

New record of species complex of Chloropidae (Insecta: Diptera) from sugarcane fields in Iran

Amin Nikpay^{* (1)}, Emilia P. Nartshuk⁽²⁾ & Francis Regis Goebel⁽³⁾

⁽¹⁾ Department of Plant Protection, Sugarcane & By-products Development Company, Salman-Farsi Unit, Ahwaz, Iran.

⁽²⁾ Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, 199034 St. Petersburg, Russian Federation.

⁽³⁾ CIRAD, Unité de Recherches AIDA (Agroecology and Sustainable Intensification of Annual Crops), Avenue Agropolis, 34398 Montpellier, France.

* E-mail: amin_nikpay@yahoo.com

Received December 1st, 2016, accepted March 16th 2017.

This research was conducted in 2015 to determine the Chloropidae fauna of sugarcane fields in Khouzestan Province (Iran). Chloropid flies were collected using sweeping nets before harvesting of sugarcane varieties. As a result of this survey 10 species from two subfamilies were identified: *Aphanotrigonum cinctellum* (Zetterstedt 1848) and *Oscinella pusilla* (Meigen 1830) (subfamily Oscinellinae); *Lasiosina herpini* (Guérin-Méneville 1843), *L. paralittoralis* (Dely-Draskovits 1981) *Meromyza nigriventris* (Macquart 1835), *Thaumatomyia sulcifrons* (Becker 1907), *T. notata* (Meigen 1830), *T. glabra* (Meigen 1830), *Platycephala umbraculata* (Fabricius 1798) and *P. rugosa* (Nartshuk 1964) (subfamily Chloropinae). *P. umbraculata* and *P. rugosa* are new for Iran fauna and all species are new to Khouzestan Province. Besides them, we identified two genera *Conioscinella* sp. and *Elachiptera* sp.

Keywords: Diptera, Chloropidae, Iran, Sugarcane, New records.

Nouvelle description d'un complexe d'espèce de Chloropidae (Insecta: Diptera) sur la canne à sucre en Iran, identifié comme nouveaux ravageurs de cette culture.

Cette recherche a été conduite en 2015 pour déterminer la faune des Chloropidae de la canne à sucre dans la province du Khouzestan (Iran). Les mouches Chloropidae ont été collectées en utilisant des filets fauchoir avant la récolte des variétés de canne à sucre. Suite à ce suivi, 10 espèces de deux sous-familles ont été identifiées : *Aphanotrigonum cinctellum* (Zetterstedt 1848) and *Oscinella pusilla* (Meigen 1830) (subfamily Oscinellinae); *Lasiosina herpini* (Guérin-Méneville 1843), *L. paralittoralis* (Dely-Draskovits 1981) *Meromyza nigriventris* (Macquart 1835), *Thaumatomyia sulcifrons* (Becker 1907), *T. notata* (Meigen 1830), *T. glabra* (Meigen 1830), *Platycephala umbraculata* (Fabricius 1798) and *P. rugosa* (Nartshuk 1964) (subfamily Chloropinae). *P. umbraculata* et *P. rugosa* sont nouvelles pour la faune iranienne et toutes les espèces sont nouvelles pour la province de Khouzestan. A côté de ces espèces, nous avons identifié deux genres *Conioscinella* sp. et *Elachiptera* sp.

Mots-clés: Diptera, Chloropidae, Iran, Canne à sucre, Nouvelles descriptions.

1 INTRODUCTION

Sugarcane is a strategically cash crop in tropical and sub-tropical regions and this plant has an effective economical role in different countries producing sugar and ethanol (James, 2004). In the context of intensifying sugarcane production with new plantations, more diversity of cultivars, and the pressure of climate change and agricultural practices, the fauna of insects associated with sugarcane has evolved and changed. This is

particularly the case in Iran, where in recent years; the number of insects found in sugarcane fields has increased. The family Chloropidae is one of the most species-rich families of Diptera with 204 genera and more than 2500 described species (Nartshuk, 2012). These flies are widely distributed in different agro-ecosystems with the exception of Antarctica (Bazyar *et al.*, 2015; Raspi, 1996). Chloropidae are small flies, usually 1.5-5 mm in length, rarely longer than 5 mm, black, yellow or

reddish, with or without black and reddish stripes (Sabrosky, 1989). They are usually named as grass flies or fruit flies and some species as sore gnats. Characteristically, chloropids have a large triangular plate on the front which this frontal triangle is obviously bare and polished (Sabrosky, 1989). Habitat of chloropid larvae is diversify, some of them are phytophagous on vegetative or generative parts of cereals and other monocotyledons (Poaceae, Cyperaceae, Juncaceae); some of larvae produce galls on plants and other species are saprophagous, and develop in damaged stems, fruits or in galls (Bazyar *et al.*, 2015). Some of the Chloropidae are predators; larvae are carnivorous, live in ground among rhizome of plants and feed on root aphids (Nartshuk, 2012). Some of chloropid larvae are secondary invaders, sapro-phytophagous, developing in shoots of Poaceae, which are damaged by other insects. Also, some species including *Platicephala*, acts as biological control agent of Common Reed (*Phragmites australis* (Cav) Trin. ex Steud 1841).

