

Redescription of *Rawania petasata* (Melichar) (Hemiptera, Cicadellidae, Typhlocybinae) with a key to genera of Empoascini related to genus *Rawania* Ghauri of Oriental region

N. Shreya¹, C.M. Kalleshwaraswamy^{1*}, M. Shankaramurthy⁴, G.K. Girijesh²,
Sharanabasappa S. Deshmukh¹, K. Rajashekharappa¹ and B.V. Champa³

¹Department of Entomology, ²Department of Agronomy, ³Department of Horticulture, Keladi Shivappa
Nayaka University of Agricultural and Horticultural Sciences, Iruvakk, Shivamogga 577 204,
Karnataka, India.

⁴Department of Entomology, University of Agricultural Sciences, G.K.V.K., Bengaluru 560065,
Karnataka, India.

Email: kalleshwaraswamycm@uahs.edu.in

ABSTRACT: *Rawania petasata* (Melichar, 1903), breeding on leaves of *Pongamia pinnata* (L.) Pierre is redescribed and illustrated. Male specimens collected from Karnataka and Sri Lanka exhibited a pair of short, tooth-like processes at the base of the aedeagal shaft, a feature previously overlooked in the original description. Besides *Pongamia*, this species was also found on mango, *Mangifera indica* Linnaeus and cashew, *Anacardium occidentale* Linnaeus in Karnataka. These leafhoppers were collected from newly emerged leaves of these plants during March 2024 and 2025. A key to distinguish the genus *Rawania* Ghauri from Empoascini genera of Oriental region with a similar forewing venation namely, forewing with all the three apical veins arising independently from forewing cell m [apical veins Radial Posterior (RP) and Median Posterior (MP) not confluent at base] is also provided.

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KEY WORDS: Auchenorrhyncha, forewing venation, host plants, Karnataka, leafhopper, *Pongamia*

INTRODUCTION

Leafhoppers are pests of considerable importance causing hopper burn symptoms (Viraktamath and Viraktamath, 1995). Among the leafhoppers, the tribe Empoascini, belonging to the second largest subfamily Typhlocybinae, currently includes 1,398 valid species grouped in 107 genera worldwide (Dmitriev *et al.*, 2022). In India, approximately 137 species belonging to 32 genera have been reported

(Sohi and Dworakowska, 1983; Sohi, 1998; Dmitriev *et al.*, 2022). Empoascini is one among the six tribes of subfamily Typhlocybinae and is distinguished from the other tribes by having submarginal vein between the apices of veins MP and MP+CuA in hindwing (Fig. 5B).

The genus *Rawania* was established by Ghauri (1963) with *Empoasca petasata* Melichar from Sri Lanka designated as the type species. *Rawania*

* Author for correspondence

is a monotypic genus of tribe Empoascini. Among the leafhoppers collected during the present study on the systematics of Empoascini of south India, some specimens exhibiting all the characteristics of *R. petasata* were examined. However, these specimens possessed a pair of tooth-like structures on the aedeagus, a feature not described by Ghauri (1963) in the original description.

Initially, the specimens were thought to belong to an undescribed species of *Rawania*, however, examination of male genitalia images of paralectotypes of *R. petasata*, kindly provided by Dr. Igor Malenovský from the Moravian Museum in Brno, Czech Republic, revealed that the paralectotypes also possessed a pair of tooth-like structures on the aedeagus (Fig. 2 A-C). Therefore, in this paper, additional details on the morphology of the aedeagus, not described earlier, are provided. Qin *et al.* (2014) provided a key to genera of Empoascini of China. In the present study, a key to Empoascini genera of Oriental region having forewing venation similar to that in *Rawania* in which all the three apical veins arise independently from forewing cell m (RP and MP not confluent at base) is given.

