

## **SOME BIOLOGICAL AND ECOLOGICAL STUDIES ON POPLAR BUD PSYLLID *Egeirotrioza justa* BURK & LAUTE IN MOSUL REGION**

Ismail N. Almaroof

Rabee A. Abdullah

Forestry Dept. /Coll. of Agric. and Forestry /Mosul University-Iraq

### **ABSTRACT**

This study was conducted on poplar bud psyllid in Ninevah during the years 2004 and 2005. For the first time *Egeirotrioza justa* Burk & Laute has been studied and recorded in Iraq. The poplar bud psyllid *Egeirotrioza justa* Burck & Laute attacks *Populus euphratica* trees and as a result of feeding by newly nymphs, small galls are formed on the twig tissues near the buds. The adults appeared on the trees during May to July. Mating usually occurred during the first week of May, mean periods of pre – oviposition, oviposition and post – oviposition ( $1.8 \pm 0.74$ ,  $5.30 \pm 0.57$ , and  $2.00 \pm 0.49$ ) days, respectively. Egg laying took place singly on the leaf petioles, and on both services and margins of mature as well as the tender young leaves and twigs. The average number of eggs laid per female was 21.80, hatching of eggs was 80%, and sex ratio was 1:2. This species hibernates as a second nymphal instar. This insect has one generation per year. The study indicated that the south direction of a tree from south side of the forest and at a height more than 3m for trees were represented high average number of eggs nymphs and adults (100.00, 64.48, and 57.40), respectively.

### **INTRODUCTION**

Poplar wood is used locally for many purposes, mainly as constructional timber in round for village handles and agricultural implements. They are also utilized to a small extent in match and chipboard industries. Besides the boring insects, the sap – sucking species represented another dangerous group attacking poplars. These insect invade the trees either directly by sucking their sap (Knopf, 1972 and Roberts, 1972) or indirectly by transmitting the plant diseases and left the trees to be weak that they can not withstand the attack of the more dangerous borers like *Menalophila picta*, and *Capnodis* sp. (Raeder – Roitzsch and Khatat 1963). Singh (1989) found that *Apsylla cistollata* causes mango galls in India, the buds change in to hard conical galls in side of which psyllid nymphs numbering to 16 per gall develop in to adults. Konova (1993) studied *Trioza brassicae* which infested spring onions in Bulgaria, he reported that the nymphs fed on the leaves. Roberts (1972) in Iraq observed that *Egeirotrioza ceardi* was infested leaves of *Populus euphratica*. Because of the inadequate information available concerning the role of most of the sap – sucking insect species infesting poplar trees in Iraq, the present investigation conducted to shed light on the biology and ecology of poplar bud psyllid *Egeirotrioza justa* Burck & laute.

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## MATERIALS AND METHODS

The present study was carried out at Ninevah forest plantation in Mosul, during the period from May 2004 to June 2005, and comprised of two parts:

**First:** Biological studies: The biology of *Egeirotrioza justa*\* was investigated by both field observation and laboratory rearing techniques. During late spring, the infested twigs carrying almost mature nymphs were collected from the field and placed in glass tubes filled with water which were covered with glass chimney. These twigs were carefully retained under laboratory condition for the purpose of collecting newly emerged adults. For each biological processes at least 10 pairs of adults was singly confined in glass chimney covered with muslin and held by rubber bands. Each pair of psyllids was supplied with a fresh and clean poplar twig preserved in a glass tube filled with water, the twig was changed daily and examined for egg-deposition. The infested twig carrying eggs was transferred to similar cages where hatching, feeding and behaviours of the subsequent stages were studied. Collaterally, all the biological processes consisting of mating, oviposition, hatching, moulting and emergence were observed and described. By means of approximately the same rearing method, the hibernation, feeding habits, host plants and duration of different stages was recorded. In this experiment, the newly emerged adults were confined for one-year euphratic poplar transplant growing in clay pots and captured by wooden cages measure 23×30×45 cm. two sides of the cage were framed with fine wire net and other sides including the top being framed by glass, but the bottom was made of wood. The plants checked and the data recorded daily.

