Research Article

New Additions to Pakistan's Aphididae (Hemiptera: Aphidoidea) Damaging *Rosa* Species

Muhammad Amin[1*], Khalid Mahmood[2], Imran Bodlah[3], Muhammad Rahim Khan[2]

[1]Department of Entomology, Balochistan Agriculture College, 87300 Quetta, Pakistan; [2]Faculty of Agriculture, Department of Entomology, University of Poonch, 12350 Rawalakot, Azad Jammu and Kashmir-Pakistan; [3]Department of Entomology, PMAS-Arid Agriculture University, 46000 Rawalpindi, Pakistan.

Abstract | Twelve aphid species, inclusive of 6 new records to Pakistan's aphidofauna, were found infesting *Rosa* species in study conducted during 2015-2016 in Poonch division of Azad Jammu and Kashmir-Pakistan. *Chaetosiphon* (*Pentarichopus*) *fragaefolii* (Cockerell), *Chaetosiphon* (*Pentarichopus*) *thomasi* Hille Ris Lambers, *Chaetosiphon* (*Pentarichopus*) *tetrarhodum* (Walker), *Metopolophium montanum* Hille Ris Lambers, *Myzaphis rosarum* (Kaltenbach) and *Myzaphis turanica* Nevsky are new records for the country. New locality records are presented, in the country, for *Macrosiphum rosae* (Linnaeus) *Macrosiphum euphorbiae* (Thomas), *Rhodobium porosum* (Sanderson), *Myzaphus bucktoni* Jacob and *Wahlgreneilla nervata* (Gillete) on *Rosa* species. *Metopolophium dirhodum* (Walker) was recorded on new host plant, *Rosa* species, in Pakistan. Distinguishing characters, morphometric data, biology and distribution of the studied species are provided herewith.

Received | May 20, 2017; **Accepted** | September 06, 2017; **Published** | Septembere 26, 2017
***Correspondence** | Muhammad Amin, Balochistan Agriculture College, Quetta, Pakistan; **Email:** mamin.edupr@gmail.com
Citation | Amin, M., K. Mahmood, I. Bodlah, M.R. Khan. 2017. New additions to pakistan's aphididae (Hemiptera: Aphidoidea) damaging *Rosa* species. *Sarhad Journal of Agriculture*, 33(4): 511-518.
DOI | http://dx.doi.org/10.17582/journal.sja/2017/33.4.511.518
Keywords | *Chaetosiphon*, *Myzaphis, Rosa* species, Poonch division, Kashmir-Pakistan

Introduction

Species of genus *Rosa* L. (Rosales: Rosaceae) constitute one of the most important floriculture crops having ornamental, cosmetic and medicinal value (Ercisli, 2007; Ulusoy et al., 2009). *Rosa* species, however, are mainly cultivated and appreciated for their aesthetic value and therefore pest free blossoms and shrub are highly desirable (Chen et al., 2000). Like many plants, *Rosa* species are also infested by aphids. Aphids mainly damage hostplant by their feeding on phloem sap, inflicting mechanical injury by their haustellate mouthparts and transmitting viruses, thereby causing both quantitative and qualitative losses to the hostplant (Mart et al., 1997; Saheed et al., 2007; Catangui et al., 2009). Indirect losses due to honeydew excreted by aphids that not only attracts formicids but also promotes black mold which in turn retards photosynthesis (Hatcher, 1995). Besides, presence of aphids along with symbiotically associated ants, sooty mold and sticky honeydew severely degrade aesthetic value of flowers and shrub (Parrella and Jones, 1987). Aphids, therefore, are a serious menace to *Rosa* spp. and industries associated therewith. Fifty five aphid species world widely infest *Rosa* spp. (Blackman and Eastop, 2012) of which only 5 species have been reported from Pakistan till to date as against 39 species documented from neighboring India (Chakrabarti and Sarkar, 2001). Naumann-Etienne and Remaudiere (1995) reported 300 aphids from Pakistan that also included rose inhabiting aphids *Wahlgreneilla nervata* (Gillete) and *Myzaphis bucktoni* Jacob, both also encountered in the present study. The aphidological studies on rose aphids before and after the preliminary checklist furnished by these two authors have frequently referred *Mac-*

rosiphum rosae, and/or *Macrosiphum euphorbiae* as the main aphid pests of *Rosa* spp. (Ahmed and Aslam, 2000; Irshad, 2001; Hassan et al., 2010; Naeem et al., 2010). Aphid fauna of Pakistan in general is fragmentarily and unevenly studied, with many regions in the country still remaining where even preliminary faunal work has not yet started/fully realized. This study was initiated to explore inter-alia aphid species inhabiting *Rosa* spp. in Poonch division Azad Jammu and Kashmir, a lush green mountainous region at an average altitude of 2000 feet, in the north east of Pakistan.

