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APHID SPECIES (HEMIPTERA: APHIDIDAE) INFESTING MEDICINAL AND AROMATIC PLANTS IN THE POONCH DIVISION OF AZAD JAMMU AND KASHMIR, PAKISTAN

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ABSTRACT

This study conducted during 2015-2016 presents first systematic account of the aphids infesting therapeutic herbs used to cure human and veterinary ailments in the Poonch Division of Azad Jammu and Kashmir, Pakistan. In total 20 aphid species, representing 12 genera, were found infesting 35 medicinal and aromatic plant species under 31 genera encompassing 19 families. *Aphis gossypii* with 17 host plant species was the most polyphagous species followed by *Myzus persicae* and *Aphis fabae* that infested 15 and 12 host plant species respectively. Twenty-two host plant species had multiple aphid species infestation. *Sonchus asper* was infested by eight aphid species and was followed by *Tagetes minuta*, *Galinosoga perviflora* and *Chenopodium album* that were infested by 7, 6 and 5 aphid species respectively. Asteraceae with 11 host plant species under 10 genera, carrying 13 aphid species under 8 genera was the most aphid-prone plant family. A preliminary systematic checklist of studied aphids and list of host plant species are provided.

Key words: Aphids, Medicinal/Aromatic plants, checklist, Poonch, Kashmir, Pakistan.

INTRODUCTION

Like elsewhere in the world (Anonymous 2003; Gedif and Hahn, 2003; Modak *et al*., 2007; Park *et al*., 2012; Bahramsoltani *et al*., 2014) plant drugs are also traditionally used in Pakistan, more so in the rural and far flung regions of the country where modern communication and health facilities are from limited to scarce (Qureshi *et al*., 2009). Out of 400-600 therapeutic plant species recorded in the country (Abbasi *et al*., 2010), most are found and heavily depended upon, for curing various human and veterinary maladies, in Northern region (Qureshi *et al*., 2010) and Azad Jammu and Kashmir (AJK) (Ajaib *et al*., 2010; Bano *et al*., 2013). Medicinal and aromatic plants, like crop plants, are also afflicted by arthropod pests including aphids (Gupta, 1991; Abdel-Moniem and Abd El-Wahab, 2006; Bhagat, 2012). Commonly referred to as plant lice or greenflies, aphids are a taxon of small, soft bodied insects belonging to the order Hemiptera, suborder Sternorrhyncha, superfamily Aphidoidea and family Aphididae (Blackman and Eastop, 2012). Being sap-feeders, aphids not only deprive host plant of important metabolites but also vector viral diseases in the same (Hooks and Fereres, 2006; Rasmussen *et al*., 2008; Catangui *et al*., 2009). El-Kordy (1999) studied population dynamics of aphids infesting medicinal and aromatic plants in Egypt. Karkanis *et al*., (2011) reported *Disaphis lappe* and *Aphis fabae* damaging *Silybum marianum*, a medicinal weed crop in Iran and Greece. Bhagat (2012) reported 63 aphid species damaging 92 medicinal plants in Jammu and Kashmir State, India. However aphidological works, both faunistic and pest-managerial, carried out in Pakistan mainly have been food crops biased (Ali and Aheer, 2007; Amer *et al*., 2009 Akhtar *et al*., 2010; Hassan *et al*., 2010; Bodlah *et al*.2011; Akmal *et al*., 2013) partly thanks to the absence of countrywide sustained cultivation/preservation practices and unrealized export-potential of medicinal plants (Shinwari and Galini, 2003; Shinwari, 2010). Consequently, no comprehensive attempt has ever surfaced in the country to unravel aphid-medicinal/aromatic flora-association. Present study was conducted to inter-alia explore aphid species damaging medicinal and aromatic plants of Poonch division. This communication presents first faunal record of the aphid species associated with medicinal/aromatic plants in the Poonch division, one of the three administrative divisions of AJK, Pakistan.

