Research Journal of Biological Sciences 5 (12): 756-759, 2010
ISSN: 1815-8846

The Study of Leaf Damage Induced by *Aceria oleae* on Different Verities of Olive *Olea europaea* L. in Greenhouse Condition: The Case Study in Fars Province, Iran

[1]Elham Sholesadi, [2]Yaghoub Fathipour, [3]Hadi Ostovan, [4]Farhad Khozeinia and [5]Rouhollah Radjabi
[1]Department of Entomology, Faculty of Agriculture, Islamic Azad University,
Science and Research Branch, Tehran, Iran
[2]Department of Entomology, Faculty of Agriculture,
Tarbiat Modares University, Tehran, Iran
[3]Department of Entomology, Faculty of Agriculture, Islamic Azad University,
Science and Research Branch, Shiraz, Iran
[4]Iranian Research Institute of Plant Protection, Tehran, Iran
[5]Islamic Azad University, Dezful Branch, Dezful, Iran

Abstract: Leaves damage of olive infected by *Aceria oleae* in greenhouse condition in Fars province, Iran were studied. Number of leaves in 10 cm of end twigs of plants and number of twisted leaves measured in this greenhouse study on seven varieties of olive including Rowghani, Fishomi, Zard, Hajiabad, Kazeroun, Shiraz and Dezful.

Key words: Olive, *Aceria oleae*, leaf damage, resistance, leaves, Iran

INTRODUCTION

Iran, located in the Eastern Mediterranean, shares many geographical characteristics and common historical roots with the countries of the Mediterranean basin which are home to the major known cultivars of olive. It is believed that the olive tree originated in the Mediterranean in prehistoric times. Iran lies in the Eastern Mediterranean; a part of the world that has been cradle of ancient civilizations and has been implicated as a possible place of birth for the olive tree (Elhadi and Birger, 2000; Jeppson *et al*., 1975; Al-Atawi and Halawa, 2011; Vidovic and Petanovic, 2008; Hatzinikolis, 1989).

The early history of olive tree in Iran has been shrouded in uncertainty but we know that olive was mentioned in ancient Iranian religious hymns of 2000 years ago. The history of olive implantation in the major olive-growing region of the country (Roodbar) has been documented for the past 900 years (Tabatabaie, 1995). Today, Iran with an olive crop area of >100,000 ha and an olive oil production of 5,000 ton year^{-1} is one of the olive-growing countries of the world. Fars province has 18,714,119 ha under olive cultivation. Most agricultural crops are attacked by numerous pests and subject to disease against which they are increasingly protected using agrochemicals which in turn may cause environmental concern. The olive (*Olea europaea* L.) is no exception being host to a diverse range of specific insect pests which include olive and other moths (*Prays oleae* and pyralid moths *Palpita unionalis*, *Euzophera pinguis*), the olive beetle (*Phloeotribus scarabaeoides)*, olive scale (*Saissetia olea)* and olive fly (*Bactrocera oleae*). Olive fly regarded as key pest of olive in Iran but olive mites are second pest that damage to olive leaves (Tzanakakes, 2006).

Mites species of the family Eriophyidae (Acari: Prostigmata) are the injurious mites of olive in the most olive-growing countries (Kamali and Amrine, 2005). Two species *Aceria oleae* (Napepa) and *Oxycenus niloticus* Zaher and Abou-Awad belonging to this family were collected and identified from Tarom, North of Zanjan province (Hajizadeh and Hosseini, 2005; Kamali and Amrine, 2005).

These mites are serious pests, especially in the greenhouses of olive propagation. *A. oleae* usually live on the underside of terminal olive leaves where, it inserts itself under the star shape hairs and causes them to drop off and to make yellow leaf spots and various forms of leaf deformation or defoliation. *O. niloticus* is normally found on upper surface of terminal olive leaves and produces some leaf pitting and deformation. In early October under natural conditions, these mites refer to be on suckers which were the most important sites of feeding for them. The mites infest both leaves surfaces causing

Corresponding Author: Elham Sholesadi, Department of Entomology, Faculty of Agriculture, Islamic Azad University, Science and Research Branch, Tehran, Iran

characteristic changes of leaf shape, leaf color and defoliation. Mite attack is evident from the appearance of the yellow-white spots on the upper surface due to cell death by mite feeding which correspond with swellings on the lower surface. Attack of flowers and fruits result on drying and drop of flowers and premature dropping or in fruits malformations. This mite will lead to olive tree death in high density.

