Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(3): 261-263

Received: 10-03-2017
Accepted: 11-04-2017

Sunita Mukherjee
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Dipti Kumari
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Jitendra Singh
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Lokesh G
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Ajit Sinha
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Correspondence
Sunita Mukherjee
Central Tasar Research and Training Institute, Central Silk Board, Piska Nagri, Ranchi, Jharkhand, India

Morphology of gall insect, *Trioza fletcheri* minor Crawford and gall infected leaves of tasar food plants

Sunita Mukherjee, Dipti Kumari, Jitendra Singh, Lokesh G and Ajit Sinha

Abstract
The Psyllid, *Trioza fletcheri* minor is the major pest of primary tasar food plants viz., *Terminalia arjuna* Bedd and *Terminalia tomentosa* W&A which causes qualitative and quantitative loss of leaves. It's a serious pest causing 40- 50 % crop loss during peak period (August-September). The leaves of food plants bearing galls were collected from infested plants grown in the Field Laboratory of Central Tasar Research and Training Institute, Nagri, Ranchi during year 2016. They were kept in plastic bags and placed in laboratory in ambient temperature for the emergence of adult gall flies. The galls on the leaves were observed under dissecting microscope. Photographs of nymph, adult and wing of gall fly were taken under binocular microscope (Carl Zeiss Microscope). Under this study we assessed the morphology of gall viz., egg, nymph and adult and morphology of gall infested leaves of *T. arjuna* and *T. tomentosa*. Minimize the crop loss due to gall insect we can adapt the IPM package for higher crop yield and minimum environmental pollution.

Keywords: *Trioza fletcheri minor,* morphology, insect, host plant

1. Introduction
Trioza fletcheri minor (Hemiptera: Psyllidae) is the most important gall forming insect on the leaves of primary tasar food plants [1]. Lot of work has been done on the seasonal abundance of Psyllids [2] and control measures. It is a serious pest causing 40-50% crop loss during peak period (August) in *T. arjuna* and *T. t*omentosa, the primary food plants of tasar silkworm [3]. Al most all the tender and medium leaves are affected by this insect making the leaves unsuitable for tasar silkworm rearing. Severe infestation of gall in *T. arjuna* in Haryana nurseries and he has also emphasized its negative impact in tasar silk industry [4]. The insect activates perturbation and growth mechanisms alter the differentiation processes in the host plants, modifying the plant architecture to its advantage [5]. The psyllid appears during the month March on fresh leaves of *T. arjuna* and *T. tomentosa.* Their population remains till mid November mid- December or until the beginning of leaf fall, however, the peak infestation period is from July to September. A major part of the life cycle of gall insect is closely associated with the formation of gall build in which the insect completes its development. Various nymphal stages live in gall which gets larger in size with subsequent developing instars. Galls initially are greenish but later on get brownish in coloration. The present study was undertaken to study the morphology of *Trioza fletcheri* minor (adult and nymph) and gall infested leaves of *T. arjuna* and *T. tomentosa*.

2. Materials and methods
An experiment was conducted in the Field Laboratory of Central Tasar Research and Training Institute, Nagri, Ranchi during year 2016 for morphological studies gall infested tasar food plants leaves and gall (Nymph and Adults). Gall infested leaves were kept in plastic bags and placed in laboratory in ambient temperature for the emergence of adult gall flies. Upon emergence adults and different nymphal instars were collected by dissecting the galls and kept in 75% ethyl alcohol in small glass vials for morphological studies. Morphological terminology for gall insects follows mostly [6, 7]. On the other hand the alterations occurred following the infestation of gall fly on the leaves of *T. arjuna* and *T. tomentosa* were also studied. The galls on the leaves were observed under dissecting microscope.

Photographs of nymph, adult and wing of gall fly were taken under binocular microscope (Carl Zeiss Microscope).

3. Results and Discussion

3.1 Morphology gall insect:

3.1.1 Egg: Eggs were laid singly or in group at more than one place on the leaf surface. The eggs appear oblong, narrow and acute at one end and creamy white in colour later turn to black (Fig: 1- E).

3.1.2 Nymph: Body oval, antennae ventral, apparently five and seven segmented in third and fourth stages and in fifth stage it is ten segmented, bearing four sensorial, four apical segments imbricate and darker, terminal segments with two minute apical spines. Legs small, sparsely bearing small, simple setae, femora not reaching margin of body (Fig: 1- F-H).