MATERIALS AND METHODS

Sampling/Surveying was carried out from January to December 2015-2016 from 15 localities of Poonch division located at 33º to 35º North and 73º to 75º East having an average altitude of 2000 m above sea level. The surveyed localities included Abbaspur, Alisojal, Bagh, Banjosa, Datoot, Hajira, Haveli, Hussainkot, Khaigala, Paniola, Rawalakot, Singola, Sudhnoti, Thorar and Tolipir. Following collection and preservation techniques described by (Martin 1983; Blackman and Eastop, 1994) aphids were collected from

vegetation using a camel hair-brush, jarring the foliage on a white paper sheet and transferring the specimens into the vials containing 70% alcohol. Plant parts viz., flower, fruit, leaves and twigs bearing aphids were removed and put in zipped-plastic bags containing mopped tissue paper to absorb moisture. The infested plant part(s) was/were later transferred to plastic jars covered with muslin cloth, to allow aphids to grow to sizeable adults and alates for preserving and mount-preparation following Martin (1983). A swab of cotton soaked in water was placed in the jar to avoid desiccation. Specimens both, preserved and mounted were observed for taxonomic characters under Olympus binocular at 10X × 4X and 10X × 10X magnification and identified using the taxonomic keys developed by Blackman and Eastop (1994), Blackman and Eastop (2008) and Martin (1983). Identified aphid species were classified according to Remaudiere & Remaudiere (1997) and Nafria (2013). The host plant species' parts (leaves, flowers and fruits) were brought to National Herbarium at National Agricultural Research Council Islamabad for identification (Ali and Qaiser, 1993-2007).

RESULTS

Twenty aphid species under 12 genera (List. 1), exclusively belonging to subfamily Aphidinae, were found infesting 35 medicinal/aromatic host plant species, under 31 genera, spreading over 17 plant families (List. 2). Two tribes of aphidinae viz., Aphidini and Macrosiphini shared 6 species under 1 genus and 14 species under 10 genera, respectively. Aphid genus-richness that is the number of species per genus was dominated by genus *Aphis* that had 6 representative species which as a whole infested 24 host plant species (List. 1). The genera *Acyrthosiphon*, *Macrosiphum* and *Myzus* had 2 species each. Highest number of genera i.e., 8 had 1 species each. Aphid species richness that is 2 to more than 2 host plant species infested per aphid species (Table. 1) of 13 polyphagous species ranged from 2 to 17. *Aphis gossypii*, infesting 17 host plant species under as such genera spread over 10 families, was the most polyphagous species followed by *Myzus persicae* that infested 15 host plant species under as such genera covering 9 families. *Aphis fabae*, *Aphis craccivora*, *Macrosiphum euphorbiae* and *Aulacorthum solani* infested 12, 11, 10 and 9 host plant species under 12, 11, 8 and 9 genera, respectively. Remaining 8 polyphagous species were recorded from 2-7 host plant species. Five aphid species were found on single host plant species each. Host plant species richness (Table. 2) i.e., 2 to more than 2 aphid species borne by host plant species ranged from 2-9 aphids. Nineteen of the thirty-three sampled host plant species were found as host-rich. *Sonchus asper* bearing 8, the highest number of aphid species among all the sampled host plant species was followed by *Tagetes minuta* (7 aphid species). Six, five and two aphid species were carried by three host plant species each. Seven host plant species harbored four aphid species each, while one plant had three aphid species. Eleven host plant species carried one aphid species each. Host plant families varied in number of host plants and aphid species (Table. 3). Asteraceae dominated the studied host plant families in having 10 host plant species, under 9 genera, collectively carrying 15 aphid species under 10 genera. Nine host plant families had one host plant each that carried 2-6 aphid species. One family, Labiatae had two host plant species, *Mentha longifolia and Mentha spicata* both carrying one similar aphid species, *Aphis affinis.* Five families viz., Cannabaceae, Euphorbiaceae, Geraniaceae, Lamiaceae, Papaveraceae and Poaceae had one host plant and one aphid species each.

Each surveyed locality is assigned an Arabic numeral that appears parenthesized in the systematic checklist following the host plant name sampled therein. Localities with respective assigned numbers in alphabetical orders are: Abbaspur: 1, Alisojal: 2, Bagh: 3, Banjosa: 4, Datoot:5, Hajira:6, Haveli: 7, Hussainkot: 8, Khaigala: 9, Paniola: 10, Rawalakot: 11, Singola: 12, Sudhnoti: 13, Thorar: 14, Tolipir: 15.