MATERIALS AND METHODS

Leafhoppers were collected from various locations across Karnataka, specifically from the young leaves of pongamia, mango and cashew trees. Measurements of various anatomical parts of the leafhoppers, including length and width, were taken using a stereo-binocular microscope equipped with an ocular grid. High-resolution images of the leafhoppers were captured using a Leica M205C stereomicroscope fitted with a DFC 425 camera. The images were processed and combined into a single, detailed composite image using Zerene Stacker software. Dissection of male genitalia was performed according to the techniques described by Oman (1949) and Knight (1965). The terminology employed for morphological descriptions follows Oman (1949) and Dietrich (2005). The nomenclature of subgenital chaetotaxy follows Qin *et al.* (2014). Drawings of the male genitalia and wing venation were prepared using a

Leica DM2000 compound microscope equipped with Camera Lucida. Dissected male genitalia were carefully placed within their respective abdomen and preserved in a drop of glycerol held in micro-vial. The micro-vial was then stoppered and attached to the pin carrying the corresponding insect specimen from which the structures were dissected. All the material examined are deposited at the University of Agricultural Sciences, G.K.V.K., Bengaluru, and Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga.

RESULTS AND DISCUSSION

Genus *Rawania* Ghauri, 1963 (Fig. 1 A-D and Fig. 3 A-K)

Rawania Ghauri 1963: 465. Type species: *Empoasca petasata* Melichar 1903, by original designation.

Diagnosis. Uniformly pale green with one black spot on either side of median line on fore margin of crown. Head about as wide as posterolateral angles of pronotum. Forewing with all apical veins arising from cell m and veins RP and MP arising separately from cell m (Fig. 5A). Male pygofer with a ventral process. Subgenital plates with group C setae uniseriate and group A setae present (Fig. 5C). Style with a group of setae at base of apophysis which is slender and smooth. Aedeagus with long preatrium dorsal apodeme short, aedeagal shaft in lateral view fairly stout and narrowing distally, with basal short process. Segment X elongate, with a hook-like anteriorly directed process arising from anterior margin directed ventrally and then anteriorly. Connective, more or less T-shaped with short stem, movably articulated with aedeagus.

Remarks. Ghauri (1963) adequately described the genus; therefore, only the diagnosis is provided here. *Rawania* is similar to four Oriental genera namely, *Austroasca* Lower, *Dialecticoperyx* Kirkaldy, *Homa* Distant, and *Kyboasca* Zakhvatkin in having all apical veins of the forewing arising separately from the cell m (RP and MP veins neither stalked nor confluent at base). *Rawania* differs from *Kyboasca*, and *Austroasca* in having uniseriate C-

