Description of a new species of Aleuroclava Singh, 1931 (Hemiptera, Aleyrodidae) infesting Schima superba from China

Ji-Rui Wang¹, Zhi-Hong Xu¹, Guo-Xin Zhou¹

¹ School of Agricultural & Food Science, Zhejiang Agriculture & Forestry University, Linan, Zhejiang 311300, China

Corresponding author: Guo-Xin Zhou (gxzhou@zafu.edu.cn)

Academic editor: P. Stoev   |   Received 30 October 2019   |   Accepted 11 September 2020   |   Published 11 November 2020

http://zoobank.org/6EF8FFB1-CF3D-4BDB-89F1-F69F1A4107FD

Citation: Wang J-R, Xu Z-H, Zhou G-X (2020) Description of a new species of Aleuroclava Singh, 1931 (Hemiptera, Aleyrodidae) infesting Schima superba from China. ZooKeys 991: 121–128. https://doi.org/10.3897/zookeys.991.47725

Abstract

A new whitefly species, Aleuroclava schimae Wang, sp. nov. infesting leaves of Schima superba (Parietales, Theaceae) is described and illustrated from Zhejiang, China. Puparia of the new species are elliptical, broad at the transverse molting suture region and broadly truncate posteriorly. Thoracic and caudal tracheal pores are discernible. In life, the puparia are covered by a thin layer of white wax.

Keywords

Aleuroclava schimae sp. nov., instar, morphology, new species, puparia, taxonomy, whitefly

Introduction

The whitefly genus Aleuroclava Singh, 1931 is represented by 124 species worldwide, of which 38 species are from China (Evans 2007; Wang et al. 2014; Wang and Du 2016), including A. schimae sp. nov.. Aleuroclava species occur predominantly in the Oriental and Austro-Oriental Regions and feed on a wide range of host plants (Evans 2007).
Wang and Du (2016) provided a diagnostic key to *Aleuroclava* species including those of Hong Kong and Taiwan. *Aleuroclava schimae* sp. nov. found densely infesting leaves of *Schima superba* Gard. & Champ. at Thousand Island Lake (TIL), Gutianshan Nature Reserve, Shuangxikou village, Zhejiang, China is described herein. Morphological characteristics of puparia and immatures of the new species are described with images of habitus, holotype, line drawings and SEM images.

*Schima superba* (Parietales, Theaceae) is an economically and ecologically important woody tree of China. It is a dominant tree species in the subtropical evergreen broad-leaved forests of southern China (Zhang et al. 2019), and commercially used for timber, furniture and construction purposes, and also as fire breaks to prevent forest fires (Yang et al. 2017).

**Material and methods**

Puparia of the new species were collected on leaves of *Schima superba* from Zhejiang, Thousand Island Lake (hereafter TIL) and Gutianshan Nature Reserve, Shuangxikou village, China. No adult emergence was noticed during rearing of puparia for two weeks. Puparia were mounted following Dubey and David (2012). The terminology for morphological structures follows Bink-Moennen (1983), Martin (1985) and Gill (1990). Habitus images were taken using a digital camera Canon IXUS 105 and a camera DFC 290 (Leica, Wetzlar, Germany) attached to a Leica stereomicroscope M 125 (Leica, Wetzlar, Germany). Puparial measurements and microphotographs were taken using a compound microscope (Carl Zeiss, Gottingen, Germany) from Zhejiang Agriculture and Forestry University (ZAFU). The scanning electron microscope images were taken by Hitachi TM-1000 Scanning Electron Microscope (Hitachi, Japan) from the Center of Electron Microscopy, Zhejiang University (Life Sciences Division). Adobe Photoshop 7 software was used for figure preparation. The holotype is deposited in the Insect Collections of Zhejiang Agriculture and Forestry University, Lin’an, China (ZAFU). One paratype will be deposited in the Shanghai Entomological Museum, Chinese Academy of Sciences (SEM-CAS) and the remainder in ZAFU.

