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Research Article

Contribution to Aphid's Fauna of Gujranwala (Punjab), Pakistan

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SM and AAS conducted research and identified aphid species. IB and MAA confirmation aphid species and wrote the article. AA identified host plants and wrote the article.

Keywords
Aphids, fauna, Gujranwala, Pakistan

Abstract | Present study was aimed to explore the Aphid's fauna of Gujranwala and carried out during January to March (2016). For this purpose aphids were collected from twenty two host plants at six different localities of Gujranwala area of Punjab province, Pakistan. Total 12 species namely; *Aphis craccivora, Aphis fabae, Aphis gossypii, Aphis nerii, Rhopalosiphum padi, Lipaphis erysimi, Macrosiphum euphorbiae*, *Myzus persicae*, *Pentalonia nigronervosa, Sitobion avenae*, *Greenidea* (*Trichosiphum*) *psidii* and *Cinara* (*Cupressobium*) *tujafilina* have been recorded for the first time from this area. General characters, measurements, distribution and host plants have been given for all recorded species. The present study can be helpful for aphid management of different plants/crops in Gujranwala District.

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Introduction

Aphids are close relatives of Adelgidae and Phylloxeridae; commonly known as phloem feeders. They belong to order Hemiptera and suborder Sternorryhncha, a diverse group of super family Aphidoidea and family Aphididae (Minks and Harrewijn, 1987). About 5000 species of aphids have been determined worldwide (Blackman and Eastop, 2018; Favr, 2018) and are commonly called plant lice. They have worldwide distribution, but most commonly found in temperate regions. They are small in size with delicate body, may be winged or wingless and are highly destructive pests in the world.

They affect the crops by decreasing the yield of plants directly by sucking their phloem sap, indirectly by transmitting pathogens and facilitating the development of sooty mould; by alluring ants on their honey dews (Lara,1992; Zucchi *et al.*, 1993; Blackman and Eastop, 2000; Kaygin *et al.*, 2008). It is estimated that aphids can reduce the yield of a crop up to 90%. Reduction of yield depends upon different crop stages and severity of aphids attack (Rana, 2005).

A lot of researchers played their role in preliminary studies on species composition of aphids in Pakistan (Hille Ris Lambers, 1966; Das,1918; Shah 1988; Nasir, 1989; Irshad, 2001). Hassan *et al.* (2010) explored aphid's fauna of Northern areas of Pakistan on different host plants including 15 species, of which 1 genus and 1 species namely; *Nearctaphis* and *Nearctaphis bakeri* respectively, were reported for the first time in Pakistan. Bodlah *et al.* (2011) recorded about 24 species of aphids from Pothwar region of

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Punjab. Mushtaq *et al.* (2013) studied some selected crops of Faisalabad with the reference to species diversity and abundance of aphids and reported nine species. Bodlah *et al.* (2013) reported *Tinocallis kahawaluokalani* (Kirkaldy) along with its natural enemies from Punjab Pakistan. Bodlah *et al.* (2017) added new distributional records of *Melanaphis donacis* (Passerini) in Osia and surrounding areas. Amin *et al.* (2017a) provided a list of aphids (Homoptera: Aphididae) infesting medicinal and aromatic plants from Kashmir (Pakistan). Amin *et al.* (2017b) added information regarding aphid species complex damaging rosa species and recorded 6 new aphid species from Pakistan. Kanturski *et al.* (2017) reported a new to science species of genus *Lachnus* Burmeister, 1835 along with a key to species of this genus in Pakistan. As a whole recent work (Amin *et al.*, 2017b; Kanturski *et al.* (2017)) was an addition to already 300 known species of aphids from Pakistan (Naumann-Etienne and Remaudière, 1995). Current studies were conducted with the aim to explore aphid fauna from six different locations of District Gujranwala; in which a total of 12 aphid's species infesting various plants were recorded.

Materials and Methods

Present study was performed to explore the aphids (Aphidoidea) fauna of District Gujranwala during 2016 (January to March). Various localities of District Gujranwala were surveyed (Figure 1).

