

**THREE NEW RECORDS OF MICROLEAFHOPPER GENUS *EMPOASCA* WALSH
1862 (HEMIPTERA: CICADELLIDAE: TYPHLOCYBINAE) FROM
BANGLADESH**

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ABSTRACT: The microleafhopper genus *Empoasca* Walsh, 1862 from Bangladesh is revised herein. With the existing species *E. vitis* (Göthe, 1875), another three species viz. *E. kerri* Singh-Pruthi, 1940, *E. motti* Singh-Pruthi, 1940 and *E. onukii* Matsuda, 1952 are described and reported first time from Bangladesh. Diagnostic descriptions, illustrations and a key to the *Empoasca* species from Bangladesh are provided.

Key words: Empoascini, Bangladesh, morphology, identification, new record

INTRODUCTION

The microleafhopper genus *Empoasca* Walsh, 1862 is popularly known as jassids. These are the key pest of vegetables and cotton chiefly amongst the Malvaceae, Leguminosae and Solanaceae (Rahman, 2014; Hamilton, 1972) in Indian sub-continent. Both nymphs and adults of this group inflict direct damage by sucking sap, causing stippling, cupping, puckering and bronzing of the leaves and resulting in 'hopper burn' symptoms, which ultimately fall off (Kranthi *et al.*, 2009). The genus is worldwide distributed and is one of the largest genera of Cicadellidae. Its diagnostic characters have been discussed by Zhang *et al.* (2008), Southern & Dietrich (2010), and Yu & Yang (2014) recently. Most of the species of this genus are so similar in external appearance (pale green to yellowish predominant body color ornamented with few symmetrical cream-colored markings on head and thorax) (Zhang *et al.*, 2008). Correct identification of pest species is very important for their documentation and proper management (Amin *et al.*, 2013). As part of a faunistic survey on the Typhlocybinae species from Bangladesh, under the genus *Empoasca* Walsh. We found three species which are recorded for the first time from Bangladesh: *E. kerri* Singh-Pruthi, 1940, *E. motti* Singh-Pruthi, 1940 and *E. onukii* Matsuda,

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1952. Here we describe these species with the existing one *E. vitis* (Göthe, 1875). Key to species of this genus in Bangladesh is also provided.

MATERIAL AND METHODS

The study was conducted at Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University during September 2020 to August 2022. Specimens of jassid species were collected from various regions of Bangladesh, which has been deposited at the Insect Museum, Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur.

Jassids were collected with a sweep net bearing a very deep net bag which was slowly opened and collected with an aspirator as they crawl toward the opening. Then the specimen was stored in a falcon tube containing cotton balls soaked in ethyl acetate. Morphological terminology that used in the study follows Dietrich (2005). Curating, preparation of specimens and dissections of male genitalia was followed after Kwon's method (Kwon, 1988). Taxonomic characters were examined under either stereo or optical microscopes, attached with a digital camera for photography. Images were produced using the software Helicon Focus 5.1 and were import into Adobe Photoshop CS6 for labeling and plate composition. Measurements of the overall body length (expressed in millimeters) were made with the aid of an ocular micrometer.

RESULTS AND DISCUSSION

Genus Empoasca Walsh, 1862

Type species: *Empoasca viridescens* Walsh, 1862

Type designation: Distant, 1908

Type locality: USA

Description: Body slender, predominant color of body pale green to yellowish ornamented with few symmetrical cream-colored markings on head and thorax; delicate, with middle part of vertex slightly elongate compared to its sides, coronal suture not extended beyond midlength of crown. Forewings with rectangular apical cells; more rarely 3rd apical cell stalked or triangular.

Male genitalia: Ventral pygofer appendage present and free of pygofer lobe for at least half its length, apex reaching or slightly surpassing posterior margin of the lobe; anal tube process prominent. Styles with weakly separated apical part denticulate on ventromedial margin, and devoid of bristles; long bristles present on outer margin of subapical part. Aedeagus with moderately long base,

sometimes bearing processes at place where shaft arises, tubular, sometimes flattened shaft; gonopore subapical or apical.

