



BIO DIVERSITY OF PLANTHOPPERS IN SORGHUM CROP-ECOSYSTEMS OF SOUTHERN AND SCARCE RAINFALL ZONES OF ANDHRA PRADESH

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ABSTRACT

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Six planthopper species were collected, identified and described from sorghum crop ecosystem of southern and scarce rainfall zones of Andhra Pradesh. The planthopper fauna collected from sorghum includes, *Cemus* sps. *Nisia nervosa* (Melichar), *Peregrinus maidis* (Ashmead), *Perkinsiella sinensis* (Kirkaldy), *Pyrilla perpusilla* (Stal) and *Sardia* sps. An illustrated key along with diagnostic taxonomic characters were provided for easy identification of the planthoppers associated with sorghum crop eco-systems.

KEYWORDS: Hemiptera, planthoppers, delphacidae, sorghum

INTRODUCTION:

Distributed worldwide, Planthoppers are phytophagous, though few are considered as pests and are included in a single superfamily *i.e.*, Fulgoroidea. Fulgoroids are most reliably distinguished from the other members of the classical “Homoptera” by two features *viz.*, the bifurcate (“Y”- shaped) anal vein in the forewing, and the thickened, three-segmented antennae, with a generally round or egg-shaped third segment that bears a fine filamentous arista. Planthoppers belong to the superfamily Fulgoroidea in Fulgomorpha of Auchenorrhynchos-Hemiptera comprising twenty families. The economically important planthoppers were included in families *viz.*, Cixidae, Delphacidae, Derbidae, Dictyophoridae, Eurobrachidae, Flatidae, Fulgoridae, Tettigometridae and Tropiduchidae (O’Brien and Wilson, 1985). Delphacids are the most diverse and economically important family of planthoppers, comprising about 1835 species of which 55 species are known pests on 25 crops. The primary distinguishing character of the family Delphacidae is the presence of a mobile spur at the tip of tibia III. Delphacids are grass feeders and devastating pests on major agricultural crops *viz.*, rice, sugarcane, maize, sorghum and other cereals (Wilson and O’Brien, 1987). Planthoppers damage plants directly by feeding

of tissue known as “hopper-burn” and in addition plant hoppers may also act as vectors for plant viral disease *viz.*, rice grassy stunt virus (*Nilaparvata lugens* (Stal), *N. bakeri* (Muir) and *N. muiri* (China). (Ou, 1985 and Hibino, 1989), rice ragged stunt virus (*N. lugens*) and (*N. bakeri*), rice stripe and black-streaked dwarf virus (*Laodelphax straitellus* (Fallen) and *Terthronalbo vittatum* (Matsumura)), hojablanca virus (*Tagosodes oryzicolus* (Muir) (Nault and Ammar 1989), sugarcane yellow-leaf syndrome (*Saccharosydne saccharivora* (Westwood)), Fiji disease virus (*Perkinsiella saccharicida* (Kirkaldy), *Perkinsiella sinensis* (Distant) and *P. vastatrix* (Kirkaldy) (Wilson, 2005), maize rough dwarf virus (*Sogatella vibix* (Haupt), maize mosaic, maize sterile stunt, maize stripe virus (*Peregrinus maidis* (Ashmead)), finger millet mosaic virus (*P. maidis*), Brazilian wheat spike disease (*Sogatella kolophon* (Kirkaldy)) (Wilson, 2005) etc.

MATERIAL AND METHODS

Intensive surveys were conducted and large number of planthopper specimens were collected from Southern zone (Chittoor, Nellore, YSR Kadapa districts) and Scarce

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rainfall (Ananthapuramu, Kurnool districts) zones in Andhra Pradesh. 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. For mounting and preparing slides of genitalia the procedure suggested by Knight (1965) was followed. For describing the different body parts the terminology suggested by O'Brien and Wilson (1985) was followed.

RESULTS AND DISCUSSION

During the present studies, from sorghum crop ecosystems of southern and scarce rainfall zones of Andhra Pradesh, the following planthopper fauna were collected, identified and described to facilitate easy identification by economic entomologists.

