EFFECT OF EMULSIFIABLE OIL ON OVERWINTERING ADULTS OF OLIVE PSYLLID *EUPHYLURA OLIVINA* COSTA (HOM.: APHALARIDAE) AND ITS PHYTOTOXICITY ON OLIVE TREES IN TAROM REGION- IRAN

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ABSTRACT: Olive psyllid *Euphyllura olivina* Costa is the most important pest of olive trees in Tarom region. The results of recent investigations on controlling overwintering adults of olive psyllid using emulsifible oil instead of summer insecticides spraying, show very precise control and farmers apply these successfully in their gardens. In order to study the effects of oil spraying in winter and autumn and also its feasible phytotoxicity on olive trees.This study carried out as a factorial experiment in completely randomized design block considering oil dosage and time of spraying as factors. The results showed no significant differences between oil treatments but there was a significant difference among different times of spraying. Therefore with the progress of the season, sensitivity of overwintering adults of olive psyllid and also the percentage of control increased. Survey of 50 fruits weight indicated that 3% oil treatment decreased yield and caused phytotoxicity during November, December and March. According to this study, early March application of 2% oil is the best choice to control olive psyllid and 3% oil in February or 1% oil in March are recommended as alternatives.

KEY WORDS: Olive psyllid, Oil spray, phytotoxicity, *Euphyllura olivina*.

Olive psyllid *Euphyllura olivina* Costa is the most important pest of olive trees in Tarom region. In this area the pest completes only one generation per year on olive. It overwinters as adult in crevices or holes on olive trunks, mating occurs in late March, followed by egg laying on the flower buds in early April and then the larva could be seen in second half of April. The pest has five larval stages (Saeb et al., 2001).

The pest, especially older stages of larva feed by rupturing cells and imbibing the sap, damaging the attacked tissues of new growth. The insect damage not only affects yield lose by direct sap feeding but also indirectly cause flowers abortion by producing waxy secretions even in those not attacked directly. The presence of honey-dew and sooty moulds aggravate the latter situation. Feeding may cause flowers to drop prematurely. Large populations are able to retard the growth of young trees and also to decrease the fruit biomass (Prophetou & Tzanakis, 1976; Saeb et al., 2001). Olive psyllid is widely distributed in Olive growing regions of Western Europe, Mediterranean countries and eastward to Iran. It occurs on olives as high population densities causing important economic losses. *E. Olivina* is a major pest of olive trees and has two summer and winter generations per year and the second generation causes more serious damage (Mustafa, 1989). In Greece and some of European countries it completes one generation per year and females lay egg in early spring and larval different stages could be observed from middle of April to late May, then the adults emerge which act all through the year on olive trees (Prophetou & Tzanakis, 1976). Olive psyllid cause about 21.2 to 23.2

percent damage and is known as an important pest of olive in Jordan (Mustafa, 1984). Pala et al. (1994) indicated that olive psyllid is a very serious sucking insect in Turkey olive orchards and its activity cause significant decrease of flowering, pollination and fruit set. Selim *et al.* (1981) through investigation in Iraq showed that the insect distribution in the four quarters of infested olive trees was not at the same level, since the northern quarter harbored the highest population, the eastern the lowest and also its population on the upper parts of the tree was higher than the lower ones.

Rallo and Martin (1991) indicated that olive flower formation starts in early November and the induction of flower buds takes place in the winter after passing essential chilling and in this period the flowers come out of dormancy indicated by an increase its biomass. Michele et al. (1973) through studies in Sicily, showed that physiological differentiation of olive flower takes place in December to January and a morphological one occurs in the middle of February.

The extensive use of pesticides has incurred ecological and toxicological side effects. These include environmental contamination, resulting from the vastness of the areas treated, destruction of non target organisms including natural enemies of pests, severe outbreaks of other secondary pests and finally presence of insecticides residues in the olive oil that are caused mainly by lipophilic pesticides (Pala et al., 1997).

In order to investigate the possibility of overwintering adult pest control through autumn and winter, evaluating lethal effects of various oil spray dosages on the adult and also oil spray possible phytotoxicity effects on shedding the flowers and leaves and thus lose of olive yield, this study was carried out during 2002 in Tarom region.