Study area

Geographically Gujranwala is located in central Punjab, Pakistan, between latitude 32^0 9' 0" North, longitude 74^0 11' 0" towards east and 226 meters (744 ft) above sea level. It is a hot semi-arid area with highest temperature with an average 42^{0}C in summer and lowest temperature with an average 7^{0}C in winter.

Collection and preparation of samples

The apterous adult aphid samples were collected by using camel hair brush on different infested plants mainly during January to March (2016). The dense colonies were observed mostly on some specific parts of host plants as on the leaf bases, upper and lower parts of leaves, new stems and inside the flower. Magnifying glass was used during collection of aphid species for observing fully developed adults. More than 50 aphid specimens were taken from each host plant with the help of a camel hair brush or/ jarring or beating the plant on a white paper sheet. Host plants included: herbaceous plants, shrub plants, weeds and trees bearing aphid colonies. The areas chosen for sample collection belonged to different habitats of aphids like crops, fields, ornamental plants in gardens and public places, domestic plants and roadside weeds. Aphids were preserved with 70% alcohol in transparent plastic vials and labeled accurately, with the name of host plant, location/ habitat, collector's name and collection date.

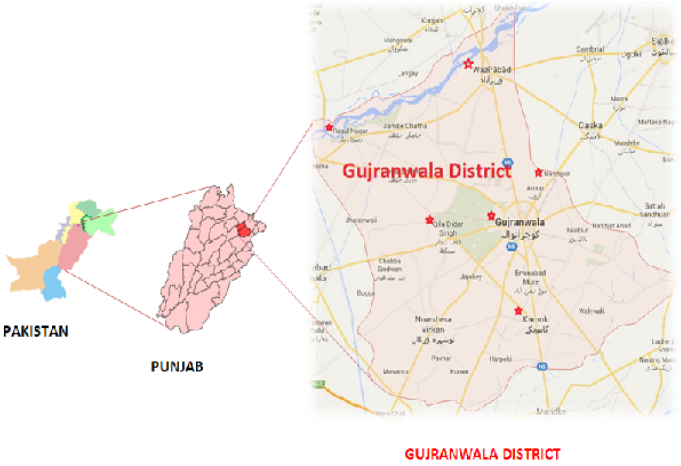

Figure 1: Six collection sites shown in this map of Gujranwala district (Punjab, Pakistan): Gujranwala City, Rasul Nagar, Wazirabad, Nandipur, Qila Didar Singh, Kamonki.

Species identification

Permanent slides of collected specimens were prepared by following the standard method (Blackman and Eastop, 2006). Specimens were slide mounted and identified up to species level by using different taxonomic keys of Blackman and Eastop (1984, 1994, 2006 and 2018) and Ghosh (1980, 1982, 1984, 1988, 1990, 1993, and 2006) at Biosystematics Laboratory, Department of Entomology, PMAS Arid Agriculture University Rawalpindi. Identification of aphids was done under Swift sm-80 binocular microscope. All the aphid collection was deposited in the Zoology Department of Post Graduate Islamia College, Gujranwala.

Results and Discussion

Aphis craccivora Koch, 1854

General Characters

Apterous body is brown to shiny black, dorsal abdomen with a prominent solid black patch, siphunculi and cauda darker than general body color. Antennae six segmented and shorter than body as 2/3 of the body length, terminal process longer than base of last antennal segment; antennae with small, weakly developed lateral tubercles. Rostrum ending to mid-coxae, its IV+V segments almost equal to 2nd segment of hind tarsus (H II). Siphunculi tubular. Cauda tongue shaped and longer than its basal width. Anal plate entire. Stridulatory apparatus absent.

Measurements (mm)

Body length 1.6-1.8; body width 0.77-0.81; terminal process 0.19-0.22; base of 6th segment 0.11-0.12; rostrum length of IV+V segment 0.08-0.10; hind tarsus length 0.10-0.11; siphunculi 0.30-0.35; cauda 0.13-0.15.

Distribution

Cosmopolitan but abundant in warm and tropical regions (Blackman and Eastop, 2018).

