

## Host Range and Descriptions of Economically Important Genera of Typhlocybinae Leafhoppers (Cicadellidae: Hemiptera) from North Coastal Andhra Pradesh

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### ABSTRACT

An experiment on taxonomic studies of Typhlocybinae leafhopper fauna in North Coastal districts of Andhra Pradesh was conducted during, 2018-19 at Department of Entomology, Agricultural College, Naira. In the present investigation, a total of 14 leafhopper species under two tribes viz., Emposcini and Erythronuerini of the subfamily Typhlocybinae were collected from different agricultural and horticultural crop systems. Among these, the leafhoppers species under the genera of *Amrasca* and *Empoasca* are widely distributed and are also causing considerable amount of damage on crops like pulses, oilseeds and vegetables in the three districts of Andhra Pradesh.

Typhlocybinae was the second largest leafhopper subfamily, after the Deltocephalinae of the family Cicadellidae by comprising around 6,000 described species worldwide. Typhlocybinae comprise of 470 genera with 5,200 species under six tribes all over the world (Viraktamath, 2005). The leafhoppers of the subfamily Typhlocybinae is mostly tiny, delicate and feed on the contents of leaf parenchyma cells of their host plants. Their size ranges from 2.5 mm to 5.5 mm. The species of this subfamily differ from the other leafhoppers in lacking closed pre apical cells in the forewing and in having the acutely protruded hind basitarsus. Some of the species cause a more severe form of injury known as “hopperburn”. They can also act as vectors of plant pathogens viz., viruses, phytoplasmas, spiroplasmas and the bacteria. The majority of the members of the genus like *Tautoneura* and *Cubnara* of the tribe Erythronuerini were widely distributed in Indian subcontinent and they feed on grasses, rice, maize, blackgram, greengram and some avenue trees like rain tree, *Delonix sp.*, yellow gulmahor, *Erythrina sp.etc.*, (Ramu and Rao, 2007). There were about 89 described genera and more than 1000 species under the tribe Emposcini in world (Xu *et al.*, 2017), and are polyphagous pests on forest trees like *Pongamia sp.*, *Albezzia sp.*, *Ficus carica*, *Samania samanetc.*, (Sohi *et al.*, 1987). *Uzeldikra citrina* (Mel.), Cotton Leafhopper *Amrasca biguttula biguttula* (Ishida), *Ficiana pruthi* Ghauri were causing considerable damage on the oilseeds and vegetable crop ecosystems (Ramu *et al.*, 2008). Some of the Emposcans act as vectors of plant diseases like potato leaf roll, witches broom diseases of potato (*Alebroides nigroscutellatus* Distant) and bunchy top disease of papaya (*Empoasca papayae* Oman).

Keeping in view of the economic importance of the subfamily typhlocybinae, the present study was conducted and denoted the distribution of the major genera of leafhoppers on different crop ecosystems in North Coastal Andhra Pradesh.

### MATERIAL AND METHODS

The leafhoppers were collected by net sweeping with the help of an insect collection net method from different field and horticultural crops viz., cereals, pulses, oil seeds, vegetables and fruit trees in 10 mandals of each district covering 3 villages in each mandal of three North Coastal districts of Andhra Pradesh. Insects trapped in the sweep nets were collected by using aspirator and killed with a cotton swab dipped in ethyl acetate. The killed leafhopper specimens were transferred into petri dishes by using camel hair brush and kept in hot air oven at 45-50<sup>o</sup> C for about 5-6 hours for drying. The collected leafhoppers were brought to the laboratory, processed, mounted on the thick chart triangular mounts and labelled with collection details, viz., name of the collector, collection date, location of collection and host. The dried specimens were preserved in the homeopathic vials. The procedure advocated by Knight (1965) was followed for mounting and preparation of male genitalia. The illustrations were made with the help of same microscope using micap 3.6 digital camera attachment using the software.