Key to the abbreviations used for distinguishing features of adult apterous viviparae: Ante: antennae; ASg: antennal segment(s); ATu: antennal tubercles; B vi: base of antennal segment 6; Cd: Cauda; Flg: Flange; Frs: Frons; HCx: hind coxae; HFm: hind femur; HTs ii: Second segment of hind tarsus; MCx: mid-coxae; MTu: marginal tubercles; Riv+v: ultimate rostral segment; Rtm: rostrum ; Siph: siphunculi; SPR: subapical polygonal reticulation; SRh: secondary rhinaria; SHr: secondary hairs; Pt: Processus terminalis; TFSHf: Trochantero-femoral suture of hind femur.

Color: In each case refers to that of live adult apterous vivipara recorded at the time of collection.

List 1. Systematic checklist of evaluated aphid species in the study area
Family: Aphididae
Subfamily: Aphidinae
Tribe 1: Aphidini
Subtribe: Aphidina
***Aphis* L.**
***Aphis affinis* Del Guercio**

Distinguishing features: Dark grayish green with intersegmental lines wax-powdered, about 1 mm long and 0.45 mm broad. Appendages pale. Siph longer than Cd. The latter is triangular and bears 6 hairs.

Host plant(s): *Mentha spicata* (1, 6) and *Mentha longifolia* (7).
***Aphis citricola* (van der Goot)**

Distinguishing features: Rather yellowish green, about 1-1.40 mm long and 0.70-1 mm wide and rather ovate. Rtm extends to MCx. Dark dorsal patch absent. Riv+v fractionally shorter than HTs ii. Siph tubular, tapered, flanged, dark brown and about 2× longer than Cd. Cd tongue shaped, dark and possessing 6-10 hairs.

Host plant(s): *Althea rosea* (3, 6, 7, 11, 13); *Dendranthema indicum* (3, 6, 7, 11, 12)*; Sonchus asper* (3, 6, 7, 11, 14) and *Tagetes minuta* (7, 11).

***Aphis craccivora* (Koch)**

Distinguishing features: Greyish black, about 1.50-2 mm long and 0.70-0.90 mm wide. ASg ii, iii, iv and v pale while vi is dusky. Pt about 3× the B vi. An extensive dark patch on abdominal dorsum. Siph dark, tubular, flanged and 2× longer than Cd which is black, tongue shaped and has 5-8 hairs.

Host plant(s): *Althea rosea* (3, 6, 7, 11, 13, 14)**;** *Amaranthus viridis* (6, 7); *Chenopodum album* (6, 7); *Bidens biternata* (11, 14); *Conyza canadensis* (3,11); *Coriandrum sativum* (11); *Dendranthema indicum* (3, 6, 7, 11, 14); *Euphorbia prostrata* (6); *Parthenium hysterophorus* (1, 2, 3, 6, 7, 8, 11, 13, 15); *Solanum nigrum* (6, 7, 10) and *Sonchus asper* (3, 6, 7, 11).

***Aphis fabae* (Scopoli)**

Distinguishing features: Dark brown to black, from 2-2.50 mm long and 0.80-1.40 mm wide. ATu weakly developed. PT about 3× longer than B vi. MTu bulged but small. Rtm extends to HCx. Siph dark, imbricated and 2× longer than Cd which is tongue shaped and bears more than 10 hairs.

Host plant(s): *Althea rosea* (3, 6, 7,11)*; Amaranthus viridis* (6, 7); *Conyza canadensis* (11); *Rumex acetosa* (1, 2, 8, 9, 11, 12, 13, 14); *Plantago major* (13, 14); *Galinosoga perviflora* (11); *Parthenium hysterophorus* (1, 2, 3, 7, 8, 9, 14); *Sonchus asper* (3, 6, 7, 11); *Tagetes minuta* (12); *Taxaracum officinale* (6, 7) and *Withiana somnifera* (6, 7).

***Aphis gossypii* (Glover)**

Distinguishing features: Dark to light green and yellowish pale. About 0.95-1.30 mm long and 0.44-0.65 mm wide. ATu poorly developed, do not exceed Frs. Pt longer than B vi. Riv+v has two SHr and is approximately 1.25× longer than Ht ii. Siph dark and about twice the Cd. Cd dusky or pale and having 4-8 hairs. Longest hair on HFm shorter than TFSHf.