Table 1: *Surveyed Localities in Poonch Division, AJ&K-Pakistan.*

Survey Locality	Latitude	Longitude	Altitude
Rawalakot	33°51'32.18" N	73° 45'34.93"E	1638 m
Khaigala	33 50' 40" N	73 49' 50"E	1760 m
Alisojal	33°51'24.9" N	73°50'35.3"E	1705 m
TauliPir	33°50'12 .59" N	73°24'58 .39" E	2690 m
Banjosa	33°48' 20" N	73°48'59.04" E	1981 m
Hajira	33° 46' 18.12" N	73° 53' 45.96" E	966 m
Abbaspur	33°48'52.092" N	73° 58' 32.3652" E	1161 m
Bagh	33°58'23.6604" N	73° 47' 30.876" E	1676 m
Haveli	33°51'14.40" N	73° 6' 11.88" E	956 m
Sudhnoti	33° 42' 54" N	74° 41'9" E	1203 m

Materials and Methods

Aphids were collected from both cultivated as well as wild *Rosa* spp., from 10 locations of Poonch division, Azad Jammu and Kashmir-Pakistan (Table 1). Specimens were transferred into transparent plastic vials containing 70% ethanol by a fine horse hair brush. Infested plant part(s), tender top shoots carrying aphids were cut and put in polyethylene-zipper bag. Samples were brought in the Entomology laboratory, University of Poonch, Rawalakot. Ethanol-preserved adult apterous vivparae, and their mounts prepared following Martin (1983), were used for taxonomic evaluation based on Blackman and Eastop (1994, 2008 and 2012) by Olympus binocular (provided with oculometer) at 10 × 40 magnification. Key morphological characters (Table 2) were used in the diagnostic description referring to (Blackman and Eastop, 1994 and 2012) and morphometric analysis of the studied data. Taxonomic literature given by Remaudiere and Remaudiere (1997) and Nafria (2013) was also referred to in the taxonomic evaluation of data. Voucher specimens of the identified species were deposited in the Entomology laboratory, University of Poonch Rawalakot, Azad Jammu and Kashmir, Pakistan. Species new to Pakistan have been marked with asterisk on top right.

Table 2: *Abbreviations used for morphological characters in the systematic account of present study. Small-case Roman Numerals in bold denote number related to a character.*

Abbreviation	Character
Bl	Body length (excluding cauda)
Bw	Maximum width across body
ATu	Antennal tubercles
Ante	Antennae; length of antenna
Ant	Antennal segment
Antr	Ratio of antennal segments' lengths
Bd iii	Basal diameter of antennal segment **iii**
Hl iii	Longest hair on antennal segment **iii**
SRh	Secondary rhinaria
Pt	Processus terminalis
B vi	Length of base of antennal segment **vi**
Ros	Rostrum
R iv+v	Ultimate rostral segment
Ht ii	2nd segment of hind tarsi
Siph	Siphunculi, siphuncular
S/Pre	Subapical polygonal reticulation
Cd	Cauda
Cdl	Length of cauda
Cdb	Base of cauda
CXm	Midcoxae

Results and Discussion

In total 12 species under 6 genera belonging exclusively to subfamily aphidinae and tribe macrosiphini were found infesting *Rosa* spp. Seven species viz., *Metopolophium dirhodum*, *Metopolophum montanum**, *Myzaphis rosarum**, *Myzaphis bucktoni*, *Macrosiphum euphorbiae*, *Macrosiphum rosae*, and *Rhododium porosum* were found on cultivated *Rosa* spp. while 4 species, *Chaetosiphon* (*P.*) *fragaefolii**, *C.* (*P.*) *tetrarhodum**, *C.* (*P.*) *thomasi**, *C.* (*P.*) *tetrarhdum** and *Wahlgreniella nervata*, were found on wild *Rosa* spp. The genera *Chaetosiphum* and *Myzaphis* had 3 species each followed by *Macrosiphum* and *Metopolophium* each having 2 species while *Rhodobium* and *Wahlgreniella* had monospecific representation. Systematics, morphometric data in mm of genera with more than one species/genus are tabulated as Table 3, 4, 5 and 6 re