**Second:** Ecological studies: Population density of *Egeirotrioza justa* was studied by collecting samples, each of 10 poplar twigs, weekly taken from Ninevah plantation, sampling was restricted to the top portion of the branches (20 – 25 cm.) at a height of about more than 3 m. and less than 3 m. from the ground level. And from the four directions (North, South, East and West) of the tree and the plantation. Immediately after picking, the twigs were packed in ventilated polyethylene bags and transferred to the laboratory where the twigs were examined either by using a hand lenses or a binocular – microscope for the purpose of recording the different stages of the psyllid.

**Statistical analyses and data standardization:** Data collected of the different insect characters conformed to the specification commonly adapted in entomological work (Knopf, 1972 and Roberts, 1972), the sufficiency of data was also insured as far as possible to make valid conclusion. Data were statically analyzed by using the Completely Randomized design and Duncan's new multiple ranges (Dawod and Zeki, 1990).

## RESULTS & DISCUSSION

The result of this study showed that *Egeirotrioza justa* was recorded for the first time in Iraq. Adults of these insects appear on *Populus euphratica* trees during April or May. This appearance of the psyllid depends upon the environmental factors, temperature and relative humidity. During season 2004, the first appearance of adult was recorded on 7<sup>th</sup> May, while in 2005 it was observed on 30<sup>th</sup> April. During the last nymphal stadium, the daily average and 57% for 2005 consequently. We additionally say that the appearance of *Ege. justa* adults coincided with the leaf-bud development and usually take

\*Identified through the Natural History Museum, London, England (ENQ 2004/795)

place one month approximately after bud opening, this insect has one generation per year.

### Biological processes:

**Egg stage:** the egg shape of *Ege. justa* is conical with narrow from anterior and round posteriorly with a small appendicle on ventral surface, and measured (0.30mm. × 0.10 mm) (table 1). The newly laid egg to be milky white in colour with transparent ringshape portion at the posterior end. The colour of egg change to yellowish accompanied by the appearance of the small orange spot on the posterior end, the viability of eggs was 80%. Description in this study in agreement with Dreistadt and et. al.(1999). Under field conditions, the incubation period lasted for 8 to 10 days at average temperature of 26.9°C and 49.5% relative humidity (table 2). Burckhardt (1994) observed that the incubation period of the genus *Trioza* under field condition range 9 – 15 days.

Table (1): Dimensions in mm of different stage of *Ege. Justa*.

| Stage        |                        | Length (mm.) |                   | Width (mm.) |                   | Wing expansion |                   |
|--------------|------------------------|--------------|-------------------|-------------|-------------------|----------------|-------------------|
|              |                        | Range        | Average<br>± S.D. | Range       | Average<br>± S.D. | Range          | Average<br>± S.D. |
| Egg          |                        | 0.20–0.40    | 0.30±0.14         | 0.20–0.50   | 0.10±0.01         |                |                   |
| Nymphs       | 1 <sup>st</sup> instar | 0.43–0.44    | 0.44±0.03         | 0.21–0.23   | 0.22±0.03         |                |                   |
|              | 2 <sup>nd</sup> instar | 0.71– 0.73   | 0.72±0.01         | 0.31–0.33   | 0.32±0.01         |                |                   |
|              | 3 <sup>rd</sup> instar | 1.25–1.45    | 1.35±0.01         | 0.37–0.39   | 0.38±0.01         |                |                   |
|              | 4 <sup>th</sup> instar | 2.20–3.00    | 2.10±0.14         | 0.64–0.66   | 0.65±0.01         |                |                   |
| Adult male   |                        | 1.11–2.15    | 1.80±0.07         |             |                   | 4.50 – 4.70    | 4.6± 0.14         |
| Adult female |                        | 1.80–2.90    | 2.30±0.07         |             |                   | 5.00 – 5.80    | 5.4 ± 0.42        |

(averages based on 30 observations).