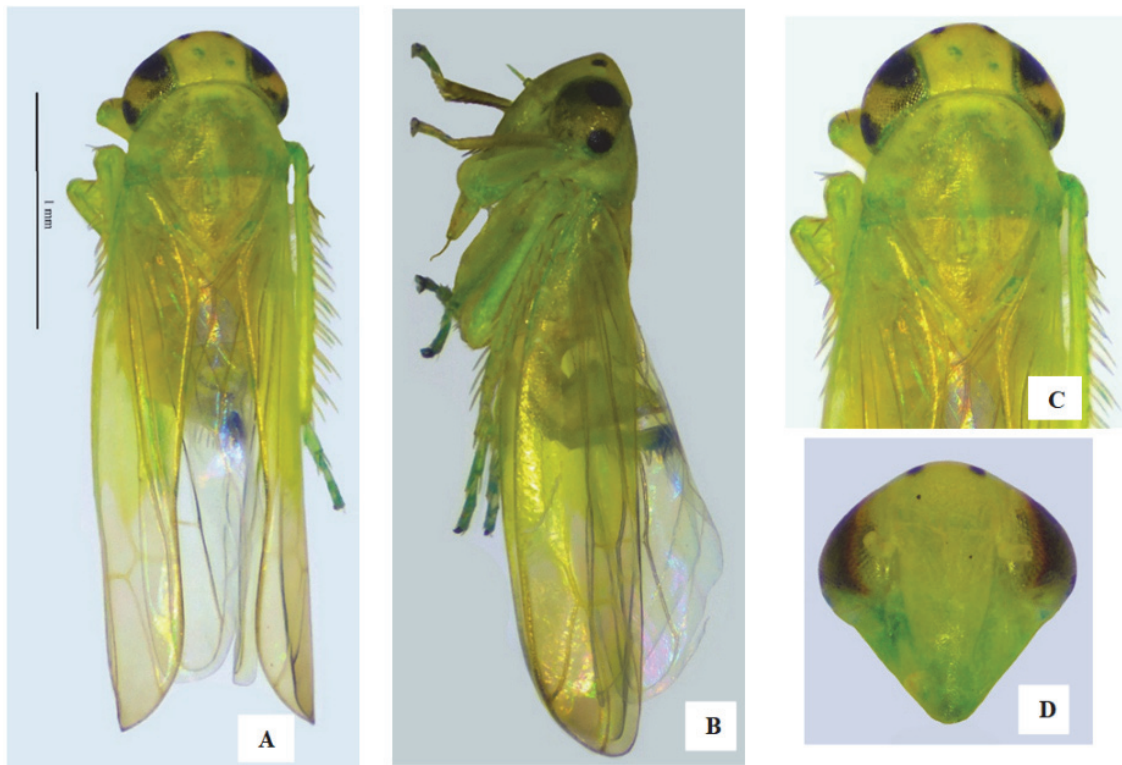


Fig. 1 *Rawania petasata* (♂): A, habitus, dorsal view; B, habitus, lateral view; C, head and thorax, dorsal view; D, face

group setae on the subgenital plates, whereas these setae are multiseriate in the latter two genera. *Rawania* differs from *Kyboasca* in having a longer and narrower process of the segment X. *Rawania* and *Dialecticopteryx* have uniseriate C-group setae, but *Rawania* differs in having a short coronal suture, whereas *Dialecticopteryx* has the coronal suture extending to the fronto-clypeus. *Rawania* is also similar to *Homa* in having a short coronal suture, and subgenital plates with uniseriate C-group setae, but *Rawania* differs from *Homa* in having a ventral pygofer process, which is absent in *Homa*. In addition, species of *Homa* have prominent red markings (Xu *et al.*, 2022; Webb and Xu, 2022) on the forewing that are absent in *Rawania*. These genera can be differentiated by the following key.

Key to genera of Empoascini having all the three apical veins arising independently from forewing cell m (RP and MP' not confluent at base) (males)

1. Subgenital plate with multiseriate group C setae 2
- Subgenital plate with uniseriate group C setae 3
2. Abdominal apodemes well-developed on all tergites; forewings with one brown spot in cell cu*Kyboasca* Zakhvatkin
- Abdominal apodemes not developed on all tergites; forewings without a brown spot in cell cu*Austroasca* Lower
3. Coronal suture reaching fronto - clypeus*Dialecticopteryx* Kirkaldy
- Coronal suture short, not reaching fronto-clypeus.....4
4. Abdominal apodemes well developed; pygofer with ventral process; connective not fused with