S. No.	Crop eco-system	Name of the Planthopper	Family
1	Sorghum	<i>Cemus</i> sps.	Delphacidae
2		<i>Peregrinus maidis</i> (Ashmead)	Delphacidae
3		<i>Perkinsiella sinensis</i> (Kirkaldy)	Delphacidae
4		<i>Sardia</i> sps.	Delphacidae
5		<i>Pyrilla perpusiella</i> (Stal) and	Lophopidae
6		<i>Nisia nervosa</i> (Melichar),	Meenopolidae

For those species which were not studied here, literature or a Taxonomist working on the planthoppers may be consulted. The key for identification of the planthoppers associated with sorghum crop ecosystems of southern and scarce rainfall zones of Andhra Pradesh is given here under.

Key for identification of planthopper fauna associated with sorghum crop ecosystem

1. Hindtibia without movable apical spur (Lophopidae, Meenoplidae).....2
 Hind tibia with a movable apical spur (Delphacidae).....3

2. Small species and size varies from 3.40 to 3.41mm. Stramineous to whitish in colour, Vertex deeply excavated and is not demarcated from the frons. Frons very much elongated, excavated and curved along the eyes with outer carina very much raised, median ocelli pearl like, pygofer is shoe shaped laterally, genital styles broader basally, elongated and with claw like structures in the middle and broader (Figure.6a-c).....*Nisia nervosa* (Motschulsky)

3. Large species and size varies from 10 to 15 mm. Uniformly ochraceous coloured body, slightly paler beneath than above. Forewings are semi-opaque, more or less uniformly yellowish brown with small black spots sparsely distributed all over the wing. Cephalic process is well developed. Conjunctival hook of phallus is very strongly developed and slightly twisted in the middle. Phallic appendage is very much elongated (Figure.5a-d). -.....*Pyrilla perpusilla* (Distant)

3. Vertex narrow, elongated between the larger compound eyes; forewings are dark brown with black fuscous markings. Aedeagus more or less straight, tubular with subapical serration, gonopore apical. Genital styles relatively short, broader medially with a deep sinuation along the inner margin and number of spines are scattered in the middle portion of the styles (Figure.4a-d).....*Sardia* Sps.
 Vertex short and not so elongated4.

5. Aedeagus tubular, slightly curved with a pair of process in the middle and another process subapically. Genital style foot shaped. Anal tube processes paired and shorter. Vertex is broader and more or less equal to its length. Wings are brownish in colour, veins are granulate and pterostigma present (Figure.3a-d).....*Perkinsiella sinensis* (Kirkaldy)

Aedeagus is not tubular as above and may be slightly decurved with a long flagellum or whip like.....5

Bio diversity of planthoppers in sorghum crop-ecosystems of southern and scarce rainfall zones of Andhra Pradesh

5. Vertex, pronotum reddish black with cream coloured carinae. Frons with conspicuous raised pits on either side of the median carina; Pygofer short dorsally, long and strongly convex ventrally, posterior opening relatively small, longer than broad. Anal segment collar like with a pair of slender processes directed ventrally. Diaphragm long dorsoventrally, with dorsal margin concave, deeply incised medially, medioventral process short, broader than long, quadrate (Figure. 1a-c).

.....*Cemus* Sps.

Mesonotum with a pair of orange longitudinal bands between the white median and yellow-brown lateral carina. Pygofer slightly oblong to rounded; parameres small, bases sunken into deeply concave medioventral area, parallel basally, the apical one-third curved out and bent inward, truncated to slightly cleft apices. Anal style short and relatively small (Figure. 2a-c).....*Peregrinus maidis* (Ashmead)

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

***Cemus* sps:** Vertex, pronotum reddish black with cream coloured carinae. The forewings with blackish dots all along the veins and fuscous maculae apically. Genae reddish black in colour with cream coloured pits. Hemielytra with characteristic black dots along veins, fuscous streaks and with a distinct pterostigma. Aedeagus long, slightly decurved, with a long flagellum arising at apex, dorsal margin with one or two processes.

***Peregrinus maidis* (Ashmead):** brownish yellow orange mesonotum with a pair of longitudinal bands between the lateral carina. Frons, clypeus and genae yellowish brown. Antennal apex is with a black ring. Wings are transparent, ungranulated and are brown in colour with a pterostigma. Pygofer slightly oblong to rounded. Style short and relatively small. Aedeagus long, narrow and whip like with sub apical process.

***Perkinsiella sinensis* Kirkaldy:** Brownish black in colour with vertex, pronotum and scutellum yellowish. Brownish wings with granulate veins and pterostigma. Anal tube processes paired and shorter. Aedeagus slightly curved,-

tubular resembles an arrow with a pair of process in the middle and another subapical process. Genital style foot shaped.