Table (2): Duration of different stage of *Egeirotrioza justa* under field conditions.

| stage        |            | Duration of individuals(days) |         |      |          |        |
|--------------|------------|-------------------------------|---------|------|----------|--------|
|              |            | Min – Max                     | Average | S.D. | Temp. °C | R.H. % |
| Egg          |            | 8 – 10                        | 9.03    | 1.41 | 26.90    | 49.50  |
| Nymph        | 1st instar | 129 – 138                     | 134.00  | 5.65 | 28.40    | 30.80  |
|              | 2nd instar | 146 – 155                     | 151.01  | 5.65 | 20.90    | 55.00  |
|              | 3rd instar | 30 – 32                       | 31.02   | 1.42 | 18.70    | 70.50  |
|              | 4th instar | 29 – 31                       | 30.04   | 1.07 | 20.80    | 61.00  |
| Adult male   |            | 4 – 8                         | 5.30    | 1.33 | 25.40    | 38.10  |
| Adult female |            | 5 – 11                        | 8.60    | 1.50 | 26.00    | 37.50  |

### Nymphal stage:

**First nymphal instar:** The newly hatched nymph is oval in shape and creamy white, with red eyes and yellowish white antenna, with sharply elongated distal segment. The abdomen is creamy white with a light along spot on the dorsal surface of the 3<sup>rd</sup> abdominal segment. First nymphal instar average

measurement  $0.44\pm0.03$ mm (length)  $0.22\pm0.03$  mm (width). Under field conditions, the duration period of this instar lasted for 134.0 days (table 2).

**Second nymphal instar:** During this instar the nymph posses rounded shape with yellowish white color in general, eyes are red with yellowish antenna. There is also a white waxy filament at the apical segment of the abdomen was observed. The average length of the second instar is  $0.72\pm0.01$  mm. while the average width was  $0.32\pm0.01$  mm under field condition, the duration of the second nymphal instar was (146 – 155 days), which was the longest duration period among all other stadia. Thus, it can be stated that this pest hibernates as second nymphal instar inside the small galls on the distal parts of *Populus euphratica* twigs from the beginning of November to early March.

**Third nymphal instar:** nymph shape of this instar was oval in general and somewhat swollen, the dorsal surface is concave, while the ventral is convex. The wing – buds are formed during this stadium and can be seen as yellowish small pads. This in agreement with Gill (1998) for the nymphs of genus Bluegun. This is light yellowish having an average (length  $1.35\pm0.01$  mm. width  $0.38\pm0.01$  mm.) with duration of 31.02 days.

**Fourth nymphal instar:** The general form of the fourth nymphal instar was similar to the third, with light green head, yellowish white antenna, greensh blue thorax and the wing – bud turn yellowish. The abdomen is greenish and obvious segmentation. This result was in agreement with Singleton et al. (1970), for the further instar of the family Trioziidae. The whit waxy filaments densely cover the dorsal surface of the body. this stage measures  $2.10\pm0.14$  mm. in length and  $0.65\pm0.01$  mm. in width (Table 1). The fourth stadium take 30.04 days in average (Table 2).

**Emergence:** During the first weak of May, minute openings could be noticed in the mature galls containing fourth nymphal instar. These exit holes gradually increase in diameter to approach of 3 mm. just before emergence. The emergence of this psyllid may either occur inside or outside the gall near its opening. The newly emerged adult stay for about 15 minutes on the branch during which the body's colour changes from yellowish orange to green after that, the psyllid is ready to fly within a few minutes later.

**The adult stage:** generally, the adult are greenish in colure, the females are bright white the males are greenish white. The colours of head, antenna, thorax and legs is yellowish to green. The eyes are red, the wings are glassy white, the abdomen is light green to blue in colour. The apical segment of the abdomen of male is elongated to be tubular, while that of the female is swollen and was oval. The average length of the male is 1.80 mm. while that of the female 2.30 mm. In agreement with who reported Buss (2003). The sex ratio was 1 : 2.