**Taxonomy**

*Aleuroclava* Singh

**Diagnosis.** Puparia small in size, elliptical or subelliptical. Margin with one row of teeth. Submarginal area not separated from dorsal disc, with papillae-like markings in some species, dorsum generally with tubercles. Thoracic tracheal folds and pores not discernible; caudal furrow and pore distinct. Vasiform orifice generally notched posteriorly; operculum cordate, nearly filling orifice; lingual hidden.
A new species of *Aleuroclava* Singh from China

*Aleuroclava schimae* Wang, sp. nov.
http://zoobank.org/2A18B6BA-16DC-41CD-834F-FCE9AA22EDB5
Figs 3–18

**Type material.** *Holotype:* China, Zhejiang, Zhejiang, Chun'an, Thousand Island Lake, 1 puparium on slide, on *Schima superba*, 6. vi. 2016, 29°31.21’N, 118°52.41’E, leg. JR Wang. Deposited in the Insect Collections of ZAFU, Lin’an, China. *Paratypes:* Fifty-six, of which 30 puparia on 21 slides, data same as for holotype; Gutianshan Nature Reserve, Zhejiang, Kaihua, 15 puparia on 12 slides, on *Schima superba*, 28.xiii.2018, 29°15.12’N, 118°06.42’E, leg. AQ Dai; Zhejiang, Jiangshan, Shuangxikou village, 11 puparia on 10 slides, 30. xiii. 2018, 28°23.12’N, 118°41.15’E, leg. AQ Dai. (SEM-CAS 1 paratype, ZAFU 55 paratypes and dry collection).

**Description.** *Egg* (Fig. 8). Fusiform; yellowish, gradually becoming dark brown over time; about 152 µm long, 69 µm wide, found deposited randomly on lower surface of leaves.

*Puparium.* Covered by a thin layer of white wax (Fig. 3); puparium in early stage white (Fig. 5), gradually turns black (Figs 3, 4), about 926–1120 µm long, 763–832 µm wide; elliptical, broadest at the transverse molting suture region; posteriorly horizontal.

*Margin* (Figs 10, 14, 17). Crenulate, 0.1 mm wide, 23–28 crenulations. Paired anterior and posterior marginal setae 27 and 16 µm long, respectively. Thoracic tracheal pore area slightly recessed and emarginated at margin. *Dorsum.* Almost flat,
Figures 3–8. Habitus, developmental stages of *A. schimae* sp. nov., on *S. superba*. 3, 4 puparium, late stage 5 puparium, early stage 6 third instar 7 second instar 8 eggs.

slightly raised on abdomen; without tubercles. Submargin demarcated from the dorsal disc by a faint line. Longitudinal moulting suture reaching anterior margin and the transverse moulting suture reaching submargin (Figs 13, 16). Thoracic and abdominal segment sutures well defined. Middle length of abdominal segment I 53 µm; segment II 47 µm; segments III–VI subequal, 37 µm; segment VII 28 µm
A new species of Aleuroclava Singh from China

Figures 9–12. Scanning electron microscope (SEM) photographs of *A. schimae* sp. nov. 9 puparium, dorsal view 10 margin 11 vasiform orifice and operculum 12 third instar nymph.

long. Geminate pores present (Figs 9, 13, 16). *Chaetotaxy*. Cephalic, first, eighth abdominal and caudal setae 9, 13, 4 and 47 µm long, respectively. Eighth abdominal setae located below the base of orifice. Caudal furrow 68 µm long. *Vasiform orifice* (Figs 11, 15, 18). Cordate to subcircular, slightly longer than wide, 48 µm long, 44 µm wide, lateral margins rounded, basal ends being curved to meet basal margin; operculum cordate, 33 µm long, 29 µm wide, almost covering the orifice and obscuring the lingula. *Venter*. Thoracic and caudal tracheal folds discernible (Fig. 16). Ventral abdominal setae placed on anterior to vasiform orifice, 6 µm long, 49 µm apart. Antennae extending near the base of prolegs. *Third instar nymph* (Figs 6, 12). Light yellow, body transparent, elliptical, about 720 µm long, 540 µm wide; eye spots obvious. *Second instar nymph* (Fig. 7): yellowish, elongate-elliptical, about 290 µm long, 170 µm wide; transparent wax secretion along the body margin, about 11 µm wide; eye spots red.

**Host plant.** *Schima superba* Gardner & Champ (Parietales, Theaceae) (Figs 1, 2).

**Distribution.** China: Zhejiang.
Figures 13–15. *Aleuroclava schimae*, sp. nov., slide mounted specimen. 13 puparium, dorsal view 14 margin 15 vasiform orifice and operculum.