MATERIALS AND METHODS

This research was carried out during 2002 in Motahari orchard with yellow cultivar olive tree in Tarom region as a factorial experiment in completely randomized design block with two factors in three replications. First factor was oil dosage at four levels: a_0= 0% (control), a_1= 1%, a_2= 2% and a_3= 3% and the second one was time of spraying, at five levels: b_1= 4th of November, b_2= 4th of December, b_3= 4th of January, b_4= 4th of February and b_5= 4th of March. Each block included 4×4 = 16 trees and sampling was done on 2×2= 4 trees at the center of each block.

Adults were collected by hand beating twigs over a 50 cm diameter net at four main geographical directions of each sampling tree. Samples of adults were taken two days before and a week after each oil spraying so they were about at one_ month intervals through autumn and winter. A hundred liter spraying machine (Mitsubishi G510L type machine, Japan) and also emulsifible oil with 80% technical mineral oil and 92 degree of sulfate were used. The number of overwintering adults was transformed to mortality percent by means of the Handerson- Tilton formula including control treatment. The Formula follows $1-(T_a/T_b \times C_b/C_a) \times 100$ where C_b, C_a, T_b and T_a are collected adults number before at control, after at control, before at treatment and after at treatment blocks respectively.

In order to evaluate the phytotoxicity effects, the treated trees were monitored for yellowing and dropped leaves and also weight of 50 fruits used as an index of yield. For this purpose about 10 kilos fruit of 2×2 = 4 trees from the center of each block, synchronizing harvesting olive trees to conserve use in late of September, 2003, were gathered and then 50 fruits randomly picked up and weighted.

The data were analyzed by means of MSTATC software then the main and interaction effects of factors were compared by a Duncan test.

RESULTS AND DISCUSSION

Analysis of variance of time and dosage of oil spaying to control overwintering adults of *Euphyllura olivina* indicated significant differences at 1% probability among of spraying times and also no significant differences between the dosages of sprayings (Table 1).

The means comparison of adult's mortality percent grouped the times of spraying in three levels (Fig. 1).

March with 82.63% mortality, showed the highest mortality, February and November with 76.78% and 72.49% mortality respectively located in the second cluster and in the end January and December with 70.90% and 68.68% mortality located in third group. There were no significant differences between November and January, December. The results indicated that except of November, as the season continued, the sensitivity of overwintering adults increased. Mustafa (1989) reported that the body fat residue of overwintering olive psyllid decreased through autumn and winter so it could be the probable reason for the increase in adult sensitivity by going on the season. It seems that the reason for the exception of November in view point of adult control, could be resulted from its high mobility and incomplete transition to overwintering places.

The interaction effects of oil dosage and times of spraying on mortality percentage of overwintering adults showed that March was the best time of oil spraying to control the pest (Fig. 2).

For introducing the best time and dosage, must be investigated in point of view probable oil phytotoxicity effects and costs of controlling processes.

Analysis of variance of time and dosage of oil spaying on weight of 50 olive fruits revealed that there are significant differences between times of spraying and also oil dosages at 5% and 1% probability respectively (Table 2).

The mean weight of 50 olive fruits was increased as the season continued by oil spraying during autumn and winter (Fig. 3). The highest weight of 50 fruits belonged to March, February and January. There was no significant difference between January and December from this view point. Finaly, the lowest amount belonged to November and also there was no significant difference between that and December. These results are in accordance with the illustration of Fig. 1 concluding the incisive control of olive psyllid was resulted by oil spraying in March.

The effect of various oil dosage spraying on mean weight of 50 olive fruits illustrated that the spraying with 2% and 1% oil dosages were successful in comparison to control treatment (0% oil), but the 3% one had side effects and decreased the fruit weight (Fig. 4). Our surveys during sampling a week after oil spraying showed leaves necrosis and dropping of trees that were treated with 3% oil dosage in November, December and slightly in March. These were confirmed by Michele et al. (1973) and Rallo and Martin (1991) studies on olive tree physiology which showed olive tree dormancy through winter and its activity during early autumn and late winter. Indeed mean weight of 50 fruits were decreased by decreasing the leaf area or photosynthesis level.

