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Research Article

New host record of *Psyllaphycus diaphorinae* Hayat, 1972 from Pakistan

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ABSTRACT

The encyrtid wasp, *Psyllaphycus diaphorinae* Hayat, was reared from nymphs of *Euphyllura olivina* (Costa, 1839), an olive psyllid on the cultivated olive in district Rawalpindi and Chakwal. Present study discovered new host association for *P. diaphorinae*, which was previously reported in association with *Diaphorina citri,* an Asian citrus psyllid from India and Faisalabad city of Pakistan. Distribution map with new additional localities for parasitoid along with host (psyllid) is provided with digital images.

Keywords: Psyllid, parasitoid, distribution; Pothwar, host association**.**

INTRODUCTION

Euphyllura olivina (Costa, 1839), commonly known as olive psyllid, is an economically important insect pests of olive and generally found in olive growing areas of the world (Ouvrard, 2020). This species can cause damage directly and indirectly to *Olea europaea* L.; high infestation of this psyllid may retard or remarkably affect the young olive cultivations (Cho et al., 2021). Geographically, it has wide distribution including Austria, Yugoslavia (Mathur, 1975); India and Western Mediterranean Basin (Hodkinson, 1986); Iran (Asadi et al., 2009); Switzerland (Burckhardt and Mühlethaler, 2003); Algeria, France, Slovenia (Asadi et al., 2011); Corsica; Montenegero; Portugal (Malumphy, 2011); Germany, Great Britain, Italy, Malta, Morocco, Spain, Tunisia (Asadi et al., 2011; Malumphy, 2011); California (Bistline-East et al., 2015), Israel (Spodek et al., 2017) and Pakistan (Rasheed et al., 2023).

Family Encyrtidae belongs to superfamily Chalcidoidea (Hymenoptera) and has been described with 460 genera and 3735 species almost from all zoogeographical regions of the world (Noyes, 2019).Moreover, encyrtids are mainly known as egg, nymphal and pupal parasitoid of various insect species (Noyes, 2019). Hayat (2006) provided detailed account and taxonomic history of family Encyrtidae.

Members of this family can easily be differentiated from other on the combination of following characters: Female. Body 0.50-2.0 mm. Antenna often 11-segmented, having tendency to reduction in funicular and claval segment. Mandibles bidentate; maxillary palpi 4 segmented; labial palpi 3-segmented. Pronotum transverse in dorsal view. Mesoscutum straight, with complete or incomplete curved notaular line; prepectus placed behind pronotum. Fore tibia with comb of spurs, usually bifid apically. Mid tibia having peg along posterior apex. Tarsi 4 or 5 segmented; male similar to female except colour and antennal structures (Hayat, 2006).

Psyllaphycus diaphorinae was originally described by Hayat (1972). Currently, Triapitsyn et al. (2013) collected and reared this species on *Diaphorina citri* and provided good taxonomic notes and host association of *P. diaphorinae*. Previously it

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was noted to be associated with *Diaphorina aegyptiaca* and *D. citri* (Hayat, 1972; Triapitsyn et al., 2013). In the present study, this species was collected from reared mummies of *Euphyllura olivina* (Costa, 1839) and suspected to be primary parasitoid of this psyllid species. Current work documented *P. diaphorinae* with new host association from Pothwar region of Pakistan.

MATERIALS AND METHODS

Parasitized nymphs of *Euphyllura olivina* were collected during the year 2017-20. Various areas of district Chakwal and Rawalpindi in Pothwar region of Punjab were visited for collection of samples. Mummified psyllids associated with olive trees were collected with the help of camel hairbrush and shifted into petri plates. However, adult individuals were also collected using sweep net and aspirator. Moreover, psyllid infested leaves were also collected and placed in plastic jars. Collected materials were transferred to laboratory and placed under ambient temperature. After 2-3 days, parasitoids were emerged. These emerged parasitoids were collected through aspirator and mounted on triangular card.

Collected psyllids and associated parasitoid were identified with the help of NOIF XSZ 107 BN Slide microscope and LEICA MS 5 Stereo microscope following Mathur (1975), Asadi et al. (2009), Hayat (2006) and Triapitsyn et al. (2013). Images of identified parasitoids were prepared with the help of Amscope 18 mega pixel camera attached with same microscopes. Images were stacked in Helicon Focus software. Prepared images were cleaned in Adobe Photoshop software as per requirements. Distribution map of identified psyllid and parasitoid was prepared in ArcGIS 10.5 software using ArcGIS map tool.