Host plant(s): *Althea rosea* (3, 6, 7, 11); *Amaranthus viridis* (6, 7); *Chenopodum album* (7); *Conyza canadensis* (11); *Coriandrum sativum* (11); *Datura alba* L. (11); *Dendrathema indicum* (6, 7, 11); *Galinosoga parviflora* (11); *Leucas cephalotes* (6); *Papaver somniferrum* L. (6); *Parthenium hysterophorus* (1, 2, 3, 6, 7, 11); *Plantago major* (10, 13, 14); *Solanum nigrum* (6, 7, 10); *Sonchus asper* (3, 6, 7, 11); *Tagetes minuta* (11); *Taraxacum officinale* (6, 7) and *Vicia sativa* (6).

***Aphis nasturtii* Kaltenbach**

Distinguishing features: Brightly pale to yellowish green, 1.20-1.40 mm long and 0.65-0.80 mm broad. Dorsal pinkish patch present. ASg i, ii, iii and iv brightly pale while vi terminally dusky. Siph long, tubular and pale. Cd pale and has 4-6 hairs. Legs pale but dusky at tarsi.

Host plant(s): *Chenopodum album* (6, 7); *Dendranthema indicum* (6, 7, 11) and *Viola biflora* (8, 11), *Tropaeolum majus* (6).

Tribe 2: Macrosiphini
***Acyrthosiphon* Mordvilko**
***Acyrthosiphon malvae* (Mosley)**

Distinguishing features: Light green, about 2-2.30 mm long, 0.96-1.20 mm wide and spindle shaped. ATu well developed and parallel. Ante shorter than body. PT 5-6× longer than B vi. ASg iii with up to 20 SRh. Siph pale, long, terminally tapered, flanged, lack SPR and about 2× longer than Cd which is pale, tongue shaped and has 4-6 hairs.

Host plant(s): *Althea rosea* (3, 6, 7, 11) and *Tropaeolum majus* (6).

***Acyrthosiphon pisum* (Harris)**

Distinguishing features: Light green to dark green, about 3.10-4.50 mm long, 1.50-1.80 mm wide and broadly spindle shaped. ATu well developed and diverged. Ante longer than body. Less than 10 SRh present at proximal end of ASg iii. Siph pale, long, tapered, flanged, with no SPR and 2× longer than Cd. Cd long, finger-shaped, tapered and having 8-10 hairs.

Host plant(s): *Lathyrus odaratus* (6) and *Malva perviflora* (11).

***Aulacorthum* Mordvilko**
***Aulacorthum solani* (Kaltenbach)**

Distinguishing features: Light green about 1.53-1.85 mm long, 0.70-0.95 mm wide and rather pear shaped. ATu well developed and parallel. Ante exceed body length. ASg pale but dark at joints. ASg iii longer than Siph. SRh absent on ASg. Siph pale, with basal dark green patch, tapered, dusky at Flg and lacking SPR. Cd pale, triangular, longer than broad and possessing 6-7 hairs.

Host plant(s): *Chenopodum album* (6, 7, 11); *Conyzacanadensis* (11); *Galinosoga perviflora* (11); *Plantago major* (13); *Silybum marianum* (6, 7, 11); *Sonchus oleraceous* (7, 11); *Ricinus communis* (11); *Coriandrum sativum* (11) and *Tagetes minuta* (11).

***Brachycaudus* van der Goot**

***Brachycaudus helichrysi* (Kaltenbach)**

Distinguishing features: Yellowish green, about 1.15-1.30 mm long and 0.50-0.65 mm wide. Ante shorter than body. Siph short, pale, tapering and about 2 × Cd. Cd pale, short, characteristically semicircular and has about 10 hairs.

Host plant(s): *Galinosoga perviflora* (11)**;** *Plantago major* (13); *Silybum marianum* (11); *Sonchus oleraceous* (6, 7, 11, 14); *Tagetes minuta* (9, 11); *Vicia sativa* (6) and *Viola biflora* (8, 11).

***Capitophorus* van der Goot**
***Capitophorus carduinus* Walker**

Distinguishing features: Translucently greyish, about 1.21-1.44 mm long, 0.68-0.85 mm broad and rather pear shaped. ATu developed and diverged. Ante pale with PT about 4× longer than B vi. Dorsum bearing small capitate hairs. Siph pale, long, tubular, flanged and with SPR. Cd tongue shaped, shorter than Siph and having 4-6 hairs.