The interaction effects of Spraying times and dosages on mean weight of 50 olive fruits indicated that the highest fruit weight belonged to treatment with 2% oil in March then 3% in February and 1% oil in March located at second level. The lowest amount belonged to 3% oil in November and the others located between

two extremes.

CONCLUSION

According to this study, early March application of 2% oil is the best choice to control overwintering olive psyllid and 3% oil in February or 1% oil in March are recommended as alternatives. These applications will kill about 80 percent of overwintering adults before laying egg and the remaining 20 percent is in the range of olive tree tolerance do not cause economic damage and also could keep natural enemies populations alive in olive orchards (Chermiti, 1992).

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Table 1. Two way analysis of variance (ANOVA) of time and dosage of oil spaying to control overwintering adults of *Euphyllura Olivia*.

Source	df	Ms	F
Time	4	278.551	17.201**
Dosage	2	6.273	0.387ns
Time × Dosage	8	0.077	0.004ns
Error	28	16.194	

ns No significant difference, ** Significant difference at 1% probability, CV= 8.44

Table 2. Two way analysis of variance (ANOVA) of time and dosage of oil spaying on 50 fruit weight of olive.

Source	df	Ms	F
Time	4	2861.287	4.298**
Dosage	3	2627.479	3.947*
Time × Dosage	12	1295.224	1.945ns
Error	28	16.194	

ns No significant difference, * Significant difference at 5% probability, ** Significant difference at 1% probability, CV= 11.5

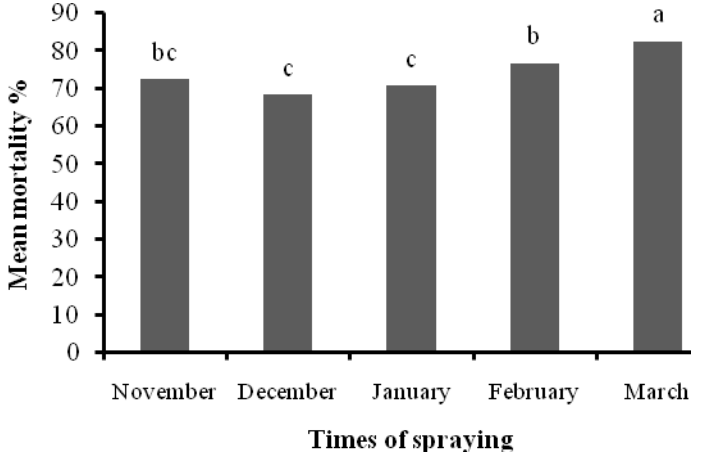

Fig. 1. Means of adult mortality caused by oil spraying during various months.

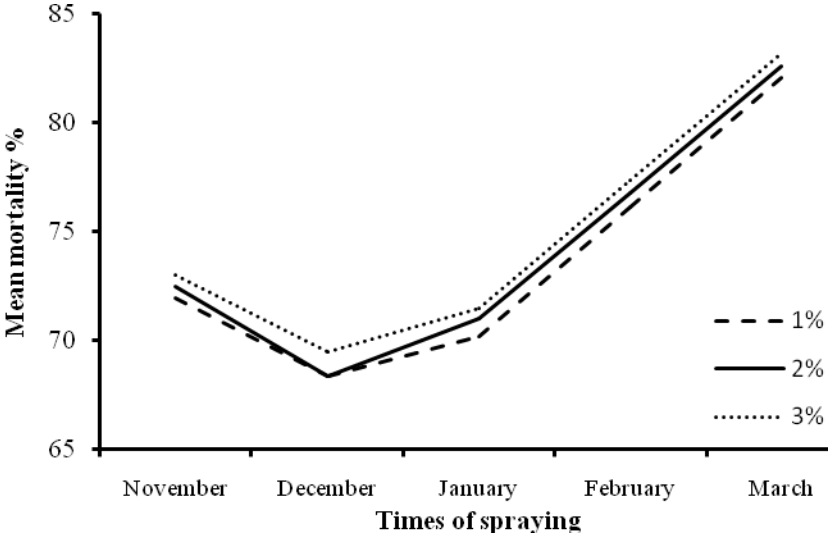

Fig. 2. Effect of oil spraying with different dosages during various months on mortality of overwintering adults of *Euphyllura olivina*.