RESULTS

Survey conducted during 2018-19 in Pothwar region of Pakistan explored new host *Euphyllura olivina*, a serious pest of olive orchards. Developing nymphs of host psyllid were found parasitized by encyrtid wasp *Psyllaphycus diaphorinae*. Herein, we report *Euphyllura olivina* as a new host psyllid of *Psyllaphycus diaphorinae* for the first time from Pakistan.

Psyllaphycus diaphorinae Hayat, 1972

Psyllaphycus diaphorinae Hayat, 1972: 208

Material Examined

Dhok Kayala, (33°58.158"N'73°15.790"E), 27-vii-2018, 01♂ and 01♀; Khaur, (33°16.00"N'72°27.806"E), 12-viii-2018, 01♂ and 02♀; Khaur, (33°44.075"N'73°23.258"E), 12-viii-2018, 02♂ and 02♀; Kallar Sayedan, (33°29.212"N'73°21.462"E), 19-x-2018, 02♂ and 03♀; Kahuta, (33°30.924"N' 73°23.905"E), 19-x-2018, 01♂ and 02♀; Kallar Sayedan, (33°29.212"N' 73°21.462"E), 19-x-2018, 02♂ and 02♀; Shahpur Dam, (33°29.690"N' 72°21.734"E), 21-x-2018, 03♂ and 02♀; Mora Malal, (33°43.358"N' 73°21.772"E), 15-xi-2018, 01♀; PMAS-AAUR, (33°37.634"N'73°05.425"E), 16-xi-2018, 03♂ and 03♀; Shah Allah Ditta village, (33°43.221"N'72°54.883"E), 21-xii-2018, 01♂ and 02♀; Fateh Jang, (33°39.903"N'72°26.354"E), 15-iv-2019, 01♂ and 01♀; Mowaari, (33°33.316"N' 73°26.320"E), 15-iii-2019, 01♂ and 03♀; Mowaara, (33°33.242"N'73°26.584"E), 15-iii-2019, 02♂ and 01♀; Punjaar, (33°39.130"N'73°31.885"E), 15-iii-2019, 01♂ and 02♀; Sehgal farm, (32°79.829"N'72°72.602"E), 30-iii-2019, 02♂ and 05♀; Sehgal farm, (32°46.113"N'72°41.648"E), 30-iii-2019, 03♂ and 04♀; Sarob Link Road, (33°19.323"N'72°49.296"E), 15-iv-2019, 04♂ and 03♀; Dhok Kayala, (33°58.158"N'73°15.790"E), 27-ix-2019, 02♂ and 02♀; Bahtar, (33°42.802"N' 72°41.831"E), 01-v-2019, 13♂ and 21♀; Kahuta, (33°39.696"N'73°32.786"E), 20-vii-2019, 01♂ and 02♀; Phran Kas (Chakwal), (33°07.376"N'72°38.347"E), 08-viii-2019, 4♂ and 7♀; Dawal Road (Chakwal), (33°04.320"N'72°28.873"E), 08-viii-2019, 01♂ and 01♀; Dhok Bhatti (Mianwali), (32°52.224"N'72°09.269"E), 08-viii-2019, 3♂ and 3♀; Shah Mamdal (Talagang), (32°48.923"N'72°00.356"E), 08-viii-2019, 02♂ and 1♀; Sohawa, (33°08.959"N'73°23.745"E), 05-ix-2019, 04♂ and 03♀; Langar Pur, (32°58.277"N'73°40.487"E), 05-ix-2019, 01♂ and 02♀; Chutala, (32°50.181"N'73°34.592"E), 05-ix-2019, 01♂ and 02♀; Pind Dadan Khan, (32°38.452"N' 73°01.637"E), 11-ix-2019, 01♂ and 01♀.

Diagnostic description:

The materials examined could be identified as belonging to the genus *Psyllaphycus* Hayat, 1972 based on the co-occurrence of a number of morphological features characteristic of this genus, as presented by Hayat (1972), Hayat (2007) and Triapitsyn et al. (2013); body orange yellow except clava yellowish brown (Figure 2a and b). Antennae light yellow except claval segment dark brown apically (Figure 2c). Head in dorsal view yellow (Figure 2d). Head in frontal view yellowish-brown (Figure 2e). Legs light yellowish except claws dark brown apically (Figure 2 i and j).