**Biology.** Puparia were found on the lower surface of leaves; 10–40 per leaf (Figs 2–4); covered by a thin layer of white wax (Fig. 5). Exuviae of previous instars were present. No parasitoids and ants were observed.

**Etymology.** The species is named after the host plant, *Schima superba*.

**Remarks.** Puparia of the new species are elliptical in outline, broad at the transverse moulting suture region, truncate posteriorly (Figs 3, 4, 9, 13, 16), thoracic tracheal pores recessed, emarginated (Figs 10, 14, 17), transverse moulting suture reaching submargin (Figs 13, 16), and vasiform orifice cordate to subcircular, slightly longer than wide.

Puparium of *A. schimae* sp. nov. resembles that of *A. tianmuensis* in body shape, size and colour, but differs in having horizontal posterior end (curved in *A. tianmuensis*), and in lacking median tubercles on abdominal segments II-VI. It differs from *Aleuroclava similis* (Takahashi) in colour of puparium, and from *A. trivandricus* Dubey & Sundararaj in colour and thoracic tracheal pores not deeply inset at the margin. It also differs from *A. hikosanensis* (Takahashi) from the characteristic of the median area of each abdominal segment.
A new species of *Aleuroclava* Singh from China

Figures 16–18. *Aleuroclava schimae* sp. nov., holotype puparium, China, Zhejiang. 16 puparium, dorsal (right) and ventral (left) views 17 margin 18 vasiform orifice.

**Acknowledgements**

We express our deep gratitude to Dr Anil Kumar Dubey (Zoological Survey of India) for editing and helpful suggestions for improvement of the manuscript. The comments by the other two reviewers, Chiun-Cheng KO (Department of Entomology, National Taiwan University) and Maurice Jansen (Netherlands Food and Consumer Product Safety Authority) are also appreciated. This research was supported by grants from the National Natural Science Foundation of China (31930073, 31601884) and the Research and Development Fund of Zhejiang A&F University (2017FR041), China.

**References**

Bink-Moenen RM (1983) Revision of the African whiteflies (Aleyrodidae). Monografieën van de Nederlandse Entomologische Vereniging. Amsterdam 10: 1–211.
Dubey AK, David BV (2012) Collection, preservation and preparation of specimens for taxonomic study of whiteflies (Hemiptera: Aleyrodidae). In: David BV (Ed.) The whiteflies or mealywing bugs: biology, host specificity and management. Lambert Academic Publishing, Germany, 1–19.

Evans GA (2007) The Whiteflies (Hemiptera: Aleyrodidae) of the World and Their Host Plants and Natural Enemies. https://keys.lucidcentral.org/keys/v3/whitefly/PDF_PwP%20ETC/world-whitefly-catalog-Evans.pdf [updated 11 June 2007; cited 22 June 2019]

Gill RJ (1990) The morphology of whiteflies. In: Gerling D (Ed.) Whiteflies, their Bionomics, Pest Status and Management. Intercept, Andover, 13–46.

Martin JH (1985) The whitefly of New Guinea (Homoptera: Aleyrodidae). Bulletin of the British Museum (Natural History) (Entomology) 50: 303–351.

Wang JR, Dubey AK, Du YZ (2014) Description of a new species of Aleuroclava Singh (Hemiptera: Aleyrodidae) from China. Florida Entomologist 97(2): 685–691. https://doi.org/10.1653/024.097.0248

Wang JR, Du YZ (2016) Contribution to our knowledge of the whitefly genus Aleuroclava Singh (Hemiptera: Aleyrodidae) in China, including Taiwan and Hong Kong, with descriptions of two new species. Zootaxa 4138(2): 332–348. https://doi.org/10.11646/zootaxa.4138.2.6

Yang HB, Zhang R, Zhou ZC (2017) Pollen dispersal, mating patterns and pollen contamination in an insect-pollinated seed orchard of Schima superba Gardn. et champ. New Forest. 48: 431–44. https://doi.org/10.1007/s11056-017-9568-6

Zhang R, Yang HB, Zhou ZC, Shen B., Xiao JJ, Wang BS (2019) A high-density genetic map of Schima superba based on its chromosomal characteristics. BMC Plant Biology 19(1): 41. https://doi.org/10.1186/s12870-019-1655-8