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Fulgaroid bio diversity of sugarcane from north coastal zone of Andhra Pradesh

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Abstract

Eight planthopper species *Tropidocephala serendiba* (Melichar); *Pyrilla perpusilla pusana* (Distant); *Toya propinqua* (Fieber); *Tagosodes pusanus* (Distant); *Sogatella furcifera* (Horvath); *Sogatella kolophon* (Kirkaldy); *Harmalia anacharsis* (Fennah); *Peregrinus maidis* (Ashmead); were reported from sugarcane crop ecosystems from North Coastal Zone of Andhra Pradesh. Systematic studies on the above species were carried out and taxonomic differentiation of collected species was provided. An illustrated key along with diagnostic taxonomic characters was provided for easy identification of the planthoppers associated with sugarcane crop eco-systems from North Coastal Zone of Andhra Pradesh.

Keywords: hemiptera, planthoppers, delphacidae, fulgoroidea, sugarcane

1. Introduction

Planthoppers belong to the super family Fulgoroidea in Fulgoromorpha of Auchenorrhynchos–Hemiptera comprising 20 families. Family Delphacidae represents one member of the Fulgaroid super family. Its members are appropriately called as “Delphacid Planthoppers” to technically distinguish them from the rest of the planthoppers. The primary distinguishing character of the delphacid planthoppers is the presence of mobile spur at the tip of tibia III. Delphacidae is the largest family in Fulgoroidea with approximately 2000 nominal species described in 280 genera. Several Delphacid species are important pests on crops like rice, maize and sorghum [1]. The economically important planthoppers were included in families viz., Cixiidae, Delphacidae, Derbidae, Dictyophoridae, Eurobrachidae, Flatidae, Fulgoridae, Tettigometridae, and Tropiduchidae. Delphacids are grass feeders and devastating pests on major agricultural crops viz., rice, sugarcane, maize, sorghum and other cereals [2]. Planthoppers damage plants directly by feeding which cause a characteristic yellowing of tissue known as “hopper burn” and in addition planthoppers may also act as vectors for plant viral diseases. Sugarcane crop is commonly infested by a lophopid planthopper *Pyrilla perpusilla pusana* (Distant), but authors have observed some other planthopper species apart from *P. pusana* while studying the planthopper fauna associate with sugarcane crop ecosystems of North Coastal Zone of Andhra Pradesh and the identification of same poses problems for the Economic Entomologists. There has been a considerable difficulty in the identification of these species since their separation is based on small differences in male genitalia. An attempt has been made in this paper to prepare a key for identification of planthopper fauna associated with sugarcane crop ecosystems in North Coastal Zone of Andhra Pradesh based on the male genital characters and other morphological characters.

2. Materials and Methods

Planthopper specimens were collected from North Coastal Zone of Andhra Pradesh by sweep netting from sugarcane crop-ecosystem. About 10-15 to and fro net sweepings were taken each time and planthoppers collected were aspirated from the net into a glass tube and killed with a cotton swab wetted with a few drops of ethyl acetate. The killed specimens were transferred to homeopathic vials, labelled, brought to the laboratory and dried in a hot air oven at 45-50 °C, for about 5 to 6 hours. Planthoppers were mounted on white triangular thick paper points on the right hand side of the thorax by using the gum prepared by diluting quick fix in amyl acetate to facilitate the examination of head, wings, legs and abdomen from all desired angles. To study the male genitalia, the specimen was gently supported on a cork piece on its back and the abdomen was removed from the thorax with the help of sharp needle by pressing down at the junction of the thorax and abdomen. The detached abdomen was transferred into a cavity

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dish containing few millilitres of 10 per cent potassium hydroxide and kept for overnight at room temperature for digestion. The digested soft tissues or internal body contents were pressed out by means of a pair of fine needles or forceps. The male genitalia were dissected out under Binocular Stereo Zoom Microscope for detailed examination and for illustrations. For taxonomic descriptions of male genitalia of planthoppers standard terminology³ was followed.