Table 3: *Morphometric data (in mm) of C. (P.) fragaefoli*, C. (P.) thomasi* and C. (P.) tetrarhdum*.*

Character	*C.(P.) fragaefolii*	*C.(P.) thomasi*	*C.(P.) tetrarhdum*
Bl	1.92-2.03	1.61-1.82	1. 87-2.02
Bw	0.98-1.02	0.60-0.70	0.85-0.99
Ante	2.10-2.17	1.38-1.60	1.76-2.20
Ant iii	0.47-0.52	0.47-0.52	0.42-0.52
Ant iv	0.34-0.40	0.34-0.40	0.23-0.36
Ant v	0.78-0.85	0.34-0.40	0.18-0.31
Ant vi (b vi+pt)	**0.78-0.85 (0.08-0.098 + 0.70-0.75)**	**0.2-0.25 (0.065-0.083+ 0.13-0.17)**	**0.88-0.99 (0.09-0.13 + 0.42-0.52)**
Pt/b vi	9-8	2-2	5-4
Siph	**0.52-0.58**	**0.16**	**0.29-0.41**
Cdl	**0.104-0.0.156**	**0.13**	**0.10-0.18**
Cdb	0.156-0.208	0.10	0.05-0.07
R iv+v	0.06-0.07	0.06-0.07	0.09-0.10
Ht ii	0.07-0.08	0.07-0.08	0.09-0.10

Distinguishing morphological characters are in bold.

Table 4: *Morphometric data (in mm) of Macrosiphum euphorbiae and Macrosiphum rosae.*

Character	*M. euphorbiae*	*M. rosae*
Bl	2.86-3.12	1.82-2.05
Bw	0.88-0.99	0.86-1.04
Ante	2.80-3.00	1.37-1.89
Ant iii	0.70-0.83	0.42-0.52
Ant iv	0.44-0.62	0.18-0.36
Ant v	0.42-0.54	0.18-0.31
Ant vi (b vi+Pt)	0.78-0.96(0.078-0.13 + 0.70-0.83)	0.54-0.65(0.10-0.13 + 0.44-0.52)
Pt/b vi	9-6	4-4
Siph	0.88-1.00 **(Pale)**	0.26-0.39 **(Black)**
Cdl	0.44- 0.52	0.16-0.21
Cdb	0.13-0.18	0.104- 0.15
R iv+v	0.10- 0.13	0.08-0.10
Ht ii	0.10- 0.13	0.06-0.08

spectively, material examined (distribution in study area), biology, distribution (worldwide) and comments (reference in Pakistan and regional countries) for the identified species on cultivated and wild *Rosa* spp. are given below:

Family: Aphididae
Subfamily: Aphidinae
Tribe: Macrosiphini
***Chaetosiphon* Mordvilko, 1914**
Chaetosiphon* (*Pentatrichopus*) *fragaefolii* **(Cockerell, 1901)**
Distinguishing morphological characters: Light green to yellowish green and medium sized. Pt more than 2 × b **vi**. Siph more than 2.5 × Cdl. Ant **iii**, **iv** and **v** with few distinctly capitated hairs. Dorsum having 2-4 longitudinal rows of capitated hairs with one row lateral margins.
Material examined: On wild *Rosa* sp. (Rosaceae): Rawalakot, 4 apterae, 14-V-2015 and 3 apterae 14-V-2016; Khaigala, 2 apterae, 14-V-2015; Banjosa, 1 aptera, 16-V-2015; Alisojal, 2 apterae, 26-V-2015.
Biology: Mostly anholocyclic on cultivated *Fragaria* spp. (strawberries) (Blackman and Eastop, 2012).
Distribution: Cosmopolitan pest on cultivated *Fragaria* spp. (Blackman and Eastop, 2012).

