

# PARASITOIDS OF THE GALL-INDUCER INSECT FROM *GARUGA PINNATA* ROXB.: A REPORT FROM SOUTHERN KARNATAKA

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## ABSTRACT

Galls are botanical curiosities and represent a two-way interaction between the insect and the host plant. Galls have been reported from several tree taxa from the temperate zone as well as the tropics. In this research communication, we report the occurrence of saccular galls for the first time on the leaves of *Garuga pinnata* Roxb., an ethno-medicinal tree from the Mysore district of Karnataka state. The gall-maker and the parasitoids have been identified for the first time from this region. Studies implicate the distribution of gall insect and parasitoids in southern India.

## INTRODUCTION

Gall insects incite abnormal growths as extensions from the host plant, which benefits the insect to complete its life cycle. Galls are most frequently found on leaves. The formation of a distinctive gall structure is often triggered by the feeding behavior of larvae or egg inserted into

plant tissues. Galls are produced by three major groups of insects viz., aphids, gall midges and gall wasps. Among the aphids, Phylloxerans and Psyllids are the major gall forming insect families (Royer & Rebek *et al.*, 2016). Gall-hosting plants employ varied strategies to mitigate and neutralize stress arising sequel to gall induction (Raman, 2012).

The multipurpose tree species *Garuga pinnata* Roxb. (Burseraceae) is found in eastern and southern parts of Asia. The tree bark in the form of decoction is ethno-medicinally used in Nepal by Tharu tribal community to enhance memory (Bhandari *et al.*, 2021). Ethno-pharmacologically, the plant has diuretic, aphrodisiac and astringent properties. The tree is used in the treatment of anaemia, leprosy and ulcers. The leaf paste is used to relieve fever (Chavan *et al.*, 2021). Significant amounts of phenolic compounds are present in the leaves of the plant, while stem bark contains terpenoids, steroids, alkaloids, flavonoids and saponins (Ramaraju *et al.*, 2013).

The gall-producing psyllid, *Phacopteron lentiginosum* Buckton (Hemiptera: Psyllidae), frequently produces galls on *G. pinnata* leaves by ovipositing in the monsoon and post-monsoon seasons (Singh & Singh, 2011). Further, a sac-like gall develops from the leaf with the development of *P. lentiginosum* (Raman *et al.*, 2012). Gall inducing *P. lentiginosum* on *G. pinnata* host has been reported from various states of the Indian subcontinent viz., Karnataka (Mathur, 1975), Kerala (Hayat *et al.*, 2012), Maharashtra (Buckton, 1896); Tamil Nadu (Kieffer, 1906; Mani, 1948; Kandaswamy, 1986; Raman, 1987); Nepal and Pakistan (Hodkinson, 1986), Uttarakhand (Mani, 1948; Mathur, 1975; Hayat *et al.*, 2012); and West Bengal (Mathur, 1975). The gall inducer, *P. lentiginosum* has been reported by many researchers from different regions. Herein we report for the first time the Braconid wasps *Bracon garugaphagae* (Ranjith *et al.*, 2016), *Psyllaephagus garuga* (Singh & Singh, 2011) as parasitizers of gall-inducer *P. lentiginosum* from the host plant *G. pinnata* from southern Karnataka.

During a field study in the Karighatta hill range (12° 25' 40" N; 76 ° 43' 43" E) in the month of January 2022, the leaf galls from *G. pinnata* of various sizes were collected (Fig. 1) and stored in 70% alcohol. The galls were dissected and the insects were collected. The scanning electron microscopy images of the insects along with the insect specimens were sent to Department of Zoology, University of Mysore for identification. The insects were identified as the gall-inducer *Phacopteron lentiginosum* and parasitoids: *Bracon garugaphagae*, *Psyllaephagus garuga*

parasitizing the gall inducer. In subtropical peninsular India, *P. lentiginosum* induces two-tier saccular galls on *G. pinnata* (Mathur, 1975; Raman, 1987; Mani, 2000). The developmental stages such as nymphs, pupae and adults were observed from the dissected galls under stereomicroscope (Fig. 2).