Key to species under the genus Empoasca Walsh, 1862 in Bangladesh:

1. Third apical cell of forewings triangular or stalked; base of subgenital plates prominently broad and aedeagus often with paired processes ---*Empoasca onukii*
 - Apical cells 2 and 3 both quadrate basally; base of subgenital plates moderately wide and aedeagus with dorsoatrium very short or absent, occasionally with paired preatrial processes near base of shaft -----2

2. Ventral pygofar process gradually tapered up to the distal end-----
 ----- *Empoasca kerri*

- Ventral pygofar process blunt, undulated to the distal end -----3

3. Body robust; anal hook short compare to width of pygofer lobe; pygofer process medially undulated, outer margin serrated -----*Empoasca motti*

- Body slender; anal hook longer compare to width of pygofer lobe; pygofer process more or less uniform medially, outer margin smooth -----*Empoasca vitis*

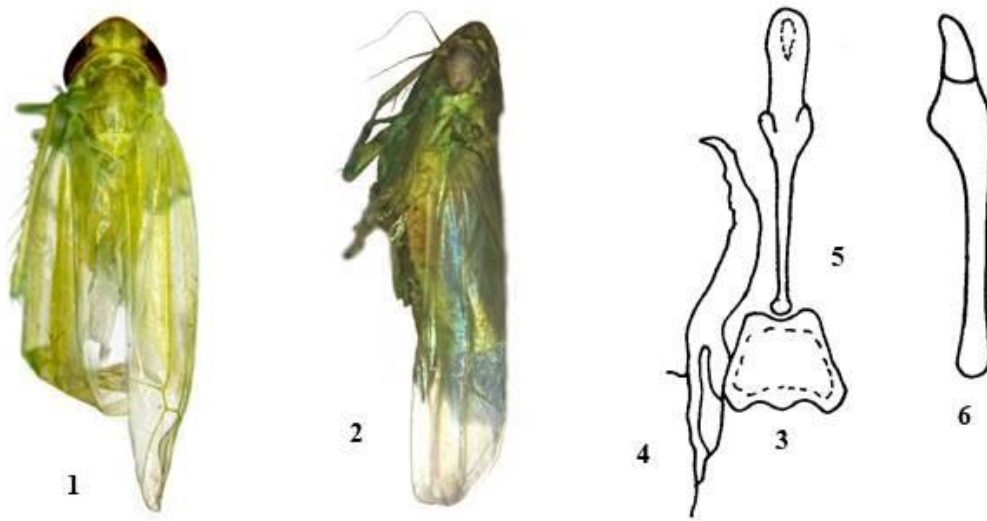
Description: Adult greenish yellow in colour; vertex short, flat or slightly raised, broadly rounded at apex; eyes dark purple; ocelli large, pale green, conspicuous; face slightly longer than broad, pronotum about double the length of vertex, anterior margin rounded, the posterior concave; scutellum about as long as the pronotum, yellow except in middle where it has a pale longitudinal patch; tegmen long transparent; legs pale green; abdomen orange yellow; genital segments green in colour; male slightly smaller than female and vertex more rounded at anterior margin.

Male genitalia: Connective well sclerotized, wider than long but not elongated, lateral margin evenly concave, anterior margin weakly concave, with distinct median lobe. Style comparatively small, narrow and serrated in the distal region, apices pointed; aedeagus narrow and rod like in proximal half, bulbous in middle, expanded at apex. *Length:* Male 2.6–2.8 mm, female 3.0–3.2 mm.

Materials examined: Two males and three females, Sirajganj, Bangladesh, on cowpea, 13.I.2021, M.S. Hossain; four males and two females, Rajshahi, Bangladesh, on cowpea and maize, 29.I.2021, M.S. Hossain; one male and two females, Bogura, Bangladesh, on cowpea, 11.II.2021, M.S. Hossain.

Distribution: India, Pakistan, Bangladesh (Dmitriev, 2003).

Host plants: *Cajanus cajan*, *Psidium guajava* (guava), *Zea mays* (maize), castor, cluster bean (Dmitriev, 2003).



Figs. 1-6. *Empoasca kerri* Singh-Pruthi, 1940: 1. Dorsal habitus; 2. Lateral habitus; 3. Connective; 4. Style; 5. Aedeagus (ventral view); 6. Aedeagus (lateral view).