Table 5: *Morphometric data (in mm) of Metopolophium dirhodum and Metopolophium montanum*. Distinguishing morphological characters are in bold.*

Characters	*M. dirhodum*	*M. montanum*
Bl	2.75-2.86	1.92-2.26
Bw	0.86-0.96	0.81-0.96
Ante	1.71-2.15	1.35-1.85
Ant iii	0.44-0.57	0.47-0.59
Ant iv	0.34-0.46	0.23-0.36
Ant v	0.31-0.40	0.23-0.31
Ant vi (b vi+Pt)	0.57-0.67(0.10-0.13 +0.47-0.54)	0.37-0.54(0.08-0.13 + 0.29-0.41)
Pt/b vi	4-4	4-3
Siph	0.44-0.52	0.42-0.52
Cdl	0.23-0.26	0.18- 0.26
Cdb	0.23-0.26	0.05-0.08
R iv+v	0.10-0.13	0.06-0.07
Ht ii	0.09-0.10	0.8-0.10

Table 6: *Morphometric data (in mm) of Myzaphis rosarum*, Myzaphis turanica* and Myzaphis bucktoni.*

Character	*M. rosarum*	*M. turanica*	*M. bucktoni*
Bl	1.25-1.43	1.58-1.74	1.53-1.66
Bw	0.73-0.91	0.65-0.81	0.60-0.68
Ante	0.70-0.92	1.10-1.57	1.27-1.49
Ant iii	0.18-0.26	0.29-0.39	0.34-0.36
Ant iv	0.16-0.21	0.23-0.34	0.23-0.26
Ant v	0.20-0.26	0.18-0.29	0.26-0.28
Ant vi (b vi+pt)	00.10-0.14(0.07-0.10 + 0.3-0.4)	0.35-0.5(0.04-0.08+ 0.31-0.42)	0.039-0.52(0.05-0.08 + 0.34-0.44)
Pt/b vi	4-4	8-5	7-6
Siph	0.38-0.4	0.36-0.47	0.47-0.52
Cdl	0.98-0.10	0.06-0.07	0.10-0.13
Cdb	0.08- 0.10	0.05-0.08	0.10-0.13
R iv+v	0.8-0.13	0.08-0.10	0.21
Ht ii	0.08-0.10	0.07-0.08	0.13

Comments: This species is new to Pakistan's aphidofauna. It was reported from western Himalaya in India by Banerjee et al. (1969).

***Chaetosiphon* (*Pentatrichopus*) *thomasi** Hille Ris Lambers, 1953**

Distinguishing morphological characters: Pale, small sized and rather spindle shaped. Head spinulose. Ante with capitate hairs. Abdomen with 2 lateral rows of capitate hairs. Siph less than 2.5 × longer than Cdl.

Material examined: Wild *Rosa* sp. (Rosaceae): Rawalakot, 4 apterae, 17-V-2016; Khaigala, 2 apterae, 18-V-2016.

Biology: Monoecious holocyclic both on wild and cultivated *Rosa* spp. (Blackman and Eastop, 2012).

Distribution: North America; South America (Chile and Argentina) (Blackman and Eastop, 2012).

Comments: This species is new to Pakistan's aphidofauna.

***Chaetosiphon* (*Pentatrichopus*) *tetrarhodum** (Walker, 1849)**

Distinguishing morphological characters: Light green to yellowish green and medium sized. Head dorsally smooth. ATu smooth and diverged. Ant **iii** with few capitated hairs, Pt more than 2 × b **vi**. Siph less than 2.5 × Cdl.

Material examined: Wild *Rosa* sp. (Rosaceae): Rawalakot, 4 apterae, 14-V-2015; Khaigala 4 apterae, 14-V-2015; Banjosa, 3 apterae, 15-V-2015; Bagh, 2 apterae, 16-V-2015; Alisojal, 2 apterae, 26-V-2015.

Biology: Monoecious holocyclic on *Rosa* spp. (Blackman and Eastop, 2012).

Distribution: Worldwide except East Asia on *Rosa* spp. (Blackman and Eastop, 2012).

Comments: This species is new record to Pakistan's aphidofauna. Bhagat (2012) reported this species from Kashmir-India.

***Macrosiphum* Passerini, 1860**

***Macrosiphum euphorbiae* (Thomas, 1878)**

Distinguishing morphological characters: Green, reddish brown and pear shaped. Ant **iii** having 2-3 SRh near its base. Siph pale, long, terminally dark, S/PRe present. Cd pale, long, finger shaped, tapered and with 4-6 hair.