The braconid wasp, *B. garugaphagae* with its developmental stages was found inside the dissected galls and identified based on the already published description (Ranjith *et al.*, 2016). The larvae target psyllid nymphs and kill with a single bite. The abdominal segments of the larvae have distinctive dorsal abdominal tubercles with extendible tips that are employed to maintain larval posture when feeding (Fig. 3.). The larvae continue to feed on gall tissue after they have finished all of the available prey until they are old enough to spin cocoons and pupate (Ranjith *et al.*, 2016). In the present study, another parasitoid, *P. garuga* with few developmental stages was located in the dissected galls (Fig. 4.) and identified based on the descriptions of Singh & Singh (2011). This is known to parasitize the gall-former of *G. pinnata*, *P. lentiginosum*.

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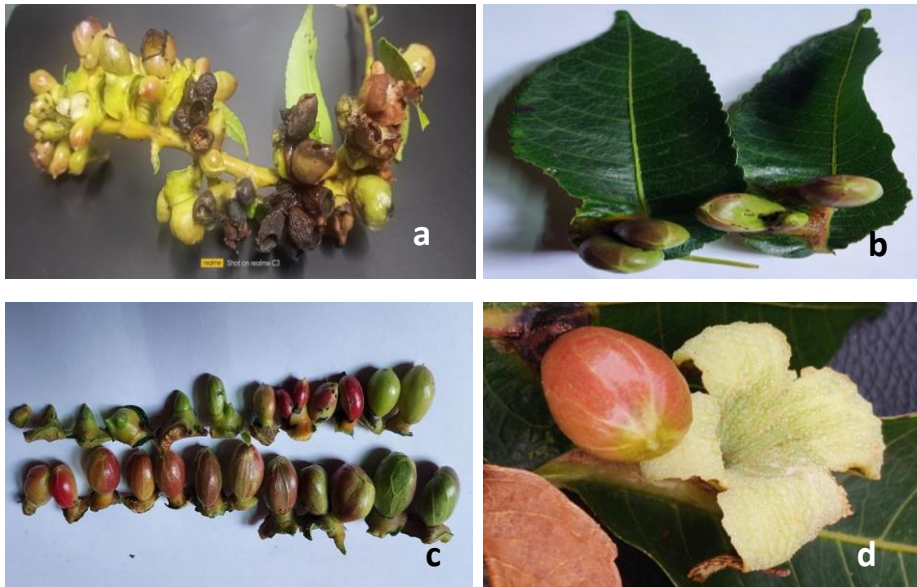
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**Fig. 1.** Leaf galls associated with the host plant *G. pinnata*. a. Photograph showing the whole twig and leaves modified into galls, b. Leaf gall of *G. pinnata*, c. Different stages of galls isolated from the host plant, d. Opened mature gall.

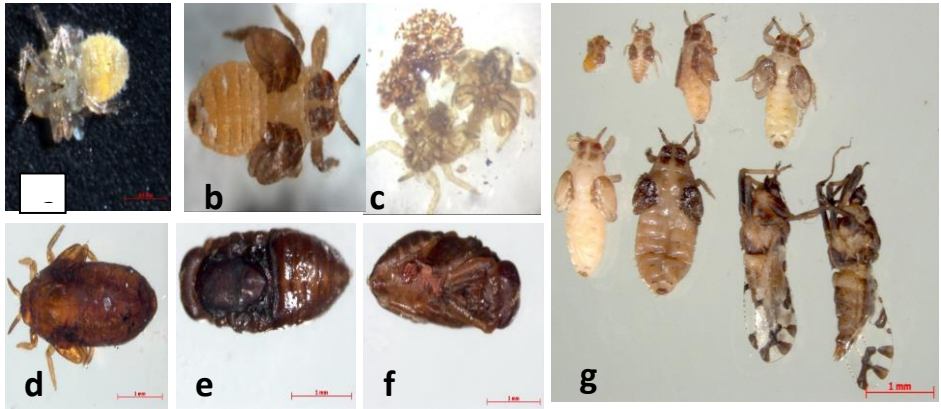


Fig. 2. Stereomicroscopic images of the developmental stages of gall inducer- *P. lentiginosum*. a. Dorsal view of nymph, b. Ventral view, c. Nymph exhibiting parental care, d. Pupa, e. & f. Dorsal and ventral view of pupa, g. Stages in the adult development.

