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MORPHOLOGY OF FOLIAR GALLS ON *TREWIA NUDIFLORA* INDUCED BY *TRIOZA FLETCHERI* CRAWFORD WITH A COMMENT ON LIFE CYCLE OF THE PSYLLID

Om Datta*[1], Dr. Sunil Tomar[2] and Dr. S. C. Dhiman[3]

[1,3]Department of Zoology, M.S. College, Saharanpur.

[2]Department of Zoology, D.A.V. College, Muzaffarnagar.

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***Corresponding Author**
Om Datta
Department of Zoology, M.S. College, Saharanpur.

ABSTRACT

The Psyllid, *Trioza fletcheri*, is the major pest of *Trewia nudiflora.* which damages the leaves both qualitatively as well as quantitatively. 50- 70 % damage occurs to the foliage of the plant during peak period (August-September and October November). Galls are pouch like, formed on dorsal side of the leaf, initiated from the ventral side of the leaf by the feeding of 1st instar nymph. Gall measures from 0.924 to 2.125mm in length and 1.142 to 2.848 mm in width. Color changes from greenish to brown. Five nymphal instars have been observed. 26-31 days duration of life cycle is observed.

KEYWORDS: *Trioza fletcheri*, *Trewia nudiflora*, Gall morphology.

INTRODUCTION

Psyllids belong to order Hemiptera and comprise a group of about 3000 species (Hodkinson, 2009) along with 6 families (Burckhardt, 2009). They are phytophagous sap-sucking insects, majority are narrowly host-specific and predominantly associated with perennial dicotyledonous angiosperms (Hodkinson, 2009). Economically these are considered as pest on one side both directly by sap sucking resulting in galling, leaf curling and sooty mould development and indirectly by acting as vector of virus like diseases (Aubert, 1987). *Trioza fletcheri* (Hemiptera: Psyllidae) is the most important gall forming insect on the leaves of *Trewia nudiflora.* It is a serious pest causing 50-70% crop loss during peak period (August). Various authors carried research work on gallinaceous insects time to time and major contributors of this field are Albert Susy (2011), Imran (2012), Chander (2015) and

Mukherjee *et al*. (2017). In the present paper an endeavor has been made to discuss morphology of the foliar galls and biology of the *Trioza fletcheri* on *Trewia nudiflora.*

MATERIALS AND METHODS

For morphological studies gall infested plant leaves were collected from Chamgadar Tapu Haridwar and Satyanarayn forest range, Uttrakhand, where the *Trewia nudiflora* trees are in good number. Gall infested leaves were kept in plastic bags and placed in laboratory at optimum temperature for the emergence of adult. Photographs of the infected leaf galls and dissected galls with nymphs were taken by Nikon digital camera and stereoscopic zoom microscope respectively. The eggs, and different stages of nymphs were collected by dissecting the galls and kept in F.A.A. fixative in small Eppendorp tubes for overnight. Permanent slides of eggs and all the nymphal stages were prepared by dehydrating them in alcohol series (30% alcohol, 50% alcohol, 70% alcohol, 90% alcohol, 100% alcohol, Pure Xylene) and mounted on Blue star glass slide in Dpx Canada Balsum. Photographs of different stages of nymphs were taken under Dewinter stereoscopic zoom microscope.

RESULTS AND DISCUSSION

Morphology of Galled Leaf:- The pouch like galls are formed on the dorsal surfaces of leaves and the opening of the gall is located on the ventral surface, from where the final stage insect comes out. The newly hatched nymph was observed to feed on the soft area of the tender leaves from the ventral surface. The nymph feeds on the affected area in circular way, keeps on releasing the gall inducing chemicals. In the beginning the size of opening of gall is larger, which becomes smaller and smaller as the gall grows up, and finally closed. Growth o the gall occurs on dorsal leaf surface. The galls were observed from single to many in number on the leaves. The galls were mainly formed on dorsal surface of *T. nudiflora* leaf. When the gall infestation is heavy, the leaf lamina has been reduced to single agglomerated mass of cells. The leaves are crumbled and deformed due to increased number of galls.