A. oleae is the main acarine pest of all varieties of olive in the mediterranean area, especially the young trees. It prefers warm areas and when feeding on and around growing points makes developing leaves twisted and stunted and may even kill shoots (Abou-Awad *et al*., 2005). Seasonal fluctuations and biology of some of olive mites were studied (Castagnoli and Souliotis, 1982). With respect to importance of olive culture and its development in Iran, the study of reaction of various olive verities to *Aceria olea* were studied in greenhouse condition in order to olive culture programming in Fars province in South of Iran.

MATERIALS AND METHODS

Plant material: Seven variety of olive included Dezful, Kazerun, Shiraz, Hajiabad, Zard, Fishomi and Rowghani selected for this study. All of them were uniform in age and height and monitored for pest for 2 months before experimental treatments.

Indoor and outdoor of greenhouse disinfected by copper oxycholror and Amitraz spray for its safety from insects and fungi contaminations. Temperature and humidity were uniform in throughout of greenhouse and Sapling irrigate every 2 days.

Experimental treatment: In order to find interval time for measurement of studied indices, determination of critical time for maximum of population of mite was important. About 20 health leaves of olive selected and disinfect by distilled water and alcohol then cutted and inserted in Petri dishes ass leaf discs. One mite from twisted leaves transferred to each Petri dish including leaf disc in 30°C temperature.

Daily monitoring accomplished on leaf disc for twisted observation. According to this investigation, every 5th day was optimum time for leaves monitoring and mite damage observation. Number of leaves in 10 cm of end twig of plants and number of twisted leaves measured in greenhouse for every variety (Fig. 1).

Data analysis: Experiment designed as base completely randomized blanks which infection or health by mite *A. oleae* regarded as factor A and olive verities as factor B.

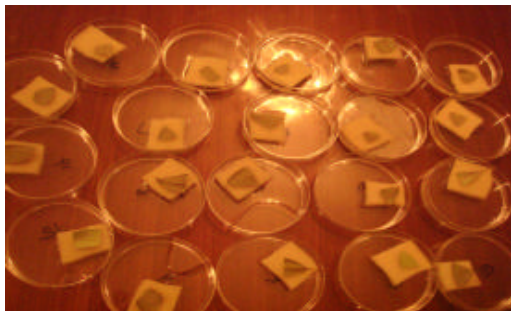

Fig. 1: Leaves disc in Petri dishes and its infection by olive mite

Experiments carried out in five replications. Data collection accomplished for D generations and its meaning used for analysis. Data enter to Excell and analyzed by MSTATC software.

RESULTS AND DISCUSSION

The effect of olive mite *A. oleae* on measured characteristics of olive saplings showed that *A. oleae* had not significant effects on the number of leaves in 10 cm of end twig between 2 groups, control and infected treatments.

The number of twisted leaves increased among infected varieties treatments significantly compared with healthy control varieties (Table 1).

Analysis variance among olive varieties showed that there is significant difference in number of leaves in 10 cm of end twig among various sapling varieties. Meaning analysis demonstrated that haji abad variety was resistant with maximum number of leaves in 10 cm of end twig compared with others (Table 2-4). Zard variety inserted in 2nd degree while Kazeroun and Rowghani varieties were susceptible varieties to olive mite due to decrease of leaves number in 10 cm of end twig.

At heavy infestations, individuals of each mite species twist and deform leaves, causing misshaped fruits and seriously reduce the amount and quality of olives available for pickling.

