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CONTRIBUTION TO THE STUDY OF GENUS *DIALEURODES* (HOMOPTERA: ALEYRODIDAE) FROM PAKISTAN

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ABSTRACT

The present study was conducted to collect, preserve and identify genus *Dialeurodes* from Punjab, Pakistan. The species were collected from Faisalabad, Gujrat, Rahim Yar Khan, Sialkot and Multan. Three species *D. abbotabadensis* Qureshi, *D. citri* (Ashmead) and *D. kirkaldyi* (Kotinsky) were identify from pupal cases mounted on slides. The identified species were severely damaging *Citrus sp*., *Jasminum sambac, Psidium guajava, Rosa hybrid*, *Syzygium cumini*. A taxonomic key for the identification of species of this genus was also given. Present research is helpful for identification of pest species of this genus for their effective control.

Keywords: Taxonomy, *Dialeurodes*, Pakistan, Punjab, Whitefly

INTRODUCTION

Aleyrodidae is an important family of Sternorrhyncha and suborder of Hemiperea. It includes whiteflies, which are small in size vary between 1-2 mm, body dusted with white mealy powder. An annotated list of the world's whiteflies was published with more than 1600 valid sub species and species Martin and Mound (2007).

Dialeurodes was raised to genus level by Cockerell (1902). Type species by original description for this genus was *Aleyrodes citri*. At present this genus includes more than 122 valid species. About 10 species were synonymised in a checklist published by Martin and Mound (2007). An annotated catalogue of whiteflies (Hemiptera: Aleyrodidae) from Arasbaran, northwestern Iran was published by Ghahari *et al*. (2009), added *Dialeurodes kirkaldyi* (Kotinsky) to Iranian fauna. Suarez *et al*. (2012), identified morphologically 21 species belong to to 12 genera from Canary Islands including *Dialeurodes citri.* Phillips and Jesudasan (2013), identified two whitefly species *Dialeurodes megaspina* and *Dialeurodes radiipuncta* from India. Ragupathy and Ravichandran (2016) reported *Dialeurodes davidi* attacking on a new host plant *Elaeodendron glaucum and Vaccinium leschenaultia* from Tirumala Hills of Andhra Pradesh, India.

Some species of this genus have been reported damaging the citrus plants, of which *Dialeurodes citri, D. elongata, A. citrifolii, A. husaini* and *A.woglumi* are major pests in different parts of the Punjab. These pests greatly reduce vigor and yield by desapping the plants Husain and Khan (1945).

MATERIALS AND METHODS

The pupae on the leaves of different types of vegetation were collected in the years 2016 to 2017 from 20 localities of the Punjab province, viz., Bahawalpur, Bhukkar, Chakwal, Dera Ghazi Khan, Faisalabad, Gujrat, Islamabad, Jhelum, Kallar Kahar, Lahore, Lodhran, Multan, Muree, Okara, Rahim Yar Khan, Rawalpindi, Sahiwal, Sargodha, Sialkot and Vehari. The leaves having pupae on them were packed and brought to the laboratory after writing the name of locality, host plant and date of collection. The pupal cases were removed from the leaves with a small needle. Finally, preserved in 75 per cent alcohol in vials. For identification of these specimens, the permanent slides were prepared according to Martin (1987) with little modifications, as given below.

First pupae were punctured from lower side by a small pin and heated them up to the boiling point in 5 to 10 per cent KOH (Potassium hydroxide) in a glass tube for 5-10 minutes to wash or remove their inner body organs. After this, they were

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treated with glacial acetic acid to neutralize the alkali. The pupae were thereafter treated with chloral phenol in a glass tube for a few minutes to remove the wax coating present on specimens. The pupae that have black color were rinsed in alcohol, then treated with hydrogen peroxide to remove their colour. They were then left as such for 30 to 40 minutes. The cases that have white or pale color were dipped and washed in glacial acetic acid, then stained with acid fuchsin for 10 to 15 minutes. After this, the specimens were treated with 95 and 100 per cent alcohol each for 5-10 minutes to remove the excessive stain. Finally, the pupae were mounted by using Hoyer's medium on microscopic slides. After this, these slides were dried at room temperature for 24 to 48 hours.