### RESULTS AND DISCUSSION

In the present investigations, 14 leafhopper species of two tribes viz., Emposcini and Erythronuerini of the subfamily Typhlocybinae were identified from different crop ecosystems of the three

North Coastal districts of Andhra Pradesh. Among these, three species viz., *Amrasca biguttula biguttula* (Ishida), *Empoasca (Empoasca) kerri* Pruthi and *Empoasca (Empoasca) motti* Pruthi under the tribe Empoascini were widely distributed in large populations and causing considerable damage to the crops like brinjal, bhendi cotton, castor, sunflower and cowpea. The tribe, Empoascini was first erected by Ahmed (1969) based on the hind wing venation. The tribe Empoascini was the second largest tribe after Erythroneurini with 20 genera and 91 species from India. The tribe Empoascini was a diverse group and differs from other leafhoppers in the subfamily Typhlocybinæ in lacking an appendix in the forewing and in having a sub marginal vein at the apex of the hind wing and veins RP, MP' confluent distally (Dietrich, 2005). Hence, quick and accurate identification of these species is the important step in dealing with them. But it is difficult to identify them externally but can be easily identified by using structures of male genitalia (subgenital plates, anal tube appendages, pygofer appendages, aedeagus) which are discussed adequately here under.

The species under the subfamily Typhlocybinæ cause a more severe form of injury known as "hopperburn". They can also act as vectors of plant pathogens viz., viruses, phytoplasmas, spiroplasmas and the bacteria. The descriptions of the predominant leafhopper species and details of their association with their host plants are provided here under (Table 1).

### *Amrasca biguttula biguttula* (Ishida) (Fig. A and Fig. 1-8)

#### Colour

Body is yellowish green in colour. The vertex with two prominent black spots. The forewings are light greenish in colour with two prominent black spots on the apical portion.

#### External morphology

Head is well developed and as broad as the pronotum. The vertex is yellowish white in colour, subacute with median coronal suture. On the anterior margin of the vertex, the ocelli are present which are away from the compound eyes. The clypellus narrower towards apex and broader at the base, slightly extended beyond the margin of the genae. The fore wings with four apical cells and there is no ante apical cells and appendix. The abdominal apodemes are well developed which resemble the bulb like structures.

#### Male genitalia

The anal tube is long with a pair of slender, curved hooks. The subgenital plates are elongated with a numerous micro and macro setae all over the surface.

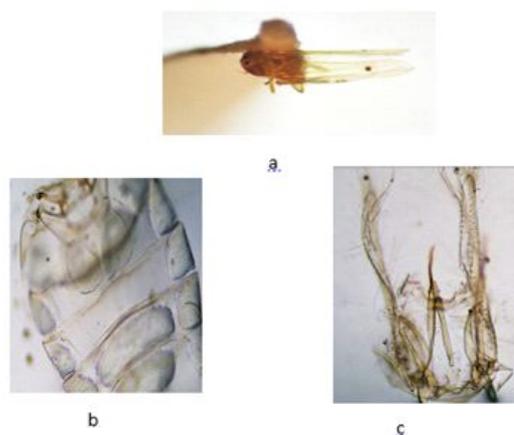
The styles are broader at the base and narrower at the apex and with serrated apex. Pygofer lobe broader at the base, narrower distally with a pair of elongated processes. The aedeagus is small, tube like, broader in the middle, gradually narrowed towards the tip and slightly curved ventrally. There are no aedeagal processes.

#### Measurements

Total body length: 2.70 mm; Length of the wings: 1.84 mm; Length of the abdominal apodemes: 0.0019mm; Length of the subgenital plates: 0.0073 mm; Length of the styles: 0.0029 mm; Length of the pygofer process: 0.0042 mm.

#### Specimens studied

6 males, 2 females, Cotton, Voni, 21. IX. 2018, Sangeetha. L; 3 males, Brinjal, Peripi, 7.I. 2019, Sangeetha.L; 3 males, 2 females, Bhendi, S.S.Valasa, 12. IX. 2018, Sangeetha. L; 4 males, Sunflower, 21. XII. 2018, Sangeetha. L; 2 males, Cowpea, S.S.Valasa, 19. IX.2018, Sangeetha.L; 4 males, Bhendi, Alikam, 11. IX.2018, Sangeetha. L; 3 males, 2 males, Brinjal, Bavajipeta, 18. X. 2018, Sangeetha. L.



**Fig. A: *Amrasca biguttula biguttula* (Ishida)**  
a. Adult dorsal view (35X);  
b. Abdominal apodemes; c. Male genitalia

