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### The diversity of aphids on medicinal and aromatic plants of Chikkamagaluru district

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#### Abstract

A study on species complex of aphids on medicinal and aromatic crops in selected taluks of Chikkamagaluru district was conducted during 2016-17. A total of 12 aphid species across seven genera, three tribes and two subfamilies of the superfamily Aphidoidea were recorded. Most of the aphid species studied belonged to the subfamily Aphidinae followed by subfamily Greenideinae. The subfamily Aphidinae was represented by two tribes, Aphidini and Macrosiphini constituting three (*Aphis*, *Hysteroneura* and *Rhopalosiphum*) and three genera (*Macrosiphum*, *Myzus*, *Hyperomyzus*, and *Sitobion*) each. One tribe and one genus were reported under the subfamily Greenideinae (Greenidini and Greenidea, respectively). The severity of per cent aphid infestation by *Aphis gossypii* (72.5%) and *Myzus persicae* (72.5%) was higher followed by *Aphis craccivora* (67.5%), *Aphis spiraeicola* (57.5%), *Macrosiphum euphorbiae* (55.5%), *Hysteroneura setariae* (55%), *Sitobion avenae* (55%), *Aphis fabae* (52.5%), *Aphis (Toxoptera) aurantii* (42.5%), *Greenidea (Greenidea) ficicola* (42.5%), *Rhopalosiphum padi* (40%) and *Macrosiphum rosae* (40%).

**Keywords:** aphids, genera, tribe, family and subfamily

#### Introduction

In India, different parts of several medicinal plants have been used to cure specific ailments in vogue since antiquity. The autochthonous system of medicine namely ayurvedic, siddha and unani have been in existence for several centuries. Karnataka is one of the few states in India which has rich flora representing evergreen, semi-evergreen, deciduous and shrub forests. Some of the crops like Periwinkle, Dioscorea, Duboisia, Senna, Gloriosa, Datura and Solanum are under commercial cultivation in the state (Parinitha *et al.*, 2005) [7].

Aphids Commonly referred to as plant lice or greenflies, are small, soft-bodied insects belonging to the order Hemiptera, suborder Sternorrhyncha, superfamily Aphidoidea and family Aphididae (Blackman and Eastop, 2012) [2]. A survey was undertaken to know different insect pests on selected medicinal plants in KRCCH, Arabhavi (Belgaum district). Various pests were recorded on these selected medicinal plants of which sucking insects, aphids were the important pests on ashwagandha (Ramanna *et al.*, 2010) [8]. The present research records aphid species damaging medicinal and aromatic plants of Chikkamagaluru district.

#### Materials and Methods

##### Study area

The study was conducted to document aphid species occurring on medicinal and aromatic crops in selected talukas of Chikkamagaluru district. Over a period of one year from April 2016 to April 2017, an intensive collection of aphids occurring on medicinal and aromatic crops was carried out in different villages of Mudigere, Chikkamagaluru, Kadur and Tarikere talukas. Maximum collection of aphids was done at Namdhari seed production unit at Kadur.

Aphids were collected from medicinal crops and aromatic crops. The aphids were collected from the host plant using a camel hair brush and stored in plastic vial and glass vials containing 70 per cent ethyl alcohol and labelled appropriately. The characteristics of aphid colony and their general appearance, as well as their hosts, were noted. The infested plant parts along with the aphids were also collected in polythene bags and marked with details of locality temporarily. Later, these field collected specimens were brought to the laboratory, College of Horticulture, Mudigere and live characters of the collected aphid specimens were recorded.

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Further, these specimens were either preserved with details of the collection for future use or processed to develop permanent slides.

Permanent slides were prepared for each type of aphid specimen by following the standard method given by Eastop and Van (1972) [3]. The permanent slides were used to observe the diagnostic characters, obtain the measurements of the specimens and the photographs. Different parts of aphid were drawn using the Camera Lucida. Measurements were taken using calibrated ocular micrometre fixed on Leica DM 1000. Aphids species encountered in the present study were classified into their respective taxonomic categories by adopting the classification given by Blackman and Eastop (2006) [1] and Joshi (2005) [5].

Besides this, quadrant sampling method was followed to assess the severity of aphid infestation in the medicinal and aromatic crops field, expressed in per cent aphid infestation.

## Results

The study recorded 12 species of aphids on medicinal and

aromatic plants in selected taluks of Chikkamagaluru district from April 2016 to April 2017.

