

A CONTRIBUTION TO THE GENUS *RODOLIA* MULSANT, 1850 (COLEOPTERA: COCCINELLIDAE) FROM POTHWAR PLATEAU OF PAKISTAN

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ABSTRACT

Genus *Rodolia* Mulsant, 1850 (Coleoptera: Coccinellidae) mostly associated with the species of scale insects and mealybugs. A total of two species i.e. *Rodolia fumida* and *R. octoguttata* were studied from Pothwar Plateau, Pakistan during 2015-2017. *R. octoguttata* is recorded for the first time from Pakistan. Both of the species have been found as predator of *Drosicha mangiferae* (Mango mealybug) and collected from six host plants viz. *Lagerstroemia indica*, *Mangifera indica*, *Eriobotrya japonica*, *Alstonia scholaris*, *Prunus persica* and *Dalbergia sissoo*. Information about host plants, prey, distribution, diagnostic characters and their illustrations have been provided. This information will be helpful in identification of these species and their possible utilization in IPM of Mango mealybug and future research.

Key words:

INTRODUCTION

The family Coccinellidae is best known by their extensive use as biological control agents. The most famous example is *Rodolia cardinalis* (Mulsant) (Australian ladybird). The predatory habits of this beetle make it well-known biocontrol agent, mainly because of their successful controlling citrus infestation by the *Icerya purchasi* (Maskell), and at the end of the 19th century it is introduced in several continents Dixon and Kindlmann (1998); Forrester and Vandenberg (2008).

The genus *Rodolia* of tribe Novini Mulsant, 1846 was established by Mulsant (1850) with *Rodolia ruficollis* Mulsant, 1850 as the type species. Gordon (1972) discussed the concept of constant generic changing of *Rodolia* of Mulsant (1850) and Weise (1895), his examination of the type species of *Eurodolia* (*E. severini* Weise) revealed that this name should also be added to generic synonym list of *Rodolia*. In 1972, Gordon included tribe Novini within subfamily Coccidulinae and divided it into three genera *Anovia* Casey, *Novius* Mulsant and *Rodolia* (Mulsant). Gordon (1985) reported that *Rodolia* and *Anovia* were virtually indistinguishable in the adult stage, and differentiated based on number of larval antennomeres, he remarked that "some species which placed in *Novius* must be transferred to *Rodolia*". Rees (1947) continued separation of the genera and study only included one exemplar of *Anovia*. However, Ślipiński (2007) transferred all Australian species in the genus *Novius* to *Rodolia*, treated in tribe Novini under the subfamily Coccinellinae. Seago *et al.* (2011) supported the new classification system of

the family Coccinellidae proposed by Ślipiński (2007), based on their molecular phylogeny.

Forrester (2008) proposed new classification, based on the cladistic analysis: *Anovia* and *Novius* are synonyms of genus, *Rodolia* (Mulsant) and this tribe is now comprised of the single genus in subfamily Coccidulinae, his study revealed that this genus comprises 46 species worldwide. Recently Kitano (2014) reported *Rodolia shuiro* (Kitano) as new to science species from Japan.

From the territory of Pakistan only three species are recorded till now i.e. *Rodolia guerini* Korschefsky, 1931, *R. fumida* Mulsant, 1850 and *R. ruficollis* Mulsant, 1850 by Rasheed *et al.* (1986); Poorani (2002); Rafi *et al.* (2005); Hayat and Khan (2013); Ali *et al.* (2014). As for as neighboring countries of Pakistan are concerned, 13 species from India Kapur (1951); Poorani (2002) and 08 species from China Ren *et al.* (2009) have been recorded. Taxonomic gaps of this genus are still present and research studies are currently needed in Pakistan. Present study was a little contribution to the fauna of genus *Rodolia*, and aimed to update the information on the current classification, distribution, host plants and their prey from Pakistan.

MATERIALS AND METHODS

Specimens were collected from the different localities of Pothwar Plateau viz.; Rawalpindi (Arid Agriculture university: 33°38'56.4"N, 73°4'54.4"E; 500m and Nawaz Sharif Park: 33°38'53.1"N, 73°4'37.2"E; 511m), Islamabad (Trail 6: 33°43'55.2"N, 73°2'8.9"E; 600m, Kachnar Park: 33°40'32.1"N, 73°4'39.2"E; 603m

and Trail 5: 33°44'42.2"N, 73°5'6.7"E; 716m), Chakwal (Dhadyal: 33°6'36.9"N, 73°0'44.1"E; 507m) and Jhelum (Dina: 33°7'1.5"N, 73°25'10.4"E, 272m and Sohawa: 33°2'2.8"N, 73°35'59.2"E; 444m) during 2015 to 2017.