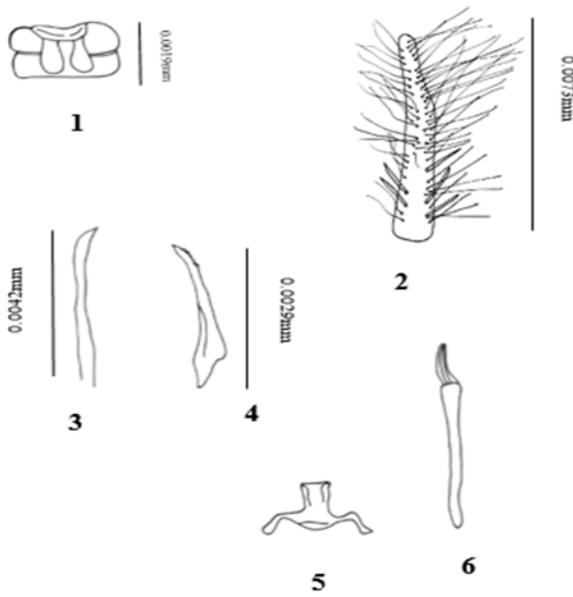
### *Empoasca (Empoasca) kerri* Pruthi (Fig. B and Fig. 6- 13)

#### Colour

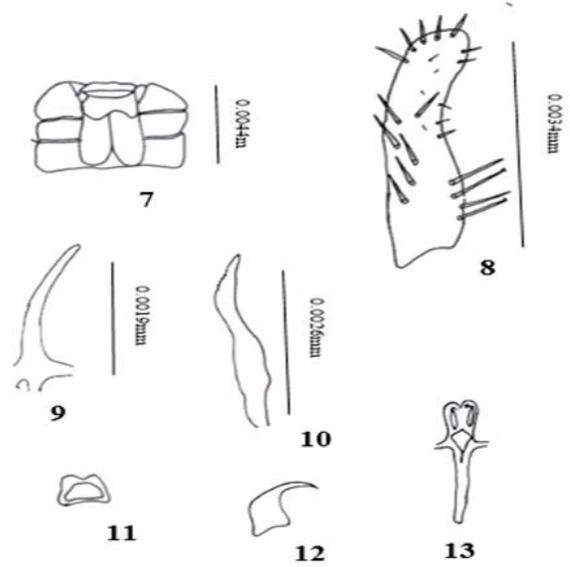
Body is yellowish green in colour. The wings are transparent and light green in colour.

#### External morphology

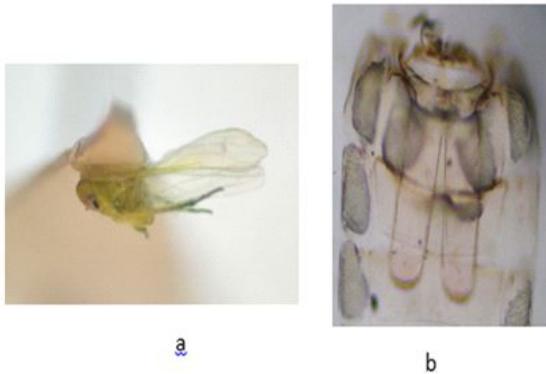
Head as broader as the pronotum. The vertex is subacute and coronal suture is not conspicuous. Ocelli are present on the anterior margin of the vertex, which are close to the compound eyes. The clypellus



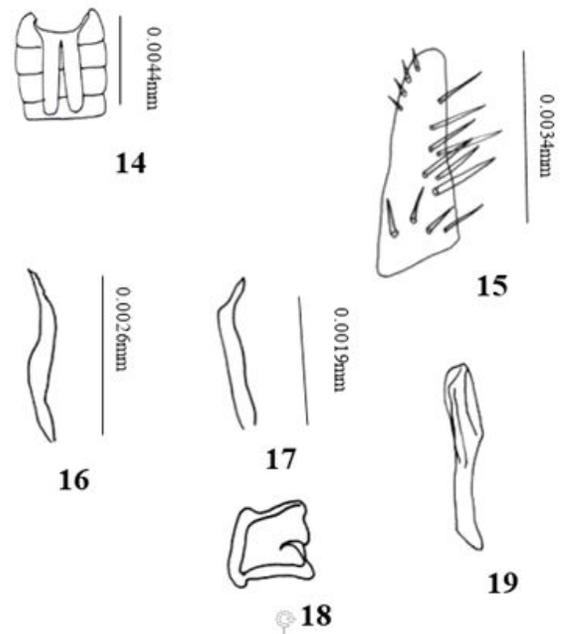
**Fig. 1- 6: *Amrasca biguttula biguttula* (Ishida)**  
 1. Abdominal apodemes; 2. Subgenital plates;  
 3. Pygofer process; 4. Styles; 5. Connective;  
 6. Aedeagus (dorsal view)



**Fig. 7 - 13: *Empoasca (Empoasca) kerri* Pruthi**  
 7. Abdominal apodemes; 8. Subgenital plates  
 9. Pygofer process; 10. Connective; 11. Anal tube  
 appendages; 12. Aedeagus (lateral view);  
 13. Aedeagus (dorsal view).



