the first season (2004/2005)

Months	Programmes					Untreated control
	I	II	III	IV	V	
Nov., 2004	93.79	92.29	92.21	86.84	70.78	57.26
Dec.	96.24	94.59	88.69	53.03	66.95	54.69
Jan., 2005	82.41	89.60	85.71	83.44	72.70	46.05
Feb.	68.02	84.64	68.09	85.85	68.77	28.17
March	72.50	81.20	85.31	77.96	81.44	38.95
Apr.	74.55	81.33	89.32	71.28	86.61	31.69
May	69.49	81.01	82.55	73.58	88.94	35.36
June	61.28	95.93	75.00	77.88	81.95	35.96
July	92.16	82.42	89.04	90.72	93.04	45.33
Average	78.94A	87.00A	83.99A	77.84A	79.02A	41.50B

Averages denoted by similar letters are statistically insignificant.

Table 2. Mortality percentages of *L. riccae* on olive as influenced by the tested programmes during the second season (2005/2006)

Months	Programmes						Untreated control
	I	II	III	IV	V	VI	
Nov., 2005	62.99	76.13	76.80	78.57	80.32	70.18	43.53
Dec.	88.95	88.61	74.37	67.11	96.17	94.87	48.64
Jan., 2006	83.29	83.81	69.24	78.81	91.41	66.27	54.56
Feb.	84.96	86.96	77.10	79.62	89.40	80.83	52.29
March	89.74	87.38	83.72	78.21	94.74	90.82	34.59
Apr.	87.96	94.87	80.13	85.44	88.82	96.83	30.32
May	88.80	92.35	91.22	91.34	80.24	83.43	29.56
June	82.04	85.71	88.61	96.34	90.18	92.86	34.24
July	77.59	82.35	85.71	94.80	88.51	90.63	35.60
Aug.	90.78	72.13	84.89	88.74	91.89	91.55	37.92
Average	83.71A	85.03A	81.18A	83.90A	89.17A	85.82A	40.13B

Averages denoted by similar letters are statistically insignificant.

stated that winter sprays containing white mineral oil appeared to be the best treatment protecting olive trees against *S. oleae*. Argyriou and Kourmadas (1983), in Greece, determined the best timing for insecticide applications of olive trees against *Aspidiotus nerii* and *Parlatoria oleae* as the first application in late May or early June and the second one at the end of August or beginning of September. Also, they reported that treatments against *Lepidosaphis ulmi* should be made in mid-May and against *L. riccae* at the end of June. El-Hakim and Kishk (1988) stated that pruning as a cultural method could be used for suppression the scale insects *P. oleae* and *L. riccae* on olive trees in Egypt.

Parasitism on *L. riccae* as Influenced by the Tested Control Programmes

As shown in Tables 3 and 4, the used chemi-horticultural programmes had highly significant effects on parasitism % during the two years of investigation. The untreated control recorded the highest values of % parasitism of 20.42 and 17.50 during 2004/2005 and 2005/2006, respectively. The percentages of parasitism on *L.*

riccae with *A. libanicus* as influenced by the tested programmes ranges between 6.32 – 13.91 and 8.67 – 12.07 during the first and second seasons, successively. In other words, pruning and spraying with mineral oil or Malathion had an adverse effects on activity of the natural parasitoid *A. libanicus*. The lowest values of % parasitism (6.32 and 8.67) were recorded with the fifth and sixth programmes that included spraying with Malathion and mineral oil during the first and second years, consecutively. The results obtained by Shoemaker *et al.* (1979) indicated that the most effective way of controlling olive pests was to depend on biological control of *P. oleae* and frequent pruning to suppress *S. oleae*. Pesticide applications should be reduced but not eliminated by reliance on biological and cultural control methods. Hassanein *et al.* (2004) studied the effect of cultural and chemical treatments on *L. riccae* and its parasitoid *A. libanicus* and they reported that pruning more than twice affected negatively the percentage of parasitism. The pruning on November and spraying with KZ oil was suitable for building up of parasite population.

Table 3. Percentages of parasitism with *A. libanicus* on *L. riccae* on olive trees as influenced by chemi-cultural programmes during the season of 2004/2005

Months	Programmes					Untreated control
	I	II	III	IV	V	
Nov., 2004	21.28	13.32	17.24	10.16	10.14	21.17
Dec.	19.37	20.14	16.62	17.28	13.52	19.26
Jan., 2005	10.82	18.62	10.53	8.33	6.29	19.65
Feb.	17.64	20.12	13.44	12.45	10.76	18.89
March	14.25	8.14	8.67	10.56	8.47	21.17
Apr.	4.18	10.63	6.89	8.16	0	18.56
May	14.92	8.44	4.92	6.48	0	18.33
June	10.37	9.56	10.11	8.56	4.11	24.11
July	12.33	8.54	7.28	8.21	3.62	22.65
Average	13.91B	13.06BC	10.63CD	10.02D	6.32E	20.42A

Averages denoted by similar letters are statistically insignificant.