Material examined

Kamonke 10 apterae 14-II-2016, Gujranwala city 8 apterae 10-II-2016, Rasul Nagar 12 apterae 6-III-2016, Nandipur 9 apterae 15-III-2016, Qila Didar Singh 9 apterae 10-III-2016.

Host plants

Sheshum (*Dalbergia sisso*), Shoe-flower (*Hibiscus* sp.)

Comments

Aphis craccivora (Cowpea aphid, black legume aphid or groundnut aphid) collected from Gujranwala, Punjab province of Pakistan was compared with the published data of Hassan *et al.* (2010) and Bodlah (2004) and found almost similar. It affects about 30 plant species by transmitting virus through salivary glands (Blackman and Eastop, 2018).

***Aphis fabae* Scoppoli, 1763**

General Characters

Apterous body dull black with transverse dorsal dark bands on 7th and 8th abdominal tergites, posterior to siphunculi and smaller dark patches on anterior abdominal segment, siphunculi, legs and cauda darker than body. Head small, smooth with weakly developed antennal tubercles. Basal portion of last antennal segment 2.5 times shorter than terminal process. Siphunculi tapering without swelling and longer than its basal width and caudal length; siphunculi much shorter than the distance between them. Rostrum reaching hind-coxae; ultimate segment longer than 2nd segment of hind tarsus. Cauda tongue shaped, with more than 10 hairs; cauda much longer than its basal width.

Measurements (mm)

Body length 1.6-1.9; body width 0.98-1.2; terminal process 0.26-0.28;base of 6th segment 0.11-0.12; rostrum length of IV+V segment 0.12-0.15; hind tarsus length 0.10-0.12; siphunculi 0.30-0.35; cauda 0.13-0.15.

Distribution

Widespread in temperate regions of North Hemisphere, Southeast Asia, Africa, Indian subcontinent, South America, Hawaii, Auckland Isles (Blackman and Eastop, 2018).

Material examined

Kamonke 8 apterae 14-II-2016, Gujranwala city 6 apterae 10-II-2016, Wazirabad 3 apterae 25-II-2016 , Nandipur 15 apterae 15-III-2016, Qila Didar Singh 17 apterae 10-III-2016.

Host plants

Wild spinach (*Rumex acutus*) and Coco grass (*Cyperus rotundus*)

Comments

Aphis fabae (Black bean aphid) collected from Punjab, province of Pakistan was compared with the published data of Gosh (2006) and Bodlah (2004) that was almost similar. It is a vector of about 30 different plants including persistent and non-persistent pathogenic viruses (Blackman and Eastop, 2018).

***Aphis gossypii* Glover, 1877**

General Characters

Apterous body has great variation in color, large specimens, dark green, almost black, pale green or light yellow, legs are pale, siphunculi dark and dusky in small specimens and cauda pale or dusky. Antennal tubercles small and weakly developed, with small and shorter hairs. Basal portion of last antennal segment is much shorter than terminal process. Rostrum exceeding mid-coxae; IV+V segments about 1.25mm as long as 2nd segment of hind tarsus and bears 2 secondary hairs. Siphunculi are tubular, longer than cauda. Cauda tongue shaped, with less than 10 hairs much longer than its basal width from the dorsal side.

Measurements (mm)

Body length 0.91-2.06; body width 0.75-1.2; terminal process 0.19-0.21; base of 6th segment 0.09-0.10; rostrum length of IV+V segment 0.08-0.12; hind tarsus length 0.8-0.11; siphunculi 0.20-0.22; cauda 0.10-0.12.

Distribution

Cosmopolitan (Gosh, 2006).

Material examined

Kamonke 20 apterae 14-II-2016, Gujranwala city 15 apterae 10-II-2016, Rasul Nagar 13 apterae 6-III-2016, Wazirabad 14 apterae 25-II-2016, Qila Didar Singh 5 apterae 10-III-2016.

Host plants

Cotton (*Gossypium* sp.), Citrus (*Citrus* sp.) and Rose (*Rosa* sp.).

Comments

Aphis gossypii (Cotton aphid) collected from Punjab, province of Pakistan were compared with the published data of Gosh (2006) and Bodlah (2004) that was almost similar. It is a vector of about 50 plant pathogenic viruses (Blackman and Eastop, 2018).