3.1.3 Adult: Body light brown, head narrower than vertex. (Fig1: -I & J)Antennae longer than width of head, ten segmented (Fig: 1-K). Vertex slightly broader, ocellar and lateral regions near the eyes swollen. Thorax arched sparsely pubescent, legs slender, pubescent and armed with minute points, winged and with bulging eyes. Abdomen broad, longer than thorax, sparsely pubescent and also beset with minute points. Male and female genital smaller than abdomen, ovipositor acutely pointed in female (Fig: 1-M&N). Male and female flies can be differentiated by the gentalia.

Forewings small hyaline longer than wider, sub-acute at apex, veins R(Radius), M (Median), Cu (Cubitus) arising from the same point, basal vein longer than Cu, Radius short, shorter than Cubitus, Marginal cells sub equal, first marginal longer and broader than second, M meeting just before apex; veins armed with microscopic setae (Fig: 1- L).

3.2 Morphology of galled leaf

Galls formed on both abaxial and adaxial surfaces of leaves but they were abundant on abaxial surface (Fig: 1-A & C). The first visible change was a slight decolourisation on areas where eggs were deposited. Gradually the decolorized area increased in size and formed a small outgrowth on an adaxial side where the gall appeared enlarged and placed in a depression or a small spindle shaped pit. Dark brown periderm formed at the rim of the opening (ostiole). The colour of the periderm was slightly darker in Arjun (Fig: 1-B) as compare to Asan (Fig: 1- D). At initial stage the gall grows towards the abaxial side of the leaf but later on its growth is towards the adaxial side. A little bulge appears on the adaxial side of the leaf which further develops into a dome shaped structure.

The galls were mainly formed on lateral veins of *T. arjuna* leaf where as in *T. tomentosa* they were usually formed in between the space of lateral veins. When the leaves are heavily infested with galls, the lamina has been reduced to a single agglomerate mass of cells. With increased number of galls, the leaves appear crumbled and deformed.

Among the insects various hemipteran are known to be capable of inducing galls [8, 9, 10, 11, 12]. In the Psyllidae, there are many species of gall inducer which attack primary leaves of dicotyledonsm [13]. Valuable information on the different galls and their morphogenesis was studied in India by renowned scientist [14]. Morphological, anatomical and biochemical studies on the foliar galls of *Alstonia scholaris* (Apocynaceae) induced by *Pauropsylla tuberculata* (Psyllidae) was studied by [15]. The distribution and morphology of gall insects reported from Punjab Province of Pakistan [16].

Eggs of *T. fletcheri minor* on the leaves trigger the induction of gall. The nymphal stages feed on the leaf and stimulate gall development by translocating a chemical stimulus on the adaxial and abaxial side of the *T. arjuna* and *T. tomentosa* of gall infested leaves is in agreement with [17], who reported similar observation on the foliar galls of *Alstonia scholaris* induced by the insect *Pauropsylla tuberculata*. In addition, gall inducing insects inhabit in a highly specialized habitat like the gall for nutrition, another option is that a gall is an enemy free space protecting the inducing insects from predators and parasitoids [18].

Minimize the crop loss due to gall insect we can adapt the Integrated Pest Management (IPM) package for higher crop yield and minimum environmental pollution in tasar culture. At present, IPM package comprising cultural, mechanical, and chemical control measures is in practice to manage/control the gall fly in tasar cultivation. Now a day's pest management practices are being developed based on the chemical cues i.e. herbivore induced plant volatiles (HIPV) emitted by the herbivore infested plant and the same chemical can identified, extracted, synthesized and can be used in tasar sericulture against gall fly. As such it is the high time to take up some strategic planning or new crop protection strategies to control / suppress the pest population in tasar cultivation. In addition, alterations in leaf morphology followed by gall fly infestation need to be studied in detail.

