Int. J. Agricult. Stat. Sci. Vol. 18, No. 1, pp. 119-123, 2022
DocID: https://connectjournals.com/03899.2022.18.119
www.connectjournals.com/ijass
ISSN: 0973-1903, e-ISSN: 0976-3392

ORIGINAL ARTICLE

POPULATION SURVEILLANCE OF *EUPROCTIS MELANIA* (STAUDINGER, 1892) (LEPIDOPTERA: LYMANTRIIDAE) IN OAK TREES

Hazim Saeed Ahmed[1,*], Abdulbaset M. Amin Mohammed[2] and Nawzad Bawakir Kadir[3]

[1,3]Department of Plant Protection, College of Agricultural Engineering Sciences, Salahaddin University, Erbil, Iraq.
[2]Department of Horticulture, College of Agricultural Engineering Sciences, Salahaddin University, Erbil, Iraq.
E-mail: hazim.ahmed@su.edu.krd

Abstract: The current study was carried out in Qalasenj valley, Erbil Governorate during the spring 2021, on some oak trees infected with larvae of *Euproctis melania* (Staudinger, 1892) (Lepidoptera: Lymantriidae). The last larval instar was observed on the oak trees from 6 April to 18 May 2021. The number of infected leaves began to rise until the average number reached (241.80) larvae/leaf in 20 April 2021, when the average temperature was 30.17°C and the relative humidity was 17.14%. The statistical analysis revealed substantial differences between the numerical densities of the insect during the sampling periods. The findings of this study point to some of the most important considerations to make when using shelters to monitor larvae numbers, as well as contribute to the development of a standardized monitoring system for this newly established insect pest. This article describes that the number of larva in the hessian shelter was higher than in the wooden shelter, indicating that the hessian shelter is better than the wooden shelter. The reason for this is that the hessian shelter covers a larger area around the oak trunk, whereas the wooden shelter only covers the sides that touch the trunk.

***Key words*:** Oak, Surveillance, Hessian shelter, Wooden shelter, *Euproctis melania*.

Cite this article

Hazim Saeed Ahmed, Abdulbaset M. Amin Mohammed and Nawzad Bawakir Kadir (2022). Population surveillance of *Euproctis melania* (Staudinger, 1892) (Lepidoptera: Lymantriidae) in oak trees. *International Journal of Agricultural and Statistical Sciences.* DocID: https://connectjournals.com/03899.2022.18.119

1. Introduction

Oak trees, *Quercus* spp., are an important type of flora that grows naturally in Iraq's Kurdistan area at elevations ranging from 600 to 1900 meters above sea level [Mohammad and Mustafa (2011)]. The oak leaf moth, *Euproctis melania*, is one of the most devastating defoliators of oak and fruit trees in northern Iraq and southwestern Islamic Republic of Iran. Many insect pests are attack oak trees, and there are differences in the density and the distribution from one country to other depending on the environmental condition [Keval *et al.* (2020)], density and the species of oak trees. However, Mohammadi *et al.* (2014) found that the highest numbers of larvae are recorded in the late March and the lowest numbers are observed in the middle of May, while there are no larvae recorded in summer and winter.

Predicting and understanding the populations dynamics of any organism are the central objective of it is ecology [Alexander *et al.* (2012), Slomy *et al.* (2008)]. However, it also has practical advantages. Understanding the seasonal distribution of forest insects is crucial for determining the hazard showed by pest species [Venette *et al.* (2010)]. Pest risk calculates from risk occurrence, the vulnerability of plants and the financial effect of damage [Dulaurent *et al.* (2012)].

Various factors are responsible for variation in tree insect population including environmental factors [Al-Jassany and Raghef (2018)], lightening and food source [Al-Shareefi *et al.* (2020)].

The study is aim to test different techniques for surveying the larvae. Therefore, it is necessary to know the presence and seasonal distribution of the larvae, the frequency of foliar damage by this insect and its

Author for correspondence ***Received** August 23, 2021* ***Revised** December 28, 2021* ***Accepted** February 07, 2022*

feeding behavior to give an exact indication of an infection and select the optimal moment to control it, and find effective monitoring system by improving the best tolls uses to collect larvae from different shelters.