Size of the gall is observed 0.924 to 2.125mm in length and 1.142 to 2.848 mm in width. The size of gall cavity extends from 0.596 mm to 1.591 mm (width), length is from 0.539 to 2.807mm and thickness of the gall wall varies from 0.314to 1.04mm. Size of agglomerated mass extends from 1.5 to 3 inches in length and 2 to 2.5 inches in width having 5 to10 and 10 to 20 galls fused with each other. Initially after gall formation mouth of gall closes, but just before the formation of adult, 5th instar nymph of *T. fletcheri* comes out from the gall through

lacerated opening develops on the ventral side of the gall, through which 5th instar nymph comes out later on. The 5th instar comes out on the leaf surface for molting into adult.

The initial slight color change was observed on the areas where eggs were laid down. Slowly the size of affected area is increased, and form a small outgrowth on the dorsal surface, developing into a dome shaped structure. Valuable information on the different gall forming psyllids and their morphogenesis has been studied in India by various scientists Bodlah Imran (2012), Jagdish Chander (2015), Albert Susy (2011), Sunita *et al* (2017).

Morphology of the Gall Insect 1. Eggs: - The eggs of *T. fletcheri* Crawford are laid on the ventral side of the soft leaf near mid rib, petiole, and upper soft stem having the hair like structures called trichomes. The eggs are microscopic, somewhat elongated and yellowish in color. The length of eggs is 0.3mm to 0.32mm and width 0.1mm to 0.14 mm. It has a curved caudal process or filament and a micropiler process on lateral side of cephalic end and becomes narrower gradually towards caudal end. Each egg is glued to the leaf surface by the female with the help of a glue secreted by accessory gland of the female reproductive organ. Initially, the laid egg is yellowish which gradually changes color during incubation period and finally becomes greenish yellow prior to emergence of the first instar nymph. Reddish eye of the nymph are clearly visible through the chorion of the eggs. The incubation period varies from 5-7 days depending upon temperature and relative humidity.

Figure 1

Figure 2

Figure 3

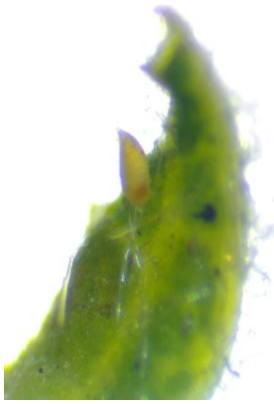

Figure 4

Figure 5

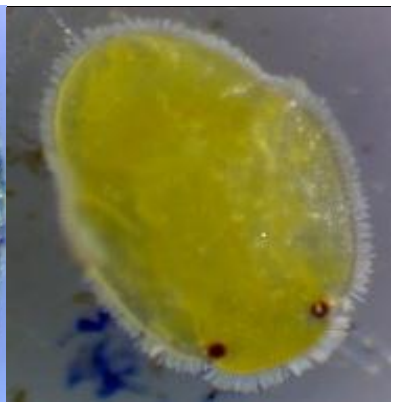

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Fig. (1) Gall induction on leaf (2) Infected leaf with galls (3) Agglutinus Gall Mass on leaf. (4) Egg (5) 1st instar nymph (6) Second instar nymph (7) 3rd Instar nymph inside the gall (8) 4th Instar Nymph (9) Final Instar nymph (10) Adult Female (11) Adult Male.

2. Nymph: The newly emerged nymphs start to feed on the ventral surface of the leaf and induce gall formation. They produce a chemical stimulus on the adaxial and abaxial side of the leaf. The nymph resides within the gall till the final stage. The gall provides special type of habitat for nymphs, where it gets its nutrition. The gall also provides protection from the natural enemies' *i.e.* predators and parasitoids. The body of nymph is oval and yellow in color. Around the whole body hair like white structure are found. There are five nymphal instars and duration of each nymphal instar is observed as 3.5, 4.0, 4, 4.5 and 5 days respectively. This duration varies upon temperature and R.H. of the environment. Entire life cycle lasts for 26-31 days. It is worthy to note that whitish honey dew secretion drops are also found within the gall. Sometimes the honey dew invites the development of fungus due to which in few cases instars dies.

3. Adult: The newly emerged adults are very active and green in color. Two pairs of transparent wings are present. Fore wing is larger than the hind wing. Body is divided in to head thorax and abdomen. In female, the ovipositor turns upward. In male the posterior end of abdomen is pointed.

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