Some genera of Chloropidae are important in human health which can transmit bacterial diseases and have a tendency to wounds (Deeming & Al-Dhafer, 2012; Sabrosky, 1941). This faunistic study is not only the first one in sugarcane fields in Iran but is the first report of Chloropidae from world fauna of sugarcane as well.

2 MATERIALS AND METHODS

The faunistic study was carried out at Salman Farsi Agro-industry Farms (48°35' E, 31°8' S) Ahwaz, Iran. All chloropid flies were collected by standard sweep nets in sugarcane fields (varieties IRC99-02 and CP69-1062) during September until November 2015. The collected chloropid samples were killed in a medium-size jar containing potassium cyanide. All killing insects were transmitted to vials which contained alcohol at 70 %. The collected flies were double pinned and labeled. Paper by Ismay & Nartshuk (2000) was used to identify material to the genera level, and Duda (1932) and more new revision of the different genera to identify the species level.

3 RESULTS

List of species

Subfamily Oscinellinae

Aphanotrigonum cinctellum (Zetterstedt 1848), 2 specimens.

Synonym *Oscinis fasciella* Zetterstedt 1855.

Description: Body mainly black, grey dusted. Frons yellow anteriorly, ocellar triangle black grey dusted, extends to 1/2 of frons, behind extends eye margin. Prefrons and genae yellow, vibrissal angle produced. Palpi yellow. Antennae yellow. Postpedicel darkened. Scutum gray, scutellum short, rectangular distally. Apical scutellar setae longer than scutellum, wide apart. Pleuron dusted. Base of abdomen yellow, remainder tergites with black bands. Halteres yellow. Legs in female usually yellow, in male femora dark, hind tibiae with small dark spur. Body length 1.0-1.3 mm.

Distribution: Nearly the all the Palaearctic Region, except high latitudes and north part of the Oriental Region.

Biology: Larvae secondary invaders, sapro-phytophagous.

Conioscinella sp., 1 female.

Biology: larvae of the known species of the genus are phytophagous in shoots of Poaceae.

Elachiptera sp., 1 female.

Biology: Larvae secondary invaders, sapro-phytophagous, develop in shoots of Poaceae and Cyperaceae damaged by other insects. Occur in shoots of cereals as well (Bazyar, 2011).

Oscinella pusilla (Meigen 1830), 11 specimens

Description: Body black. Frons dull with smooth shining ocellar triangle, which extends front of frons. Postpedicel rounded. Genae a little wider than postpedicel. Scutum and scutellum black dusted. Pleuron mainly shining. Femora black, fore and mid tibiae yellow, hind tibia yellow with black band in the middle. Body length 1.5-2.0 mm.

Distribution: Common species. Nearly the all Palearctic Region.

Biology: Larvae phytophagous, develop in shoots of different grasses (Poaceae), pest of cereals (wheat, rye, barley) (Tschirnhaus & Nartshuk, 2012).

Subfamily Chloropininae

Lasiosina herpini (Guérin-Méneville 1843), 10 specimens (6 female, 4 male).

Synonym *Lasiosina cinctipes* auct, not Meigen 1830.

Description: Head broader than deep or long. Frons wider than long, yellow with black setae and setulae. Ocellar triangle extends by main part

a half on frons and continues as line front of frons, yellow with two black spots, one on ocellar tubercle and another rhomboid spot on apex. Genae wider than postpedicel. Postpedicel rounded, yellow, darkened around insertion of arista in male and black in female. Palpi yellow in male and black in female. Scutum yellow with 3 black thickly grey dusted stripes, scutellum yellow. Pleuron with four black marks. Triangular spot on katepisternum completely dusted or shining at anterior and posterior ends in some specimens. Abdomen covered with black setulae. Legs yellow. Body length 2.5-3.0 mm.

Distribution: Near all Palearctic Region, except high latitudes.