2. Materials and Methods

The experiment was carried out in Erbil-Government (Qalasenj valley) during 06/04/2021 and 18/05/2021, in six sites *viz*., Khoran (Lat. 36.29^o, Long. 44.33^o), Haji Ahmed (Lat. 36.30^o, Long. 44.33^o), Tobzawa (Lat. 36.30^o, Long. 44.32^o), Sartka (Lat. 36.30^o, Long. 44.31^o), Qalasenj (Lat. 36.35^o, Long. 44.32^o), and Tawska (Lat. 36.39^o, Long. 44.28^o) to test different survey and the most effective survey method. The open area of these sites has over 100 000 trees, mainly *Quercus aegilops*. The forest was selected for the experimental trial because it was located within the main larvae of *E. melania* outbreak area and a large number of oak trees in the forest.

Oak trees selected for the experiment were at least 10m in height and were accessible from a path, track or highway. A total of 72 trees were selected with a diameter of 15 to 50cm a height of 2m above the ground. The space between selected trees was, at least, 50m to minimize the impact of the traps from one shelter to another. Trees were assigned a trial number, and treatments (shelter type) were assigned to each tree based on random numbers.

To test the hypothesis that larval shelters are a good survey approach than visual surveys, a standardized survey strategy for larvae populations had to be established first. Walking through each habitat and assigning trees an experimental number resulted in the selection of 72 oak trees. The trees were chosen for their accessibility and availability. When fully grown trees were unavailable, semi-hard trees were chosen, with the smallest having an 8cm width diameter. Then, using random numbers, each test tree was assigned to one of three types of surveys. The first treatment was a hessian shelter [Timms and Smith (2011)] (hessian is used in systematic surveys of the closely related with gypsy moth). This included a hessian sack nearly 40cm by 20cm tied using 10mm black polypropylene rope to the main stem of the tree at a height of 2m (Fig. 1A). The hessian was placed horizontally and the overhang provided a shelter that measured 70cm by 20cm. A wooden larval shelter was used as the second treatment (larvae have been seen under wooden things such as fence posts and crates). To ease connection to the tree, a 20cm square was cut out of 9mm plywood and a 15mm hole was drilled in two corners. The wooden shelter was connected to the main stem of the tree at 2m above the ground with a 10mm diameter black polypropylene rope passed through the holes (Fig. 1B). The third treatment was a control, in which the tree was not equipped with a larval shelter. Using random numbers, each shelter and control tree was allocated a random directional aspect. At the end of the survey, the shelters were removed. Individual larvae and nests were surveyed weekly and the trees in each treatment were in addition surveyed visually for nests after the main larval surveying period. By moving around the base of the tree and counting each side by visual count from the main trunk, binoculars (50x optical zoom) were used to assess each tree for larvae and nests. And for fifteen minutes, each tree was surveyed. The selected site of all trees was chosen using a GPS point (Garmin GPSMap 64). The infestation percent of insects on the different parts of trees were calculated using the following equation [Arab (2003)].

Fig. 1: The larval shelter (A), the hessians larval shelter (B) the wooden larval shelter

$$\% \text{ Infestation/insect} = \frac{\text{Number of infected leaves with insects}}{\text{Total number of examined leaves}} \times 100$$

The statistical data processing was conducted using the statistical software program – IBP SPSS version 22.0 [Corp (2013)]. Descriptive statistics for the primary parameters were calculated. Each locality was analyzed separately. The estimation of statistical significance ($p < 0.05$) of the different level sources was conducted using analysis of variance test (ANOVA). The significant effects were carried out using completely randomized design (CRD). The Duncan test was used to identify the differences between treatment means.