Description: Adult yellowish green in colour. *E. motti* and *E. kerri* are similar in length, but the *E. motti* looks more robust. Vertex smaller than pronotum, almost flat, greenish yellow, distinctly yellow at apex; eyes are black in colour; pronotum smooth and flat; scutellum green in colour, medially broadly pale especially near tip, dark near the basal angles. Forewing long, narrow, semitransparent, pale green, deep green at costal and claval margins, grey in the distal region.

Male genitalia: Connective wider than long, free, well sclerotized, lateral margin distinctly constricted, anterior margin weakly concave, without median lobe. Style apophysis much longer than apodeme, preapical lobe absent, dentifer distinctly narrower than basal section, teeth numerous, well distributed, not densely grouped at apex. Aedeagus shaft orientation in profile forming $> 30^\circ$ but $< 60^\circ$ angle with preatrium. Aedeagus dorsal apodeme very short, postatrium absent, shaft very short, in caudoventral view expanded (broadest in distal half).

Length: Male 2.8-3.2mm, female 3.2-3.8mm.

Materials examined: Six males and three females, Mymensingh, Bangladesh, on brinjal and mungbean, 19.XII.2020, M.S. Hossain; six males and seven females, Sirajganj, Bangladesh, on brinjal, 13.I.2021, M.S. Hossain; four males and three females, Rajshahi, Bangladesh, on brinjal, mungbean and cow pea, 29.I.2021, M.S. Hossain; six males and twelve females, Jashore, Bangladesh, on brinjal and cotton, 25.II.2021, M.S. Hossain; seven males and four females, Gazipur, Bangladesh, on brinjal, mungbean, soybean and cotton,

27–28.IV.2021, M.S. Hossain; five males and four females, Pabna, Bangladesh, on brinjal and mungbean, 17–18.VI.2021, M.S. Hossain; five males and five females, Natore, Bangladesh, on brinjal, mungbean and cowpea, 19.VI.2021, M.S. Hossain.

Distribution: Burma, India, Bangladesh, Nepal, Pakistan, Sri Lanka, Myanmar, China (Dmitriev, 2003).

Host plants: *Acacia nilotica*, *Capsicum annum*, *Chenopodium* sp., *Gossypium* sp. (cotton), *Linum usitatissimum*, *Lycopersicum esculentum*, *Milletia auriculata*, *Nicotiana tabacum*, *Pisum sativum*, *Psidium guajava* (guava), *Sesbania sesban*, *Solanum melongena*, *Solanum tuberosum* (potato), *Trifolium alexandrinum*, *Vigna unguiculata*, *Vigna unguiculata* (cowpea), castor, cluster bean, linseed, mung (Dmitriev, 2003).

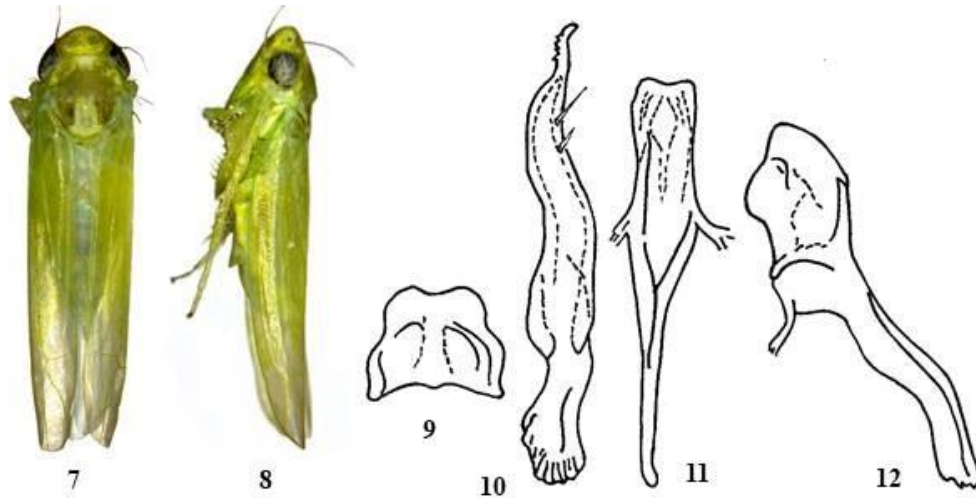


Fig. 7–12. *Empoasca motti* Singh-Pruthi, 1940: 7. Dorsal habitus; 8. Lateral habitus; 9. Connective; 10. Style; 11. Aedeagus (ventral view); 12. Aedeagus (lateral view).