**Mating:** Mating usually occurred during May after the appearances of adults from their galls. Young shoots at  $25^{\circ}\text{C}$  and 50% R.H. commonly to be the favorable mating place. The male first stands beside the females left side. It then puts its front legs over the thorax of the female and gently strikes the female head and thorax with its antenna and fore legs. Then the male lifts the apical ends of the female wings by its abdomen and inserts its parameter in to the female genital opening. The entire mating process takes, on the average, 5 minutes.

**Oviposition:** The female psyllid laid the eggs singly after about 12 hours from mating on the leaf petioles, both surface and margins of the mature as well as the tender young leaves and twigs, scattered randomly on the leaf and started in the first week of May. The description of eggs in agreement with Hollis and Martin, Dreistadt and Dahlsten (1997, 2001). The female take 2.4 minutes average for laying one egg. Under field condition, with an average temperature of 24.5°C and 51.8% relative humidity, the average number of eggs per female were 21.80 in 5.30 days. Under field condition with an average temperature of 26.5°C and 49% relative humidity, the average longevity of males and females was 5.30 and 8.60 days, respectively.

**Ecological study:** During May to July, the average number of egg per 10 twigs was found to be 91.8 egg, under field condition, the oviposition period lasted about two months. A small number of eggs were seen during the last week of April and increased to a maximum at the beginning of June, then the number decreased at the first week of July, after which no eggs were laid, the mean periods of pre-oviposition, oviposition and post – oviposition were ( $1.8 \pm 0.74$ ,  $5.30 \pm 0.75$  and  $2.00 \pm 0.49$ ) days, respectively. Statistical analysis (Table 3) showed that there were significant differences between the direction, highest

Table (3): Effect of interaction between (height of a tree  $\times$  direction of a tree  $\times$  forest direction) on the average number of eggs, nymphs and adult *Ege. justa* under field conditions

| High of tree   | Direction of tree | Direction of forest | Average number of eggs | Average number of nymphs | Average number on adults |
|----------------|-------------------|---------------------|------------------------|--------------------------|--------------------------|
| More than 3 m. | North             | North               | 90.50 d                | 61.35 m                  | 52.97 ijkl               |
|                |                   | South               | 90.00 d                | 64.40 a                  | 53.18 hijk               |
|                |                   | East                | 90.00 d                | 62.60 f                  | 53.48 ghi                |
|                |                   | West                | 90.10 d                | 61.73 kl                 | 53.20 hijk               |
|                | South             | North               | 92.00 c                | 61.45 m                  | 55.10 c                  |
|                |                   | South               | 100.00 a               | 64.48 a                  | 57.40 a                  |
|                |                   | East                | 93.25 c                | 62.85 e                  | 57.01 a                  |
|                |                   | West                | 92.25 c                | 61.65 l                  | 54.90 c                  |
|                | East              | North               | 95.75 b                | 61.10 o                  | 53.40 ghij               |
|                |                   | South               | 96.75 b                | 63.83 b                  | 55.90 b                  |
|                |                   | East                | 96.76 b                | 62.15 h                  | 55.92 b                  |
|                |                   | West                | 96.74 b                | 61.93 ij                 | 54.80 cd                 |
|                | West              | North               | 90.75 d                | 61.15 no                 | 52.50lmno                |
|                |                   | South               | 91.25 c                | 62.58 g                  | 52.90jklm                |
|                |                   | East                | 90.50 d                | 61.90 jk                 | 52.80klmn                |
|                |                   | West                | 91.00 d                | 62.30 d                  | 52.31 no                 |
| Less than 3 m. | North             | North               | 81.75 e                | 61.35 m                  | 52.08 op                 |
|                |                   | South               | 79.75 ef               | 63.60 c                  | 52.90jklm                |
|                |                   | East                | 79.74 ef               | 62.10 hi                 | 52.70klmn                |
|                |                   | West                | 79.76 ef               | 61.10 o                  | 52.40 mno                |
|                | South             | North               | 78.75 f                | 61.03 op                 | 53.73 fg                 |
|                |                   | South               | 78.76 f                | 63.65 c                  | 55.10 c                  |
|                |                   | East                | 78.74 f                | 61.80 jkl                | 54.40 de                 |
|                |                   | West                | 78.76 f                | 61.30 mn                 | 53.40 ghij               |
|                | East              | North               | 78.50 f                | 61.35 m                  | 53.00 l                  |
|                |                   | South               | 79.00 f                | 63.00 e                  | 54.20 e                  |