3. Results and Discussion

3.1 Effect of environmental factors on larval stage populations

Table 1 demonstrates that the highest mean value of larvae was (84.94) larvae/trees in Haji Ahmed site at the temperature 30.17°C and relative humidity 17.14%. The lowest mean value of larvae was (9.25) larvae/trees in Tawska site at the temperature 26.58°C and relative humidity of 20.00%. The statistical analysis indicated that there were significant differences in the numerical density of the insect depending on the dates of weekly sampling.

The difference in the infection rate and density of insect larvae depended on various factors, firstly, belongs to the temperature and humidity, with the increase in temperature, the infection rate was increased to the acceptable limit for the insect and these findings are in agreement with Faraj *et al.* (2017), who mentioned the role of temperature in increasing the rate of infection by this insect, while with decreasing the chlorophyll in the leaves the infection rate increases, where the chlorophyll provides the food to the leaves for their growth and other activities, and the second factor is site variability of pest in the forest, this result is supported by Woiwod and Hanski (1992), who reported that the differences in the density of insect depending on the location (woodland populations and non-woodland populations) also on the trend.

Table 1: The mean number of larvae of *E. melania* in different sites.

Sites	Number of larvae of *E. melania* per weeks							Average	Tempt. °C	R.H.%
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7			
Haji Ahmed	98.00a	133.30 A	241.80 a	87.00 a	17.80 a	11.10 a	5.60 a	**84.94 a**	30.17	17.14
Khoran	4.40 b	27.90 C	117.40 b	26.40 c	7.70 C	5.60 d	4.20 b	**27.65 c**	28.38	19.00
Qalasenj	7.20 b	12.90 E	19.10 e	13.00 d	7.20 C	5.60 d	3.90 b	**9.84 e**	27.34	18.00
Sartka	5.50 b	22.10 D	48.70 d	14.60 d	11.10 b	7.10 bc	4.70 ab	**16.25 d**	29.27	20.28
Tawska	4.50 b	13.00 E	19.10 e	10.40 e	7.70 C	6.20 cd	3.90 b	**9.25 f**	26.58	20.00
Tobzawa	7.90 b	44.70 B	90.10 c	30.90 b	10.70 b	7.40 b	4.30 b	**28.00 b**	29.07	17.85

Different letters in a column indicate the significant differences at $P < 0.05$/Duncan test.

Table 2: The mean number of larval nests of *E. melania* in different sites.

Sites	Average number of larval nests/tree				Average
	North	East	South	West	
Haji Ahmed	1.70 a	4.80 a	2.90 a	3.60 a	**3.25 a**
Khoran	1.20 a	3.90 ab	1.30 b	0.90 b	**1.82 c**
Qalasenj	0.50 a	2.20 b	0.80 b	0.70 b	**1.05 e**
Sartka	1.10 a	2.40 b	1.20 b	1.40 b	**1.52 d**
Tawska	1.30 a	2.10 b	0.90 b	1.90 b	**1.55 d**
Tobzawa	1.00 a	3.80 ab	4.30 a	2.20 ab	**2.82 b**

Different letters in a column indicate the significant differences at $P < 0.05$/Duncan test.

3.2 Effect of environmental condition on the larval nest population

Table 2 shows that the lowest mean value was (1.05) nests/tree in the Qlasenj site, the highest mean number of nests was (3.25) nests/tree in Haji Ahmed site and other four sides sites at the middle. According to statistical analysis, there was significant difference in the average number of nests per tree between sites.

The differences of larval nests in present study belong to various factors; the main factor is the presence of lightening resource in the Haji Ahmed site since it is near from residential area and these findings