The pesticides used in olive nurseries destroy the predacious mites which are most important in controlling the it eriophyid species (Abou-Awad and El-Banhawy, 1986; El-Laithy, 1999; Al-Azzazy, 2000). Chemical control has been used to achieve a fast effective management but this method rarely produced more than a temporary reduction of the pest population. Therefore, it suggested integrated pest management for olive mite. About 25 genotypes of olive (most from Hashemabad orchard, Gorgan, North of Iran) were evaluated in relation to their

Table 1: The effects of olive mite on measured indices in two infected and health olive sapling varieties

Olive verities	Average of leaves no. in 10 cm of end twig±SE	No. of twisted leaves in saplings±SE
Infected	2.43±0.05[a]	1.264±0.01[a]
Control	2.32±0.05[a]	0.000±0.01[b]

Means with the same letter in the columns are not significantly different at p<0.05

Table 2: Analysis variance of leaves number in 10 cm of end twig of infected and control sapling various olive varieties

Changes resources	df	SS	MS	F value
Replication	4	0.1920	0.030	0.2616[NS]
Factor A	1	0.2150	0.215	1.8789[NS]
Factor A error	4	0.4570	0.114	-
Factor B	6	1.4790	0.246	2.7610*
Factor B error	24	2.1420	0.089	-
Factor A×B	6	0.2370	0.039	0.4175[NS]
Error	24	2.2680	0.095	-
Total	69	6.9180	-	-

CV%: 12.94; Factor A: infected and no. of infected by olive mite, Factor B: seven olive varieties; [NS]Non-significant, *significant at p<0.05

Table 3: The study of mite damage on average of leaves number in 10 cm of end twig of sapling among various varieties (varieties effects)

Olive verities	Average of leaves no. in 10 cm of end twig
Hajiabad	27.60[a]
Zard	27.61[ab]
Fishomi	17.70[abc]
Shiraz	16.80[bc]
Dezful	16.22[c]
Kazeroun	15.31[c]
Rowghani	14.59[c]

Table 4: The study of mite damage on average of leaves number in 10 cm of end twig of sapling among various varieties (varieties and infection interaction effects)

Olive verities	Average of leaves no. in 10 cm of end twig
Hajiabad	2.79[a]
Zard	2.60[a]
Fishomi	2.39[a]
Shiraz	2.35[a]
Dezful	2.33[a]
Kazeroun	2.31[a]
Rowghani	2.25[a]

Means with the same letter in the columns are not significantly different at p<0.05

resistance to these species. Based on the greenhouse scoring, six categories were designated; F6 genotype with relatively immune response, E1, M4, J4, J11, 30-Ilam kolafaraj and 61-shengeh Gorgan with highly resistance response, D8, B8 and sevilana with resistance response, F10, E11, H7, I6 and A12 with moderately resistance response, D2, F7, C12, G8, C5, F2 and Rowghani with susceptible and D12, E2 and Zard with highly susceptible response. Considering the high density of eriophyid mites in propagation greenhouses and possible of their transfer to pest appropriate areas, application of above resistant genotypes or use of them to produce resistant cultivars are recommended. Based on obtained results, Shiraz and Dezful varieties have maximum deformed leaves

Table 5: Analysis variance of twisted leaves number of infected and control sapling various olive varieties

Changes resources	Df	SS	MS	F value
Replication	4	0.017	0.004	1[NS]
Factor A	1	27.960	27.960	6483.9436**
Factor A error	4	0.017	0.004	-
Factor B	6	0.020	0.003	2.4997*
Factor B error	24	0.032	0.001	-
Factor A×B	6	0.020	0.003	2.4997*
Error	24	0.032	0.001	-
Total	69	28.099	-	-

CV%: 12.94; Factor A: infected and no. of infected by olive mite, Factor B: seven olive varieties; NS: Non-significant; *significant at p<0.05 and **significant at p<0.01

Table 6: The study of mite damage on average of number deformed leaves of sapling among various varieties (varieties and infected interaction effects)

Olive verities	Average of no. of twisted leaves of sapling
Shiraz	1.308[a]
Dezful	1.300[a]
Zard	1.286[ab]
Fishomi	1.264[abc]
Kazeroun	1.252[bcd]
Rowghani	1.288[cd]
Haji abad	1.210[d]

Means with the same letter in the columns are not significantly different at p<0.05

compared to other varieties. Hajiabad varieties which had maximum number of leaves in 10 cm of end twig showed minimum twisted leaves in infected saplings too (Table 5 and 6). Then, it can be introduce as resistant variety in greenhouse condition.

CONCLUSION

Results of this investigation showed that there is significant difference among varieties in number of leaves in 10 cm of end twigs. Average maximum of twisted leaves recorded 1.308 and 1.300 for Shiraz and Dezful verities, respectively. According to obtained results, Hajiabad variety as resistance one with minimum damage against *A. oleae* which can recommend for regional culture.

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