***Sardia* sps.:** Vertex, thorax and tegmina are dark brown in colour with black fuscous markings. The clypeus is black in colour and gradually narrows apically. Genae black in colour. Forewings are dark brown with pterostigma and fuscous apically. Aedeagus more or less straight, tubular with subapical serration, gonopore apical. Genital styles relatively short, medially broader with a deep sinuation along the inner margin with number of spines scattered in the middle portion of the style

***Pyrilla perpusilla* (Distant):** Body is uniform ochraceous in colour. 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. 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

Nisia nervosa: Stramineous to whitish in colour. Tegmina light straw coloured, veins darker, claval vein granulate or tuberculate. Legs slender, mobile spur absent. Pygofer dorsoventrally long, whose posterior opening is slightly longer and is shoe shaped laterally. Anal segment without a pair of spines. Aedeagus very broad basally, gradually narrowed and slightly curved with a pair of transparent wing like structures. Genital styles broader basally, elongated and with claw like structures in the middle and broader

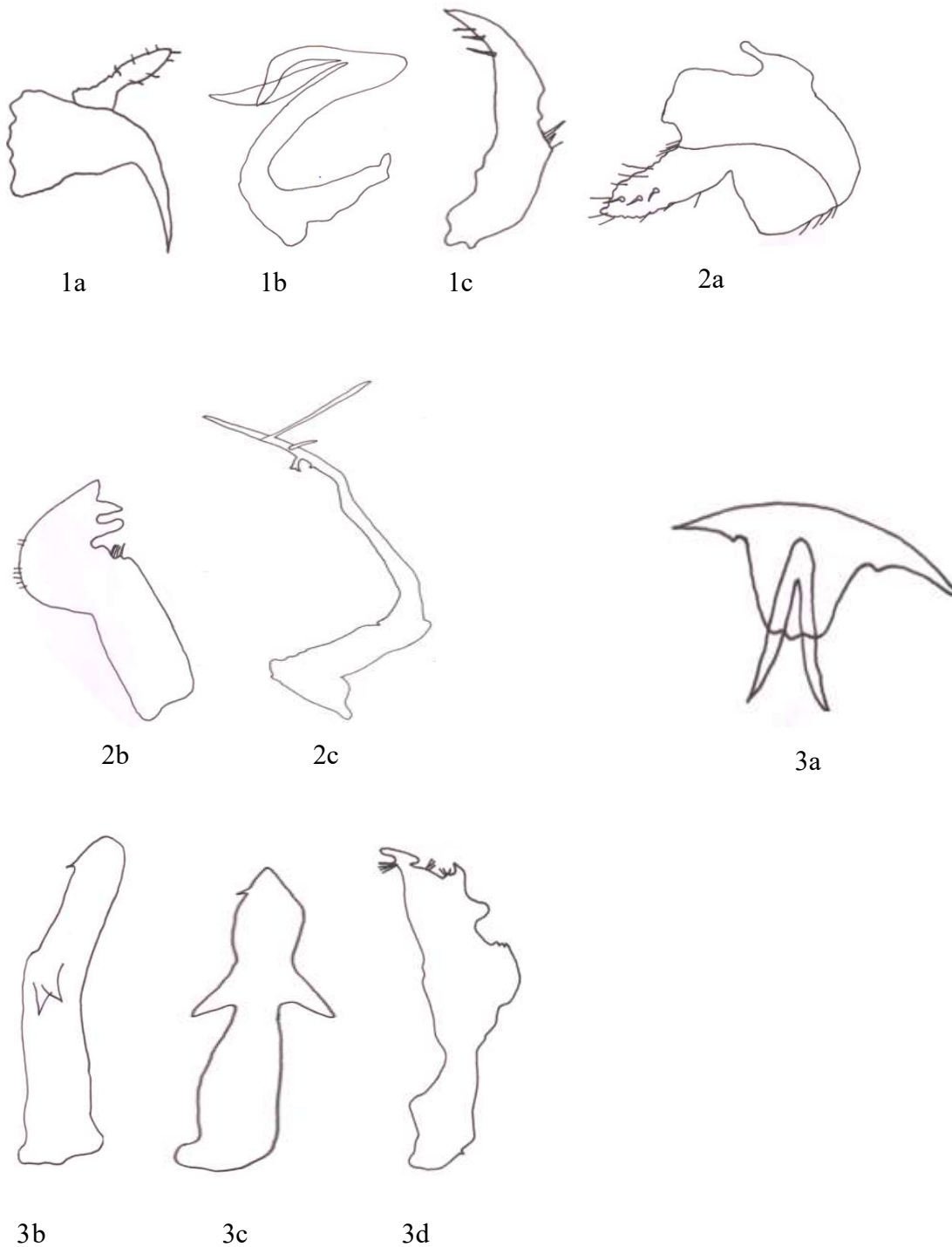
Wilson and Claridge (1991) described 28 species of planthoppers belonging to the families viz., Delphacidae, Lophopidae, Meenoplidae and Cixiidae of Fulgoridae on rice and sugarcane. Mustaque and Akbar (1998) reported *Pyrilla aberrans* on sugarcane, rice, maize and sorghum. Rao and Chalam (2007) reported 23 delphacid planthoppers in India from rice and sugarcane ecosystems. Shashank (2009) reported 5 delphacid planthoppers viz., *Cemus* sps., *Nilaparvata lugens*, *Sogatella furcifera*, *Sardia rostrata*, and *Tagoso despusanus* found associated with different rice and sugarcane crop ecosystems from Karnataka. In the present studies six planthopper species belonging to family Delphacidae, Lophopidae and Meenoplidae from sorghum crop ecosystems were collected, identified, described and illustrated for easy and quick identification. An identification key well supported