Description: General coloration yellowish-green, with grayish-green patch on each side of vertex centrally and creamy streak along coronal suture not reaching anterior margin, bordering eye with creamy patch basally at each side; coronal suture beige; eyes blackish-brown. Frontoclypeus yellow with small creamy patches in anteocular areas; anteclypeus yellowish; lora and genae whitish-yellow. Pronotum with 3 irregular creamy patches along anterior margin and arcuate area in anterior part; scutellum with quadrate creamy patch in centre. Forewings subhyaline; hindwings hyaline; abdomen yellow; legs sordid green.

Male genitalia: Styles with 5 apical teeth and 2 relatively bigger teeth subapically, preceded by about 4–5 setae and few sensory pits; connective

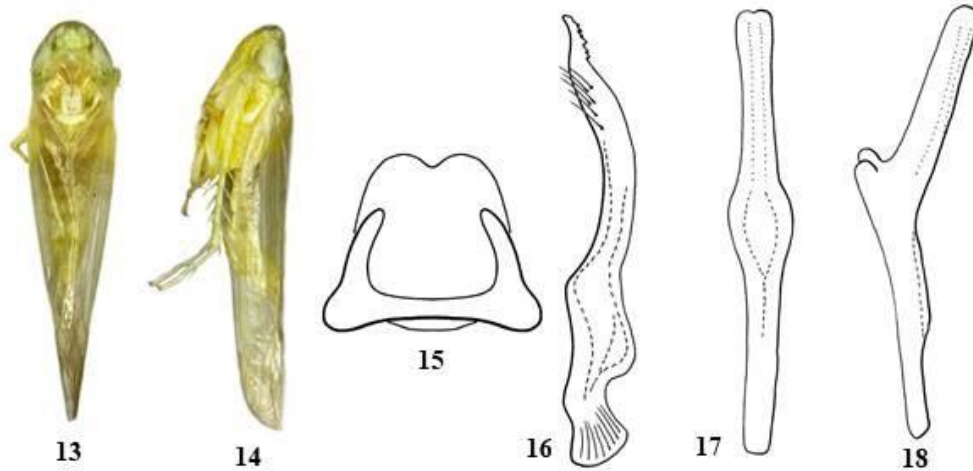
lamellate, with caudal margin incised medially. Aedeagal shaft straight nearly as long as preatrium in lateral view, broad basally and narrowing terminally; dorsal apodeme short, expanded laterad in ventral view; gonopore ventrad near apex.

Length: Male 2.8–3.0 mm, female 3.0–3.2 mm.

Materials examined: Three males and three females, Mirsharai, Chattogram, Bangladesh, on tea, 06.X.2022, M.S. Hossain.

Distribution: India, Bangladesh, Vietnam, China, Taiwan, Korea, Japan, Oriental region (Dmitriev, 2003).

Host plants: *Artemisia* spp., *Citrus junos*, *Citrus* spp., *Citrus unshiu*, *Thea sinensis* (Dmitriev, 2003).



Figs. 13–18. *Empoasca onukii* Matsuda, 1952: 13. Dorsal habitus; 14. Lateral habitus; 15. Connective; 16. Style; 17. Aedeagus (ventral view); 18. Aedeagus (lateral view).

Description: Predominant color of dorsum pale green or yellowish green or yellow with few symmetrical cream-colored markings on head and thorax. Vertex distinctly longer medially than next to eye and distinctly shorter than width between eyes. Head subequal to that of pronotum, coronal suture extended well beyond vertex midlength but not onto face. Forewings with colorless subhyaline longitudinal stripe in medial cell and apices of cubital and radial cells, apical cells 2 and 3 both quadrate basally, apical cell 4 distinctly tapered near base.