Key to the species of *Dialeurodes* in Punjab

1. Pupal case subtriangular, broadening anteriorly, with border broadly undulating; thoracic tracheal pore not invaginated; thorax with a group of circular tubercles inner to each leg…….....…..*abbotabadensis*
- Characters not as above…….....….....…….....2

2. Pupal case pyriform, with a median brown to reddish patch extending from rostrum to second abdominal segment…….....…..*kirkaldyi*
- Pupal case not pyriform, without a median brown to reddish patch extending from rostrum to second abdominal segment…..….....…..…..…..*citri*

RESULTS AND DISCUSSION

Genus *Dialeurodes* Cockerell

Aleyrodes (Dialeurodes) Cockerell, 1902a. Proc. Acad. nat. Sci. Philad., 54: 283.
Type species: *Aleyrodes citri* Riley & Howard
Specimens belong to three species have been identified form the Punjab in this study. These species were identified from the published morphological description of David & Subramaniam (1976), Qureshi (1978) and Jesudasan & David (1991) of this genus.

1. Dialeurodes abbotabadensis Qureshi

Dialeurodes abbotabadensis Qureshi, 1980b. Pakistan J. sci. Res., 32 (1-2): 62-64.
Pupal case: Pale yellow, medium sized, broadest from anterior but slightly depressed from thorax, length 0.98 to 0.99 mm and width 0.68 to 0.71mm.
Margin: Crenulate, with a single row of teeth, marginal setae present on anterior and posterior side, with length 22 and 25µ in length respectively, thoracic tracheal comb with 12 to 14 sharp teeth, caudal margin with 6 to 8 teeth.
Submargin: Submargin is not separated from dorsal disk but faint radial lines are present, caudal setae not visible.
Dorsal surface: A pair of seta 20µ in length present on postero-lateral side of vasiform orifice, but cephalic and 8th abdominal pair is not visible, a group of small circular dots are present on both sides of thorax, transverse moulting suture first bends down and ends just near outer side of meta leg, 7th abdominal segment is almost equal to the 6th one in length.
Vasiform orifice: Almost subcordate in shape, 33 to 36µ long and 42 to 45µ wide, operculum similar inshape and filling the vasiform orifice, lingual cylindrical in shape, hide by operculum, caudal furrow narrowing posteriorly, longer than vasiform orifice, without dots and ending near the posterior border.
Ventral surface: Thoracic and tracheal caudal folds are visible without dots, legs visible, antenna ends inside proleg, posterior abdominal spiracles are present with setae.
Material examined**:** 3 pupae, on Jaman (*Syzygium cumini)*, 20-XII-2016 (M.T.Roy); Sialkot, 2 pupae, on Guava (*Psidium guajava)*, 9-III-2017 (M.T.Roy); Rahim Yar Khan

2. Dialeurodes citri (Ashmead)

Aleurodes citri Ashmead, 1885. Flor. Disp., 2(42): 704.
Pupal case*:* Yellowish, almost elliptical, broadest at first abdominal segment, length 1.21 to 1.42 mm, width 0.98 to 1.11 mm.
Margin: Crenulate to smooth, anterior marginal seta measuring 37µ, posterior marginal seta measuring 43µ, thoracic tracheal pore visible with 4 to 6 teeth, caudal margin with 4 teeth.
Submargin: Distinct from dorsum, dorsum is raised from submarginal area, submargin highly rich with radial striations.
Dorsal surface: Dorsum raised, transverse moulting suture ends near submarginal area, thoracic tracheal fold with black dots, three tubercle like markings are present on meso, metathorax and on second abdominal segment, 7th abdominal segment forming an arch like structure over vasiform orifice
Vasiform orifice: Semi- circular in shape, length of vasiform is 41 to 42µ, with width of 32 to 34 µ, operculum filling entire vasiform orifice, lingual hide by operculum, caudal furrow zigzag, narrowing posteriorly, caudal fold with course black dots, caudal seta nor visible,
Ventral surface: Ventral abdominal setae visible, rostrum visibly raised, antenna ends near outer margin of proleg, setae present at the base of each leg.
Material examined**:** 2 pupae, on Rose (*Rosa hybrid)*, 13-I-2016 (M.T.Roy), Faisalabad; 4 pupae, on Kali (*Jasminum sambac)*, 20-XII-2016 (M.T.Roy), Sialkot; 2 pupae, on Citrus (*Citrus sp)*, 10-II-2017 (M.T.Roy), Gujrat; 5 pupae, on Rose (*Rosa hybrid)*, 4-V-2017 (M.T.Roy), Multan; 3 pupae, on Citrus (*Citrus sp)*, 12-III-2017 (M.T.Roy), Multan; 4 pupae, on Rose (*Rosa hybrid)*, 21-XI-2016 (M.T.Roy), Rahim Yar Khan.