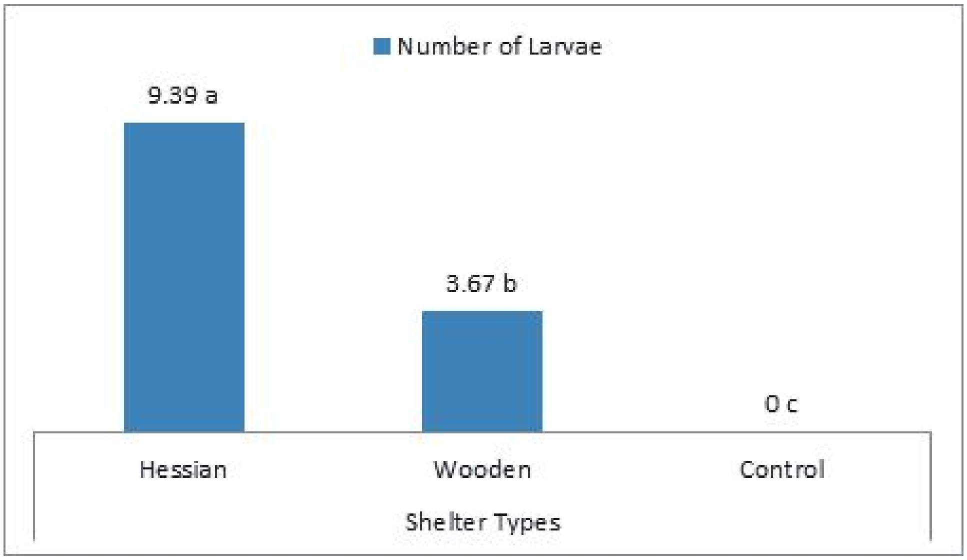

Fig. 2: The mean number of larvae under three shelter conditions at Qalasenj valley

Table 3: Average number of infested leaves at the forest condition in different tree sides.

Sites	Average number of infested leaves				Tempt. °C	R.H. %
	North	East	South	West		
Haji Ahmed	6.60 a	8.00 a	6.90 a	7.40 a	30.17	17.14
Khoran	5.40 ab	7.00 ab	4.80 b	4.70 b	28.38	19
Qalasenj	2.70c	4.70 c	3.00c	2.70c	27.34	18
Sartka	2.70c	6.30 b	5.00ab	4.70b	29.27	20.28
Tawska	6.20ab	7.60 ab	5.50ab	5.90ab	26.58	20
Tobzawa	4.40b	7.00 ab	6.90a	5.80ab	29.07	17.85
Average	**4.66 b**	**6.76 a**	**5.35 b**	**5.20 b**		

Different letters indicate the significant differences at $P < 0.05$/Duncan test.

are supported by McManus (1989), who reported that the population of insects larvae affected by light intensity.

3.3 Effect of tree directions on the larval population

Table 3 reveals that the highest mean value of infested leave by larvae of *E. melania* was (6.76) leaves/tree in the East side, the lowest mean value of infested leave was (4.66) leaves/tree in the North side. The statistical analysis indicated the significant differences between East side and other three sides (North, South and West).

The results are in agreement with Faraj *et al.* (2017), where they reported that the highest number of infestation records on the east side, which is warmer than other sides.

3.4 Effect of shelter types on the larval population

Fig. 2 displays the number of larvae in different types of shelter at Qalasenj valley. The ANOVA test revealed a significant difference in the number of larvae detected the differences between all shelters not each shelter type; with the mean value in the hessian shelter being (9.39) larvae/shelter and the mean value in the wooden shelter being (3.67) larvae/shelter, while there was no larvae recorded no larvae were recorded in control treatment.

In this study, it is revealed that, the shelters have a significant effect on collecting larval stage of the moth during the study and it is contributing in management programs, in addition, there was a significant difference between shelters and the control. The findings of the current study are in line with those reported by Sands (2017), who said that the effectiveness of hessian shelter is higher than the control. However, they did not found significant deference between hessian and wooden shelters, or between wooden shelters and the control. Liebhold *et al.* (1986) reported that hessian shelters are the best method for collecting larvae for genetic experiment.

4. Conclusion

In the present study, it is concluded that the population density of pest insect is vary according to the tree sides and locations. The maximum population of the larvae was recorded in East side of the Oak tree, and in Haji Ahmed site. The environmental factors have great impact on the infestation percentages and pest population. The hessian shelter is the best method for surveying and collecting the larvae of *E. melania* for further studies.

Acknowledgement

The authors are grateful to the reviewers for their useful comments which have led to the significant improvement on the earlier version of this paper.