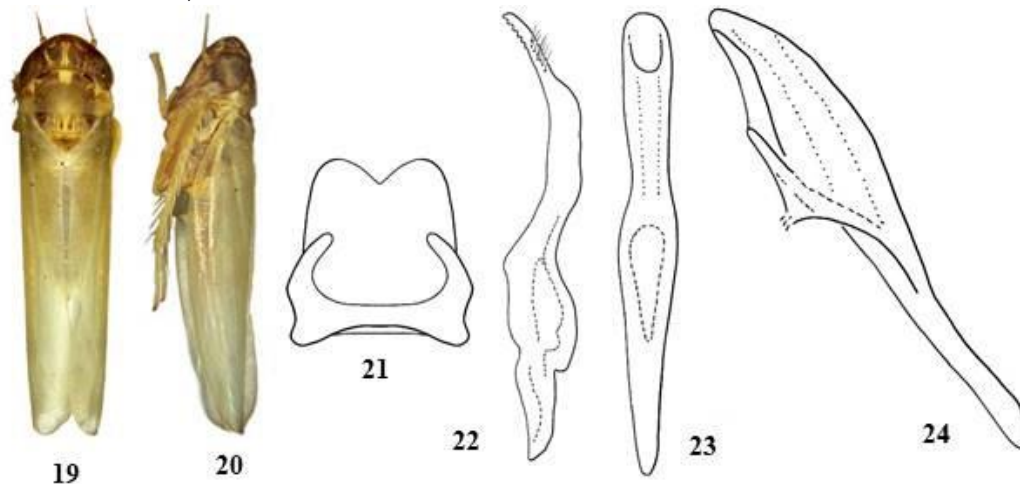
Male genitalia: Styles in ventral view not extended as far, or nearly as far posterad as pygofer ventral process, with 8 teeth on dentifer, 5–7 setae subapically; connective broad, anterior margin medially emarginate. Aedeagal shaft more than 2 times longer than maximum width in lateral view, tapering distally, dorsal and ventral margins distinctly convergent through most of length.

Length: Male 2.8–3.5 mm, female 3.0–3.8 mm.

Material examined: Four males and six females, Mymensingh, Bangladesh, on grape, 20.XII.2020, M.S. Hossain; five males and seven females, Jashore, Bangladesh, on rose, 26.II.2021, M.S. Hossain.

Distribution: India, Bangladesh, China, Uzbekistan, Palestine, Korea, Japan, Russia, Europe, Nearctic region, Oriental region, Mexico, USA (Dmitriev, 2003).

Host plants: *Acer pseudoplatanus*, *Acer* sp., *Alnus glutinosa*, *Alnus incana*, *Alnus* sp., *Beta* sp., *Betula pendula*, *Betula* sp., *Carpinus* sp., *Corylus* sp., *Crataegus* sp., *Fagus* sp., *Filipendula ulmaria*, *Fraxinus* sp., *Hippocastanus* sp., *Juniperus* sp., *Lonicera* sp., *Malus* sp., *Paulownia tomentosa*, *Phaseolus* sp., *Picea* sp., *Pinus* sp., *Pirus* sp., *Pirus ussuriensis*, *Populus* sp., *Prunus avium*, *Prunus insitilia*, *Prunus* sp., *Quercus* sp., *Rhamnus* sp., *Rosa rugosa*, *Rosa* sp., *Rubus* sp., *Salix* sp., *Sorbus* sp., *Tilia* sp., *Ulmus* sp., *Vitis* sp., *Vitis vinifera* (Dmitriev, 2003).



Figs. 19–24. *Empoasca vitis* (Göthe, 1875): 19. Dorsal habitus; 20. Lateral habitus; 21. Connective; 22. Style; 23. Aedeagus (ventral view); 24. Aedeagus (lateral view).

CONCLUSION

Three species viz. *Empoasca kerri* Singh-Pruthi, 1940, *Empoasca motti* Singh-Pruthi, 1940 and *Empoasca onukii* Matsuda, 1952 are new distribution in Bangladesh. These groups of pest species show a wide variation in their morphological and growth characteristics as well as their host range. Regular monitoring and proper identification of leafhoppers are essential in an agroecosystem in order to forecast their infestations and develop strategies for proper management.

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