Biology: Larvae secondary invaders, saprophytrophagous, develop in shoots of Poaceae, damaged by other insects. Occur in cereal shoots as well.

Lasiosina paralittoralis Dely-Draskovits 1981, 1 female.

Description: Head broader than deep or long. Frons as wide as long, yellow with black setae and setulae. Ocellar triangle extends to 2/3 of frons, yellow with black ocellar tubercle, black lines along sides and black median sulcus on apex. Genae wider than postpedicel. Postpedicel rounded, yellow. Palpi yellow. Scutum yellow with 3 black grey dusted stripes, extend to scutellum and narrow before scutellum. Scutellum yellow with brownish sides. Pleuron with four brown marks. Abdomen covered with black setulae. Legs darkened yellow. Body length 2.5-3.0 mm.

Distribution: Israel and Iran.

Biology: Probably, larvae are phytosaprophagous, as other species of the genus.

Meromyza nigriventris Macquart 1835, 16 specimens (12 female, 4 male).

Synonyms: *Meromyza basalis* von Rosen 1840: 63, *Meromyza cerealium* Reuter 1902: 84.

Description: The species very variable in colour, two colour forms are more distinct. Summer form. Ground colour yellow. Frons produced in front no more than 1/2 breadth of pedicel. Ocellar triangle no longer than wide at base, yellow, wrinkled, black spot on ocellar tubercle small. Palpi black in apical part and a little swollen. Stripes of scutum are entirely reddish or central stripe behind and marginal stripes brown to black. Central stripe reaches scutellum and scutellum with red or brown mark. Pleuron with brownish marks, except

small black spot on anepisternum. Abdomen with 3 reddish to brown stripes. Hind femora moderately swollen, no more than 3 times as thick as tibiae. Spring form dark colored.

Ocellar triangle entirely black, or with large square black spot at base and occiput black. Scutal stripes wide and black and sometimes fused, leaving scutum black with small marginal yellow marks. Abdomen black dorsally, only hind margins of tergites narrow yellow. Legs partly black. Body length 3.0-3.5 mm.

Distribution: Holarctic species. In the Palearctic Region nearly all territories, except high latitudes, in the Nearctic Region only western part.

Biology: Larvae phytophagous, develop in shoots of different Poaceae species, including cereals (wheat, rye, barley) (Nartshuk & Fedoseeva, 2011).

**Platycephala umbraculata* (Fabricius 1794), 1 male, 1 female.

Synonym *Platycephala nigra* Meigen 1830: 26.

Description: Body yellowish brown. Frons as long as wide, slightly produced anteriorly. Prefrons with a median carina. Ocellar triangle large, smooth, occupies nearly all fronts, but lateral margins a little incurved, with median shallow, covered some small punctures with small setulae inserted from punctures. Postpedicel 3 times longer than deep, narrowed to apex. Apical segment of arista distinctly pubescent, white. Genae roughly wrinkled, behind as wide as eye. Vibrissal setae absent. Scutum shining, with brownish stripes, roughly punctured. Scutellum rounded behind with apical setae nearly a half as long as scutellum, subapical setae absent. Pleuron with pale punctures. Abdomen flattened, long narrow. Legs with thickened hind femora and curved hind tibiae. Body length 4-6 mm.

Distribution: Widely distributed in the Palearctic Region from Europe to Japan.

Biology: Larvae phytophagous, develop in shoots of Common Reed (*Phragmites australis*).

**Platycephala rugosa* (Nartshuk 1964), 1 female.

Description: Body yellowish brown. Frons as long as wide, strongly produced anteriorly. Head nearly triangular in lateral view. Prefrons with a median carina. Ocellar triangle large, occupies all frons with transverse wrinkles and median dark sulcus. Postpedicel longer than deep truncate at apex. Arista shortly pubescent, white. Genae roughly wrinkled, behind as wide as eye. Vibrissal setae absent. Scutum shining, with brownish stripes.

Scutellum rounded distally. Pleuron with pale punctures. Abdomen flattened, long narrow. Legs with faintly thickened hind femora. Body length 4-6 mm.

Distribution: South-eastern part of Europe (Orenburg district), Kazakhstan, Middle Asia (Nartshuk 2012).

Thaumatomyia glabra (Meigen 1830), 2 specimens (1 female, 1 male).