For the classification of the Coccinellidae Seago *et al.* (2011) is followed in the arrangements of tribe, genus and species, and are listed alphabetically for convenience. Morphological terminology used is after Ślipiński (2007) and Ślipiński and Tomaszewska (2010).

Genitalia extraction was done by following the method of Majerus and Kearns (1989) along with some modifications. The specimens were softened in hot water (usually 2 to 4 minutes). Abdomen was detached with helps of two needles, and boiled for 30 minutes in 10% Potassium hydroxide (KOH) solution to dissolve fat material. Once boiled, the abdomen was rinsed in hot water and transferred into glacial acetic acid up-to five minutes. To dehydrate its, initially immersed in 75% ethanol, and then rinsed in absolute alcohol for 4 to 5 minutes. Once dehydrated the abdomen, transferred to a cavity slide with a drop of glycerin. After drawn and examined, male genitalia were mounted on a plastic strip with hydro-soluble glue.

Collected specimens were identified by following literatures of Rafi *et al.* (2005); Forrester (2008); Ren *et al.* (2009); Kapur (1949, 1951). Morphological characters were observed under CZM6 Labomed microscope.

Measurements: An ocular micrometer was used to measure the following characters:

Total length (TL); from the apex of clypeus to the apical margin of elytra

Total width (TW); across the widest part of both elytra

Height (TH); at highest part of elytra to metaventrite

Head width (HW); at width part (including eyes)

Pronotum Length (PL); along the longest part of pronotum

Pronotal width (PW); across widest part of pronotum

Elytral length (EL); from longest part of elytra along the suture (including scutellum)

Elytral width (EW); from widest part of both elytra

Images were captured with Nikon SMZ 1500 (Digital Sight) mounted at stereoscope. Photos were edited with Helicon Focus 6.7.1 and Adobe Photoshop CS6 to clear their appearance. Specimens were deposited in the Biosystematics Laboratory of Entomology Department, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan.

RESULTS

Subfamily Coccinellinae Latreille, 1807: Coccinellinae Latreille, 1807: 70. Type genus: *Coccinella* Linnaeus, 1758.

Tribe Noviini Mulsant, 1850: Noviini Mulsant, 1846: addenda et errata. Type genus: *Novius* Mulsant, 1850.

Diagnosis: Noviini can easily be differentiated with other tribes of subfamily Coccinellidae by combination of characters as follows: Body oval to elongate-oval, dorsal surface densely pubescence; head broad; eyes large and setose; antennae distinctly shorter than head, composed of 7 to 8 antennomeres, scape indistinct and enlarged, antennal club serrate; maxillary palpi with terminal palpomere large and strongly securiform; labial palps composed of 2 segments; prothoracic hypomerion without fovea near anterior angles; prosternum very short in front of coxae; prosternal process very narrow, usually without carinae; elytral epipleuron not foveate; pro-tibia externally angulated; tibia without spurs, tarsi with 3 segments. Abdominal postcoxal line complete and recurved (Ślipiński, 2007).

Genus *Rodolia* Mulsant, 1850 (Figure 1 A–F): *Rodolia* Mulsant, 1850: 902. Type species: subsequently designation by Crotch, 1874, *Rodolia ruficollis* Mulsant, 1850.

Nomius Mulsant, 1846: 4. (misspelling; corrected by the author in the 'Addenda et Errata,' issued at the same time as the original work, but not paginated).

Novius Mulsant, 1850: 942. Type species: *Novius cruentatus* Mulsant, 1846 by monotypy. Synonymized by Forrester, 2008: 226.

Macronovius Weise, 1885: 63. Synonymized by Korschefsky, 1931: 98.

Eurodolia Weise, 1895: 149. Type species: *Eurodolia severini* Weise, 1895, by monotypy.

Anovia Casey, 1908: 408. Type species: *Scymnus virginalis* Wickham, by monotypy. Synonymized by Forrester 2008: 226.

Diagnosis: Genus *Rodolia* differ from all other genera of Coccinellidae by combination of the following morphological characteristic: body dorsally with long white pubescent. Head (Fig. 1A) exposed dorsally. Eye (Fig. 1A) finely faceted, with not emargination; interocular distance about 0.6, interfacetal setae distinct, eyes large non-emarginate and setose. Antennae (Fig. 1B) 8-segmented, antennal insertion in weak shelf, but scape visible, antennal club 3-segmented, penultimate antennomere shorter than terminal segment, terminal antennomere elongate and apically rounded. Mandibles (Fig. 1C) with subapical tooth, remote from apex, terminal segments of maxillary palpi broadly securiform. Pronotum anterior angles, blunt, indistinct; lateral edge smooth; sub-marginal carina absent. Prosternum very short in front of coxae, prosternal process usually narrow (Fig. 1E). Elytra at base broader than the pronotum, lateral margins completely explanate, surface smooth. Elytral epipleuron apically incomplete. Elytral margin without sublateral carina. Tibiae on pro, mid and hind

without apical spurs, tarsal claws dimorphic, pro-leg (Fig. 1F) tibia flattened and angulate from external, pro-tarsus trimerous. Abdomen (Figs. 2E and 3B) with six ventrite, postcoxal lines on 1st abdominal sternum complete, rarely extending beyond center of segment (Ślipiński, 2007).

