International Journal of Agricultural Technology 2021Vol. 17(4):1569-1576
Available online http://www.ijat-aatsea.com
ISSN 2630-0192 (Online)

First report on the population dynamics of *Egeirotrioza ceardi* (DeBergevin) (Hemiptera: Psyllidae) on Euphratica poplar trees in Iraq

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Rabeea, A. A. (2021). First report on the population dynamics of *Egeirotrioza ceardi* (DeBergevin) (Hemiptera: Psyllidae) on Euphratica poplar trees in Iraq. International Journal of Agricultural Technology 17(4):1569-1576.

Abstract Poplar Psyllids, *Egeirotrioza ceardi* (DeBergevin) (Hemiptera: Psyllidae) is an important pest of Euphratica poplar trees in Iraq. This study was included different leaf shapes of Populus euphratica (Olivier) as cordate, reniform, oval and ovate. The nymphs moved to the leaf surface of Populus euphratica and they were begun feeding by sucking the sap from leaf tissues. Leaf tissues were surrounded the nymph to form small opened causing leaf deformation. Noteworthy all stages of growth and development of *E. ceardi* were present on the upper surface of the examined leaves. Results indicate numerical density and monthly population density of the insect on poplar trees was fluctuated during this period and reached its highest level in June (102 and 667) nymph /leaf. The proportion of nymphs on the leaf surface was associated with a gradual increase on the reniform shape of the leaf. The activity period of nymphs may be affected by environmental condition especially temperature and relative humidity (RH). Among the different shapes of *P. euphratica* leaves had the highest infection that occurred when temperature and humidity are 35 °and 19% respectively. This study will be helpful in knowing the assessment of incidence and severity of damage caused by the *E. ceardi*. So that, the proper control measures can be used in future to minimize the load of insecticides. It is firstly reported on the population dynamics of *E, ceardi* on Euphratica poplar trees in Iraq

Keywords: *Egeirotrioza ceardi*, Populus euphratica, Population density, Leaves shapes, Leaf gall

Introduction

Worldwide of around 3800 species of described Psyllids or jumping plant-lice are phloem-feeding insects inherently (Burckhardt *et al*., 2014). Plant phloem sap feeding insects like psyllids are known to be vector highly depend on host plant for feeding sheltering Life cycle of the psyllids require a completion the growth of host plant and phonological synchrony, which happen at the same time during Arctic growing season. Usually, most instars of exuviate of nymphal and other hemipterans have long enough styles to stay

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attached to their host plants (Ammar and Hall, 2012). According to the surrounding environmental conditions of varied climates, Psyllids are able to utilize a number of the host plants that have change their physiognomy, physiology and phenology. These changes may cause deformation of leaf and shoot by pitting leaf galls or rolling them in unusual shape to enclose gall structures on leaves, shoots, flowers rootlets and stems. Globally there are around 4000 species of jumping plant lice (Psylloidea, Sternorrhyncha and Hemiptera) constitute a well-defined taxonomy (Li, 2011; Ouvrard, 2017).Most species of psyllids are monophagous or oligophagous, which are limited to development on plants within a single genus or family. Some psyllid species have their different galls parts of the host plants (Hodkinson, 1984; Burckhardt, 2005) or leave a waxy lay on it (Hollis, 2004). Pased on the ecology studies, phytophagous insects are highly depend on nitrogenous compounds, that related with environmental conditions for their lives (Mattson, 1980; Bi *et al.*, 2007; Blackmer and Byrne, 1999). As known, nitrogen considers essential component of amino acids which are source for phloem-feeding insects (Mattson, 1980; Douglas, 2006). Although, mature host plants have plenty of carbohydrates, but also they have small amounts of amino acids and may micronutrients (Mattson, 1980; Douglas, 2006; Douglas, 1993). There is a little information about psyllid fauna in the eastern Mediterranean and Middle East. However, it was proposed to expose different species of psyllid to bio - control agents that are nominated for weed control (Burckhardt and Ouvrard, 2012).While the host plant was attacked by psyllid adults and nymphs, marginal leaf was rolling and galls forming due to sucking up sap by the insects. Good understanding of insect population dynamics leads to a successful control procedure, and it helps to keep pest populations below the threshold of economic damage by using insecticides. Unlike polyphagous, many psyllid species are specialized and occur only on one specific host plant. The aim of this study was providing information regarding the population dynamics of *Egeirotrioza ceardi* (De Bergevin) psyllid insect where there is lack information investigating role of the jumping plant lice insect species infesting poplar trees in Iraq. So that proper control measures can be used in future to minimize the load of insecticides. Additionally to Prediction appearance of *Egeirotrioza ceardi* on poplar trees.