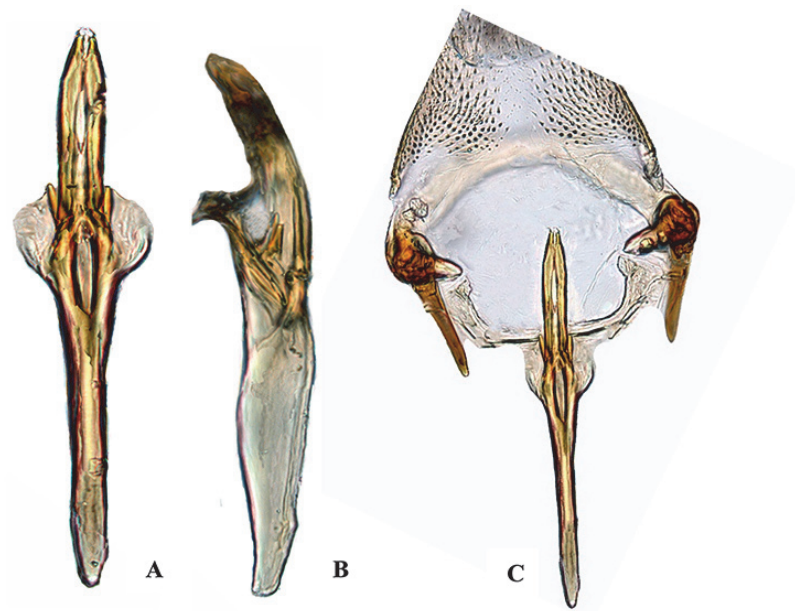


Fig. 2 *Rawania petasata*, male paralectotype: A, aedeagus, ventroposterior view; B, aedeagus, lateral view; C, aedeagus and segment X, ventroposterior view.

aedeagus.....*Rawania Ghauri*

- Abdominal apodemes not well developed; pygofer without ventral process; connective fused with aedeagus.....*Homa Distant*

***Rawania petasata* (Melichar, 1903)**

Empoasca petasata Melichar 1903: 215; Distant 1908: 406, fig. 251.

Rawania petasata (Melichar): Ghauri 1963: 466, figs 1A-L.

Empoasca sp., Gnanewaran *et al.*, 208: 8, fig. 1f.

Materials examined: INDIA: Karnataka: 6♂, 5♀, Bengaluru: GKVK, 13.077985°N, 77.578253°E, 937m, 26.iii.2024, N. Shreya, *ex Pongamia pinnata*; 3♂, Bengaluru: Kodigehalli, 918m, 13.070457°N, 77.578127°E, 10.iv.2024, N. Shreya, *ex Mangifera indica*; 1♂, Bengaluru: G.K.V.K., 13.077985°N, 77.578253°E, 937m, 14.iv.2025, N. Shreya, *ex Anacardium occidentale*; 6♂, 6♀, Shivamogga: Navile, 13.97°N, 75.57°E, 569m, 03.iv.2024, N. Shreya, *ex*

Pongamia pinnata; 1♂, 3♀, Yadgir: Bhimarayanagudi, 16.73°N, 76.80°E, 02.ii.2023, Hemanth, *ex Pongamia pinnata*.

Sri Lanka: 1♂, 4♀, Peradeniya, 22.viii.2007, Raji, *ex Nephelium lappaceum*; 1♀, Peradeniya, 12.ix.2008, R. Gnanewaran (deposited in UASB, G.K.V.K.)

Redescription: Body dark green when alive, older specimens light green with yellowish tinge; abdomen, dorsal and ventral side yellowish green; two black spots on head fore margin; eyes light yellow with two black dots at the anterior and posterior edges; forewing dull or light greenish, translucent; hindwing transparent. Body moderately robust. *Head:* including eyes, as wide as pronotum at posterolateral angles; crown, slightly longer medially than next to eye; coronal suture (remnant of stem of the ecdysial suture present on crown of head) faint and short, not extending beyond mid-length of crown; ocelli, almost in contact with inner margin of eye. *Pronotum:* convexly produced at anterior margin; posterior margin straight; pronotum and scutellum almost equal in length (Fig. 1A, B).