3. Results and Discussion

In the present studies eight planthopper species were collected from sugarcane crop ecosystem of North Coastal Zone of Andhra Pradesh (table 1). The collected planthopper fauna were identified and described to facilitate easy identification by economic entomologists.

Table 1: List of identified planthoppers from Sugarcane crop ecosystem of North Coastal Zone of Andhra Pradesh

S. No.	Crop ecosystem	Name of the Planthopper	Family
1	Sugarcane	<i>Tropidocephala serendiba</i> (Melichar)	Delphacidae
2		<i>Pyrilla perpusilla pusana</i> (Distant)	Lophopidae
3		<i>Toya propinqua</i> (Fieber)	Delphacidae
4		<i>Tagosodes pusanus</i> (Distant)	Delphacidae
5		<i>Sogatella furcifera</i> (Horvath)	Delphacidae
6		<i>Sogatella kolophon</i> (Kirkaldy)	Delphacidae
7		<i>Harmalia anacharsis</i> (Fennah)	Delphacidae
8		<i>Peregrinus maidis</i> (Ashmead)	Delphacidae

For those species which were not studied here, literature or a Taxonomist working on the planthoppers may be consulted.

1. Hind tibia with a movable apical spur (Delphacidae) -- 2

-- Hind tibia without a movable apical spur. Frons very much elongated and extended as cephalic process, dorsally the length of the cephalic extension is more or less equals the length of the vertex. Tegmina more or less yellowish brown in colour with small black spots sparsely distributed all over the wing. Style is very much broadened. Aedeagus has a sinuation on the ventral aspect (Fig. 3-5).....*Pyrilla perpusilla pusana*

2. Vertex and mesonotum with a distinct pale yellow or orange or white stripe extending from the head -- 3

-- Vertex and mesonotum without a distinct pale yellow or orange white stripe extending from the head. Aedeagus tubular but not with uniform width, serrated subapically, below which slightly sinuated; diaphragm Y-shaped (Fig. 6-8).....*Toya propinqua*

3. Aedeagus twisted, tapering to apex with two rows of small teeth -- 4

-- Aedeagus not twisted, tubular or whip shaped without two rows of small teeth --5

4. Aedeagus twisted, tapering towards apex with two rows of small teeth; tegmina with a pterostigma; clypeus, genae and frons blackish; diaphragm 'U' shaped; genital styles strongly dilated at base, apex relatively small and almost equally bifurcated (Fig. 12-13).....*Sogatella furcifera*

-- Tegmina without pterostigma; face with frons, clypeus and genae not entirely blackish; genital styles not as above. Face with frons, clypeus, genae entirely pale yellowish in colour; genital styles relatively short, broad, flattened, deeply bifurcated distally and anterior process of the apical

bifurcation strongly produced tapering to apex, not distinctly dilated in the middle part, inner process very short; inner edge of the diaphragm rectangular (Fig. 14-15).....*Sogatella kolophon*

5. Light yellow-brown coloured insects. Pygofer slightly oblong to rounded; parameres small, bases sunken into deeply concave medioventral area, parallel basally, anal style short and relatively small. Aedeagus long narrow and whip like with processes sub apically (Fig. 18-20).....*Peregrinus maidis*

-- Aedeagus not twisted, tubular or definitely not whip shaped-----6

6. Aedeagus tubular with uniform width throughout and with or without any teeth ----7

-- Body chocolate brown in colour, greenish tinge on the pronotum and mid mesonotum. Aedeagus broader basally and gradually narrowed towards apex and aedeagal process sickle shaped, arises from base of the aedeagus. Genital style with sclerotised curved apex and also with sclerotised serrated process arising from inner side of the style (Fig. 1-2).....

Tropidocephala serendiba

7. Aedeagus tubular with a few small teeth like projections subapically. Aedeagus basally wider, gradually narrowed and tubular; two to three spines are there subapically, gonopore apical; genital styles relatively flattened, trapezoidal, distally and shallowly bifurcated (Fig. 9-11).....*Tagosodes pusanus*

-- Aedeagus tubular with uniform width throughout and without any teeth; genital style bifurcated apically (Fig. 23-24)

Harmalia anacharsis

The most brief and important taxonomic and morphological characters of the above keyed species were provided here under for confirmation of identifications.