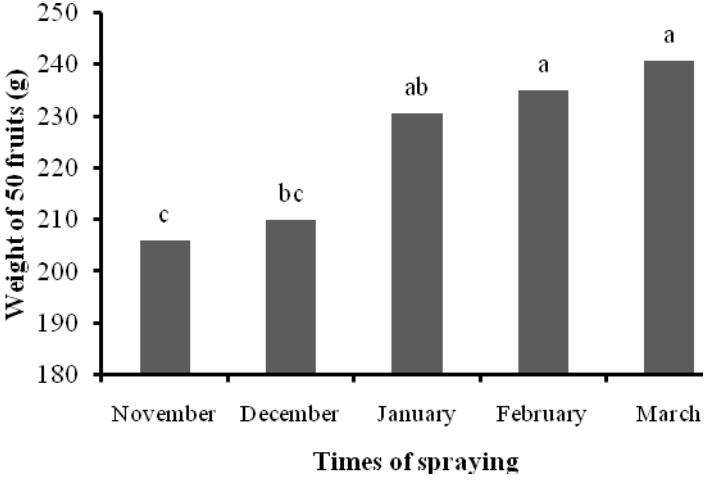

Fig. 3. Effect of oil spraying during various months on weight of 50 olive fruits.

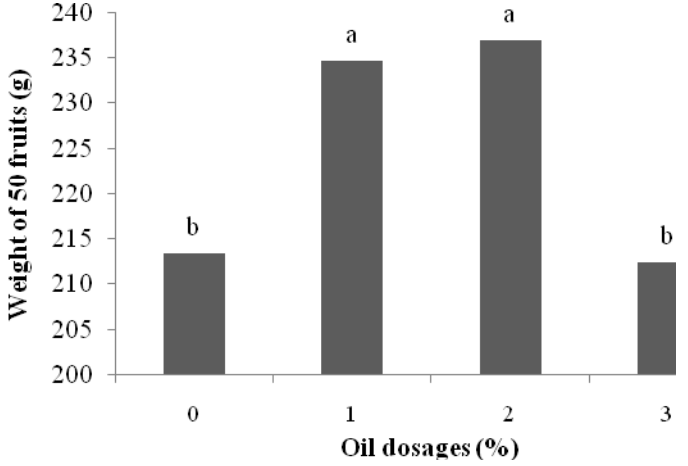

Fig. 4. Effect of oil spraying with various dosages on weight of 50 olive fruits.

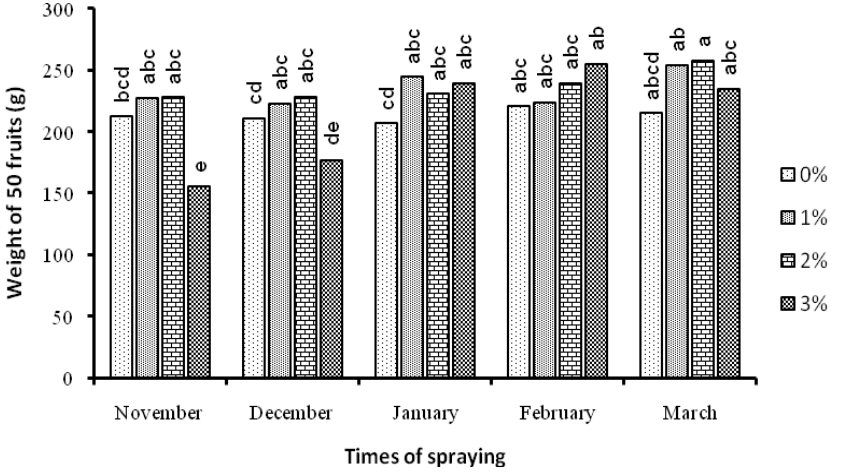

Fig. 5. The interaction effects of oil spraying times and dosages on weight of 50 olive fruits.