***Aphis nerii* Boyer de Fonsecolombe, 1841**

General Characters

Apterous body bright yellow, siphunculi, cauda, anten-

nae and legs clearly dark, femora and tibiae apically dark. Antennal tubercles small and less developed. Basal portion of last antennal segment much shorter than terminal process. Rostrum reaching mid-coxae; ultimate segment bears 2 secondary hairs about twice as long as segment 2 of hind tarsus. Siphunculi black, tapering gradually about twice as long as tongue shaped black cauda. Cauda tongue shaped, smaller than siphunculi and with less than 20 hairs.

Measurements (mm)

Body length 1.99-2.25; body width 0.98-1.25; terminal process 0.32-0.33;base of 6th segment 0.08-0.10; rostrum length of IV+V segment 0.13-0.15; hind tarsus length 0.11- 0.13; siphunculi 0.46; cauda 0.22-0.24.

Distribution

India: all over; Africa; America; Australia; Bhutan; Burma; British Guinea; China; Europe; Fiji; Formosa; Japan; Java; Korea; Malaya; Middle East; Nepal; New Zealand; Siam; Solomon Is., Spain; Sri Lanka; Somaliland; Transvaal; U.S.A. (Gosh 2006).

Material examined

Kamonke 10 apterae 18-II-2016, Gujranwala city 20 apterae 10-II-2016, Rasul Nagar 35 apterae 6-III-2016, Wazirabad 25 apterae 25-II-2016, Nandipur 27 apterae 15-III-2016.

Host plants

Oleander (*Nerium oleander*), AK (*Calotropis* sp.)

Comments

Aphis nerii (Oleander aphid) collected from Punjab, province of Pakistan were compared with the published data of Gosh (2006) and Bodlah (2004) that was almost similar. They have the ability to transmit sugarcane and chilly mosaic viruses (Blackman and Eastop, 2018).

***Rhopalosiphum padi* Linnaeus, 1758**

General Characters

Body broadly oval, green mottled yellowish green or olive green, or dark olive to greenish black; often with rust-colored patches around the bases of siphunculi. Head with small but distinct tubercles. Antennae 6-segmented, with hairs mostly shorter than diameter of antennal segment III, terminal process of antenna is straight, terminal process more than 3 times longer than base of last antennal segment. Rostrum reaching mid-coxae; its ultimate segment with 2-secondary hairs, just equal to 2nd segment of hind tarsus. Siphunculi tubular and longer than basal width; longer than cauda about 1.5mm and less than half as long as the distance between them. Cauda tongue shaped, with 5-7 hairs.

Measurements (mm)

Body length 1.92-2.01; body width 1.03-1.24; terminal process 0.32-0.44; base of 6th segment 0.08-0.10; rostrum length of IV+V segment 0.10-0.12; hind tarsus length 0.11-0.12; siphunculi 0.30-0.35; cauda 0.08-0.12.

Distribution

Cosmopolitan (Gosh 2006).

Material examined

Kamonke 15 apterae 14-II-2016, Gujranwala city 16 apterae 10-II-2016, Rasul Nagar 20 apterae 6-III-2016, Wazirabad 14 apterae 25-II-2016 , Nandipur 13 apterae 15-III-2016, QilaDidar Singh 18 apterae 10-III-2016.

Host plants

Wheat (*Triticum* sp.) and Oat (*Avena sativa*)

Comments

Rhopalsiphum padi (Bird Cherry-Oat aphid) collected from Punjab, province of Pakistan were compared with the published data of Gosh (2006) and Bodlah (2004) that was almost similar. They have the skill to transmit Onion yellow dwarf virus, Maize leaf fleck virus, and Barley yellow dwarf viruses (Blackman and Eastop, 2018).

***Lipaphis erysimi* Kaltenbach, 1843**

General Characters

Body small to medium-sized, yellowish green, grey green or olive green; antennae gradually darkening towards apex. Antennal tubercle little developed. Terminal process longer than base of last antennal segment. Rostrum exceeding mid-coxae; its ultimate segment with 2-secondary hairs, slightly shorter to 2nd segment of hind tarsus. Siphunculi dusky, slightly clavate at apex not more than half of the width of the head across eyes in length. Siphunculi less than 1.5 times as cauda. Cauda tongue shaped, clearly longer than its basal width in dorsal view.