Host plant(s): *Silybum marianum* (9, 11).
***Hyadaphis* Kirkaldy**
***Hyadaphis coriandri* (Das)**

Distinguishing features: Dull green, about 0.88-1.00 mm long and 0.60-64 mm broad. Ante about less than 0.5×BL. Appendages pale. Pt about 2 × B vi. Siph short, barrel shaped, constricting just below Flg and about 2 × Cd which bears 4-6 hairs.

Host plant(s): *Coriandrum sativum* (11).
***Hyperomyzus* Borner**
***Hyperomyzus carduelinus* (Theobald)**

Distinguishing features: Yellowish pale, about 2-2.45 mm long and 0.90-1.10 mm wide and rather spindle shaped. Pt about 5× as long as B vi. About 11 SRh present at the base of ASg iii. Siph pale, clavate and lack SPR. Cd pale, tongue shaped and possesses 4-6 hairs.

Host plant(s): *Sonchus oleraceous* (2, 6, 7, 11, 14, 15).
Hysteroneura Thomas

***Hysteroneura. setariae* Thomas**

Distinguishing features: Brown, about 1.30-1.65 mm long and 0.70-0.85 mm broad and broadly ovate. ASg i, ii, iii, and iv pale while vi is dark. Dorsum with short pointed hairs. Siph brown, tubular, apically tapered, unflanged and without SPR. Cd long, tongue shaped and without hairs.

Host plant(s): *Cynodon dactylon* (6, 7, 13).
***Macrosiphum* Oestlund**
***Macrosiphum euphorbiae* (Thomos)**

Distinguishing features: Light green, about 2.35-3.12 mm long and broadly spindle shaped. Ante long but shorter than BL. ASg iii, iv and v pale but vi is dark. About 2-3 SRh present basally on ASg iii. Pt about 5 × longer than B vi. Siph basally pale and dark in the upper half, long, tubular, imprecated, flanged and have distinct SPR. Cd pale, finger-like, tapered and possesses about 8 hairs.

Host plant(s): *Althea rosea* (6, 7, 11); *Galinosoga perviflora* (11); *Ricinus communis* (11); *Rosa indica* (3, 6, 7, 11); *Rosa chinensis* (1, 2, 3,4, 5, 6, 7, 8,9, 11, 12,13, 14, 15); *Rumex acetosa* (1, 2, 3, 6, 7, 11); *Sonchus asper* (3, 6, 7, 11); *Sonchus oleraceous* (6, 7, 11); *Tagetes minuta* (11) and *Viola biflora* (8, 11).

***Macrosiphum rosae* (Linnaeus)**

Distinguishing features: Pinkish green, about 1.80-2.30 mm long, 0.78-0.98 mm wide and broadly spindle shaped. Ante approximately as long as BL. SRh present at the base of ASg iii. Siph totally dark, long, tubular and with SPR covering most of the upper half. Cd pale, tongue shaped and with 6-8 hairs.

Host plant(s): *Rosa chinensis* (1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15) and *R. indica* Lindl *var* (1, 2, 3, 4, 5, 6, 7, 8, 12, 13, 14, 15).

***Myzus* Passerini**
***Myzus persicae* (Sulzer)**

Distinguishing features: Yellowish green, about 2.00-2.35 mm long and 0.94-1.17 mm wide. ATu well developed with their inner faces gibbously converged. Appendages pale. Rtm reaches HCx. Riv+v equal to HTs ii. Siph slightly longer than ASg iii. Cd tongue shaped and has 5-7 hairs.

Host plant(s): *Althea rosea* (6, 7, 11); *Amaranthus viridis* (6, 7); *Chenopodum album* (3, 6, 7, 11); *Conyza canadensis* (11); *Galinosoga perviflora* (11); *Tagetes minuta* (11); *Dendranthema indicum* (6, 7, 11); *Bidens bitternata* (11); *Plantago major* (13); *Ricinus communis* (11); *Rumex acetosa* (1, 2, 3, 6, 7, 11); *Solanum nigrum* (6, 7); *Sonchus asper* (11); *Sonchus oleraceous* (2, 3, 6, 7, 11) and *Viola bioflora* (8, 11).