with illustrations was also provided which will be useful aid to identify the planthoppers by 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.

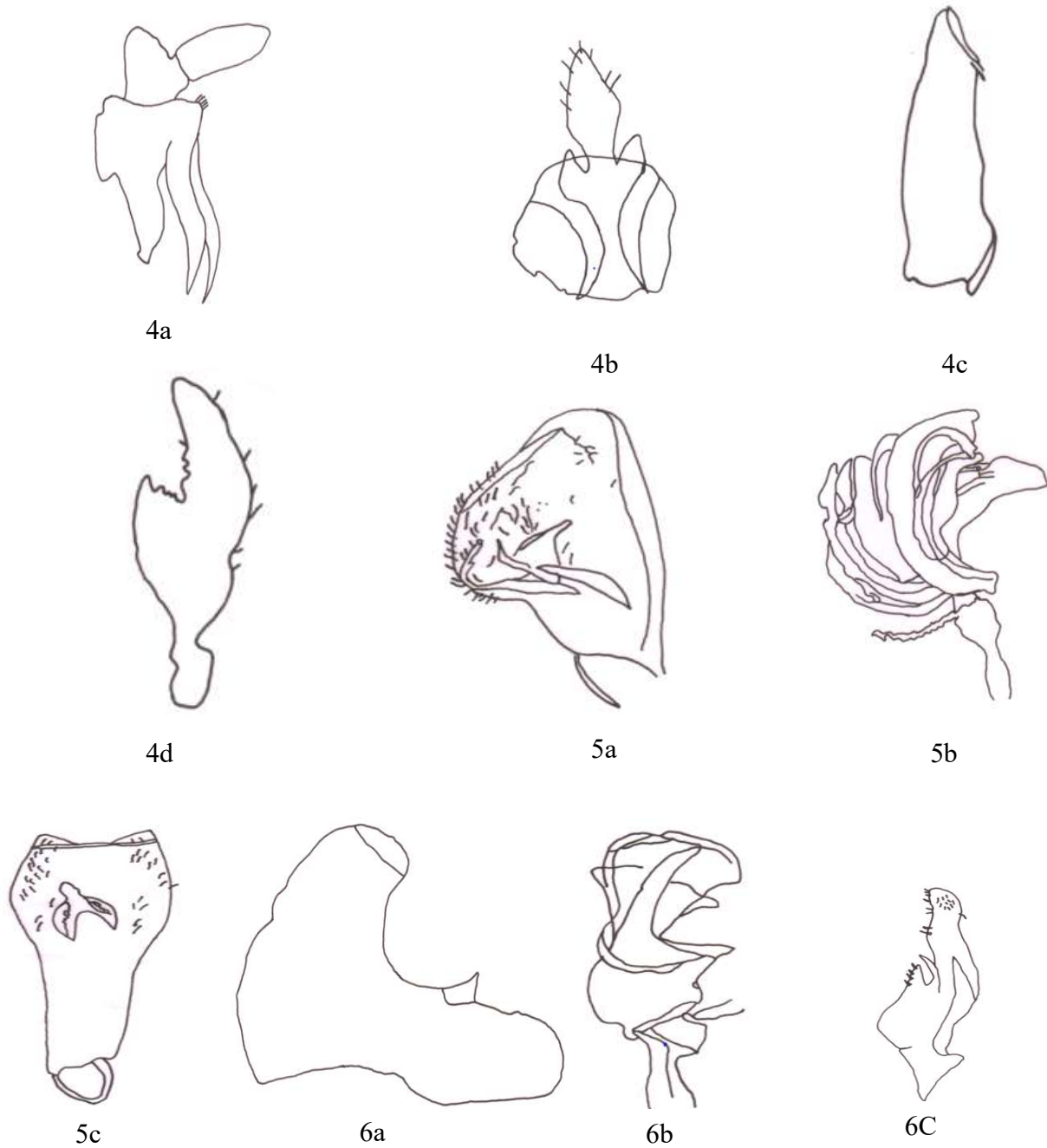
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Bio diversity of planthoppers in sorghum crop-ecosystems of southern and scarce rainfall zones of Andhra Pradesh



