

# Infestation of *Pauropsylla tuberculata* (Gall Insect) on *Alstonia scholaris* (Saptaparni) tree

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## Abstract

The present study is based on the infestation of gall insect (*Pauropsylla tuberculata*) on Alstonia tree which is species specific. Gall insect belongs to the order Hemiptera and is commonly known as the jumping lice. It is recorded from all over India, Malaya, Myanmar, Siam, Philippines etc. The gall insect form galls in the *Alstonia scholaris* tree as it is the host plant for it.

The life cycle of gall insect and the infected Alstonia tree from CSIR-NEERI office premises were studied. It was observed that, this insect lacks the pupal stage and directly turns to become adult. It has 5 nymphal stages namely stage 1, stage 2, stage 3, stage 4 and stage 5. As soon as it hatched, it forms the galls by sucking the plant sap which is a source of food and nutrition for it. In the gall, it completes its whole life cycle and emerges out as the adult and habitat nearby the same tree, where it again lays eggs on the leaves of this tree. To minimize the infestation on the trees removal of the infected leaves and burying or dumping was done as the preliminary measure. As the infestation is causing a huge loss to the plant it is categorized as pest.

**Keywords:** *Pauropsylla tuberculata*, gall insect, Hemiptera, *Alstonia scholaris*, Apocynaceae

## Introduction

*Alstonia scholaris* R. Br. (Saptaparni) tree belonging to the family Apocynaceae and is also known as devil tree, blackboard tree, milk wood-pine. It can grow up to 40 m height. It is evergreen tree and native of Indian subcontinent. The genus consists 45 species which are inhabiting in Southeast Asia, Australia, Central America, tropical and subtropical Africa.

Saptaparni is an evergreen tree having a medium to large growth with a straight cylindrical lobe which blooms between October and December. Saptaparni species is native to India but is also found in China, and South-east Asia and Australia.

The wood of the Alstonia is used for making black boards and wooden slates for writing. The tree parts are filled with milky latex which can be poisonous. The bark is dark grayish, somewhat rough, and rapidly yielding a milky sap which is abundant, bitter when injured. The leaves are 10-20 cm long, 3-4.5 cm wide and arranged in a whorl of up to eight at the node. The stalk of leaf is short. The margin of leaf whereas is smooth having rounded tip or shortly pointed which tapers to the base. The ventral surface of the leaf is dark green and shiny and the dorsal surface is light green as compared to the ventral side.

The *Pauropsylla tuberculata* form galls which are semi-globose or obtusely conical on one side and truncated conical on the other. *Pauropsylla tuberculata* is hemi metabolous and lacks the pupal stage. After copulation, female lays eggs one by one near the midrib or side veins on the ventral side of 1<sup>st</sup> instar nymph. Sometimes, female lays eggs on the upper surface too. After hatching the nymph starts sucking plant sap from the leaf at one spot and in doing so injects saliva which stimulates the induction of gall. Along with the egg, it deposits yellow colored nymphal instars (4-5) and develop inside the gall (zooecidia). From third instar onwards the nymph resembles the adult except pigmentation. The body of the nymph is oval shaped with distinct abdomen and thorax covered with setae. The newly moulted adult is yellow colored but soon its color changes to red to dark reddish brown. The adults are robust, with large globular eyes with a triangular base. The

male is darker in color than the female. Mature ultimate instars nymphs escaped from the gall through lacerated openings present on the ventral side of the leaf and moults into an imago. *P. tuberculata* builds pouch galls on the leaves of *Alstonia scholaris*. The inducer leads to the rupture of the cells and the cellular process resulting in the redirection of the present ontogenetic patterns which benefits the inducer (Taft & Bissing, 1988). One of the opinions states is that a gall is an 'enemy free' space where the inducing insect is protected from the predators and parasitoid (Price *et al.* 1987).