***Myzus ornatus* Laing**

Distinguishing features: Yellowish pale, about 1.95-2.34 mm long and 1.10-1.40 mm wide, dorsoventrally compressed and rather ovate. Medially broken dorsal bands present. Siph pale, short and incised below Flg. Cd pale, shorter than Siph, triangular and bears 6-8 hairs.

Host plant(s): *Sonchus asper* (14) and *Bidens biternata* (6).

***Phorodon* Passerini**
***Phorodon cannabis* Passerini**

Distinguishing features: Dull green, about 1.80-2.20 mm long and 1.00-1.10 mm wide and rather elongate.

ATu well developed, bearing characteristic forwardly directed finger like processes with rounded apices. Appendages pale. Hairs with knobbed ending on ASg i,ii and iii.

Host plant(s): *Cannabis sativa* (6, 7).
***Uroleucon* Mordvilko**
***Uroleucon compositae* (Patch)**

Distinguishing features: Brightly dark red to blackening, about 2.40-3.20 mm long and 0.60-1.10 mm wide. Siph black, long, tubular, with rather extended patch of SPR and 2× longer than Cd which is black and has about 16 hairs.

Host plant(s): *Sonchus asper* (7) and *Tagetes minuta* (11).

List 2. Studied medicinal/aromatic host plants (Local name/common name; Family and infesting aphid species) in Poonch division, Kashmir, Pakistan.

Althea rosea L**.** Gule Khaira/Hollyhock; Malvaceae: *Acyrthosiphon malvae*, *Aphis citricola*, *Aphis fabae*, *Aphis gossypii*, *Macrosiphum euphorbiae* and *Myzus persicae.*

Amaranthus viridis L. Ganar/Amaranth; Amarantheaceae: *Aphis craccivora*, *Aphis fabae*, *Aphis gossypii* and *Myzus persicae*.

***Bidens biternata* (Lour.) Merr. & Sherff**-/Black Jack; Asteraceae: *Aphis craccivora*, *Aphis fabae*, *Myzus persicae* and *Myzus ornatus*.

Cannabis sativa L. Bhang/Hemp; Cannabaceae: *Phorodon cannabis.*

Chenopodium album L. Ghanari/ Goosefoot; *Chenopodiaceae*: *Aphis craccivora*, *Aphis gossypii*, *Aphis nasturtii*, *Aulocorthum solani* and *Myzus persicae*.

***Conyza canadensis* (L.)** Kali Boti/Canadian Horseweed; Asteraceae: *Aphis crassivora*, *Aphis fabae; Aphis gossypii*, *Aulocorthum solani* and *Myzus persicae.*

***Coriandrum sativum* L.** Dhania/Coriander; Apiaceae: *Aphis crasccivora*, *Aphis gossypii*, *Aulocorthum solani* and *Hyadaphis coriandri*,

***Cynodon dactylon* (L.) Pers.** Khabal/ Lawn grass: Poaceae: *Hysteroneura setariae.*

Datura alba/Devil's trumpet; Solanaceae: *Aphis gossypii*.

***Dendrathema indicum* L.** Gule Daudi/Chrysanths**:** Asteraceae: *Aphis citricola*, *Aphis craccivora*, *Aphis fabae*, *Aphis gossypii*, *Aphis nasturtii and Myzus persicae*

***Euphorbia prostrata* Aiton** Dudhli, Hazar/Prostrate spurge; Euphorbiaceae: *Aphis craccivora*

***Galinosoga parviflora* Cav**.-/Potato Weed; Asteraceae: *Aphis craccivora, Aphis fabae*, *Aphis gossypii*, *Aulocorthum solani*, *Macrosiphum euphorbiae* and *Myzus persicae.*

Geranium rotundifolium Janorunu Geraniaceae: *A. fabae.*

Lathyrus sativus L. Jangli Phali/Grass pea; Fabaceae: *Acyrthosiphon pisum.*

Lucas cephalotes Chatra/Guma; Lamiaceae:*Aphis gossypii.*

Malva perviflora Sonchal/Cheeseweed; Malvaceae: *Acyrthosiphon pisum.*

***Mentha longifolia* (L.) L.** Jangli Podina/Wild Mint; Labiatae: *Aphis affinis*.

Mentha spicata (L.) Huds. Podina/Mint; Labiatae: *Aphis affinis.*

***Papaver somniferum* L.** Afeem/Opium poppy, (Papaveraceae): *Aphis gossypii.*

Parthenium hysterophorus L. -/whitetop weed, (Asteraceae): *Aphis crasccivora*, *Aphis fabae* and *Aphis gossypii.*