Description: Frons slightly longer than wide. Ocellar triangle large, mostly black, linearly yellow on sides and poster lateral cornes. Genae very broad. Postpedicel about 1.2 times as long as broad, distally brown, basally yellow. Only outer vertical setae distinct from head setae. Scutum glabrous with 3 broad black stripes, all of which extend to scutellum. Setulae covered scutum very minute. Scutellum flat, nearly bare, apical setae black approximated. Abdomen black dorsally. There is a large membranous vesicula between 5 tergite and epandrium. Body length 2.3-2.6 mm.

Distribution: Nearctic species, widely distributed in the Palearctic Region.

Biology: Larvae carnivorous live in ground among rhizome of plants and feed on root aphids.

Thaumatomyia notata (Meigen 1830), 8 specimens (4 female, 4 male).

Description: Frons nearly as long as wide. Ocellar triangle from black to yellow with median black stripes of different wide, with 2-3 roughly arranged rows setulae along lateral sides. Genae narrow, nearly 1/3 of postpedicel. Postpedicel nearly orbicular or sometimes very slightly broader than long, almost entirely black or brownish basally. Only outer and inner vertical setae rather strong from cephalic setae. Scutum with 5 black or partly or entirely reddish-yellow stripes not reaching scutellum. Scutellum flat, apical setae black, approximated. Pleuron with black or red spot on katapisternum. There are two membranous vesiculae between 5 tergite and epandrium. Body length 2.0-2.5 mm.

Distribution: Multiregional species, occurs in the Palearctic, Oriental and Afrotropical Regions

Biology: Larvae carnivorous live in ground among rhizome of plants and feed on root aphids.

Thaumatomyia sulcifrons (Becker 1907), 21 specimens (13 female, 8 male).

Description: Frons nearly as long as wide. Ocellar triangle large yellow with median sulcus. Genae nearly 1/2 of postpedicel. Postpedicel nearly

orbicular, almost entirely yellow. Scutum with 5 reddish-yellow stripes not reaching scutellum. Scutellum flat, apical setae approximated. Pleuron with red spot on katapisternum. Body length 2.0-2.5 mm.

Distribution: Southern part of the Palearctic Region from Canary Island to China.

Biology: Larvae carnivorous live in ground among rhizome of plants and feed on root aphids (Nartshuk, 2012).

4 DISCUSSION

In our study a total of 12 species were found and the complex of chloropid is shown in **Figure 1**. But two of them identified only at the genus level, as they were represented only by one female each. Two species which are marked by asterisk are new to Iranian Chloropidae fauna. All species not only are new to Khuzestan Province but all are reported for the first time from sugarcane as well.

The most completed list of Iranian Chloropidae fauna was published by Baziyar *et al.* (2015). It contains 50 species from 20 genera (39 identified to species level). Examined materials were collected from sugarcane fields. We can compare our list with the list of Chloropidae, collected on agricultural localities, on *Medicago sativa* (L), *Hordeum* spp., *Vigna sinensis* (Endl), *Solanum tuberosum* (L), *Dacus carotae* (L), *Beta vulgaris* (L), *Allium sepae* (L) and others in Makrazi Province of Iran (Rabieh *et al.*, 2012). Six species from 12 (50 %) listed in Rabieh *et al.* paper's are found on sugarcane fields as well. Species *Lasiosina herpini*, *Meromyza nigriventris*, *Thaumatomyia glabra*, *T. notata* and *T. sulcifrons* are common in the agricultural landscape in other parts of the Palearctic Region (Nartshuk, 1971).

Four groups of species ecologically different are distinguished in the examined material. Species *Aphanotrigonum cinctellum*, *Lasiosina herpini*, *L. paralittoralis* are secondary invaders, their larvae are saprophytophagous, develop in decaying plant tissues of plants, including cereals. They can develop on sugarcane plants damaged by other insects. Next group includes species with phytophagous larvae develop in shoots of cereals (wheat, barley) and wild grasses: *Oscinella pusilla* and *Meromyza nigriventris*. We found that *Meromyza nigriventris* caused webs on sugarcane leaves (**Figure 2**) and this species is reported here as a new pest of world sugarcane fauna.



Figure 1: Complex of chloropid on IRC99-02 variety of sugarcane (October 2015).

M.nigriventris was earlier known as pest of wheat, larvae feed on young shoots of cereals. Central leaf of shoots become yellow and dry, and then all shoots dry. We not found in the literature mention on *M. nigriventris* as a pest of sugarcane. Further studies on biology and ecology of this new pest are required.