### Classification of Saptaparni

<b>Kingdom</b>	Plantae
<b>Order</b>	Gentianales
<b>Family</b>	Apocynaceae
<b>Tribe</b>	Plumeriae
<b>Subtribe</b>	Alstoniinae
<b>Genus</b>	<i>Alstonia</i>
<b>Species</b>	<i>scholaris</i>

### Classification of Gall Insect

<b>Kingdom</b>	Animalia
<b>Phylum</b>	Arthropoda
<b>Class</b>	Insecta
<b>Order</b>	Hemiptera
<b>Family</b>	Psyllidae
<b>Genus</b>	<i>Pauropsylla</i>
<b>Species</b>	<i>tuberculata</i>

### Material and method

The studies were carried out in the CSIR-NEERI office premises. This institute possesses a good and healthy climate. The temperature of NEERI is less than 2<sup>0</sup> C as compared with the temperature outside of the Institute. In Institute and colony tree types are categorized into dry deciduous and mix deciduous. The present studies were carried out by collection of the *Alstonia scholaris* leaves which were infected. The galls were safely dissected from the leaves and the nymphs were taken out for their nymphal stage identification and were later preserved in formalin. Some of the mature galls were not dissected and they were kept in fresh water and covered with polythene to catch the adults of the jumping lice. A life cycle was made from the observed specimens. A comparison is also done between the infected and the non infected leaves of the tree.

### Results and Discussion

The present study shows that the galls of *A. scholaris* are not similar to tumour growth which is uncontrolled. The alterations in the leaves due to the insect galls indicate the plasticity of plant tissues which may be induced and controlled by insects. The galls are green, spherical in shape and of open type usually having a cone on ventral side of the leaf. The mature gall had an opening on the lower surface of the moults to escape out. The empty gall turns brown after the escape of the adult and gradually changes to brownish black and become hard and woody. Maximum number of galls on the leaves is observed on the dorsal side near the midrib and side veins. The maximum number of gall per leaf was 72 and on an average during severe

infestation it was found to be 30 per leaf. The severe infested leaf crumble, collapse and/or exhibit major morphological deformities.

The 1<sup>st</sup> instar looks transparent in colour and is very small having a blunt posterior region, the thoracic regions are slightly visible having reddish eyes and emerging antennae. The 2<sup>nd</sup> and the 3<sup>rd</sup> instar nymphs become slightly yellowish in colour, the size increases gradually, thoracic and abdomen regions are visible and the blunt posterior region becomes a bit sharp. Eyes become more prominent. The 4<sup>th</sup> and the 5<sup>th</sup> instar nymphs resemble the adult and become reddish brown in colour. Antennae are seen very prominently. The eyes gradually become compound eyes mostly in the 5<sup>th</sup> instar and resemble the adult in every manner except the presence of wings. The last nymphal instar does not convert into a pupa but emerges as an adult from the gall thus they lack the pupal stage. The adult is winged, brown in colour and shows sexual dimorphism.

## Conclusion

This study on the gall induced by *P. tuberculata* on *A. scholaris* contributes to the knowledge about the plasticity of plant tissues stimulated by biotic factors. The gall insect is species specific to the host plant and completes its life cycle around that tree only. The insect takes its nutrition from the tree and if they are in fewer amounts no harm is caused to the tree. But if the infection is increased to a certain level where the leaves get crumbled and die then the insects are categorized as pests. Sometimes it is observed that the insects are preyed by other insect predators. The predator enters the gall through a small opening, eats the gall insect and stays in their galls taking up their nutrition. Thus the presence of gall insects maintains the food chain and the ecological balance for the higher animals. But it is also a matter of concern that if the infestation increases it harms the plant growth and gradually kills the plant therefore if the gall insect is present in a large amount and infecting the plant continuously then it is stated as a pest for that plant and measures should be taken to lower down the number of infections.



Fresh non infected leaf of *Alastonia scholaris*



Infected leaf of *Alastonia scholaris*



Highly infected leaf



Gall when the nymph is inside

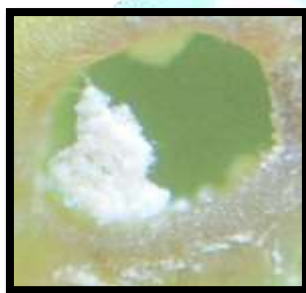


Gall after adult is emerged out



*Alastonia scholaris* leaves trapped in polybag for trapping of adult *P. tuberculata*

**Life cycle of *Paraupस्या tuberculata***



1<sup>st</sup>nymphal instar



2<sup>nd</sup>nymphal instar



3<sup>rd</sup>nymphal instar



Adult of *Paraupस्या tuberculata*



5<sup>th</sup>nymphal instar



4<sup>th</sup>nymphal instar

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