Distribution: Worldwide.

Key to the Species

1. Elytra completely black or reddish brown to rose red (Fig. 2A-C), penis guide with apically hook like, smoothly curved outward, very minute sub-apical projection.....*fumida* Mulsant

- Elytra with eight spots (Fig. 3A) penis guide with apically hook like, with large and deeply notched sub-apical projection.....*octoguttata* Mulsant

1. ***Rodolia fumida* Mulsant, 1850 (Figure 2 A–H):** *Rodolia fumida* Mulsant, 1850: 904; Korschefsky, 1931: 101; Kapur, 1949: 534; Rafi *et al.* 2005: 35.

Vedalia fumida Mulsant, 1850: 904; Crotch, 1874: 281. (* Weise, 1892 transferred this species back to *Rodolia*).

Rodolia rufopilosa Mulsant, 1850: 903. Synonymized by Forrester, 2008: 229

Rodolia roseipennis Mulsant, 1850: 904; Crotch, 1874: 281; Korschefsky, 1931: 101.

Rodolia chermesina Mulsant, 1850: 905; Gordon, 1985: 34.

Rodolia sexnotata (Mulsant), 1850: 906; Booth and Pope 1989: 363. Synonymized by Forrester, 2008: 229.

Epilachna arethusa Mulsant, 1853: 254; Crotch, 1874: 281; Korschefsky, 1931: 101; Gordon, 1985: 34.

Epilachna sexnotata Mulsant, 1850: 807; Booth and Pope 1989: 363. Synonymized by Forrester, 2008: 229.

Vedalia Guerinii Crotch, 1874: 282; misspelling by Korschefsky 1931: 101.

Epilachna testicolor Mulsant, 1853: 255; Crotch, 1874: 281; Korschefsky, 1931: 101; Gordon, 1985: 34.

Rodolia punctigera Weise, 1901: 431. Synonymized by Forrester, 2008: 229.

Rodolia dionysia Sicard 1909: 116; Korschefsky, 1931: 101. Synonymized by Forrester, 2008: 229.

Rodolia immsi Weise, 1912: 120; Korschefsky 1931: 101. Synonymized by Forrester, 2008: 229

Rodolia guerini Korschefsky, 1931: 101; Booth and Pope 1989: 363. Synonymized by Forrester, 2008: 230

Rodolia formosana Korschefsky, 1935: 255. Synonymized by Forrester, 2008: 230

Rodolia 6-maculata Korschefsky, 1940: 02; Kapur 1949: 535. Synonymized by Forrester, 2008: 230.

Material examined: Pakistan; Jhelum, 1 male and 3 females, Sohawa, 9.IV.2015 leg. Z. Iqbal; 1 male, Dina, 1.VI.2015, leg. Z. Iqbal; Rawalpindi, 7 males and 3 females, Arid Agriculture University, 10.V.2015, leg. I. Bodlah; 1 male and 4 females, Arid Agriculture University, 20.V.2015, leg. Z. Iqbal; 3 males and 6 female, Arid Agriculture University, 13.VI.2015, leg. I. Bodlah; 2 females, Nawaz Sharif Park, 9.VII.2015, leg. I. Bodlah; 2 males and 2 females, Arid Agriculture University, 13.VII.2015, leg. M.F. Nasir; 3 males and 4 females, Arid Agriculture University, 13.VIII.2015, leg. I. Bodlah; 1 male and 3 females, Arid Agriculture University, 22.IX.2015, leg. M.F. Nasir; 2 males and 4 females, Arid Agriculture University, 8.X.2015, leg. Z. Iqbal; 3 males and 5 females, Arid Agriculture University, 19.V.2016, leg. Z. Iqbal; 9 males and 10 females, Arid Agriculture University, 11.VI.2016, leg. Z. Iqbal; 4 males and 5 females, Arid Agriculture University, 4.VII.2016, leg. Z. Iqbal; 3 males and 2 females, Arid Agriculture University, 4.IX.2016, leg. Z. Iqbal; Islamabad, 2 males and 3 females, Trail 5, 10.V.2015, leg. Z. Iqbal; 1 male and 2 females, Kachnar Park, 11.X.2015, leg. Z. Iqbal; Chakwal, 1 male and 3 females, Dhadyal, 21.VI.2015, leg. Z. Iqbal.