**Fig. B: *Empoasca (Empoasca) kerri* Pruthi**  
 a. Adult lateral view (35X); b. Abdominal apodemes



**Fig. 14- 19: *Empoasca (Empoasca) motti* Pruthi**  
 14. Abdominal apodemes; 15. Subgenital plates; 16.  
 Styles; 17. Pygofer process; 18. Connective; 19.  
 Aedeagus (dorsal view)



**Fig. C: *Empoasca (Empoasca) motti* Pruthi**

**Table 1. Leafhopper fauna associated with different host plants in North Coastal districts of Andhra Pradesh**

S.No.	Name of the species	Tribe	Hosts
1.	<i>Amrasca biguttula biguttula</i> (Ishida)	Empoascini	Brinjal, Cotton, Cowpea, Okra, Groundnut, Redgram and Sunflower.
2.	<i>Amrasca bilobata</i> Mathew and Ramakrishnan.	Empoascini	Brinjal, Groundnut, Okra, Redgram and Sunflower
3.	<i>Empoasca (Distantasca) barawa</i> (Dworakowska).	Empoascini	Cowpea and Greengram
4.	<i>Empoasca (Distantasca) bulbosa</i> (Dworakowska).	Empoascini	Cowpea, Greengram and Redgram.
5.	<i>Empoasca (Distantasca) faciata</i> (Dworakowska).	Empoascini	Rajma and Redgram.
6.	<i>Empoasca (Distantasca) latava</i> (Dworakowska).	Empoascini	Cowpea, Greengram and Redgram.
7.	<i>Empoasca (Distantasca) terminalis</i> Distant.	Empoascini	Cowpea and Greengram
8.	<i>Empoasca (Distantasca) tna</i> (Dworakowska).	Empoascini	Redgram
9.	<i>Empoasca (Empoasca) kerri</i> Pruthi.	Empoascini	Groundnut and Redgram.
10.	<i>Empoasca (Empoasca) motti</i> Pruthi.	Empoascini	Groundnut and Redgram.
11.	<i>Empoasca (Empoasca) spirosa</i> Dworakowska and Viraktamath.	Empoascini	Cowpea
12.	<i>Empoascanara indica</i> (Datta)	Erythronuerini	Rice
13.	<i>Tautoneura ficaria</i> Dworakowska	Erythronuerini	Redgram
14.	<i>Tautoneura prima</i> Dworakowska	Erythronuerini	Redgram

***Empoasca (Empoasca) motti* Pruthi (Fig. C and Fig.14- 19)****Colour**

Body is straw coloured without any spots on the vertex and on the wings.

**External morphology**

Head is slightly broader than the pronotum. The vertex is subacute and coronal suture is indistinct. The ocelli distinct and situated on the outer margin of the vertex, which are away from the compound eyes. The clypellus extending beyond the margin of the genae. The fore wings are subhyaline with four apical cells, ante apical cells and appendix is absent. The hind wings are hyaline.

**Male genitalia**

Abdominal apodemes are long and well developed. The subgenital plates are elongated with micro and macro setae. Styles are elongated and

serrated at the apex. The anal tube beak is hook like apically. The connective is trapezoidal, without arms, with a median notch at the apex. The aedeagus is tubular, bulbous in middle and apex is broadened.

**Measurements**

Total body length: 2.68 mm; Length of the wings: 1.60 mm; Ocular distance: 0.50 mm; Length of the abdominal apodemes 0.0044 mm; Length of the subgenital plates: 0.0034 mm; Length of the styles: 0.0026 mm; Length of the pygofer process: 0.0019 mm.

**Specimens studied**

2 males, 2 females, Groundnut, Karlam, 5. I. 2019, Sangeetha.L; 5 females, 3 males, Redgram, Naira, 8. IX. 2018.

The distribution of these genera of leafhoppers like *Amrasca biguttula biguttula* (Ishida) and *Amrasca bilobata* Mathew and Ramakrishnan and

*Empoasca (Empoasca) kerri* Pruthi and *Empoasca (Empoasca) motti* on the crops like brinjal, bhendi, cotton, cowpea and sunflower have been observed during this investigation in large populations feeding on these plants by sucking the sap and causing economical damage. These results are in accordance with the finds of Sohi and Dowarakowska, 1983; Mathew and Ramakrishnan, 1995 and Ramu *et al.*, 2008.

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