Material examined: On wild *Rosa* sp.; Hajira, 2 apterae, 10-III-2016; Haveli, 2 apterae, 15-III-2016; Bagh, 2 apterae, 13-IV-2016; Banjosa, 2 apterae, 27-III-2016; Abbaspur, 3 apterae, 25-III-2016; Sudhnoti, 6 apterae, 31-III-2016; Rawalakot, 6 apterae, 16-IV-2016; Khaigala, 4 apterae, 16-IV-2016; Banjosa, 4 apterae, 16-V-2016; Alisojal, 4 apterae, 17-V-2016;

Biology: Heteroeciously holocyclic. Primary host *Rosa* spp. whereon sexual phase is passed in north-eastern USA, but mainly lives anholocyclically on secondary hosts spreading over more than 20 plant families (Blackman and Eastop, 2012).

Distribution: Cosmopolitan (Blackman and Eastop, 2012).

Comments: Bodlah et al. (2011) reported this species on the same host plant. Present study has added new locality records for this species.

***Macrosiphum rosae* (Linnaeus, 1758)**

Distinguishing morphological characters: Pink, pinkish green to pinkish brown and pear shaped. SRh on basal part of Ant **iii**. Siph cylindrical, tapered, entirely dark and S/PRe not distinct. Cd pale, finger shaped and with 6-8 hairs.

Material examined: On cultivated *Rosa* sp. : Hajira, 2

apterae, 10-III-2016; Haveli, 2 apterae, 15-III-2016; Bagh, 2 apterae, 13-IV-2016; Banjosa, 2 apterae, 27-III-2016; Abbaspur, 3 apterae, 25-III-2016; Sudhnoti, 6 apterae, 31-III-2016; Rawalakot, 6 apterae, 16-IV-2016; Khaigala 4 apterae, 16-IV-2016; Banjosa, 4 apterae, 16-V-2016; Alisojal, 4 apterae, 17-V-2016; Taulipir, 2 apterae, 18-V-2016.

Biology: The species can live throughout summer in colonies on *Rosa* spp. Sexuales appear in autumn. In warm climates overwintering occurs anholocyclically (Blackman and Eastop, 2012).

Distribution: Worldwide except east and south East Asia.

Comments: Irshad (2001) reported this species on *Dipsacus nermis* and *Rosa* sp. In present study new locality records were added up.

***Metopolophium* Mordvilko, 1914**

***Metopolophium dirhodum* (Walker, 1849)**

Distinguishing morphological characters: Yellow to yellowish green, medium sized and rather spindle shaped. ATu well developed, with smooth inner faces and diverged, R **iv+v** less than 0.7 × Ht **ii**. Siph pale and dusky distally. Cd pale, longer than wide and with 6-8 hairs.

Material examined: On cultivated *Rosa* sp.: Bagh, 2 apterae, 13-IV-2016; Banjosa, 2 apterae, 27-III-2016; Abbaspur, 3 apterae, 25-III-2016; Sudhnoti, 6 apterae, 31-III-2016; Rawalakot, 6 apterae, 16-IV-2015; Khaigala 4 apterae, 16-IV-2015; Banjosa, 4 apterae, 16-V-2015; Alisojal, 4 apterae, 17-V-2015; Taulipir, 2 apterae, 18-V-2015.

Biology: Heteroecious holocyclic. In spring it occurs on wild *Rosa* spp. and in summer migrates to plants of Poaceae and Cyperaceae (Blackman and Eastop, 2012).

Distribution: Cosmopolitan (Blackman and Eastop, 2012).

Comments: Hassan et al. (2010) reported this species on *Triticum* sp. from northern areas of Pakistan. Present study gives both, new host plant and locality records. It has also been reported from India (Dutta et al., 2008).

Metopolophium montanum* **Hille Ris Lambers, 1966**

Distinguishing morphological characters: Yellow to yellowish brown. Siph pale, tapered and less than 2 × Cdl. R **iv+v** more than 0.8 × Ht **ii**. Cd pale, finger shaped and with 4-6 hairs.

Material examined: On Cultivated *Rosa* sp.: Abbaspur, 2 apterae, 25-III-2016; Sudhnoti, 2 apterae, 31-III-2016; Rawalakot, 4 apterae, 25-V-2016; Khaigala, 2 apterae, 16-V-2016; Banjosa, 2 apterae, 16-IV-2015; Alisojal, 1 aptera, 17-V-2015 and Taulipir, 2 apterae, 18-V-2015.

Biology: Heteroecious holocyclic. In spring it occurs on wild *Rosa* spp. and in summer migrates to plants of Poaceae and Cyperaceae.

Distribution: Cosmopolitan (Blackman and Eastop, 2012).

Comments: Hassan et al. (2010) reported this species on *Triticum* sp. from northern areas of Pakistan. Present study gives both, new host plant and locality records.