Table 4. Percentages of parasitism with *A. libanicus* on *L. riccae* on olive trees as influenced by chemi-cultural programmes during the season of 2005/2006

Months	Programmes						Untreated control
	I	II	III	IV	V	VI	
Nov., 2005	12.11	13.14	15.61	14.62	15.00	9.15	16.82
Dec.	10.16	11.22	13.53	17.31	12.62	6.84	11.64
Jan., 2006	9.68	10.92	11.42	20.16	14.14	2.61	9.22
Feb.	9.82	18.00	16.32	16.84	12.41	12.19	12.35
March	11.71	5.67	6.88	6.93	5.62	12.73	22.54
Apr.	9.81	3.32	9.59	4.78	6.91	9.44	19.62
May	14.30	9.19	11.92	13.31	8.65	14.65	17.84
June	6.25	10.12	6.56	9.72	9.16	8.35	23.55
July	11.62	5.82	2.94	7.91	6.25	3.57	21.20
Aug.	9.17	7.88	8.38	9.11	8.46	7.14	20.17
Average	10.46B	9.53B	10.32B	12.07B	9.92B	8.67B	17.50A

Averages denoted by similar letters are statistically insignificant.

Comparing the Programmes

The graduate scoring system, that based on both mortality and parasitism percentages as well as the cost per feddan, was used to compare the tested programmes. The high % mortality or parasitism, the high score, but the reverse was true in case of the cost (Table, 5). The total score recorded for the tested programmes reveal that the second one (pruning in the end of November with placing the pruned by-products under trees for two weeks and spraying mineral oil in the end of May) was the most effective program recording the highest score (14) whereas the fourth programme (spraying

mineral oil twice in the end of both December and May) was the least showing the lowest score (6) in the first season of 2004/2005. But, in the second one of 2005/2006 the highest scores of 14 and 15 were recorded for the first and fourth programmes that depended on pruning once (in the end of February) or twice (in the end of both November and February) with placing the pruned by-products under trees for two weeks, consecutively. As shown in Table 5 the untreated control of the two years of investigation showed high scores of 13 and 15 during 2004/2005 and 2005/2006, consecutively.

Table 5. Comparison between the tested chemi-cultural programmes used to control *L. riccae* on olive trees during 2004/2005 and 2005/2006

	2004/2005							2005/2006						
	% mortality	Score	% parasitism	Score	Cost/Fed. (L.E.)	Score	Total of scores	% mortality	Score	% parasitism	Score	Cost/Fed. (L.E.)	Score	Total of scores
I	78.49	3	13.91	5	322	3	11	83.71	3	10.46	5	150	6	14
II	87.00	6	13.06	4	322	4	14	85.03	5	9.53	2	322	4	11
III	83.99	5	10.63	3	494	1	9	81.18	2	10.32	4	462	3	8
IV	77.84	2	10.02	2	344	2	6	83.90	4	12.07	6	300	5	15
V	79.02	4	6.32	1	280	5	10	89.17	7	9.92	3	472	2	12
VI			-					85.82	6	8.67	1	612	1	8
Control	41.50	1	20.42	6	0	6	13	40.13	1	17.50	7	0	7	15

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برامج كيميائية - زراعية لمكافحة حشرة الزيتون المحارية على أشجار الزيتون

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معهد بحوث وقاية النباتات - الدقى - الجيزة

تم اختبار ١١ برنامج مكافحة خلال الموسمين ٢٠٠٤/٢٠٠٥ ، ٢٠٠٥/٢٠٠٦ ، لمكافحة الحشرات القشرية على أشجار الزيتون فى محافظة الفيوم. وقد اعتمدت معاملات البرامج على التقليل وحرق نواتج التقليل أو التقليل مع ترك الأفرع الناتجة عن التقليل تحت الأشجار لمدة أسبوعين (حتى تتمكن الطفيليات والمفترسات من الانتقال ثانية إلى الأشجار) وكذلك تضمنت البرامج الرش بالملاثيون ٥٧% بمعدل ٠,١٥% أو الرش بالزيت المعدنى (كزد أويل ٩٥%) بمعدل ١,٥% كل على حده أو الرش بالزيت ثم الملاثيون بنفس المعدلات. وقد طبقت هذه البرامج مرة أو مرتين بالتبادل. وقد تم مقارنة البرامج على أساس نسبة الموت فى حشرة الزيتون المحارية ونسبة التطفل على الحشرة المحارية إضافة إلى تكلفة كل برنامج للفدان بالجنيه. وفى الموسم الأول كان البرنامج المتضمن تقليل الأشجار فى أواخر نوفمبر مع ترك نواتج التقليل تحت الأشجار ثم الرش بالزيت المعدنى فى أواخر مايو هو الأكثر نجاحا حيث سجل أعلى نسبة موت (٨٧%) وأعلى نسبة تطفل (١٣,٠٦%) وكان الأقل تكلفة (٣٢٢ جنيه/فدان). وفى الموسم الثانى كان البرنامج المتضمن التقليل مرتين فى أواخر كل من نوفمبر وفبراير مع ترك مخلفات التقليل تحت الأشجار لمدة أسبوعين من أفضل البرامج فقد بلغت نسبة الموت فى الحشرة المحارية ٨٣,٩% وكانت نسبة التطفل ١٢,٠٧% وتكلفة الفدان ٣٠٠ جنيه.