References

Al-Jassany, R.F. and A.H. Raghef (2018). Population density of the peach fruit fly *Bactrocera zonata* (Diptera: Tephritidae) and some plant species that infect it. *Int. J. Agricult. Stat. Sci.,* **14(1)**, 279-285.

Al-Shareefi, M.J., J.A. Abbass and M.A.A. Abdulhussein (2020). Effect of light sources and culture systems on micro tubers production of potato (*Solanum tuberosum* L.) *in vitro*. *Int. J. Agricult. Stat. Sci.,* **16(2)**, 679-686.

Alexander, H.M., B.L. Foster, F. Ballantyne IV, C.D. Collins, J. Antonovics and R.D. Holt (2012). Metapopulations and metacommunities: combining spatial and temporal perspectives in plant ecology. *J. Ecol.,* **100**, 88-103.

Arab, A. (2003). Preliminary survey of economic insects and their insect predators on poplar trees at Euphrates region in Syria. *Arab J. Plant Protection*, **21**, 39-42.

Corp, I. (2013). *IBM SPSS statistics for windows*. Version 22.0. Armonk, NY: IBM Corp.

Dulaurent, A.M., A.J. Porte, I. van Halder, F. Vetillard, P. Menassiu and H. Jactel (2012). Hide and seek in forests: colonization by the pine processionary moth is impeded by the presence of nonhost trees. *Agricult. Forest Entomol.*, **14**, 19-27.

Faraj. F.M.H., O.K. Aref, H.K.H. Awalla and S.A. Mustafa (2017). Ecologycal studies on oak leafcutter, *Euproctis melania* Staud (Lymantriidae: Lepidoptera) in the Azmar region Governorate of Sulaymniyah. *Euphrates J. Agriculture Sci*., **9(4)**, 1136-1143.

Keval, R., H.S. Vanajakshi, S. Verma and A. Kumar (2020). Sesonal occurrence of major insect pests infesting pea (*Pisum saivum* L.) in relation with abiotic factors. *Int. J. Agricult. Stat. Sci.*, **16(1)**, 173-176.

Liebhold, A.M., J.S. Elkinton and W.E. Wallner (1986). Effect of burlap bands on between-tree movement of late-instar gypsy moth, *Lymantria dispar* (Lepidoptera : Lymantriidae). *Environ. Entomol.*, **15**, 373-379.

McManus, M.L. (1989). *Gypsy moth*, US Department of Agriculture, Forest Service.

Mohammad, S.M. and S.A. Mustafa (2011). Primary study of comman insects and their predators trees in Koysinjaq Region, Irbil. *Journal of Kirkuk University for Agricultural Sciences*, **2**, 10-22.

Mohammadi, E., A.A. Zamani, S. Goldasteh and F. Jalilian (2014). Population fluctuation and biology of oak moth, *Porthesia melania* Stgr. (Lep., Lymantriidae), **5(4)**, 375-384.

Sands, R.J. (2017). *The Population Ecology of Oak Processionary Moth.* University of Southampton.

Slomy, A.K., A.K. Jasman, F.J. Kadhim and M.R. Sahib Alsabri (2008). Study impact of some biofactors on the eggplant *Solanum melongena* L. vegetative characteristics under glass houses conditions. *Int. J. Agricult. Stat. Sci.* **15(1)**, 371-374.

Timms, L.L. and S.M. Smith (2011). Effects of gypsy moth establishment and dominance in native caterpillar communities of northern oak forests. *The Canadian Entomologist*, **143**, 479-503.

Venette, R.C., D.J. Kriticos, R.D. Magarey, F.H. Koch, R.H. Baker, S.P. Worner, N.N. Gómez Raboteaux, D.W. McKenney, E.J. Dobesberger and D. Yemshanov (2010). Pest risk maps for invasive alien species: A roadmap for improvement. *BioScience*, **60**, 349-362.

Woiwod, I. and I. Hanski (1992). Patterns of density dependence in moths and aphids. *J. Anim. Ecol.*, **61(3)**, 619-629.