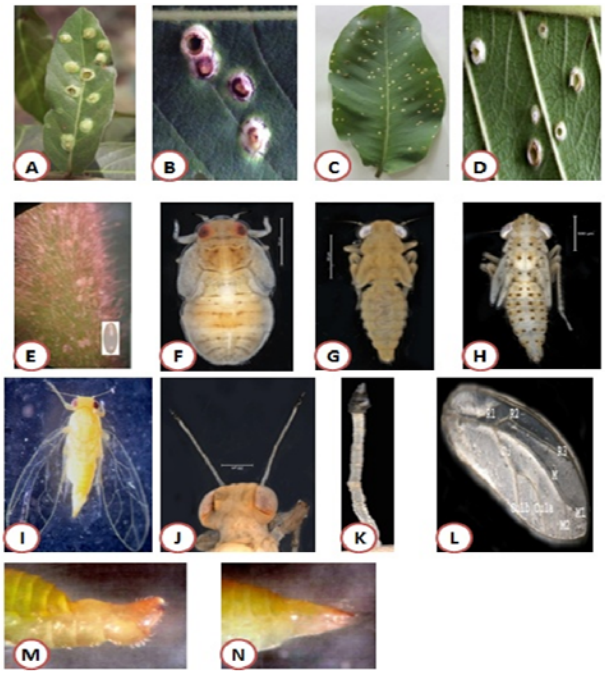

Fig 1: (A) Gall infested Arjun leaf, (B) Burst gall on adaxial surface of Arjun leaf, (C) Gall infested Asan leaf, (D) Burst gall on abaxial surface of Asan leaf, (E) Eggs of gall fly (inset), (F-H) Nymphal stages of *T. fletcheri* minor (I) Adult of *T. fletcheri minor*, (J) Head portion (K) Antennae (L) Fore wing venation of *T. fletcheri minor* (R1-R3: Radius, M1, M2: Media, Cu: Cubitus)(M) Male genetalia, (N) Female genetalia

4. Acknowledgement

We gratefully acknowledge help from Mr. Amitava Mazumder from Zoological Survey of India, Kolkata and Mr. Babusona Mondal, Field assistant of Entomology Section for their help in Photography of the insect.

5. References

1. Singh RN, Thangavelu. Host discrimination ability in parasitoid wasp Psix straticeps (Hymenoptera: Scelionidae). Annals of Entomology 1994; 12:19-23.
2. Dhar SL, Mondal KC, Singh RN. Gall Infestation and its control measures in tropical tasar ecosystem. Indian Silk, 1988; 27(3):19-21.
3. Thangavelu K, Singh RN. Integrated pest management in tasar culture. Annals of Entomology. 1991; 9(2):52-65.
4. Jagdish Chander. First record of gall forming jumping plant louse, *Trioza fletcheri*, Crawford,on *Terminalia arjuna* in Haryana nurseries and plantations. *The Indian Forester* 2015; 141(3):349-351.
5. Raman A. Insect-induced plant galls of India: unresolved questions. *Curr. Sci* 2007; 92:748-757.
6. Hollis D. Afrotropical jumping plant lice of the family Triozidae (Homoptera:Psylloidea). Bull. Br. Mus. nat. Hist(Ent) 1984; 49:1-102.
7. Ossiannilsson F. The Psylloidea (Homoptera) of Fennoscandia and Denmark. *Fauna Ent. Scand* 1992: 26:346.
8. Meyer J. Plant galls and gall inducers. Gerbruder Borntraeger, Berlin, 1987.
9. Rohfritsch, O. Patterns in gall development. In Biology of insect induced galls (J.D. Shorthouse & O.Rohfritsch, eds.). Oxford University Press, New York, 1992, 60-86.
10. Wool D, Aloni R, Bem-Zvi O, Woolberg M. A galling aphid furnishes its home with a built-in pipeline to host food supply, *Entomologia Experimentalis ET Applicata* 1999; 91:183-186.
11. Raman A. Cecidogenetic behaviour of some gall-inducing thrips, Psyllids, coccids, and gall midges, and morphogenesis of their galls. Oriental Insects 2003; 37:359-413.
12. Albert Susy. Morphological, anatomical and biochemical Studies on the foliar galls of Alstonia scholaris (*Apocynaceae*) 2011; 34(3):343-358.
13. Hodkinson ID. The biology and ecology of the gall-forming Psylloidea (Homoptera), *In Biology of gall insects* (T.N. Ananthakrishnan, ed,). Arnold, London, 1984, 59-77.
14. Raman A. Cecidogenetic behaviour of some gall-inducing thrips, Psyllids, coccids, and gall midges, and morphogenesis of their galls. *Oriental Insects* 2003; 37:359-413.
15. Albert Susy. Morphological, anatomical and biochemical Studies on the foliar galls of Alstonia scholaris (*Apocynaceae*) 2011; 34(3):343-358.
16. Bodlah Imran 2012. First record, Distribution and Morphology of Psyllid, *Trioza fletcheri* minor Crawford, *Punjab Province of Pakistan* 1912; 44(5):1361-1365.
17. Albert Susy. Morphological, anatomical and biochemical Studies on the foliar galls of Alstonia scholaris (*Apocynaceae*) 2011; 34(3):343-358.
18. Price PW, Fernandes GW, Waring GL. Adaptive nature of insect galls, Environmental Entomology 1987; 16:15-24.