|  |      |       |         |           |          |
|--|------|-------|---------|-----------|----------|
|  |      | East  | 79.10 f | 62.10 h   | 54.00 e  |
|  |      | West  | 79.20 f | 60.90 p   | 53.50 gh |
|  | West | North | 79.00 f | 60.65 q   | 51.37 p  |
|  |      | South | 79.20 f | 62.35 h   | 52.16 op |
|  |      | East  | 79.10 f | 61.80 jkl | 52.14 op |
|  |      | West  | 79.30 f | 62.60 f   | 51.74 p  |

Average number followed by the same letters are not significantly different within a colum at  $p \leq 0.05$  for the forest and tree on the characteristic under study. South direction of tree and forest at the highest more than 3 m for tree were represented high average number of eggs ( 100.00 egg), but the east direction of tree and north direction of forest at the highest under 3 m. represented a lower average number (78.50 egg), the result indicated that the female preferd the south direction of tree for laying eggs. According to the average number of nymphs, the statistical analysis showed that significant difference among the direction, of forest and tree highest on the characteristic under study. South direction of trees and forest gave (64.48 nymph) at the highest more than 3 m for trees, while the lower average number (60.65 nymph) was represented at the west direction of the tree and north direction of forest at the hight under 3 m. of tree (Table 3). This study indicates that there were a significant differences between the average number of adult on the characteristic for mention. Its also recorded that the south direction of tree and forest were represented high average number of adult (57.40) at the hight more than 3 m. of tree (Table 3), but the west direction of the trees, north direction of the forest at highest under 3 m. of tree were represented a lower average number (51.37 adults). Finally these result indicate that the *Eg. Justa* insect prefers the south direction of the tree and more worm forest condition.

### دراسات حياتية وبيئية في بسليد تورم براعم القوغ *Egeirotrioza justa* Burk & Laute منطقة الموصل

ربيع عبد عبدالله

اسماعيل نجم المعروف

كلية الزراعة والغابات/جامعة الموصل

#### الخلاصة

نفذت الدراسة في غابة نينوى خلال الموسمين ٢٠٠٤ و ٢٠٠٥. تصيب هذه الحشرة اشجار القوغ الفراتي. نتيجة لتغذية الحورية الحديثة الفقس يتكون تورم في نسيج الفرع بالقرب من قاعدة برعم، يحدث التزاوج خلال الاسبوع الاول من ايار. بلغ متوسط فترة ما قبل وضع البيض، وضع البيض وما بعد وضع البيض (٠.٧٤±١.٨ و ٠.٥٧±٥.٣٠ و ٠.٤٩±٢.٠٠) يوما على التوالي. تضع الانثى البيض بشكل مفرد وعلى كافة اجزاء الاوراق الحديثة التكوين والناضجة. بلغ متوسط عدد البيض للانثى الواحدة ٢١.٨٠. بلغت نسبة الفقس ٨٠% وبلغت النسبة الجنسية ٢:١. تقضي الحشرة سباتها الشتوي على هيئة حوريات في العمر الثاني. وجد ان هذا البسليد له جيل واحد في السنة. تشير الدراسة البيئية الى ان متوسط عدد البيض، والحوريات والبالغات لهذا النوع من البسليد كان اكثر كثافة في التداخل بين الواجهة الجنوبية للشجرة والواجهة الجنوبية للغابة والارتفاع العلوي للشجرة، اذ بلغ متوسط اعدادها (١٠٠.٠٠ و ٦٤.٤٨ و ٥٧.٤٠) على التوالي.

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