***Myzaphis* van der Goot 1913**

Myzaphis rosarum* **(Kaltenbach, 1843)**

Distinguishing morphological characters: Yellow to yellowish green with 2 dark stripes on dorsum, medium sized and rather spindle shaped. Frons squarish with 2 hairs, each hair less than 0.5 × bd **iii**.

Material examined: On cultivated *Rosa* sp. : Abbaspur, 2 apterae, 25-III-2015; Banjosa, 1 apterae, 27-III-2015; Sudhnoti, 2 apterae, 31-III-2015; Rawalakot, 4 apterae, 16-IV-2015; Khaigala, 2 apterae, 16-IV-2015; Alisojal, 1 apterae, 17-V-2015 and Taulipir, 2 apterae, 18-V-2015.

Biology: Mainly monoecious holocyclic on Rosaceae. Also anholocyclic population reported in New Zealand (Blackman and Eastop, 2012).

Distribution: Worldwide (Blackman and Eastop, 2012).

Comments: This species is new record to Pakistan's aphidofauna. This species was reported by Kanakaraj (1970) in India.

Myzaphis turanica* **Nevsky 1929**

Distinguishing morphological characters: Yellow with light dark irregular dorsal marking, and small to medium sized. Frontal hairs more than ½ as long as bd iii. R **iv+v** fractionally less than Ht **ii**. Siph without S/PRe, Cd triangular and as long as broad.

Material examined: On cultivated *Rosa* sp.: Rawalakot, 4 apterae, 15-V-2016; Khaigala, 2 apterae, 15-V-2016.

Biology: Monoecious holocyclic with male alatae (Blackman and Eastop, 2012).

Distribution: Central Asia, Sweden, Israel, Italy, Turkey, India, Mongolia and Brazil (Blackman and Eastop, 2012).

Comments: This species is a new record for Pakistan and was reported from India by Kanakaraj (1970) and Ghosh (1986) in India.

***Myzaphis bucktoni* Jacob, 1946**

Distinguising morphological characters: Yellowish pale, medium sized and rather elongate. Frontal hairs

as long as bd **iii**. R **iv+v** reaches CXm, with 4-6 secondary hairs and longer than Ht **ii**. Siph pale, long, distally clavate. Cd triangular and bears 6-8 hairs.

Material examined: On cultivated *Rosa* sp.: Rawalakot, 4 apterae; 15-V-2016; Khaigala, 2 apterae, 15-V-2016; Alisojal, 2 apterae, 16-V-1016.

Biology: Mainly monoecious holocyclic (Blackman and Eastop, 2012).

Distribution: Europe, Kazakhstan, Pakistan, Mongolia and introduced to USA and Argentina (Blackman and Eastop, 2012).

Comments: This species was reported by Naumann-Etienne and Remaudiere (1995) on *Rosa* sp. in Pakistan. Present study gives new locality record for the same.

***Rhodobium* Hille Ris Lambers, 1947**

***Rhodobium porosum* (Sanderson, 1900)**

Distinguishing morphological characters: Light green to yellowish green, small to medium sized and rather spindle shaped aphids. ATu with inner scrabous faces almost parallel. Ant **iii** with about 10 linearly placed SRh.

Measurements (mm): Bl 1.93-2.15; Bw 0.89-1.04; Ante 1.87-2.00; Antr **iii**: **iv**: **v**: **vi** (b **vi** + Pt) 0.52-0.62: 0.31-0.42: 0.18-0.31: 0.584-0.65 (0.078-0.13 + 0.42-0.52); R **iv+v** 0.104-0.156; Ht **ii** 0.13-0.15; Siph 0.42-0.52; Cdl 0.28-0.29; Cdb 0.21-0.13.

Material examined: On Cultivated *Rosa* sp.: Hajira, 2 apterae, 10-III-2016; Haveli, 2 apterae, 15-III-2016; Bagh, 3 apterae, 13-III-2016.

Biology: Monoecious holocyclic in North America but anholocyclic in warmer regions (Blackman and Eastop, 2012).

Distribution: Cosmopolitan (Blackman and Eastop, 2012).

Comments: Bodlah et al. (2011) reported this species on *Rosa* sp. In present study new locality record has been added up.

