

THE IMPACT OF PRUNNING AND WORMING TREATMENTS AS ENVIRONMENTAL SAFE CONTROL METHOD OF *ZEUZERA PYRINA* L.(LEPIDOPRERA: COSSIDAE) IN OLIVE ORCHARDS

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ABSTRACT: *Alternative non-conventional and environmentally safe means (pruning as horticultural and worming as mechanical treatments) for the reduction of Zeuzera pyrina infestation were evaluated in infested olive orchards at Wady El-Natroun district, Behera governorate. The direct effects for single year as well as cumulative effects for two and three successive years were estimated during 2010, 2011, and 2012 seasons. Results concluded that the infestation of Z. pyrina was reduced by 56.44%, 42.74%, 32.72%, 22.29% and 13.91% due to the following single year treatments: Combined winter and summer pruning together with the whole year worming, Combined winter and summer pruning, Winter pruning, Whole year worming and Summer pruning, respectively. The respective cumulative effects for two successive years treatments resulted the reduction of infestation were 70.28%, 59.77%, 50.16%, 34.65 and 22.91%. Applying the respective cumulative effects for three successive years' treatments magnified the reduction of infestation to 85.65%, 78.13%, 75.07, 58.77% and 38.58%, respectively.*

Key words: *environment, olive orchards, pruning, worming, Zeuzera pyrina*

INTRODUCTION

Olive fruits and oil nowadays is an important exporting crop in Egypt. The cultivated area is yearly increasing in the new reclaimed lands in addition to the old valley lands. *Zeuzera pyrina* is a serious polyphagous pest in Egypt, attacking several fruit trees especially olive, apple, pear and pomegranate, in addition to some ornamental and wood tree species. Larvae bore tunnels inside the tree branches and stem, consume large amount of wood, causing weakness, reducing the production, and finally death of trees. Monitored the population fluctuation in olive orchards (El-Sherif *et al.*, 1985-b) are essential in determination of the proper timing of the pest control treatments.

The use of insecticides for the protection of fruit trees from *Z. pyrina* infestation still the main tool of control (El-Sherif *et al.*, 1985-a), and has been recently increased. However, Tadros *et al.* (1993), (2006-b) and Abdel Azim *et al.* (2008) obtained good control results of *Z. pyrina* by using horticultural, mechanical and chemical treatments in pear and pomegranate orchards.

Moreover, promising results were achieved under field conditions by attraction of *Z. pyrina* using sex pheromone traps by Tadros and Voerman (1994) and Tadros *et al.* (2006-a) in Egypt, Vettori and Pasqualini (1997) in Israel, Natale and Pasqualini (1999), Pasqualini *et al.* (1999) in Italy, and Haniotakis *et al.* (1999) in the Netherlands. In addition, Shehata *et al.* (1995) in Egypt carried out microbiological control of *Z. pyrina* in pear orchards. These are safe for the environment, human and animal.

The main scope of this study is to prevent the yield losses due to the damage of this boring pest, eliminate the pesticide residues, prevent the outbreaks of secondary species, decrease the environmental pollution, magnify the role of the biological control agents (parasites, predators and pathogens) and obtain better production of decontamination of fruits through using non traditional approaches for controlling *Z. pyrina* in olive orchards.

MATERIALS AND METHODS

Experiments on *Zeuzera pyrina* were carried out during the activity seasons all over three successive years (2010, 2011

and 2012). Field trials were carried out in heavily infested olive orchards (10 feddans, more than 15 years old) at Wady El-Natroun district, Behera governorate as follows:

1. Effect of one-year treatments: Treatments to control *Z. pyrina* were applied during 2010, 2011, and 2012.

a-Winter pruning treatment: During the horticultural winter pruning in January of each year, olive branches infested with *Z. pyrina* were pruned by sharp scissors and saws, then immediately got rid of them.

b- Summer pruning treatment: During the horticultural summer pruning in July of each year, pruning of newly appeared severely infested branches were applied by the sharp scissors and saws, then immediately got rid of them.

c-Whole year worming treatment: Manual killing *Z. pyrina* larvae inside their tunnels using a flexible wire was applied four times each season (during winter (in January), spring (in April), summer (in July), and autumn (in October).

d- Combined winter and summer pruning treatments: Treatments number 1.1 and 1.2.

e- Combined winter and summer pruning treatments together with the whole year worming treatments: Treatments number 1-1, 1-2 and 1-3.

f- Untreated check: Trees of this treatment did not receive any horticultural or mechanical treatments.

2. Effect of two and three successive years treatments:

The same six previously mentioned one - year treatments that applied during 2010 were repeated in other olive orchards during 2011 and 2012 seasons to confirm the results for the 2nd and 3rd years. In addition, the same previously one-year treatments of 2010 were repeated in the same olive orchard during 2011 and 2012 seasons to studying the effect of the cumulative effect of treatments for two and three successive years.