Diagnosis: *R. fumida* Mulsant is polymorphic species and resembles with *R. rubea* in general appearance, and generally distinguished on the base of male genital characters. In *R. fumida*, tegminal strut very small, dorsally narrow and having pointed apex. But in *R. rubea* it is much larger, and dorsally has a rounded apex.

Description: TL: 5–5.9 mm, TW: 4–4.4 mm, TH: 2–2.2 mm, HW: 1.15–1.27 mm, TL/TW: 1.25–1.28; PL/PW: 0.47–0.50; EL/EW: 1.02–1.49.

Body elongate-oval, moderately convex, dorsum with white hair. Head with antennae and mouth parts brownish yellow. Pronotum dark brown to brownish yellow, sometime with black v-shape strip at middle of posterior margin. Scutellum brown to dark brown. Elytra black except in the discal area with reddish brown (Fig. 2A). Sometimes completely reddish or rose red (Fig. 2B). Somewhat, sutural and basal margin are dark brown, discal and medial area yellowish brown (Fig. 2C). Prothoracic hypomeron, prosternum, meso-ventrite and meta-ventrite are brown to yellowish brown. Elytral epipleuron slightly yellow, both margins dark brown. Legs yellowish brown to brown. Head transverse, with smooth surface about 0.52 times of pronotal width (HW/PW= 1.21/2.35), usually exposed dorsally. Eye large, finely faceted and interfacetal setae present, interocular distance about 0.5 time the head width. Pronotum with the lateral margins rounded, 0.53 times of the elytral width (PW/EW= 2.35/4.42), pronotal and elytral surface smooth. Prosternal carinae indistinct, covered with dense setose. Prosternal process 3 times

longer in length than width at base. Abdominal postcoxal lines complete, separate medially and recurved (Fig. 2D). **Male Genitalia:** Penis (Fig. 2E) slender, extremely long and strongly curved. Penis capsule T- shape, outer arm slightly short than inner arm. Apex of penis (Fig. 2F) throat like, strongly curve tip. Tegmen phallobase short and rectangular, terminal strut small and narrowly pointed. Penis guide trapezoidal toward tip in ventral view (Fig. 2G), in lateral view apex with hook-like projection, smoothly curved outward, sub-apical projection of hook is very minute (Fig. 2H). Parameres long and as longer as penis guide, with short fine apical hairs.

Host Insects: Rasheed *et al.* (1986) reported *R. fumida* as a predator of *Drosicha stebbingi* (Homoptera: Margarodidae) and Rafi *et al.* (2005) recorded on *Coccus mangiferae* (Homoptera: Coccidae) and *Drosicha stebbingi* (Homoptera: Margarodidae) from Dir, Peshawar and Gujrat of Pakistan. Currently, it is found to be a predator of *Drosicha mangiferae* (Homoptera: Margarodidae).

Habitat: Host plants from which this species was collected are as follow; *Lagerstroemia indica* (Crepe myrtle), *Mangiferae indica* (Mango), *Eriobotrya japonica* (Loquat), *Alstonia scholaris* (Devil tree), *Prunus persica* (Peach) and *Dalbergia sissoo* (Sheesham).

Pakistan distribution: Previously, Rafi *et al.* (2005) reported from Dir, Peshawar and Gurjra. Recently, *R. fumida* Mulsant has been recorded for the first time from these localities i.e. Rawalpindi, Islamabad, Chakwal and Jhelum, Pakistan.

World Distribution: Bengal Sicard (1909), India Kapur (1949, 1951); Poorani (2002), Pakistan Rasheed *et al.* (1986); Rafi *et al.* (2005) and USA Forrester (2008).

2. *Rodolia octoguttata* Weise, 1910 (Figure 3 A–F): *Rodolia octoguttata* Weise, 1910: 5; Korschefsky, 1931: 102; Kapur, 1951: 2; Canepari, 1997: 47.