3. Dialeurodes kirkaldyi (Kotinsky)

Aleyrodes kirkaldyi Kotinsky, 1907. Bull. Bd. Commnrs. Agric. For. Hawaii Div. Ent., 2: 95-96.
Pupal case: Yellowish in color, pyriform in shape, broadest at second abdominal segment, depressed from meso and meta thorax, 1.27 to 1.30mm long, 0.95 to 0.99 mm wide.
Margin: Irregularly crenulate or uneven, anterior marginal seta measuring 20µ, posterior marginal seta measuring 32µ, thoracic tracheal and caudal pore visible with sharp theeth.
Submargin: Dorsum not separated from submargin, highly rich with radial striations, minute pores are present in a row.
Dorsal surface: A median dark brown patch is present on pro, meso, matethorax and first abdominal segment, subdorsum area with a row of tubercles, three pair of setae are present, cephalic measuring 12µ, first abdominal is 12µ and eight abdominal is 9µ, thoracic and caudal folds are without dots, transverse moulting suture ends near margin, a suture anterior

to cephalic is visible.

Vasiform orifice: Almost cordate shaped, length of vasiform orifice is 42 to 44µ, with width of 40 to 42µ, operculum filling entire vasiform orifice, lingual hide by operculum, caudal furrow is visible without black dots, caudal seta nor visible

Ventral surface: Abdominal setae measuring 14µ, antenna extending beyond outer margin of prolag, rostrum visibly raised.

***Material examined*:** 5 pupae, on Citrus (*Citrus sp)*, 6-I-2016 (M.T.Roy), Faisalabad; 5 pupae, on Rose (*Rosa hybrid)*, 1-XI-2016 (M.T.Roy), Faisalabad; 3 pupae, on Kali (*Jasminum sambac)*, 5-IX-2016 (M.T.Roy), Faisalabad; 3 pupae, on Jaman (*Syzygium cumini)*, 24-II-2016 (M.T.Roy), Sialkot; 3 pupae, on Citrus (*Citrus sp)*, 20-XII-2017 (M.T.Roy), Sialkot; 4 pupae, on Jaman (*Syzygium cumini)*, 24-X-2017 (M.T.Roy), Sialkot; 2 pupae, on Citrus (*Citrus sp)*, 17-X-2017 (M.T.Roy), Gujrat; 3 pupae, on Jaman (*Syzygium cumini)*, 7-IX-2017 (M.T.Roy), Rahim Yar Khan.

Purpose of present work is to prepare a key for the identification of species under this genus. Very little work has been done on the taxonomic study of this genus in Pakistan. In the present study 3 species were *Dialeurodes abbotabadensis, Dialeurodes citri* and *Dialeurodes kirkaldyi* identified under the genus *Dialeurodes* from the Punjab. The recorded species have been collected in large number from Citrus (*Citrus sp),* Jaman (*Syzygium cumini)*, Kali (*Jasminum sambac)* and Rose (*Rosa hybrid)*. These may become serious pests of plants in future.

Fig.1.

Dialeurodes abbotabadensis, pupal case.

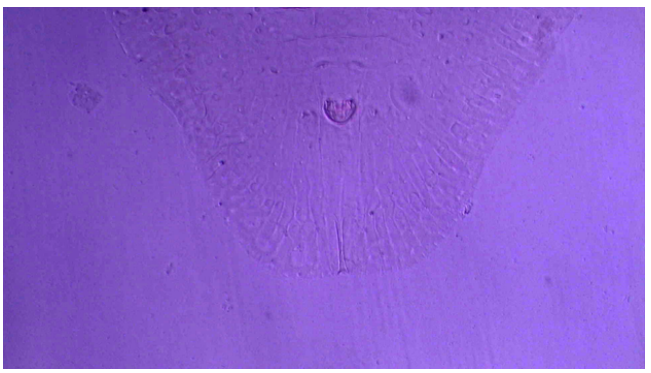

Fig.2.