***Tropidocephala serendiba* (Melichar):** Body chocolate brown in colour, greenish tinge on the pronotum and mid mesonotum; vertex, basal half of frons, and genae green; frons tricarinate, raised and pinkish in colour. Veins granulate with black coloured maculae near clavus. Anal style is very much elongated and anal tube processess absent. Aedeagus broader basally and gradually narrowed towards apex and aedeagal process sickle shaped, arises from base of the aedeagus.

***Pyrilla perpusilla pusana* (Distant):** Uniformly ochraceous coloured body. Cephalic process is well developed. The length of vertex is more than twice the width at base and is elongated, rectangular in shape. Frons very much elongated and extended as cephalic process, dorsally the length of the cephalic extension is more or less equals the length of the vertex. Conjunctival hook of phallus is very strongly developed and slightly twisted in the middle. Genital style is very much elongated. Aedeagus has a sinuation on the ventral aspect.

Toya propinqua: Stramineous in colour. Vertex very short and shallowly excavated. Fore wing without pterostigma and is light stramineous in colour. A pair of moderately long slender spine like processes are present on collar like anal segment. Aedeagus tubular, serrated and slightly sinuated, gonopore apical. Genital styles flattened, broader, concave

and wider in the middle with number of spines apically.

Tagosodes pusanus: A white band present along the middle line from the anterior cell of vertex to the caudal tip of the mesonotum. Frons and genae are black in colour. Hemelytra subtransparent, longer than wide with a pattern of dark markings and pterostigma. Pygofer moderately long, posterior opening slightly longer dorsoventrally than broad. Aedeagus tubular, wider basally, gradually narrowed with 2-3 spines which are sub apical. Gonopore apical. Genital styles relatively flattened, trapezoidal distally and shallowly bifurcated.

Sogatella furcifera: Vertex yellowish white, Frons, clypeus and genae black in colour. Pronotum is yellowish. Forewing sub-transparent with black pterostigma. The body is black dorsally, creamy white ventrally with a distinct yellowish white region in the middle of mesothorax in both males and females. Anal segment collar-like with a pair of stout spine like processes which are directed ventrally. Diaphragm broadly U-shaped. Aedeagus is simple, tubular usually sinuate with two rows of teeth, and with apical gonopore. Genital styles broad basally, bifurcated apically.

Sogatella kolophon: Vertex, pronotum and mesonotum yellowish-white to pale stramineous. Face with frons, clypeus and genae entirely pale yellowish brown in colour. Anal segment, collar like with a pair of stout spine like processes directed ventrally up to the length of anal tube. Aedeagus twisted, tubular, usually sinuate with two rows of teeth and apical gonopore. Inner edge of diaphragm rectangular. Genital styles relatively short, broad, flattened, deeply bifurcated distally and anterior process of the apical bifurcation strongly produced tapering to apex, not distinctly dilated in the middle part, inner process very short.

Harmalia anacharsis: Body is light brown in colour. Vertex very short, broad and excavated, triangular between eyes. Frons dark brown in colour, and carinae lighter in colour. Light brown coloured legs, first tarsal segments longer than the remaining segments, leaf like tibial spur which is broader. Anal segment collar like with a pair of spines directed ventrally. Aedeagus tubular without teeth, uniform width throughout. Genital styles bifurcated apically.

Peregrinus maidis (Ashmead): Light yellow-brown to yellow-orange mesonotum with a pair of orange longitudinal bands between the white median and yellow-brown lateral carina. Transparent ungranulated wings which are brown on apical one-third portion. Pterostigma present. Abdomen including pygofer dark brown to dark reddish brown. Pygofer slightly oblong to rounded; parameres small, bases sunken into deeply concave medioventral area, parallel basally. Anal style short and relatively small. Aedeagus long, narrow and whip like with sub apical process.