Material examined: Pakistan, Rawalpindi, 8 males and 12 females, Arid Agriculture University, 6.IV.2015, leg. Z. Iqbal; 8 males and 8 females, Arid Agriculture University, 16.IV.2015, leg. Z. Iqbal; 3 males and 2 females, Arid Agriculture University, 9.VI.2015, leg. M.F. Nasir; 1 male and 2 females, Arid Agriculture University, 3.VII.2015, leg. M.F. Nasir; 3 males and 4 females, Arid Agriculture University, 13.VIII.2015, leg. I. Bodlah; 6 male and 10 females, Arid Agriculture University, 22.IX.2015, leg. M.F. Nasir; 1 male and 2 females, Arid Agriculture University, 8.X.2015, leg. Z. Iqbal; 8 males and 9 females, Arid Agriculture University, 22.IV.2017, leg. Z. Iqbal; 5 males and 5 females, Nawaz Sharif Park, 21.V.2017, leg. Z. Iqbal; 8 males and 9 females, Arid Agriculture University, 5.VI.2017, leg. I. Bodlah; Jhelum, 1 male, Dina,

15.IV.2015 leg. Z. Iqbal; Islamabad, 2 females, Trail 6, 11.X.2015, leg. I. Bodlah.

Diagnosis: *R. octoguttata* Weise resembles with other species of genus *Rodolia* in general appearance, but morphologically different with them by eight spots on elytra. Male genitalia quite similar to that of *R. fumida* but in *R. octoguttata*, apex of penis guide with distinct sub-apical projection.

Description: TL: 4.0–4.8 mm, TW: 3.6–4.1 mm, TH: 1.9–2.0 mm, HW: 1.15–1.20 mm, TL/TW: 1.11–1.17; PL/PW: 0.47–0.51; EL/EW: 0.95–1.03

Body rounded-oval, slightly convex, dorsum with long white pubescence. Head, antennae and mouth part light brown. Pronotum reddish brown. Scutellum brown. Elytra red to reddish brown, elytra with four small black spots, numbering given to spots from left to right and from base to apex, 1st and 3rd spots are situated near to the suture, same line, 2nd and 4th near the external margins, the 3rd spot away from the transverse median line to a backward distance of 3/5th to 7/10th length of elytron; 4th spot is situated at an equal distance from a 2nd, 3rd spot (Fig. 3A). Prothoracic hypomeron yellowish brown. Prosternum, mesoventrite and metaventrite are brown to dark brown. Elytral epipleuron yellowish brown with both margins dark brown. Legs brown. Head finely puncture, 0.52 times of pronotal width (HW/PW= 1.18/2.26), dorsally exposed. Eye large, fine faceted, with distinct whitish interfacetal setae, interocular distance about 0.5 times the head width. Pronotum with the anterior and lateral margins sub-rounded, 0.59 times of the elytral width (PW/EW= 2.26/3.85), pronotal punctures fine, same as in head. Elytral punctures distinctly coarser than those on pronotum. Prosternal carinae absent, covered with dense hairs. Prosternal process 2.4 times in length than width at base. Abdominal postcoxal lines complete and recurved (Fig. 3B), 6th abdominal sternum of the male with middle notch, in female complete and sub-rounded. **Male Genitalia:** Penis (Fig. 3C) slender, strongly curved, long and T-shape penis capsule, inner arm slightly longer the outer arm. Penis apex (Fig. 3D) skewed to throat like structure from 2/3th of it length towards apex, very slightly curve tip. Tegmen stout, phallobase small and rectangular, terminal strut short and broad apically. Penis guide in ventral view (Fig. 3E), tapered gradually from mid of it length to apex, in lateral view (Fig. 3F) apical hook-like projection large and deeply notched, with large sub-apical projection. Parameres as longer as penis guide, with short fine apical setae.

Host Insects: Currently this species is recorded as a predator of *Drosicha mangiferae* (Homoptera: Margarodidae).

Habitat: Collected from following host plants; *Eriobotrya japonica* (Loquat), *Alstonia scholaris* (Devil

tree), *Lagerstroemia indica* (Lagerstromia), *Mangifera indica* (Mango) and *Dalbergia sissoo* (Sheesham).

Pakistan distribution: The species is recently reported from Rawalpindi, Islamabad and Jhelum. *R. octoguttata* Weise, 1910 is recorded for the first time in Pakistan.

World Distribution: China Ren *et al.* (2009) and India Kapur (1949); Poorani (2002).