Measurements (mm)

Body length 1.96-2.11; body width 1.03-1.08; terminal process 0.32-0.42;base of 6th segment 0.11-0.15; rostrum length of IV+V segment 0.08-0.12; hind tarsus length 0.12- 0.15; siphunculi 0.16-0.19; cauda 0.10-0.18.

Distribution

Cosmopolitan (Blackman and Eastop, 2018).

Material examined

Kamonke 13 apterae 14-II-2016, Rasul Nagar 8 apterae 6-III-2016, Wazirabad 11 apterae 25-II-2016, Nandipur 15 apterae 15-III-2016, QilaDidar Singh 17 apterae 10-III-2016.

Host plants

Radish (*Raphanus sativus*) Cabbage (*Brassica oleracea*) and Turnip (*Brassica rapa*)

Comments

Lypaphis erysimi (Turnip aphid) collected from Punjab, province of Pakistan were compared with the published data of Bodlah (2004) that was almost similar. They have the ability to transmit 10 plant viruses including cabbage black ring spot (Blackman and Eastop, 2018).

***Myzus persicae* Sulzer, 1776**

General Characters

Adult apterae small to medium-sized, whitish green, pale yellow green, grey green, mid-green, pink or red, more deeply pigmented green in cold conditions; rather uniformly colored, not shiny. Antennal tubercles sometimes rather low, but always higher than medial parts of frons; inner faces of antennal tubercles convergent. Antennae 6-segmented, terminal process longer than base of last antennal segment. Siphunculi tubular and longer than basal width and cauda. Siphunculi slightly clavate, without any polygonal reticulation. Cauda tongue shaped.

Measurements (mm)

Body length 1.608-1.96; body width 0.84-1.008; terminal process 0.41-0.44; base of 6th segment 0.12-0.15; rostrum length of IV+V segment 0.10-0.12; hind tarsus length 0.09- 0.16; siphunculi 0.61-0.63; cauda 0.10-0.12.

Distribution

Cosmopolitan (Blackman and Eastop, 2018).

Material examined

Kamonke 20 apterae 14-II-2016, Gujranwala city 27 apterae 10-II-2016, Rasul Nagar 15 apterae 6-III-2016, Wazirabad 18 apterae 25-II-2016 , Nandipur 50 apterae 15-III-2016, Qila Didar Singh 28 apterae 10-III-2016.

Host plants

Radish (*Raphanus sativus*), Cabbage (*Brassica oleracea*), Turnip (*Brassica rapa*) and Tomato (*Solanum lycopersicum*).

Comments

M. persicae (Green peach aphid) collected from Punjab, province of Pakistan were compared with the published data of Bodlah (2004) that was almost similar. They have the ability to transmit more than 100 plant viruses (Kennedy *et al.,* 1962).

***Sitobion avenae* Fabricius, 1775**

General Characters

Apterae on grasses and cereals are medium-sized, broadly spindle shaped, yellowish green or dirty reddish brown, sometimes rather shiny, with black siphunculi not much longer than the pale cauda. Antennae uniformly dark. Antennal tubercle little developed. Terminal process longer than base of last antennal segment. Siphunculi tubular, less than 1.4 times longer than cauda, less than twice as long as the distance between their bases. Siphunculi tapering, with a subapical zone of polygonal reticulation. Second segment of hind tarsus more than 1.25 times longer than last rostral segment. Cauda tongue shaped, pale or if dusky much paler than siphunculi.

Measurements (mm)

Body length 1.34-1.92; body width 0.6-0.9; terminal process 0.46-0.59; base of 6th segment 0.10-0.13; rostrum length of IV+V segment 0.11-0.20; hind tarsus length 0.13-0.15; siphunculi 0.16-0.19; cauda 0.10-0.12.