In the present studies eight planthopper species viz.,

Tropidocephala serendiba (Melichar); *Pyrilla perpusilla pusana* (Distant); *Toya propinqua* (Fieber); *Tagosodes pusanus* (Distant); *Sogatella furcifera* (Horvath); *Sogatella kolophon* (Kirkaldy); *Harmalia anacharsis* (Fennah); *Peregrinus maidis* (Ashmead) were reported for the first time from sugarcane crop ecosystems of North Coastal Zone of Andhra Pradesh. The taxonomic studies on planthopper fauna associated with sugarcane crop ecosystem were not studied earlier and in the present studies the collected species were described for easy identification by the economic entomologists. Planthoppers belonging to the families of Delphacidae, Lophopidae, Meenoplidae and Cixiidae of Fulgoridae on sugarcane were described from China [4]. *Pyrilla punjabensis* sp. nov. and *Pyrilla rahimyarnesis* sp. nov., two new species belonging to genus *Pyrilla* were described from sugarcane crop ecosystems of Pakistan⁵. Five delph acid planthoppers viz., *Cemus* sp., *Nilaparvata lugens*, *Sogatella furcifera*, *Sardia rostrata*, and *Tagosodes pusanus* found associated with different rice and sugarcane crop ecosystems from Karnataka were reported [6]. Two new species viz., *Cemus quilicii* and *Thriambus reynaudi* were described from sugarcane in France [7].

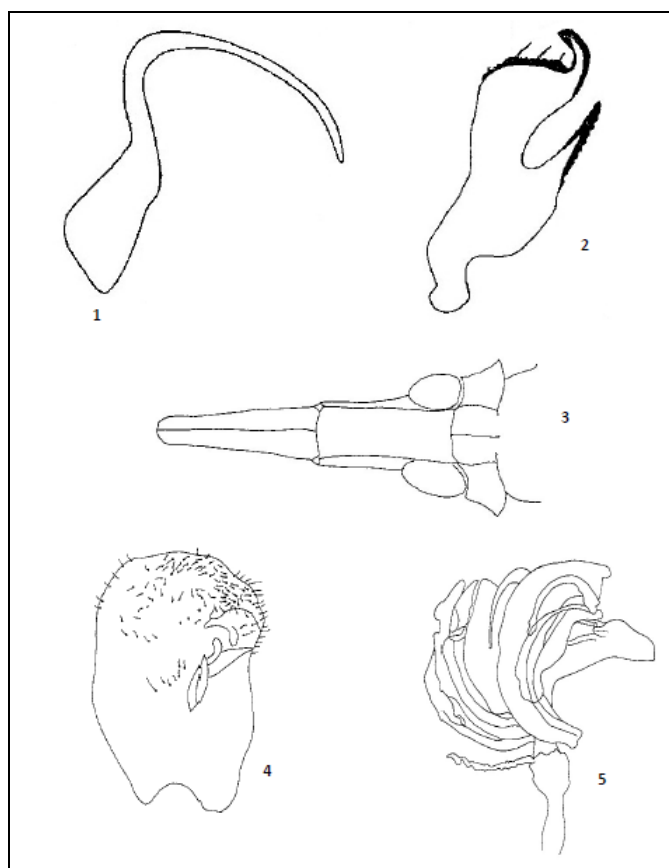


Fig 1, 2: *Tropidocephala serendiba*, 1. Aedeagus, lateral view; 2. Style, lateral view;

Fig. 3-5: *Pyrilla perpusilla pusana*, 3. Vertex, dorsal view; 4. Style, dorsal view; 5. Aedeagus, lateral view