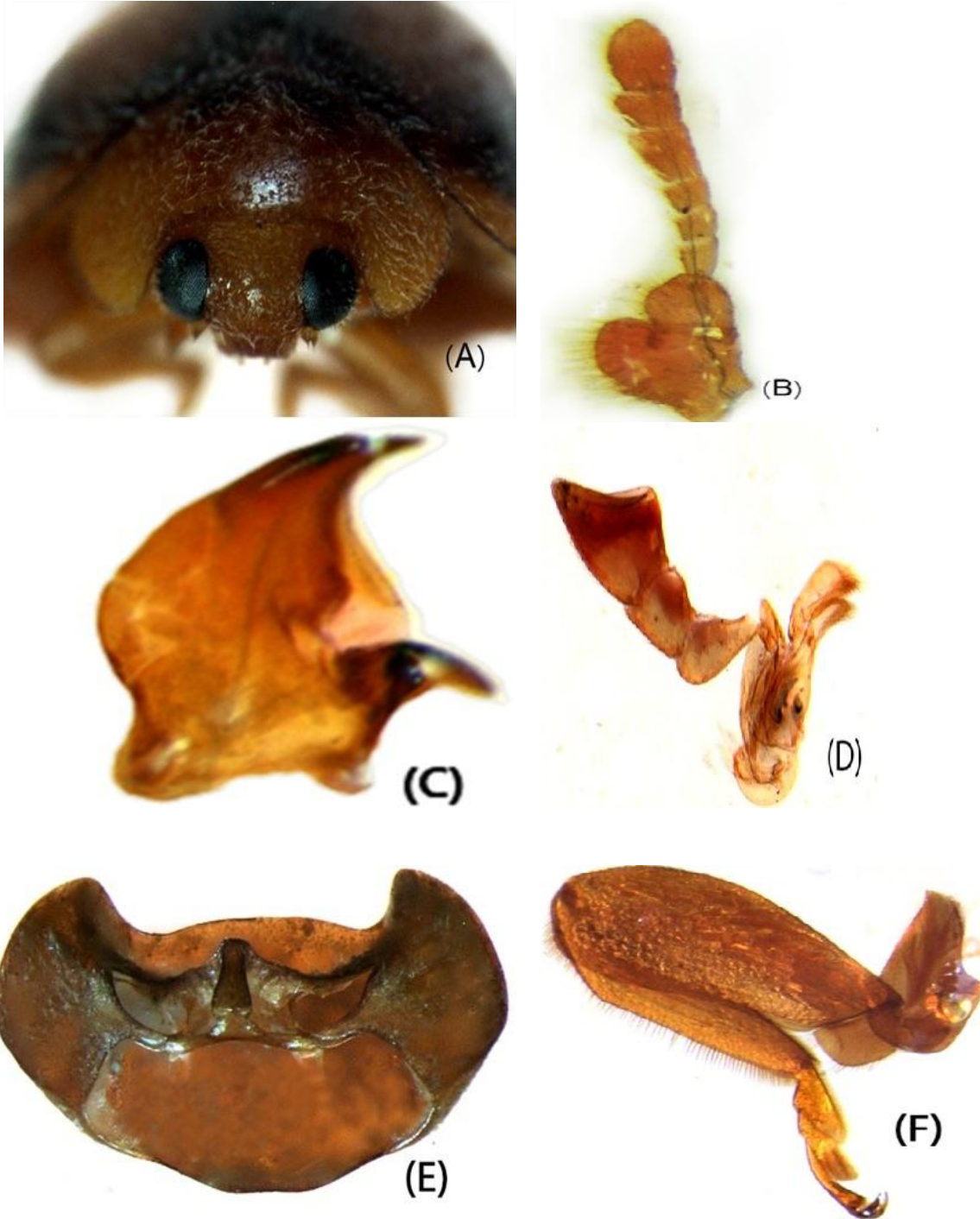


Figure 1. *Rodolia fumida*: frontal view of head and pronotum (A), antenna (B), mandible (C), maxilla pulps (D), prosternum and prosternal process in pronotum ventral view (E) and pro-leg (F).