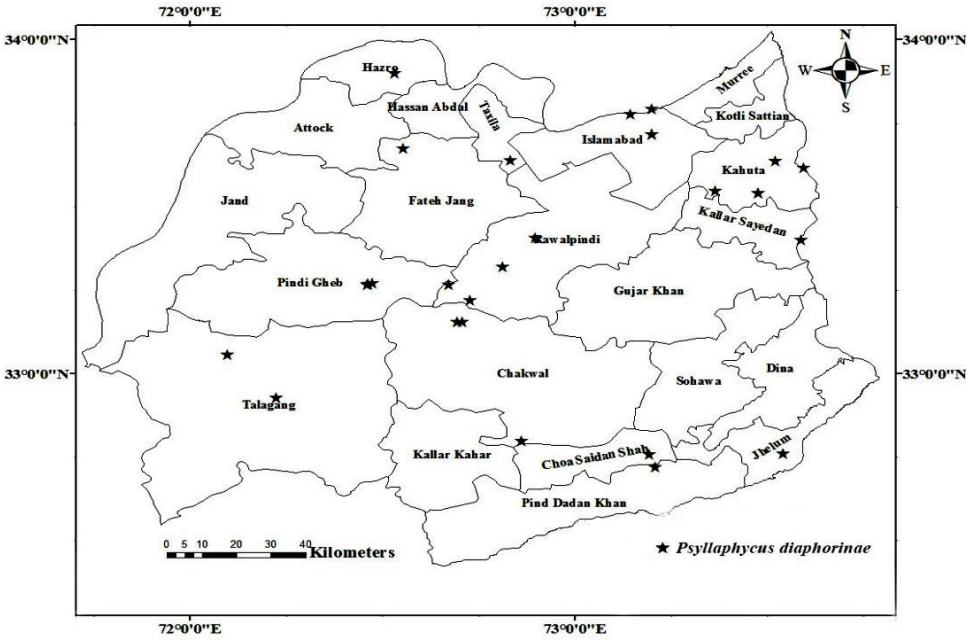

Figure 1. Distribution map of *Psyllaphycus diaphorinae* in Pothwar region of Pakistan.

Gaster orange yellow throughout. Posterior one third with black setae based on prominent projection (Figure 2f). Clava three segmented with long sensillae (Figure 2c). Post marginal vein 4 times smaller than MV (Figure 2g). Apical spure of middle leg 1.84X as long as basitarsus (Figure 2i); spur of hind leg 1.27X as long as basitarsus (Figure 2j). Gaster 1.2 times smaller than mesosoma. Apical portion tilted upward in lateral view.

Host: Reared mummies of *Euphyllura olivine* (Costa, 1839).

Global distribution: India (Hayat, 1972).

Distribution in Pakistan: Faisalabad (Triapitsyn et al., 2013); Rawalpindi, Kahuta, Chakwal, Kallar Kahar (Current study).

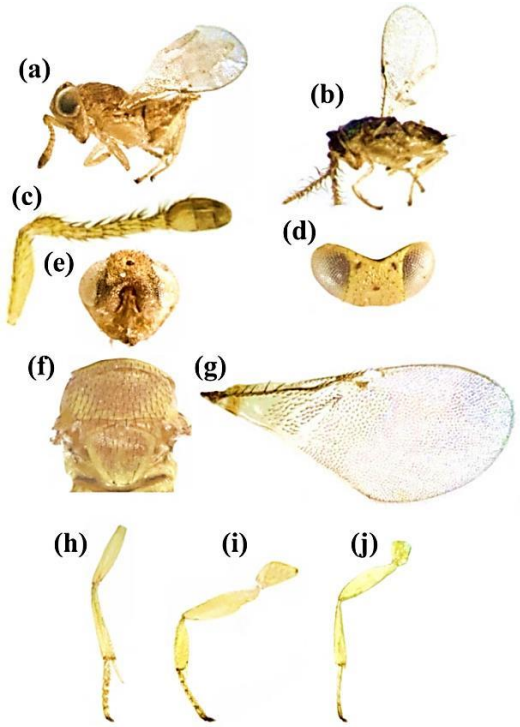

Figure 2: *Psyllaphycus diaphorinae* (a-j) (a) Habitus, female (lateral view) (b) Habitus, male (lateral view) (c) Antenna (female) (d) Head (dorsal view) (e) Head (frontal view) (f) Mesosoma (dorsal view) (g) Fore wing (h) Foreleg (i) Meso leg (j) Hind leg.

DISCUSSION

Psyllaphycus diaphorinae was originally described by Hayat (1972). Currently, Triapitsyn et al. (2013) collected and reared this species on *Diaphorina citri* and provided good taxonomic note and host association of *P. diaphorinae.* Previously, this species was noted to be associated with *Diaphorina aegyptiaca* and *D. citri* (Hayat, 1972; Triapitsyn et al., 2013). In present study, this species was collected from reared mummies of *Euphyllura olivine* (Costa, 1839) and suspected to be primary parasitoid of this psyllid species. Current work documented *P. diaphorinae* with new host association from Pothwar region of Pakistan.

Present study not only improved understanding of the psyllid fauna of Pakistan, but it also enabled to learn important aspects of the host preference of *P. diaphorinae,* including its range extension.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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