***Wahlgreniella* Hille Ris Lambers, 1949**

***Wahlgreniella nervata* (Gillette, 1908)**

Distinguishing morphological characters: Translucently pale or greenish pale and spindle-shaped. The femora without distinctly dark apices. Siph pale, slightly clavate, flanged.

Measurements (mm): Bl 1.30-1.61; Bw 0.44-0.60; Ante 0.35-1.22; Antr **iii**: **iv**: **v**: **vi** (b **vi** + Pt) 0.104-0.156: 0.05-0.08: 0.05-0.08: 0.09-0.90 (0.33-0.80 + 0.052 + 0.10); R **iv+v** 0.05-0.08; Ht **ii** 0.05-0.08; Cdl 0.10-0.16; Cdb 0.052-0.08.

Material examined: On wild *Rosa* sp.: Rawalakot 4 apterae 16-V-2016.

Biology: Heteroecious holocyclic between *Rosa* spp. and Ericaceae in N. America, also anholocyclic in regions (Blackman and Eastop, 2012).

Distribution: North America, Central and South America, Europe, Turkey, Saudi Arabia, India (Blackman and Eastop, 2012).

Comments: Naumann-Etienne and Remaudière (1995) reported this species from Pakistan (Quetta) on *Rosa* spp. Present study first time gives new locality record for this species in Pakistan. This species was reported on the same host plant by Joshi et al. (2014) from India.

Conclusions

A total of 12 aphid species, including 6 new to Pakistan's aphidofauna and with all twelve species described for the first time from study area on cultivated and wild *Rosa* spp. points to tremendous biodiversity of study area. Cultivated *Rosa* spp. harbored 8 of the 12 encountered aphid species showing greater palatability to aphid species. *Macrosiphon rosae* and *Macrosiphon euphorbiae* were recorded in all surveyed localities. *Wahlgreniella nervata* was found only in the samples collected from wild *Rosa* sp. from Rawalakot. Results of present study not only signify the importance of faunistic exploration of country's biodiversity rich remote areas but also reveal potential threat to cultivated *Rosa* spp. in the study area.

Author's Contribution

MA collected, identified the specimens, studied the related literature and prepared the manuscript. KM suggested the problem and helped in improvement of manuscript. IB guided and assisted in identification process. MRK reviewed the manuscript and gave input for the improvement of the latter. All authors read and approved the final manuscript.

Conflict of Interest Statement

The author's declare that there is no conflict of interest regarding publication of this article.

References

Ahmed, S. and M. Aslam. 2000. Influence of environmental factors on rose aphid (Macrosiphum rosaeiformis das (Homoptera: Aphididae) attacking rose (Rosa indica var. Iceburg, Rosaceeae). Pak. J. Biol. Sci.

3:2163-2164. https://doi.org/10.3923/pjbs.2000.2163.2164

Banerjee, H., A.K. Ghosh and D.N. Raychaudhuri. 1969. On a collection of aphids (Homoptera) from Kuti valley, West Himalaya. Orient. Insects. 3(3):255-264. https://doi.org/10.1080/00305316.1969.10433914

Bhagat, R.C. 2012. Aphids (Insecta) damaging medicinal and aromatic plants of Jammu and Kashmir State (India): An updated checklist and biodiversity. Indian J. Appl. Pure Biol. 27(1):1-10.

Blackman, R.L. and V.F. Eastop. 1994. Aphids on the world's trees an identification and information guide. CAB International Wallingford, United Kingdom.

Blackman, R.L. and V.F. Eastop. 2008. Aphids on the world's herbaceous plants and shrubs, Volume Set 2. John Wiley & Sons.

Blackman, R.L. and V.F. Eastop. 2012. Aphids on the world's plants: An online identification and information guide. Available at http://www.aphidsonworldsplants.info.

Bodlah, I., M. Naeem and A.U. Mohsin. 2011. Checklist distribution host range and ecology of Aphidoidea (Homoptera) from the rainfed region of Punjab province of Pakistan. Sarhad J. Agric. 27:93-101.

Catangui, M.A., E.A. Beckendorf and W.E. Riedell. 2009. Soybean aphid population dynamics, soybean yield loss, and development of stage-specific economic injury levels. Agron. J. 101: 1080-1092. https://doi.org/10.2134/agronj2008.0233x

Chakrabarti, S. and A. Sarkar. 2001. A supplement to the food-plant catalogue of Indian Aphididae (Homoptera). J. Aphidol. 15:9-62.