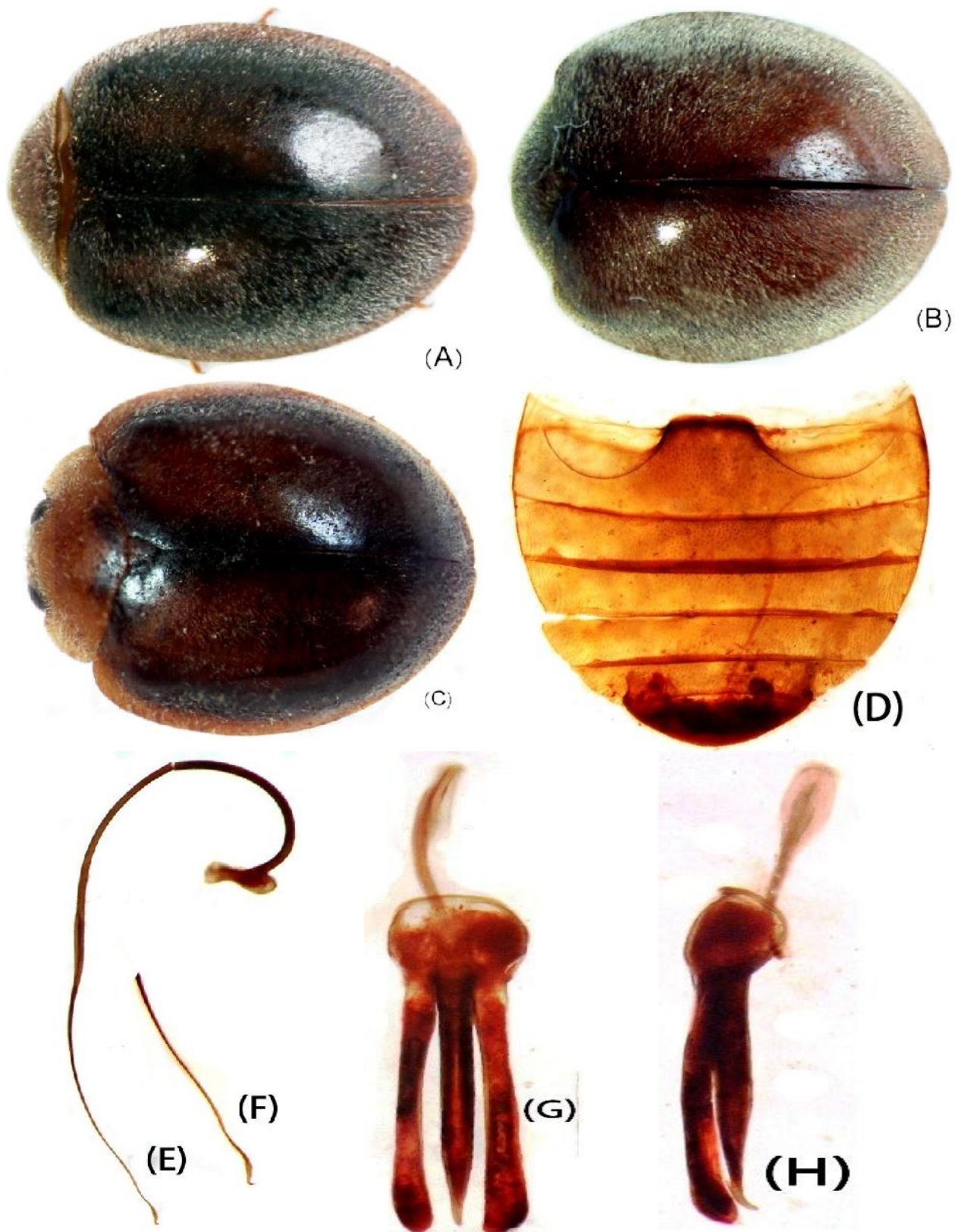


Figure 2. *Rodolia fumida*: Morph (A–C), 1st Morph (A), 2nd Morph (B) and 3rd Morph (C), abdomen (D); male genitalia (E–H): penis (E), penis apex (F), tegmen ventral view (G) and tegmen lateral view (H).