Dialeurodes abbotabadensis, vasiform orifice, caudal furrow

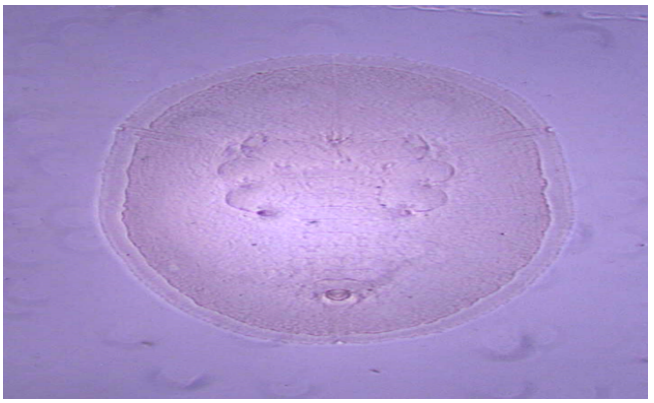

Fig.3.

Dialeurodes citri, pupal case,

Fig.4.

Dialeurodes citri, thoracic tracheal comb, transverse suture

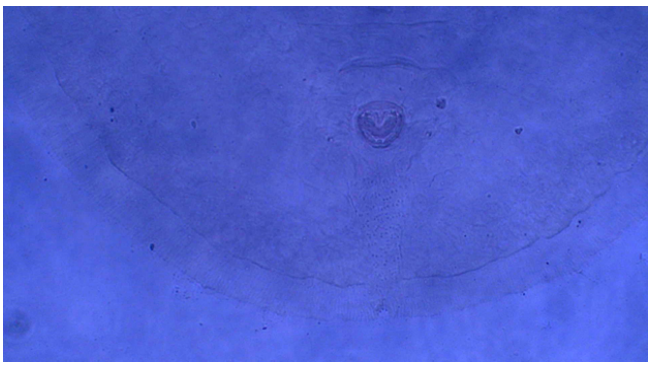

Fig.5.

Dialeurodes citri, vasiform orifice, caudal furrow

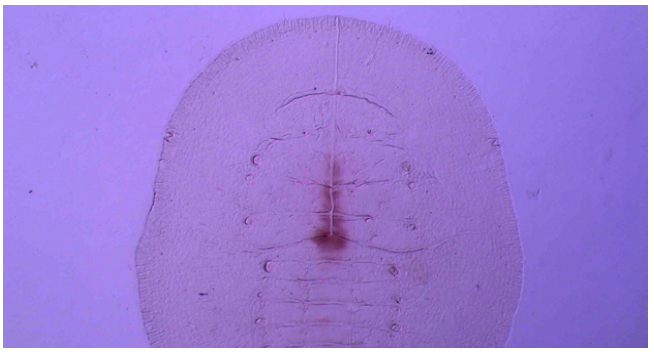

Fig.6.

Dialeurodes kirkaldyi, pupal case.

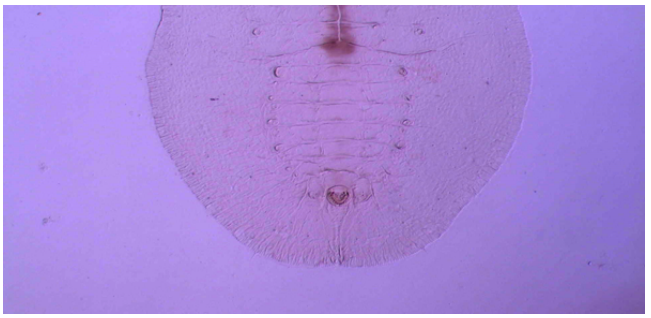

Fig.7.

Dialeurodes kirkaldyi, Transverse moulting suture.

Fig.8.

Dialeurodes kirkaldyi, vasiform orifice, caudal furrow

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