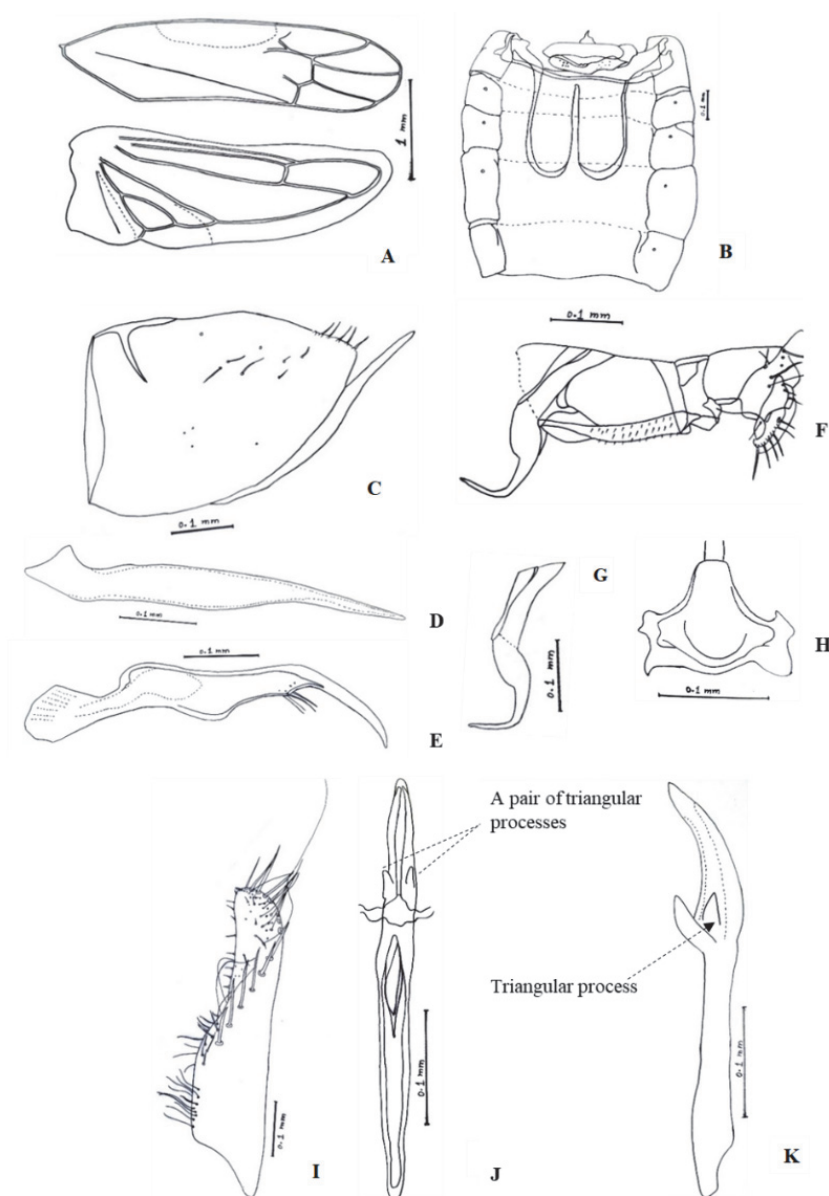


Fig. 3 Morphological features of *Rawania petasata*: A- forewing and hind wing venation; B- abdominal S2 apodemes; C- pygofer, lateral view; D- pygofer ventral process, lateral view; E- Style, dorsal view; F- segment X, lateral view; G- process segment X, lateral view; H- connective, dorsal view; I- subgenital plate, dorsal view; J- aedeagus, dorsal view; K- aedeagus, lateral view

Forewing: all three apical veins, RP, MP and MP+CuA arise from cell m separately (Fig. 5A). **Hindwing:** with CuA vein unbranched apically (Fig. 5B); **Abdominal apodemes:** (a pair of apodemes arising from second abdominal segment (2S) which are used for sound production and these vary in their size and shape) elongate (length: width= 2.26:1), (Fig. 5D) parallel to each other, arising from

2S, crossing 4th abdominal sternite, not reaching 5th abdominal sternite posterior margin (Fig. 3B).

