



Research Article

Inducing Resistance in Olive Seedlings against Olive Psyllid, *Euphyllura straminea* Using Natural Phenol Compound

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ARTICLE INFO

Article No.: 020313432

DOI: 10.15580/GJAS.2013.4.020313432

Submitted: 03/02/2013

Accepted: 22/04/2013

Published: 29/04/2013

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Keywords:

Olive psyllid, *Euphyllura straminea*, Olive seedlings, Toxicity, Control, inducing resistance, Natural phenol compound

ABSTRACT

Olive psyllid *Euphyllura straminea* Loginova was recorded as a key pest in Egypt in 1988 on olive trees in El Arish and caused considerable losses in fruit yield. This work aims at evaluating the toxic and repellent effect of a natural phenol compound (3, 4 dihydroxy phenol ethanol) to control and induce resistance to olive seedlings against this insect pest under insectary conditions. Results showed that percentages of reduction of insect population were increased as the phenol compound concentrations increased. The reduction percentage of nymphs and adults were reached 100% after 15, 18, 21 days at concentration of 1.0, 0.75 and 0.5 mM, respectively. Also this compound was more effective on nymphal stage than adults. Spraying this natural phenol compound (3, 4 dihydroxy phenol ethanol) could be used to control and induce resistance to olive seedlings against this pest infestation. Also results indicated that increasing concentration of 3,4 – DHPE found to prolong the protective period from 17, 27 and 35 days at 0.50, 0.75 and 1.00 mM concentrations, respectively. Therefore this compound could be used to induce resistance of olive trees against olive psyllid infestation.

INTRODUCTION

Olive groves are spread all over the world to produce edible olive oil, pickling fruits and fine wood. Olive trees are attacked by many pests i.e. scale insects, olive fruit fly, stem borers, lepidopteroes worms, olive thrips, mites and root knot nematode. During the twentieth century olive psyllid was recorded as key pest in many countries all over the world. In Egypt olive psyllid, *Euphyllura straminea* Loginova was recorded as a new pest in 1988 in El Arish on olive trees (Nada, 1994).

Ecological and population studies showed that *E. straminea* had one main period of seasonal abundance which extended from early December to late May. This seasonal abundance reached its peak of seasonal activity during April. During this period olive trees were at sprouting of vegetative and floral buds. Therefore, the activity of this species was coinciding with the phenology of olive trees (Youssef, 2011).

Field observations showed that females of *E. straminea* preferred floral buds as oviposition sites than vegetative buds. Zouiten et al. (2000) stated that vegetative buds contained phenol compounds 2-3 times than flowering buds. They extracted this phenol compound and identified it as 3, 4 dihydroxy phenol ethanol (3, 4 – DHPE).

The present work aims at evaluating this natural phenol compound to control and induce resistance to olive seedlings under insectary conditions.

MATERIALS AND METHODS

Locality and duration of experiments

Toxic and repellent effects of phenol compound, 3,4 dihydroxyphenolethanol [3,4 DHPE] were carried out against olive psyllid, *Euphyllura straminea* on olive seedlings, *Olea europaea* under insectary conditions at Ain Ghosain, Ismailia Governorate during April, 2010.

Olive seedlings Stocks

For studying the toxic and repellent effects of the phenol compound [3,4-DHPE] on *E. straminea*, stock of sixty-three olive seedlings (40-45 cms height) was obtained from seedling nursery at Ain Ghosain, Ismailia Governorate. Each seedling was planted separately in plastic pots (15 cms diameter). To bioassay the toxicity of this compound on *E. straminea*, thirty- six heavily infested olive seedlings were chosen and divided into four groups, each nine seedlings of each group were divided into three plots which put inside wooden cages (60 x 50x 50 cms) covered with gauze wire. While for determining the repellent effect of this compound on olive psyllid the other 27 seedlings were chosen, these seedlings were

divided into nine groups each with 3 seedlings. Each group was put inside wooden cage.

Treatment with the phenol compound [3, 4-DHPE]

The Phenol compound, 3,4 dihydroxyphenolethanol [3,4 DHPE] was kindly obtained as free sample (150 ml) from Oliver Schemit, Technical Support, Cayman Chemical Company, Hamburg, Germany). For evaluating the toxicity of this compound on *E. straminea*, three concentrations (0.50, 0.75 and 1.00 mM) were prepared. The nine seedlings which represented each treatment were sprayed using handle sprayer for each concentration. The fourth group was sprayed with water and left as control index. For determining the repellent effect, the three seedlings inside each cage treated as follows; one was heavily infested with *E. straminea* as a source of this pest infestation, while the other two seedlings were free of infestation, one of them was sprayed with natural phenol compound [3,4-DHPE]. Three concentrations (0.50, 0.75 and 1.00 mM) were sprayed using handle sprayer. Each treatment was replicated three times.

Examining and Counting

For evaluating the toxic effect, the seedlings were examined just before spraying, after 3, 6, 9, 12, 15, 18 and 21 days by using USB microscope. Number of nymphs and adults were recorded. The mortality percentages were calculated and corrected according Abbott's formula (1952). While for determining the repellent effect after application the uninfested seedlings which sprayed or unsprayed were examined daily for 45 days. Number of nymphs and adults as well as date of transferred to olive seedlings were recorded and counted during this period.

RESULTS AND DISCUSSION

Toxic Effect

Results of percentages of reduction of nymph and adults of olive psyllid, *E. straminea* are given in Table 1. These results showed that the percentages of reduction of insect population were increased as the phenol compound concentrations increased. The reduction percentage of nymphs and adults were reached 100% after 15, 18, 21 days at concentration of 1.0, 0.75 and 0.5 mM, respectively. This finding indicated that high concentration of this compound gave quick effects for controlling this pest. Regarding the toxic effects on nymphs and adults this compound was more effective on nymphal stage than adults; this phenomenon may be due to the thickened wax secretions which protect adults from the toxic effects of this compound.