Materials and methods

Study area and data collection

This study was conducted on poplar trees that are located on the rivers banks in Shirqat district (latitude 35 °49 and longitude 43 °24) that is located in

the middle of Iraq. Cultural practices were carried out according to normal practice and no pesticides were applied during the study period. Samples were taken at the middle of the month (the day 15th of each month) from April to November during 2019, and five *Populus euphratica* (Olivier) were selected randomly for that. Four different shapes leaves of *Populus euphratica* (Olivier) (reniform, cordate, ovate and oval) were taken randomly since the appearance of the adults until disappearance it from field. Sample size was 25 leaves from each shape. At laboratory the closed gall was opened using a special knife, and nymph were obtained using a needle. Numbers were counted to quantify the effect leaves shape on population density of nymphs and determine the seasonal active of insect on some leaves shapes *Populus euphratica* (Olivier) Figure 1.

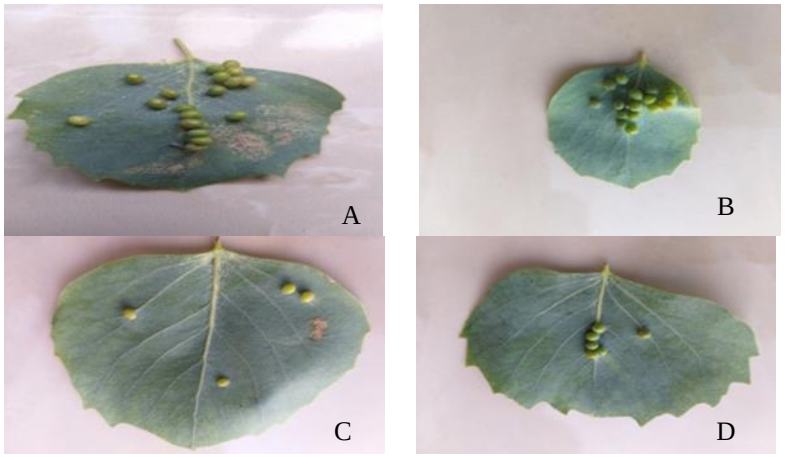

Figure 1. Formation of galls on Poplar euphratica leaves

Results

Adult psyllid females of *Egeirotrioza ceardi* (De Bergevin) laid their eggs on the new leaves. The new nymphs moved to the leaf surface of *Populus euphratica* (Olivier) after hatching, where they started feeding by sucking up the leaf sap from tissues. Leaf tissues that surrounding the nymph were started to form a small opened causing leaf deformation (Figure 1). The nymphs began to appear in the second week of April in small numbers with the different forms of the Euphrates poplar and nymph's numbers were gradually increased during the season, reaching a peak at the end of June with 102 nymphs on the reniform shape. However, nymph's numbers on the oval shape were the lowest with 11 nymphs in the second week of November. It was noticed that nymph's numbers were reduced gradually until disappeared completely from field Figure 2**.**

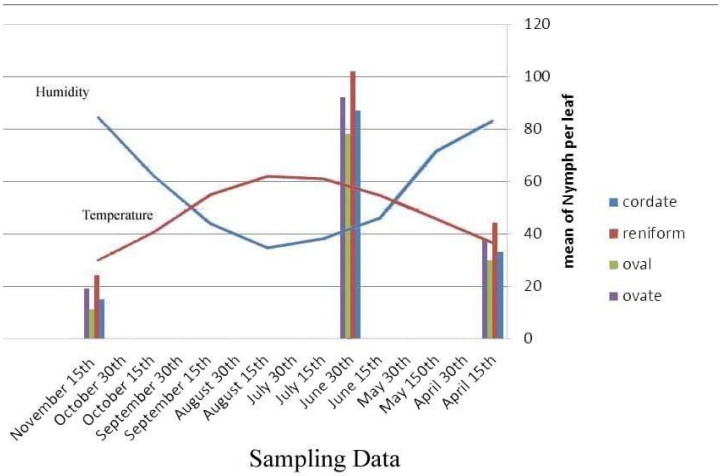

Figure 2. Population dynamics of *Egeirotrioza ceardi* on different shapes of Poplar euphratica leaves

Monthly population density

Monthly population density of *Egeirotrioza ceardi* (De Bergevin) was explained in Figure 3. The results showed that of nymph was the highest level in June with 667 nymph while was recorded the lowest level in November with 69 nymph. The activity period of the nymphs may be affected by environmental conditions especially temperature and relative humidity (RH). Among the different shapes of Poplar euphratica leaves had the highest infection that occurred when temperature and humidity are 35 °and 19% respectively.