Male-genitalia: Pygofer in lateral view, more or less triangular with posterior lobe conically rounded, posterior dorsal portion slightly pointed (Fig. 3C); pygofer processes long, arising from ventral margin of pygofer, pointed at the tip and slightly sclerotized

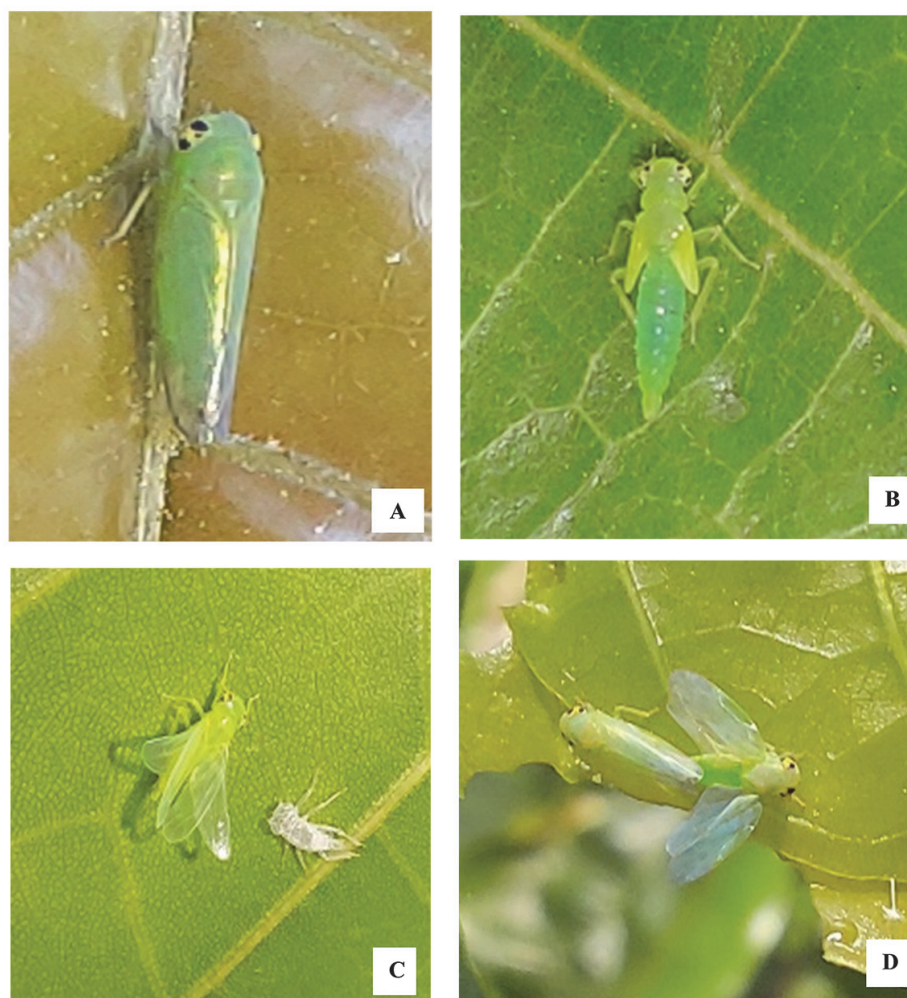


Fig. 4 *Rawania petasata* on *Pongamia pinnata*. A, adult; B, nymph; C, teneral adult; D, mating pair

and extended beyond pygofer (Fig. 3D); segment X, with numerous microsetae at ventral surface (Fig. 3F); segment X process (a pair of ventrolateral sclerotized processes arising on segment X), anteriorly directed ventral curved anteriorly forming a hook (Fig. 3G); subgenital plates, separate, elongate, (length: width = 4.93:1) (Fig. 5C), apices dark pigmented and C- group setae uniseriate (Fig. 3I); style with a group of setae at base of apophysis which is slender and smooth (Fig. 3E); aedeagus, pre-atrium long; shaft slightly curved with lateral extension at the base of shaft; pointed (triangular) structure/ process present near the base of the shaft in lateral view; shaft with a triangular process laterally on each side in dorsal view (Fig. 3 J & K).

Nymph: Light green body without black pigment or spots (Fig. 4B).

Measurements: Male: Length 3.2–3.5 mm; Head length 0.21–0.25 mm; Pronotum length 0.46–0.51 mm; Scutellum length 0.44–0.58mm; Face length 0.87–0.97 mm; Head width 0.83–0.87 mm; Vertex width 0.34–0.37mm and Pronotum width 0.85–0.89 mm (n =6).