Chen, W., K.L. Gast and S. Smithey. 2000. The effects of different freeze-drying processes on the moisture content, color, and physical strength of roses and carnations. Sci. Hortic. Amsterdam. 84(3): 321-332. https://doi.org/10.1016/S0304-4238(99)00106-5

Dutta, S., B.K. Bhattacharya, D.R. Rajak, C. Chattopadhyay, V.K. Dadhwal, N.K. Patel, J.S. Parihar and R.S. Verma. 2008. Modelling regional level spatial distribution of aphid (Lipaphis erysimi) growth in Indian mustard using satellite-based remote sensing data. Int. J. Pest Manage. 54(1): 51-62. https://doi.org/10.1080/09670870701472314

Ercisli, S. 2007. Chemical composition of fruits in some rose (Rosa spp.) species. Food Chem. 104(4):1379-1384. https://doi.org/10.1016/j.foodchem.2007.01.053

Ghosh, L.K. 1986. Conspectus of aphididae (Homoptera) of Himchal Pradesh in North-West Himalaya, India. Zool. Surv. India.

Hassan, A.S., M.A. Rafi, H. Javed, A. Zia, M. Naeem, I.A. Khan and H. Bilal. 2010. Aphidoidea (homoptera) from the northern areas of Pakistan. Sarhad J. Agric. 26(4): 609-611.

Hatcher, P.E. 1995. Three-way interactions between plant pathogenic fungi, herbivorous insects and their host plants. Biol. Rev. 70(4):639-694. https://doi.org/10.1111/j.1469-185X.1995.tb01655.x

Irshad, M. 2001. Aphids and their biological control in Pakistan. Pak. J. Biol. Sci. 4(5):537-541. https://doi.org/10.3923/pjbs.2001.537.541

Joshi, S., D. Lokeshwari, N.K. Kumar, H. Manjunatha, A. Verghese and S.K. Jalali. 2014. Wahlgreniella nervata (Hemiptera: Aphididae), a new pest of rose in India. Fla. Entomol. 97(1): 162-167. https://doi.org/10.1653/024.097.0122

Kanakaraj-David, S., S.G. Rajasingh and K. Narayanan.1970. The Myzaphidines (Homoptera) of India with descriptions of three new species. Orient. Insects. 4(4): 395-406. https://doi.org/10.1080/00305316.1970.10433976

Martin, J. H. 1983. The identification of common aphid pests of tropical agriculture. Int. J. Pest Manage. 29(4):395-411. https://doi.org/10.1080/09670878309370834

Mart, B., J.L. Collar, W.F. Tjallingii and A. Fereres. 1997. Intracellular ingestion and salivation by aphids may cause the acquisition and inoculation of non-persistently transmitted plant viruses. J. Gen. Virol. 78(10): 2701-2705. https://doi.org/10.1099/0022-1317-78-10-2701

Nafría, J.N. 2013. Fauna Europaea. Version 2.6.1. Available at www. faunaeur.org/taxon_tree.php.

Naeem, M., A.A. Mohsan and N.A. Abbassi. 2010. Bionomics of rose aphids and their natural enemies. Pakistan J. Sci. Ind. R. 53(4): 212-217.

Naumann-Etienne, K. and G. Remaudière. 1995. A commented preliminary checklist of the aphids (Homoptera: Aphididae) of Pakistan and their host plants. *Parasitica*, 51(1).

Parrella. M.P. and V.P. Jones. 1987. Development of integrated pest management strategies in floricultural crops. Bull. Entomol. Soc. Am. *33*(1): 28-34. https://doi.org/10.1093/besa/33.1.28

Remaudiere, G. and M. Remaudiere. 1997. Catalogue of the World's Aphididae. Paris: INRA.

Saheed, S.A., C.E.J. Botha, L. Liu and L. Jonsson. 2007. Comparison of structural damage caused by Russian wheat aphid (Diuraphis noxia) and bird cherry-oat aphid (Rhopalosiphum padi) in a susceptible barley cultivar, Hordeum vulgare cv. Clipper. Physiol. Plantarum. 129(2): 429-435. https://doi.org/10.1111/j.1399-3054.2006.00821.x

Ulusoy, S., G. Boşgelmez-Tınaz and H. Seçilmiş-Canbay. 2009. Tocopherol, carotene, phenolic contents and antibacterial properties of rose essential oil, hydrosol and absolute. Curr. Microbiol. 59(5): 554-558. https://doi.org/10.1007/s00284-009-9475-y