Distribution

Europe, the Mediterranean, the Middle East, Central Asia, India, Nepal, Pakistan, Africa, North, Central and South America (Black and Eastop, 1984).

Material examined

Kamonke 15 apterae 14-II-2016, Gujranwala city 10 apterae 10-II-2016, Wazirabad 18 apterae 25-II-2016, Nandipur 14 apterae 15-III-2016.

Host plants

Wheat (*Triticum* sp.)

Comments

Sitobion avenae (Grain aphid) collected from Punjab, province of Pakistan was compared with the published data of Zia *et al.* (2010) that was almost similar. They have ability to transmit barley yellow dwarf virus and bean yellow mosaic virus (Blackman and Eastop, 2018).

***Greenidea* (*Trichosiphum*) *psidii* van der Goot, 1917**

General Characters

Dark brown aphids with pear shaped body and long yellowish brown siphunculi. Antennae concolorous with head, darker towards the apex, terminal process longer than base of the last antennal segment. Antennal tubercle little developed. Rostrum reaching upto or little beyond middle of the body; ultimate rostral segments longer than the second segment of hindtarsus. Siphunculi pale brown with the base and apex darker, 0.26-0.33 x as long as body and 5.2-6.8 x as long as their maximum width; curved outwards; bearing many hairs. Siphunculi shorter than hind tibia, with pale reticulation only at base. Cauda transversely oval, with a distinct median process, with 6-8 long and fine hairs.

Measurements (mm)

Body length 1.27-1.6; body width 0.08-1.08; terminal process 0.50-0.57; base of 6th segment 0.14-0.18; rostrum length of IV+V segment 0.13-0.19; hind tarsus length 0.10-0.14; siphunculi 0.54-0.6; cauda 0.03-0.06.

Distribution

Bangladesh, China, India, Indonesia (Java, Sumatra),

Japan, Nepal, Pakistan, Philippines, Taiwan and various countries of Neotropical region (Halbert, 2004, Culik *et al.*, 2016)

Material examined

Kamonke 12 apterae 14-II-2016, Gujranwala city 16 apterae 10-II-2016, Nandipur 20 apterae 15-III-2016, QilaDidar Singh 18 apterae 10-III-2016.

Host plants

Guava (*Psidium guajava),* Jambolan (*Syzygium cumini*)

Comments

This an invasive species reported from various parts of the world including Asia (Culik *et al.*, 2016). *Greenidea psidii* collected from Pakistan was compared with main identification characters given by Culik *et al.* (2016) that was almost similar.

***Cinara* (*Cupressobium*) *tujafilina* Del Guercio 1909**

General Characters

Apterae reddish brown with two dark brown divergent curved bands running from head to about level of siphunculi. Antennal tubercles sometimes rather low, but always lower than medial parts of frons; inner faces of antennal tubercles convergent. Terminal process is longer than base of antennal segment VI which bears 8-14 fine hairs. Rostrum shorter than body; rostrum reaches siphunculi, bearing 6-8 accessory hairs, segments 4+5, longer than second segment of hind tarsus. Hairs on the dorsum of abdomen numerous, fine, longest one on anterior tergites 0.130-0.137 mm long, shortest one 0.066-0.083 mm long. Siphunculi on small brown hairycones. Femora pale, and tibia wholly pale or dark only apices, hairs on femora and tibiae fine and numerous. Cauda broadly rounded, bearing hairs.

Measurements (mm)

Body length 2.23-2.4; body width 1.32-1.51; terminal process 0.14-0.19; base of 6th segment 0.07-0.08; rostrum length of IV+V segment 0.13+0.08; hind tarsus length 0.07- 0.10; siphunculi base 0.18 and apex 0.05; cauda 0.04-0.06.

Distribution

Nepal and all Zoogeographical regions. Distribution of *tujafilina* is much wider in warmer and drier part of the world than most other species of *Cinara* (Gosh, 1982).

Material examined

Gujranwala city 30 apterae 10-II-2016, Wazirabad 18 apterae 25-II-2016.

Host plants

Oriental arborvitae (*Thuja* sp.)