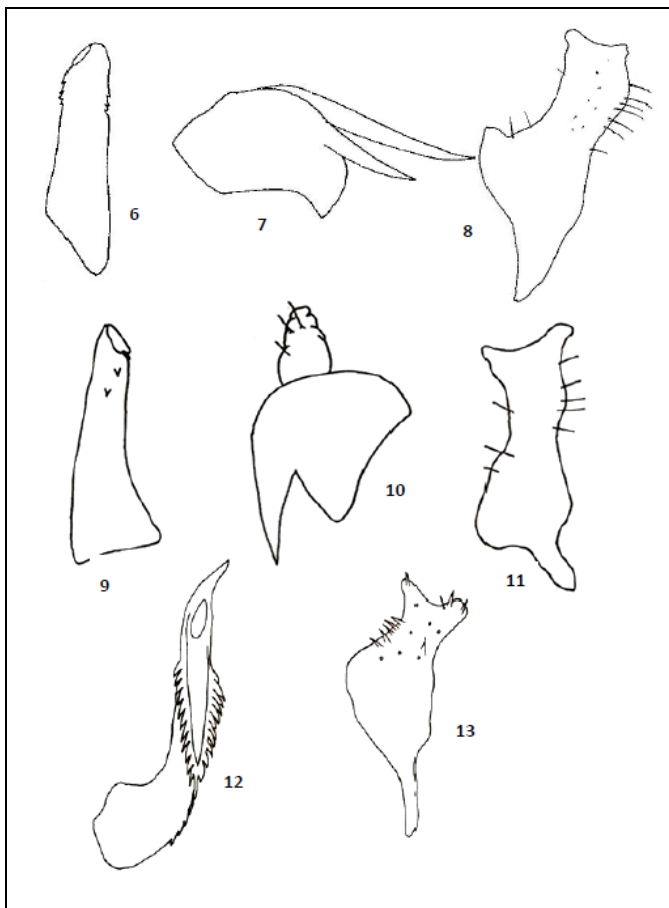


Fig 6-8: *Toya proniqua*, 6. Aedeagus, lateral view; 7. Pygofer, lateral view; 8. Style, lateral view; Fig. 9-11; *Tagosodes pusanus*, 9. Aedeagus, lateral view; 10. Anal tube, lateral view; 11. Style, lateral view; Fig. 12-13; *Sogatella furcifera*, 12. Aedeagus, lateral view; 13. Style, lateral view

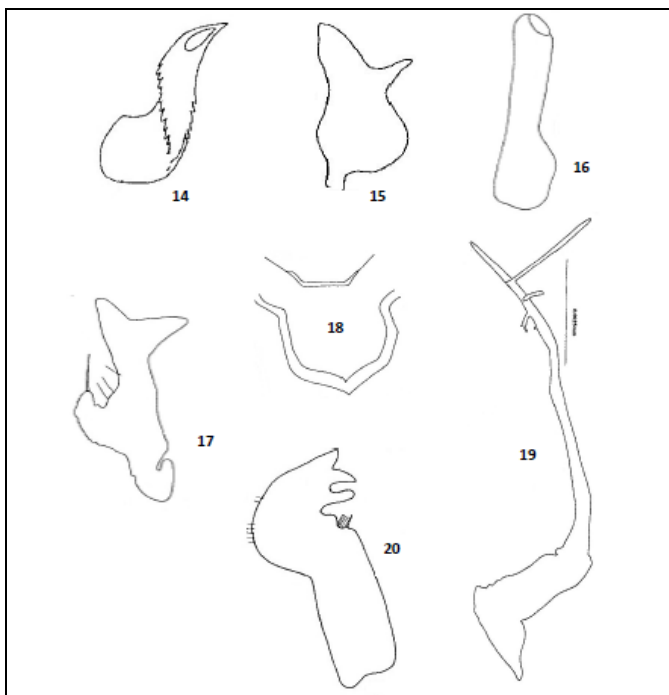


Fig 14-15: *Sogatella kolophon*, 14. Aedeagus, lateral view; 15. Style, lateral view; Fig. 16-17; *Harmalia anacharsis*, 16. Aedeagus, lateral view; 17. Style, lateral view; Fig. 18-20; *Perigrinus maidis*, 18. Anal tube, dorsal view; 19. Aedeagus, lateral view 20. Style, lateral view

4. Conclusions

In the present studies eight planthopper species belonging to two different families were collected, identified, described and illustrated for easy and quick identification. An illustrated key is provided to identify the planthopper fauna associated with sugarcane crop ecosystems of North Coastal Zone of Andhra Pradesh which will be useful for research and extension workers. The accurate identification of planthopper fauna associated with a particular agro-ecosystem is very much needed along with their identification key to formulate integrated management strategies whenever they attain pest status.

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