Figs. 1-3 *Cemus* sp. (Fennah) 1a. anal tube; 1b. aedeagus, lateral view; 1c. style. Figs. 2a-c. *Peregrinus maidis* (Ashmead) 2a. anal tube; 2b. style; 2c. aedeagus, lateral view. Figs. 3a-d. *Perkinsiella sinensis* (Kirkaldy) 3a. anal tube. 3b & 3c. aedeagus, (different orientations); 3d. style.



Figs. 4-6. *Sardia* sps. (Melichar):4a. & 4b. anal tube (different orientations); 4c. aedeagus, lateral view; 4d. style; Figs. 5a-d.*Pyrilla perpusilla* (Distant): 5a. genital style, lateral view; 5b. aedeagus; 5c. anal tube; Figs. 6a-c. *Nisia nervosa* (Motschulsky):6a. Pygofer, lateral view;6b. Aedeagus, lateral view; 6c. Style

Bio diversity of planthoppers in sorghum crop-ecosystems of southern and scarce rainfall zones of Andhra Pradesh

Morphometric studies on planthopper fauna (in millimetre) - (average of 10 specimens)

S. No.	Planthopper species	Length of body	Length of wing	Inter-ocular distance	Pronotum width	Width of insect	Width of head	Scutellum width	Length of Parameres	Width of Parameres	Length of aedeagus	Width of aedeagus
1.	<i>Cemus</i> sps.	6.97	5.80	0.45	1.20	1.56	1.09	0.40	0.22	0.15	0.37	0.08
2.	<i>Nisia nervosa</i>	4.11	3.51	0.51	1.09	1.58	1.07	0.70	0.14	0.11	0.30	0.04
3.	<i>Peregrinus maidis</i>	4.74	3.95	0.35	0.93	1.37	0.83	0.48	0.08	0.06	0.14	0.05
4.	<i>Perkinsiella sinensis</i>	6.14	5.10	0.58	1.44	1.74	1.20	0.51	0.21	0.14	0.35	0.07
5.	<i>Pyrilla perpusiella</i>	14.2	10.34	0.75	2.04	3.81	0.75	1.53	0.25	0.16	0.38	0.10
6.	<i>Sardia</i> sps.	5.71	4.65	0.21	1.18	1.25	0.69	0.38	0.25	0.13	0.32	0.27

Distribution pattern of planthoppers associated with Sorghum crop ecosystem of Southern and Scarce rainfall zones of Andhra Pradesh

S. No.	Species of planthopper	Chittoor	Anantapuramu	Kurnool	YSR Kadapa	Nellore
1.	<i>Cemus</i> sps.	P	P	P	P	P
2.	<i>Nisia nervosa</i>	P	P	P	P	P
3.	<i>Peregrinus maidis</i>	P	P	P	P	P
4.	<i>Perkinsiella sinensis</i>	P	P	P	P	P
5.	<i>Pyrilla perpusiella</i>	P	P	P	P	P
6.	<i>Sardia</i> sps.	P	P	P	P	P

P - Present