3. Statistical analysis:

The experimental design was completely randomized at significance level 5% split design with 10 trees, each replicated 3 times (33 trees each treatment). Evaluation of the different treatments was carried out at the end of the year (during December) by counting the alive larvae in the treated and untreated olive trees. Active holes with mass of sawdust indicate alive larvae (in case of uncertainty, branches were dissection). The efficiency of treatments was based on the percentage reduction of infestation according to the following formula :

$$\% \text{ Reduction of infestation} = [(C-T) / C] \times 100$$

Where: C: Mean number of alive larvae in the untreated trees.

T: Mean number of alive larvae in the treated trees.

Analysis of variance (F test) and Least Significant Difference (LSD) (Snedecor and Cochran, 1990) were used for differentiation between treatments.

RESULTS AND DISCUSSION

The effect of horticultural and mechanical treatments on the reduction of *Z. pyrina* infestation was studied in olive orchards at Wady El-Natroun district, Behera governorate during 1, 2 and 3 successive seasons (2010, 2011 and 2012). Data concluded the following results:

1. Effect of one single year treatments (direct effect):

Statistical analysis of variance and LSD in Table (1) resulted in the following descending reduction of *Z. pyrina* infestation:

- 1.1. Combined winter and summer pruning treatments together with the whole year worming treatments: These treatments showed superior results, as the reduction of infestation reached 56.44% (range, 54.27 – 59.32%).
- 1.2. Combined winter and summer pruning treatments: Treatments resulted in adequate reductions of infestation showing 42.74% (range, 40.67 – 44.51%).

The impact of pruning and worming treatments as environmental safe.....

Table 1: Effect of one single year treatments on the reduction of *Z. pyrina* infestation in olive orchards at Wady El-Natroun district, Behera governorate during 2010, 2011 and 2012.

No	Treatments	Mean no. of alive larvae per tree (L/T) and percent reduction of infestation (%RI)								Grouping
		2010		2011		2012		Mean		
		L/T	%RI	L/T	%RI	L/T	%RI	L/T	%RI	
1	Winter pruning	3.62	31.83	3.11	30.11	3.15	35.98	3.29	32.72	bc
2	Summer pruning	4.65	12.43	3.90	12.36	4.09	16.87	4.21	13.91	e
3	winter and summer pruning	3.01	43.31	2.67	40.67	2.73	44.51	2.8	42.74	ab
4	Whole year worming	4.30	19.02	3.41	23.37	3.68	25.2	3.8	22.29	d
5	winter and summer pruning together with whole year worming	2.16	59.32	1.98	55.51	2.25	54.27	2.13	56.44	a
6	Untreated (check)	5.31	--	4.45	--	4.92	--	4.89	--	ef

Values in the same column followed by different letter are significantly different ($P>0.05$), L.S.D. 5%= 0.51

1.3. Winter pruning treatment: The treatment achieved a good percentage reduction of infestation averaged 32.72% (range, 30.11 – 35.98%).

1.4. Whole year worming treatment: The treatment achieved a good percentage reduction of infestation averaged 22.29% (range, 19.02 – 25.2%).

1.5. Summer pruning treatment: The treatment was of some reduction of infestation averaged 13.91% (range, 12.36 – 16.87%).

2. Effect of two successive years treatments (cumulative effect):

Statistical analysis of variance and LSD in Table 2 resulted in the following descending reduction of *Z. pyrina* infestation:

2.1 Combined winter and summer pruning treatments together with the whole year worming treatments: These treatments showed superior results, as the reduction in infestation reached 70.28% (range, 69.95 – 70.63%).

2.2 Combined winter and summer pruning treatments: Treatments resulted in adequate reductions of infestation showing 59.77% (range, 59.62 – 59.93%).

2.3 Winter pruning treatment: The treatment achieved a good percentage reduction of infestation averaged 50.16% (range, 48.17 – 52.29%).

2.4 Whole year worming treatment: The treatment achieved a good percentage reduction of infestation averaged 34.65% (range, 33.11 – 36.09%).

2.5 Summer pruning treatment: The treatment was of some reduction of infestation averaged 22.91% (range, 21.62 – 24.28%).

3. Effect of three successive years treatments (cumulative effect):

Statistical analysis of variance and LSD in Table (2) resulted in the following descending reduction of *Z. pyrina* infestation:

3.1. Combined winter and summer pruning treatments together with the whole year worming treatments: These treatments showed superior results, as the reduction in infestation reached 85.65%.

3.2. Combined winter and summer pruning treatments: Treatments resulted in adequate reductions of infestation showing 78.13%.

Table 2: Effect of two and three successive year's treatments on the reduction of *Z. pyrina* infestation in olive trees at Wady El-Natroun district, Behera governorate during two and three successive years (2010, 2011 and 2012).