***Plantago major* L.** Ispagol/Broadleaf plantain; Plantaginaceae: *Aphis gossypii, Aulacorthum solani*, *Myzus persicae* and *Brachycaudus helichrysi.*

Ricinus communis L. Harnoli/Castor oil plant; Ricinidae: *Aphis fabae*, *Aulacorthum. solani*, *Macrosiphum euphorbiae* and *Myzus persicae*.

***Rosa chinensis* Jacq.** Cheeni Ghulab/Chinese rose; Rosaceae: *Macrosiphum euphobiae* and *Macrosiphum rosae*.

***Rosa indica* L.** Desi Ghulab/Cyme rose; Rosaceae: *Macrosiphum euphorbiae* and *Macrosiphum rosae*.

Rumex acetosa L. Herli/Common sorrel; Polygonaceae**:** *Aphis fabae*, *Macrosiphum euphorbiae* and *Myzus persicae*.

Silybum marianum L. Kandyara/Milk Thistle; Asteraceae: *Aphis fabae, Aulacorthum solani*, *Brachycaudus helichrysi* and *Capitophorus carduinus.*

Solanum nigrum L. Neelli bail/Black nightshade; Solanaceae: *Aphis gossypii*, *Aphis fabae* and *Myzus persicae.*

Sonchus asper (L.) Hill Dodal/Prickly sow-thistle; Asteraceae: *Aphis citricola, Aphis craccivora, Aphis fabae*, *Aphis gossypii*, *Aulacorthum solani*, *Macrosiphum euphorbiae, Myzus ornatus* and *Uroleucon compositae.*

Sonchus oleraceous (L.) L.-/Common thistle: Asteraceae: *Aulacorthum solani, Brachycaudus helichrysi, Hyperomyzus carduelinus, Macrosiphum euphorbiae* and *Myzus persicae.*

Tagetes minuta L.-/Black mint; Asteraceae: *Aphis citricola, Aphis fabae, Aphis gossypii, Aulacorthum solani, Brachycaudus helichrysi, Macrosiphum euphorbiae* and *Myzus persicae.*

Taraxacum officinale (L.) Hannd/ Common Dandelion; Asteraceae: *Aphis fabae* and *Aphis gossypii.*

Tropaeolum majus (L.) *Aphis nasturtii and Acyrthosiphon malvae.*

***Vicia sativa* L. Mutri/connon vetch;** Fabaceae: *Aphis gossypii.*

Viola biflora L. Banafsha/Alpine –Yellow-Violet; Violaceae: *Aphis nasturtii* and *Myzus persicae. Brachycaudus helichrysi, Macrosiphum euphorbiae.*

***Withania somnifera* (L.) Dunal**; Gidar tobacco/Indian ginseng; Solanaceae: *Aphis fabae.*

Table 1. Aphid species-richness of polyphagous aphids: Aphids with more than two host plant species

Polyphagous Aphid species Infesting medicinal and Aromatic plants	Number of host plant species infested	Number of host plant genera	Number of host plant families
Aphis gossypii	17	17	13
Myzus persicae	15	14	9
Aphis fabae	12	12	5
Aphis craccivora	11	11	7
Macrosiphum euphorbiae	10	8	6
Aulacorthum solani	9	9	5
Bravhycaudus helichrysi	7	7	4
Aphis citricola	4	4	2
Acyrthosiphon malvae	3	3	3
Aphis Affinis	2	1	1
Aphis nasturtii	2	2	2
Acyrthosiphon pisum	2	2	2
Uroleucom compositae	2	2	1
Macrosiphum rosae	2	1	1

Table 2. Host plant species-richness: Sampled medicinal/aromatic plant species bearing more than one aphid species.