The third group includes two species *Platycephala umbraculata* and *P. rugosa* with larvae, as far as known, develops on Common Reed (*Phragmites australis*). They are indifferent in sugarcane. Lastly fourth group contains three carnivorous species of the genus *Thaumatomyia*: *T. glabra*, *T. notata* and *T. sulcifrons*. Larvae of these species are, as far as known, predators of root aphids live in rhizome of plants. Larvae of another species of the same genus *T. elongatula* (Becker, 1910) feed on aphids which live on tree trunks and branches (It is necessary to conduct further observation on feeding behavior of larvae of *T. glabra*, *T. notata* and *T. sulcifrons*). Not improbably that larvae of these species can feed on larvae of whiteflies (Allerodidae) living on leaves of sugarcane.



Figure 2: Symptoms of sugarcane leaf miner on IRC99-02 variety of sugarcane (October 2015).

Acknowledgements

We are very grateful to Zoological Institute, Russian Academy of Sciences (Saint Petersburg, Russian Federation) for providing facilities for identification of Chloropidae samples. For E.P. Nartshuk work was performed in frame of State program (No 01201351183) and financial support of RFBR grant (15=54-53038).

REFERENCES

- Bazyar Z., 2011. Fauna of Chloropidae (Diptera) in central region of Fars Province, MSc Thesis, Islamic Azad University, Jahrom Branch, Iran.
- Bazyar Z., Dousti A.F., Von Tschirnhaus M. & Fallahzadeh M., 2015. A first overview of the fauna of Chloropidae of Iran (Diptera, Acalypratae). *Turkish Journal of Zoology*, **39**(6), 1041-1049.
- Deeming J.C. & Al-Dhafer H.M., 2012. Chloropidae from the Arabian Peninsula: (Diptera: Cyclorrhapha). *Zoology in the Middle East*, **58**(1), 3-88.
- Duda O., 1932. Chloropidae. In: Lindner E., ed. *Die Fliegen der Palaearktischen Region*, 1-248. Schweizerbart Science Publishers.
- Ismay J. & Nartshuk E.P., 2000. Family Chloropidae. *Contribution to a Manual of Palaearctic Diptera*, 387-430, Budapest. Appendix Volume.
- James G., 2004. *Sugarcane*. Second edition. Blackwell Publishing, London/ Britain. P.
- Kubík Š. & Barták M., 2008. *Platycephala isinensis* sp. n. (Diptera: Chloropidae) from Iran. *Biologia*, **63**(5), 696-698.
- Nartshuk E., 1971. Some problems of the formation of Chloropidae-complex as pests of cereals. In: *Proceedings of XIII International Congress of Entomology, Leningrad Nauka, Moscow*, 365-366.

- Nartshuk E. & Fedoseeva L., 2011. A review of the grassflies of the genus *Meromyza* Meigen, 1830 (Diptera, Chloropidae) of the Palaearctic fauna, with a key to the species, analysis of synonymy, host specialization, and geographical distribution: Part 1. *Entomological Review*, **91**(1), 103-120.
- Nartshuk E.P., 2012. A check list of the world genera of the family Chloropidae (Diptera, Cyclorrhapha, Muscomorpha). *Zootaxa*, **3267**, 1-43.
- Nartshuk E.P., 2012. Chloropidae (Diptera) of Turkey with descriptions of new species and new records. *Israel Journal of Entomology*, **41**(42), 115-144.
- Rabieh M.M. *et al.*, 2012. Checklist of Grass Flies (Diptera: Chloropidae) of Markazi province, Iran. *International Journal of dipterological Research*, **23**(2), 95-101.
- Raspi A., 1996. *Thaumatomyia elongatula* (Becker) (Chloropidae) and *Leucopis annulipes* Zetterstedt (Chamaemyiidae): two Diptera preying on *Phloeomyzus passerinii* (Signoret) (Homoptera: Phloeomyzidae) in Italy. *Proceedings of the Entomological Society of Washington*, **98**(3), 509-516.
- Sabrosky C.W., 1941. An annotated list of genotypes of the Chloropidae of the world (Diptera). *Annals of the Entomological Society of America*, **34**(4), 735-765.
- Sabrosky C.W., 1989. Chloropidae. In: Evenhuis N.L., ed. *Catalog of the Diptera of the Australasian and Oceanian Regions*, 650-665. Bishop Museum Press, Honolulu & E.J. Brill, Leiden.
- Tschirnhaus M. & Nartshuk E.P., 2012. *Oscinella* Becker, 1909 (Insecta, Diptera, CHLOROPIDAE): proposed conservation by reversal of precedence with *Melanochaeta* Bezzi, 1906 and *Pachychaetina* Hendel, 1907. *Bulletin of Zoological Nomenclature*, **69**, 37-43.

(16 réf.)