Remarks. Gnaneswaran *et al.* (2008) identified this species as *Empoasca* sp. and reported this species on mango, rambuttan (*Nephelium lappaceum* L.) and cocoa (*Theobromae cacao* L.)

The specimens deposited in UASB, examined

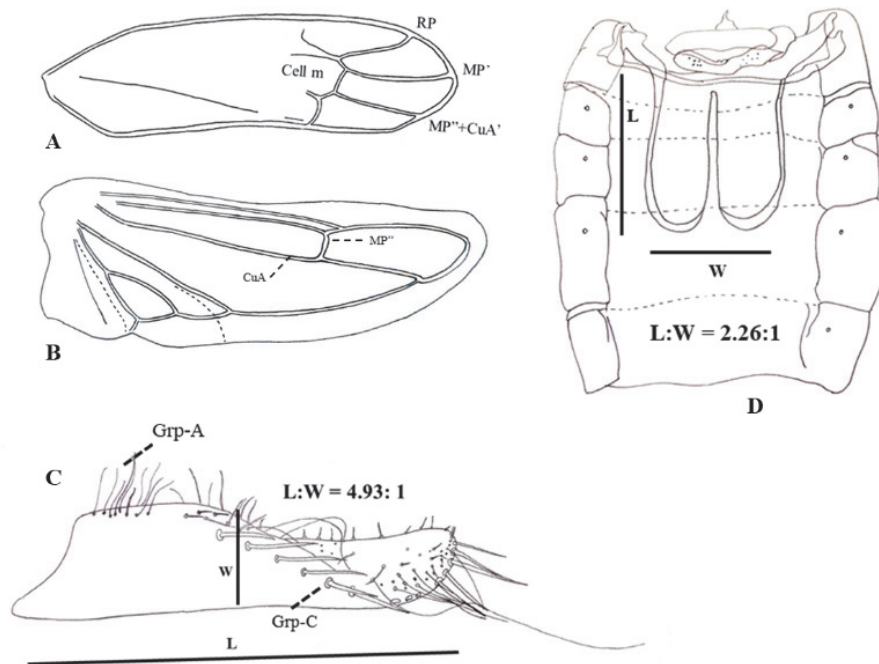


Fig. 5 A- forewing venation; B- hindwing venation; C- subgenital plate with length-width ratio; D- abdominal apodemes with length-width ratio

during this study confirm the identity of this as *Rawania petasata* Ghauri.

Host plants: *Pongamia* (*P. pinnata*), Cashew (*A. occidentale*), Mango (*M. indica*) and Rambutan (*N. lappaceum*).

Seasonal occurrence: Incidence of leafhoppers [*Empoasca motti* Pruthi, *Amrasca biguttula biguttula* (Ishida)], showed a positive correlation with maximum temperature (Sunil *et al.*, 2017), while a significant negative correlation was observed with mean relative humidity (Meena *et al.*, 2017). In the present study, both nymphs and adults were found on the tender leaves of *Pongamia* during March, indicating that their populations are higher during the new flush season, while they were absent during other seasons in the absence of new flushes. Previously, Viraktamath and Viraktamath (1985) had described three new species of mango hoppers namely, *Busoniomimus manjunathi*, *Idioscopus anasuyae* and *I. jayashriae* on mango in Karnataka indicating that mango as an important host plant for leafhoppers. Similarly, Gnanaswaran

et al., 2008 reported typhlocybinae leafhoppers, *Motschulskyia (Togaritettix) serratus* from Japan, Korea, Pakistan, Australia, Taiwan, Thailand and Sri Lanka *Amrasca splendens* from India, Thailand and Sri Lanka and *Empoasca* sp. from Sri Lanka on mango. The present study marks the first report of *R. petasata* on mango in Karnataka adding significant number of leafhoppers on mango.

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