Aphid infested Host plant species	Number of aphid species/genera harboured
Sonchus asper	8/5
Tagetes minuta	7/5
Althea rosea	6/3
Dendrathecum indicum	6/2
Galinosoga perviflora	6/3
Conyza canadensis	5/3
Chenopodium album	5/3
Sonchus oleraceous	5/5
Amaranthus viridis	4/2
Coriandrum sativum	4/3
Plantago major	4/4
Ricinus communis	4/4
Rumex acetosa	4/4
Silybum marianum	4/4
Viola biflora	4/4
Solanum nigrum	3/2
Rosa Chinensis	2/1
Rosa indica	2/1
Taraxacum officinale	2/1
Tropaeolum majus	2/2

Table 3. Host plant families harboring more than 2 aphid species per number of host plant species.

Host plant family	Host plant species		Infesting Aphid species	
	No. of species	Genus/genera	No. of species	Genus/genera
Asteraceae	10	9	15	10
Malvacee	2	2	7	5
Fabaceae	2	2	4	2
Solanaceae	3	3	3	2
Rosaceae	2	1	2	1
Amarantheaceae	1	1	4	2
Apiaceae	1	1	4	4
Chenopodiaceae	1	1	5	3
Plantaginaceae	1	1	4	4
Ricinidae	1	1	4	4
Polygonaceae	1	1	3	3
Trapaeolaceae	1	1	2	2
Violaceae	1	1	4	4

DISCUSSION

Twenty aphid species infesting 33 medicinal and aromatic plant species are reported for the first time from Poonch Division of Azad Jammu and Kashmir, Pakistan. The species encountered during the study are cosmopolitan with no solitary endemic species. Association of recorded aphid species with medicinal plants suggests either these aphid species have adapted most of these plants as their regular secondary hosts or reservoir hosts to tend over the period when their food crop host plants or preferable stage thereof is not available. In either case, these beneficial plants would suffer both quantitative and qualitative loss associated with aphid infestation.

Like Bhagat (2012) in our study too host plant family Asteraceae, among 19 studied plant families, emerged as the most palatable family to aphids, however in our work *Aphis gossypi*, was the most polyphagous species amongst 20 evaluated aphid species with Myzus *persicae* being the second in this category. On the contrary, the latter species was recorded as the most polyphagous species followed by the former in Bhagat's study referred to above. In our study both these species had fairly wider host plant range than reported for these in the latter study. The other polyphagous species viz., *Aphis fabae*, *Aphis craccivora*, *Macrosiphum euphorbiae* and *Aulacorthum solani* also exhibited much wider host plant range than that reported for these species in the study referred to above. *Sonchus asper* and *Sonchus oleraceous* each in the same work while latter species in our work harbored 7 aphid species. The aphid species recorded on these two *Sonchus* species in our study have also been reported by Blackman and Eastop (2012) for these host plant species. *Rosa chinensis* in our study had simultaneous infestation of *Macrosiphum rosae* and *Macrosiphum euphorbiae* whereas in Bhagat's study it carried *Macrosiphum rosae* alone.

Silybum marianum, in our study borne four aphid species viz., Aphis *fabae, Aulacorthum solani, Brachycaudus helichrysi and Capitophorus carduinus* while Karkani *et al.* 2011 reported *Disaphis lappe* and *Aphis fabae* on this therapeutic plant. Whereas according to Blackman and Eastop (2012) 16 aphid species have been recorded for this plant inclusive of three species in our study excepting *Capitophorus carduinus.* However two species *Capitophorus elaeagni* and *Capitophorus horni* are among 16 aphid species on this plant. Thus our study adds one more species associated with *Silybum marianum*, making a total sum of 17 aphid species for this plant.

Given the limited scope of present study and constraints involved therein viz., inaccessibility to far off human-inhabitations, local medicinal plant collectors, and dependency on schedule-bound, private transport, it is quite logical to assume that many aphid species, possibly some endemic ones and their medicinal host plants would have gone unnoticed during exploratory surveys carried out in this work. Findings of the latter, however, would provide preliminary baseline for the future workers interested in aphid-medicinal/aromatic plants-associations, IPM managers seeking protection of food crops and propagation/conservation of medicinal plant crop(s) in the study area. Tremendous biodiversity of study area and its people's heavy dependence on medicinal plants to cure human and veterinary ailments warrant further intensive investigation on aphid species infesting medicinal and aromatic plants in the region.

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