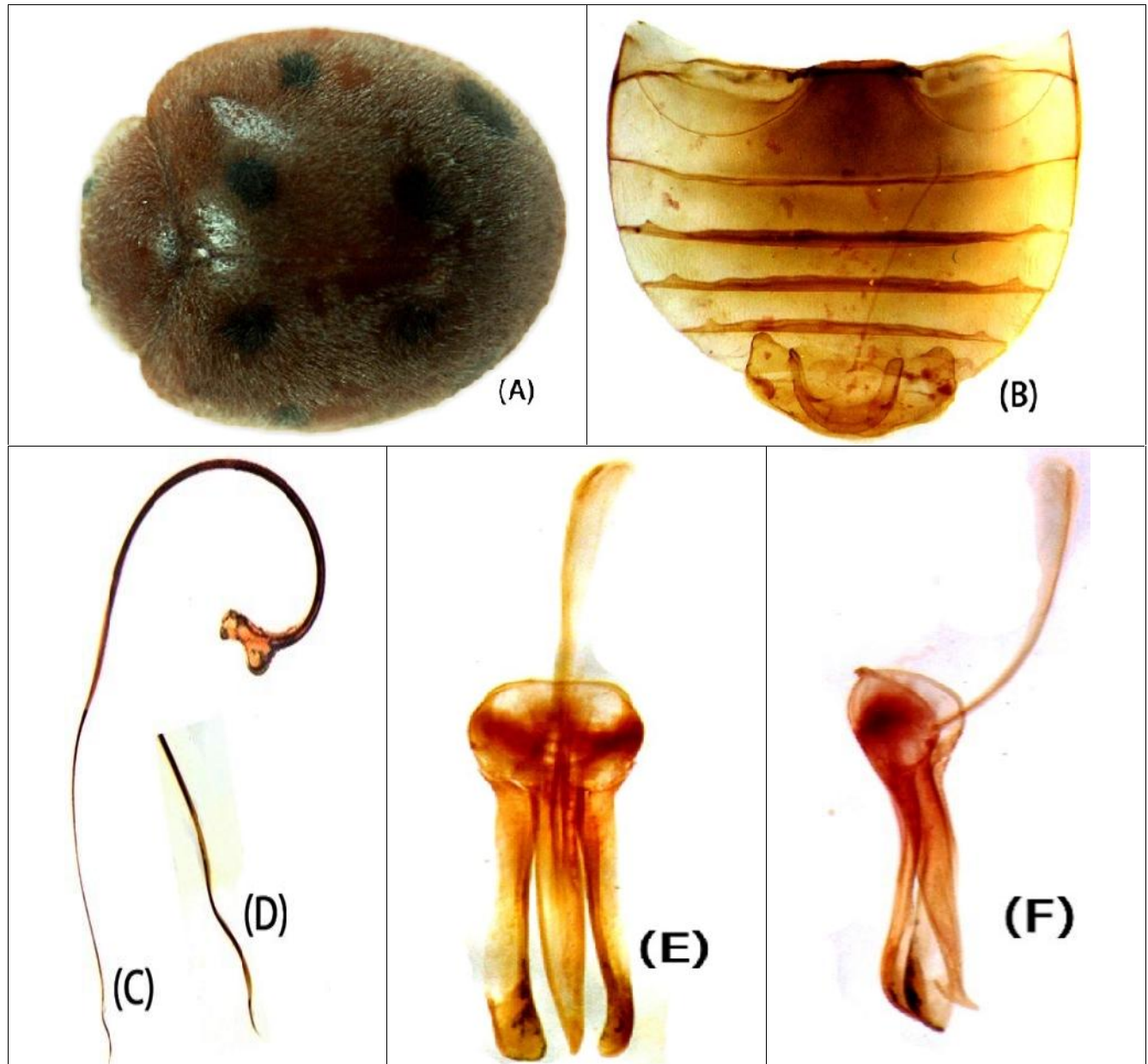


Figure 3. *Rodolia octoguttata*: dorsal view of Adult (A) and abdomen (B); male genitalia (C–E): penis (C), penis apex (D), tegmen ventral view (E) and tegmen lateral view (F).

DISCUSSION

From Pakistan, previously three species of the genus *Rodolia* have been reported i.e. *Rodolia guerini* Korschefsky, 1931, *R. fumida* Mulsant, 1850 and *R. ruficollis* Mulsant, 1850 by Rasheed *et al.* (1986); Rafi *et al.* (2005); Hayat and Khan (2013); Ali *et al.* (2014). During current study, a total of 93 specimens of the genus *Rodolia* from different localities of Pothwar Plateau were examined, and their results revealed two species i.e. *R. fumida* Mulsant, 1850 and *R. octoguttata* Weise, 1910. Among these two, *R. octoguttata* Weise, 1910 is a new

contribution for the fauna of Pakistan. For Indian subcontinent, Kapur (1949) has reported *R. octoguttata* Weise, 1910 for the first time (India) and Poorani (2002) enlisted this species in her Indian checklist of predatory coccinellids. Ren *et al.* (2009) reported this species from China. During current research work it is predatory on pest species *Drosicha mangiferae* (Homoptera: Margarodidae) of following host plants i.e. Loquat, Devil tree, Lagerstromia, Mango and Sheesham. It remains active during April to June and a few individuals were also observed during October in Rawalpindi, Islamabad and Jhelum.

Rodolia fumida Mulsant, 1850 is a polymorphic species. Most common morph of this species contains entirely black elytra except with brown discal area. Reddish testaceous and rose-red morphs have been least observed during present study. Sicard (1909); Kapur (1949, 1951); Poorani (2002) reported this species from India. In 2005, Rafi *et al.* founded it as predator of *Coccus mangiferae* (Homoptera: Coccidae) and *Drosicha stebbingi* (Homoptera: Margarodidae) from Dir, Peshawar and Gujrat regions of Pakistan. Currently, this species has new distributional records from Pakistan i.e. Rawalpindi, Islamabad, Chakwal and Jhelum, and founded as a predator of *Drosicha mangiferae* (Homoptera: Margarodidae) of host plants i.e. Lagerstromia, Mango, Loquat, Devil tree, Peach and Sheesham during April to July. This species was also observed till the end of October on Devil tree in Rawalpindi. Findings within genus *Rodolia* Mulsant, 1850 along with their associated prey and host plants will serve as baseline study in Pothwar Plateau, Pakistan.

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