Repellent Effect

Results obtained are graphically illustrated in Fig. 1. These results showed that some individuals of *Euphyllura straminea* began to transfer from infested to uninfested olive seedlings after 1 – 2 days inside the same cage in the three tested concentrations. While same individuals were transfer after 17, 27 and 35 days to sprayed olive seedlings with 3,4 – DHPE at concentrations 0.50, 0.75 and 1.00 mM, respectively. This result revealed that this compound gave olive seedlings protection from infestation with *E. straminea* and this period was increased as the concentration increased. For instance, spraying with concentration 0.50, mM gave resistance to olive seedlings for 17 days, while with concentration 1.00 mM gave resistance for 35 days. This phenomenon may be due to repellent effect of this compound as well as toxic effects of 3,4 – DHPE on both adults and nymphs of *E.*

straminea. Preliminary results obtained by Youssef (2011) showed that this compound had toxic effects on both nymphs and adults and found to be more toxic on nymphs than adults.

These results are in agreement with those obtained by Tajnari (1992) who stated that higher accumulation of phenol compound on vegetative buds before flowering period protect them from *E. straminea* infestation while reduction in level of this compound on flowering buds was found to be more preferable. Havlickova et al. (1998) mentioned that a negative correlation exists between the degree of susceptibility of olive trees cultivars to Psyllid infestation and concentration of soluble phenols. Zouiten et al. (2000) stated that 3,4 – DHPE found to be positively correlated with the degree of resistance for olive trees to psyllid infestation especially during flowering period.

Table (1): percentages of reduction in nymphs and adults of *E. straminea* on olive seedling sprayed with three concentrations of 3,4 dihydroxyphenoethanol in April, 2010 under insectary conditions.

Concent. (mM)	Days after application	Mean % of reduction		Average % reduction
		Nymphs	Adults	
0.5	3	85.5	30.9	58.2
	6	90.8	58.1	74.4
	9	94.1	89.2	91.7
	12	95.5	93.7	94.6
	15	96.5	96.1	96.3
	18	99.6	97.6	98.6
	21	100	100	100
	Mean		94.6	80.8
0.75	3	87.6	56.6	72.1
	6	92.1	73.1	82.6
	9	96.5	91.4	94.0
	12	97.6	94.1	95.9
	15	99.6	98.5	99.1
	18	100	100	100
	Mean		95.6	85.6
1.0	3	95.6	87.6	91.6
	6	96.8	93.2	95.0
	9	98.4	97.3	97.9
	12	98.8	100	99.4
	15	100	100	100
	Mean		97.9	95.6

From these results it could be concluded that this natural phenol compound could be used to spray on olive trees under field conditions just before flowering

period to induce resistance in olive trees and to protect them against olive psyllid, *E. straminea* infestation.

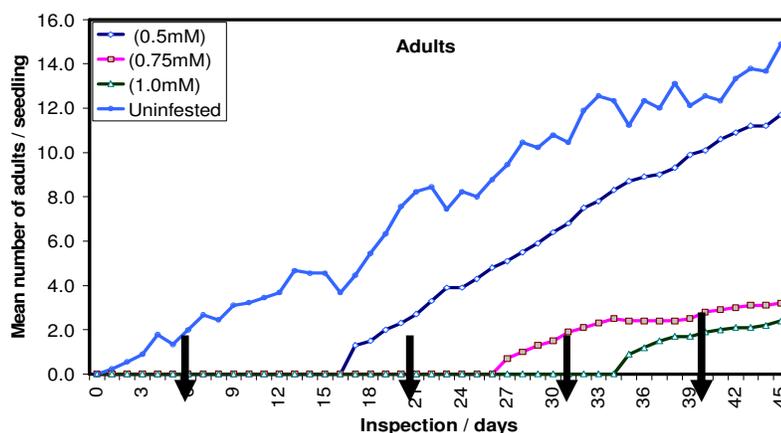
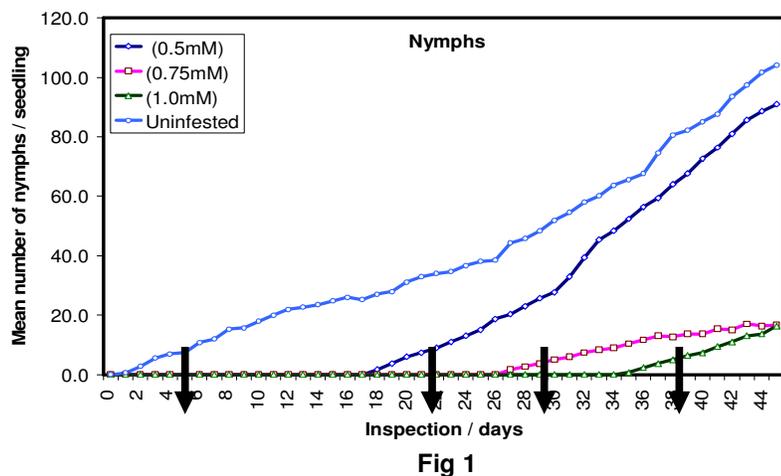


Fig. 1: The relation between used phenol concentrations and repellency time on nymphs and adults of olive psyllid, *E. straminea*

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Cite this Article: Amin AH, Helmi A and Youssef AS (2013). Inducing Resistance in Olive Seedlings against Olive Psyllid, *Euphyllura straminea* Using Natural Phenol Compound. *Greener Journal of Agricultural Sciences*, 3(4): 295-298, <http://doi.org/10.15580/GJAS.2013.4.020313432>.