Comments

Cinara tujafilina collected from Gujranwala district of Punjab, province of Pakistan were compared with the published data of Gosh (1982) and Mifsud and Pérez Hidalgo (2013) that was almost similar.

***Pentalonia nigronervosa* Coquerel, 1859**

General Characters

Apterae are small reddish brown to black and oval in shape. Antennae are pale except for dark base and apex. Antennae as long as body, terminal process is much longer than base of last antennal segment. Siphunculiclavate, longer than cauda. Cauda is small and pentagonal in shape, bearing 3-5 hairs.

Measurements (mm)

Body length 1.46-2.01; body width 0.8-1.08; terminal process 0.34-0.40;base of 6th segment 0.10-0.15; rostrum length of IV+V segment 0.17-0.25; hind tarsus length 0.13-0.14; siphunculi 0.32-0.38; cauda 0.08-0.10

Distribution

Widespread in tropical and subtropical regions of the world (Blackman and Eastop, 2018).

Material examined

Gujranwala main city 85 apterae 20-III-2016.

Host plants

Banana (*Musa* sp.)

Comments

Pentalonia nigronervosa collected from Gujranwala district was compared with the published data of Ghosh (1993) that was almost similar. They have ability to transmit banana bunchy top virus in Australia, Africa and Asia (Blackman and Eastop, 2018).

***Macrosiphum euphorbiae* Thomas, 1878**

General Characters

Adult apterae medium-sized to rather large, spindle-shaped a pear shaped, usually some shade of green but sometimes yellowish, pink or magenta, often rather shiny. Antennal tubercles moderately to well developed, projecting anteriorly beyond medial part of frons in dorsal view. Terminal process is longer than base of antennal segment. Rostrum with its last segment bearing 4 secondary hairs, shorter than segment 2 of hind tarsus. Siphunculi usually dark on distal part, pale at basal half, dusky toward apex, with a sub-apical zone of polygonal reticulation. Cauda tongue-shaped, clearly longer than its basal width in dorsal view.

Measurements (mm)

Body length 1.8-2.04; body width 0.84-0.96; terminal

process 0.52-0.65; base of 6th segment 0.10-0.15; rostrum length of IV+V segment 0.14-0.18; hind tarsus length 0.08-0.11; siphunculi 1.10-1.19; cauda 0.04-0.05

Distribution

Cosmopolitan (Blackman and Eastop, 2018).

Material examined

Kamonke 20 apterae 14-II-2016, Gujranwala city 34 apterae 10-II-2016, Rasul Nagar 28 apterae 6-III-2016, Nandipur 40 apterae 15-III-2016, QilaDidar Singh 50 apterae 10-III-2016.

Host plants

Rose (*Rosa* sp.)

Comments

Macrosiphum euphorbiae collected from Punjab, province of Pakistan was compared with the published data of Bodlah *et al.* (2004) that was almost similar. They have the skill to transmit 40 non-persistent viruses and five persistent viruses (Blackman and Eastop, 2018).

Discussion and Conclusion

As a whole, 12 species of aphids belonging to 9 genera from 24 different host plants only in six localities of Gujranwala were recorded. Bodlah *et al.* (2011) reported 24 aphid species from rainfed region of the Punjab. It indicates that there is a wide potential of aphids in Gujranwala which may be explored by extensive sampling. Further, natural enemies of aphids may also be in great potential in Gujranwala which may be explored and used in various IPM programmes in the country against aphid pests. *Aphis craccivora, Aphis fabae, Aphis gossypii, Aphis nerii, Rhopalosiphum padi, Lipaphis erysimi, Macrosiphum euphorbiae*, *Myzus persicae* and *Sitobion avenae* have been reported as serious aphid pests in Pakistan by Irshad (2001).

Cinara (*Cupressobium*) *tujafilina* and *Greenidea* (*Trichosiphum*) *psidii* are invasive species of aphids, recorded from various parts of the world. Their monitoring and management is the need of time. Control of these invasive aphid species depends on integrated pest management (IPM) including biological control by native natural enemies of the pest. So there is a need to explore natural enemies of these species and their possible use against them. Additionally there is a need to determine potential negative economic and ecological impacts of these invasive organisms in this region.

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