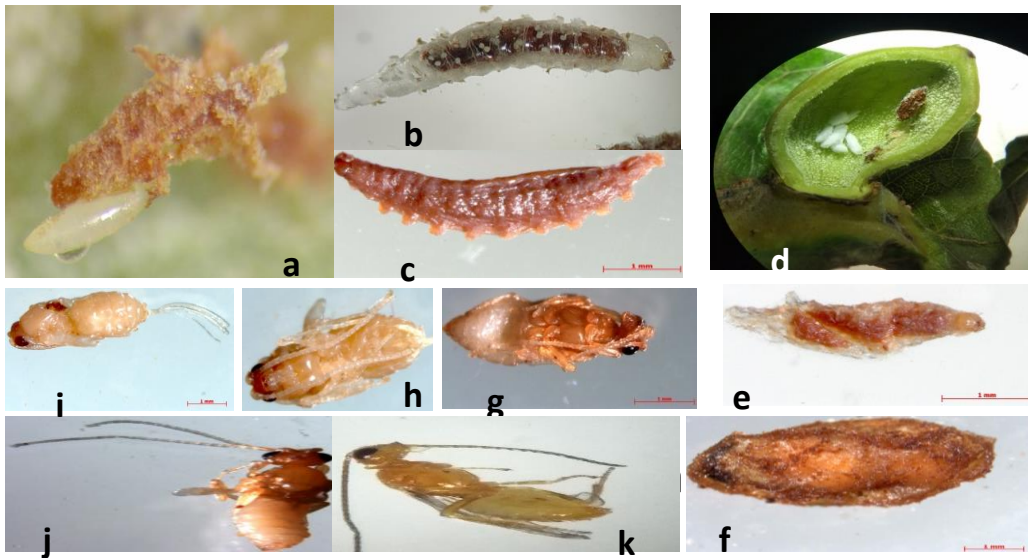
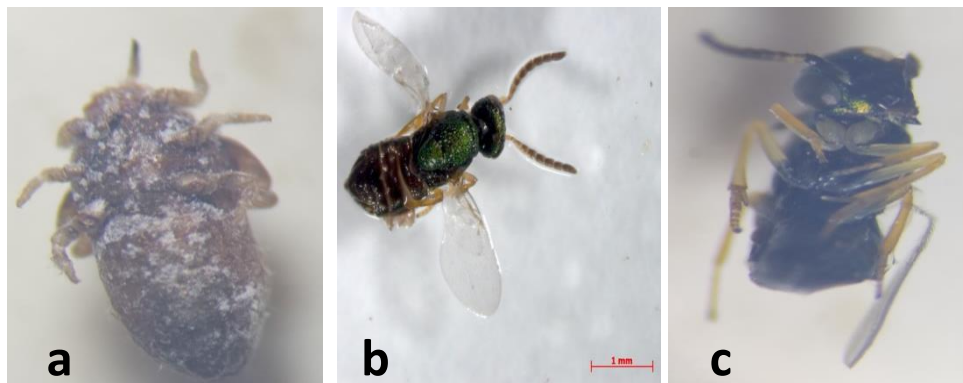


Fig. 3. Stereomicroscopic images of different developmental stages of the parasitoid wasp, *Bracon garugaphagae*. a. Braconid egg, b. & c. Different larval stages, d. Stereomicroscopic image of *Bracon* pupa and its cocoon, e. & f. Pupa, g-k. Stereomicroscopic images of different stages of adult development.



**Fig. 4.** Stereomicroscopic images of pupa and adults of *Psyllaephagus garuga*- the parasitoid of *Garuga* gall-former. a. Pupa, b.& c. Adults.