No	Treatments	Mean no. of alive larvae per tree (L/T) and percent reduction of infestation (%RI)							
		2- successive years						3- years	
		2010/11		2011/12		Mean		Mean (2010/12)	
		L/T	%RI	L/T	%RI	L/T	%RI	L/T	%RI
1	Winter pruning	3.26	48.17	2.81	52.29	3.035 b	50.16	1.79 ab	75.07
2	Summer pruning	4.93	21.62	4.46	24.28	4.695 d	22.91	4.41 d	38.58
3	winter and summer pruning	2.54	59.62	2.36	59.93	2.45 ab	59.77	1.57 ab	78.13
4	Whole year worming	4.02	36.09	3.94	33.11	3.98 c	34.65	2.96 c	58.77
5	winter and summer pruning together with whole year worming	1.89	69.95	1.73	70.63	1.81 a	70.28	1.03 a	85.65
6	Untreated (check)	6.29	--	5.89	--	6.09 e	--	7.18 e	--

Values in the same column followed by different letter are significantly different ($P > 0.05$), L.S.D. 5 % for 2 years = 0.83, and for 3 years = 0.95

3.3. Winter pruning treatment: The treatment achieved a good percentage reduction of infestation averaged 75.07%.

3.4. Whole year worming treatment: The treatment achieved a good percentage reduction of infestation averaged 58.77%.

3.5. Summer pruning treatment: The treatment was of some reduction of infestation averaged 38.58%.

CONCLUSION

As shown in Tables (1 and 2), the environmentally safe means of control resulted in rather good and adequate reduction of *Z. pyrina* infestation. However, repeating these treatments year after another on the same trees magnified the reduction of infestation. Satisfactory cumulative reduction of infestation ascending from 56.44% when the combined winter and summer pruning treatments together with the whole year worming treatments were applied for one single year, increased to 70.28% when applied for two

successive years, and magnified to 85.65% reduction of infestation when applied for three successive years.

Combined winter and summer pruning treatments were also satisfactory, showed the respective 42.74%, 59.77% and 78.13% reduction of infestation.

Winter pruning treatment was promisingly good that averaged the respective 32.72%, 50.16% and 75.07 reduction of infestation.

Whole year worming treatment was impractical as it is difficult, needs too much cost in labor, time and cost, however it achieved the respective 22.29%, 34.65 and 58.77% reduction of infestation.

On the contrary, summer pruning treatment was of some – but not good – results as the branches even infested, farmers do not want to prune fruitful infested branches. The reduction of infestation averaged only the respective 13.91%, 22.91% and 38.58%.

The present results were in agreement with Tadros *et al.* (1993) who evaluated the

efficiency of pruning, worming, and complete coverage spraying treatments in the reduction of *Z. pyrina* infestation, and obtained good results. Moreover, they stated that worming showed low reduction of infestation due to the difficulty of applying this treatment.

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المكافحة الآمنة بيئياً لحفار ساق التفاح *Zeuzera pyrina* L. في حدائق الزيتون باستخدام المعاملات البستانية (التقليم) والميكانيكية (قتل اليرقات في أنفاقها بالسلك)

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المُلخَص العَرَبِي

يعتبر الزيتون من المحاصيل التصديرية الهامة في مصر في الآونة الأخيرة سواء طازجا أو زيتا، إلا أن حفار ساق التفاح *Z. pyrina* L. يسبب أضرارا اقتصادية في حدائق الزيتون. ولحد من التلوث البيئي بالمبيدات وتعظيم دور الأعداء الحيوية، تم تقييم فعالية بعض الطرق الآمنة لتقليل الإصابة بالحفار مثل المعاملات البستانية (التقليم)، والميكانيكية (قتل اليرقات داخل أنفاقها بالسلك)، والمعاملات البستانية والميكانيكية معا، في منطقة وادي النطرون محافظة البحيرة خلال ثلاث سنوات متتالية (٢٠١٠، ٢٠١١، ٢٠١٢). أظهرت النتائج فعالية المعاملات البستانية (التقليم الشتوي والصيفي) والميكانيكية (بقتل اليرقات داخل أنفاقها بالسلك) في برنامج متكامل خلال الموسم. أدت المعاملة لمدة عام واحد ثم عامين متتالين ثم ثلاث أعوام متتالية بالتقليم الشتوي والصيفي معا بالإضافة الي قتل اليرقات بالسلك إلي تقليل الإصابة بنسبة ٥٦.٤٤%، إزدادت إلي 70.28%، وتعاضمت إلي 85.65%، علي الترتيب. وعند إجراء التقليم الشتوي والصيفي معا بلغت النسبة المئوية لتقليل الإصابة إلي 42.74% إزدادت إلي 59.77%، وتعاضمت إلي 78.13%، علي الترتيب. وعند إجراء التقليم الشتوي فقط بلغت النسبة المئوية لتقليل الإصابة إلي 32.72% إزدادت إلي 50.16%، وتعاضمت إلي 75.07%، علي الترتيب. وعند إجراء معاملة قتل اليرقات بالسلك فقط بلغت النسبة المئوية لتقليل الإصابة 22.29% إزدادت إلي 34.65%، وتعاضمت إلي 58.77%، علي الترتيب. وعند إجراء التقليم الصيفي فقط بلغت النسبة المئوية لتقليل الإصابة 13.91% إزدادت إلي 22.91%، وتعاضمت إلي 38.58%، علي الترتيب.