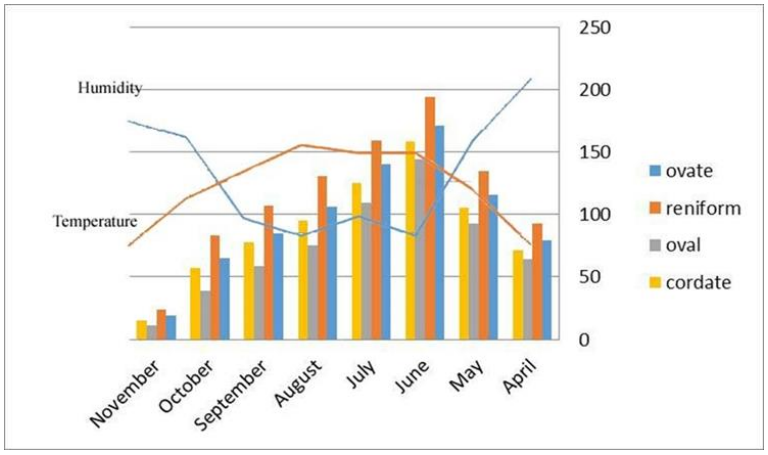

Figure 3. Monthly Population density of *Egeirotrioza ceardi* on different shapes of Poplar euphratica leaves

Discussion

Poplar euphratica trees are infected by many insects, the sap – sucking species represented another dangerous group attacking poplars. These insects attack the trees in two ways by sucking their sap (Knopf, 1972; Roberts, 1972) and by transmitting the plant disease Roberts 1972. In Iraq, it was clear that *Egeirotrioza ceardi* (De Bergevin) infested leaves of *Populus euphratica* (Olivier) (Figure 3) .The results indicate of (Figure 1) the population density of insect on poplar trees was fluctuated during the study period and continued until end month November. These results are in agreement with the present results (Brabec *et al.*, 2014) reported insects populations can show periodic fluctuations. Indeed all of the developmental stages of *Egeirotrioza ceardi* found on the upper surface of the leaves and that was related to the parameters of the its leaf (Reavey and Gaston, 1991) and first appearance infestation was in the 2rd week of April, reaching population density 30, 33, 38 and 44 nymph /leaf respectively, on poplar euphratica leaves with temperature (17.81) and relative humidity (49.59 %) In general, aphids and psyllids feed directly from the phloem, and there is no true nutritive tissue was expected to develop (Bronner, 1992; Álvarez *et al.*, 2009; Álvarez, 2011; Kurzfeld-Zexer *et al.*, 2015). then increased population density quickly , reached its peak 78,87, 92 and 102 nymph leaf respectively, at the end of June on poplar euphratica leaves with temperature (35.47) and relative humidity (19.57 %). These results are comparable to the work of (Malaquias *et al.*, 2015) reported on Prediction of insects peaks is an important tool for ecological studies, and can also be useful for field crops and then receded population density unite the 2rd week of November, reached it 11, 15 , 19 and 24 nymph /leaf respectively on poplar euphratica leaves. A number of insects have a strategy of leaving the host plant when there is no enough feed to an alternative resource that is considered nutritionally rich (Simpson and Simpson, 1990; Waldbauer and Friedman, 1991). The difference in the infestation of on different shapes leaves and differences in the population density Because of difference in the components of plants sap in the leaf compared to species other Similar results with those reported by (Banks and Macculary, 1964; Müeller, 1966; Younis *et al.*, 1985) attributed to of the difference in degree of the infestation and population density to the difference in mineral components in the varieties. We observed nymph's number increased (Figure 1, 2) on the shapes of the leaves and special on shape reniform. Also the population dynamics increased on with high temperatures. The population dynamics of insects can be disturbed by seasonal changes in climate conditions, physiological characteristics of the host-plant, agricultural methods and administration practices (Sequeira and Dixon, 1997). Some galling-insects such as psyllids, aphids and their relatives cause limited changes

in host tissue that is called a nutritive-like layer (Álvarez *et al.,* 2009; Oliveira and Isaias, 2010; Carneiro and Isaias, 2015). Although, there was a strong relationship between the presence of nymphs and leaf shape. The distribution of developmental stages of the *Egeirotrioza ceardi* is correlated to the leaf shape and leaf composition. Through this strategic behavior, the first nymphs instar that form galls on the leaf ensures a better evolution for survive. Finally, we can conclude that the results obtained in this study are helpful in understanding the population dynamics of *Egeirotrioza ceardi*. Also showed differences between infestation on different leaf shapes by nymphs, reniform shape was more infested than oval shape were the lowest. Additionally to Prediction appearance of *Egeirotrioza ceardi* on poplar trees. So that proper control measures can be used in future to minimize the load of insecticides.

Acknowledgements

The author gratefully acknowledges all from helped me to for revising this manuscript.

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(Received: 23 April 2021, accepted: 30 June 2021)