## Species composition of aphids

The 12 aphid species recorded in Chikkamagaluru district from different medicinal and aromatic crops belonged to seven genera representing three tribes and two subfamilies under the family Aphididae (Table 1). The two subfamilies included Aphidinae and Greenideinae. Aphidinae was the most dominant subfamily among the collected taxa represented by 11 species belonging to six genera distributed in two tribes viz., Aphidini and Macrosiphini. Tribe Aphidini was represented by seven species belonging to three genera viz., *Aphis* (5), *Hysteroneura* (1) and *Rhopalosiphum* (1). Whereas, tribe Macrosiphini was represented four species belonging to three genera; *Macrosiphum* (2), *Myzus* (1), and *Sitobion* (1). The subfamily Greenideinae constituted only one tribe Greenideini with one species under the genus *Greenidea*.

## Observations

**Table 1:** List of aphid species reported on medicinal and aromatic crops in selected taluks of Chikkamagaluru districts.

Sl No.	Species	Subfamily: Tribe	Host plants	Place (India: Karnataka)
1	<i>Aphis craccivora</i> Koch	Aphidinae: Aphidini	<i>Hibiscus rosa-sinensis</i> L. (Malvaceae) <i>Jasminum auriculatum</i> Vahl. (Oleaceae) <i>Solanum nigrum</i> L. (Solanaceae)	Chikkamagaluru, Kadur and Mudigere
2	<i>Aphis fabae</i> Scopoli	Aphidinae: Aphidini	<i>Cestrum nocturnum</i> L. (Solanaceae) <i>Solanum nigrum</i> L. (Solanaceae) <i>Solanum viarum</i> Dunal (Solanaceae)	Chikkamagaluru and Kadur
3	<i>Aphis gossypii</i> Glover	Aphidinae: Aphidini	<i>Catharanthus roseus</i> (L.) (Apocynaceae) <i>Cestrum nocturnum</i> L. (Solanaceae) <i>Costus productus</i> (L.) (Costaceae) <i>Oscimum sanctum</i> L. (Lamiaceae) <i>Rauwolfia serpentina</i> (L.) (Solanaceae) <i>Withania somnifera</i> (L.) (Solanaceae)	Chikkamagaluru, Kadur, Mudigere and Tarikere
4	<i>Aphis spiraeicola</i> Patch	Aphidinae: Aphidini	<i>Lawsonia alba</i> Lam. (Lythraceae).	Mudigere
5	<i>Aphis (Toxoptera) aurantii</i> (Boyer.)	Aphidinae: Aphidini	<i>Eucalyptus</i> sp. (Myrtaceae) <i>Orchis</i> sp. (Orchidaceae)	Mudigere
6	<i>Hysteroneura setariae</i> (Thomas)	Aphidinae: Aphidini	<i>Cynodon dactylon</i> (L.) (Poaceae) <i>Cyperus rotundus</i> Miq. (Cyperaceae) <i>Digitaria longiflora</i> (Retz.) (Poaceae)	Chikkamagaluru and Mudigere
7	<i>Rhopalosiphum padi</i> (Linnaeus)	Aphidinae: Aphidini	<i>Cyperus rotundus</i> L. (Poaceae) <i>Scirpus</i> sp. (Poaceae)	Chikkamagaluru and Mudigere
8	<i>Macrosiphum euphorbiae</i> (Thomas)	Aphidinae: Macrosiphini	<i>Rosa chinensis</i> Jacq. (Rosaceae) <i>Rosa damascena</i> Mill. (Rosaceae) <i>Rosa kordesii</i> Wulff. (Rosaceae)	Chikkamagaluru, Kadur and Tarikere
9	<i>Macrosiphum rosae</i> (Linnaeus)	Aphidinae: Macrosiphini	<i>Rosa chinensis</i> Jacq. (Rosaceae) <i>Rosa damascena</i> Mill. (Rosaceae) <i>Rosa kordesii</i> Wulff. (Rosaceae)	Chikkamagaluru, Kadur and Tarikere
10	<i>Myzus persicae</i> (Sul.)	Aphidinae: Macrosiphini	<i>Solanum nigrum</i> L. (Solanaceae)	Chikkamagaluru
11	<i>Sitobion avenae</i> Fabricius	Aphidinae: Macrosiphini	<i>Cymbopogon</i> sp. (Poaceae) <i>Cynodon dactylon</i> (L.) (Poaceae)	Chikkamagaluru and Mudigere
12	<i>Greenidea (Greenidea) ficicola</i> Takahashi	Greenideinae: Greenideini	<i>Syzygium cumini</i> (L.) (Myrtaceae)	Mudigere

Subfamily: Tribe- Aphidinae: Aphidini

### *Aphis craccivora* Koch, 1854

Live appearance: Apteræ are shiny black, rarely pale brown and immature lightly dusted with wax. Colonizing young growth of numerous plants.

Diagnostic characters: Antennae 6 segmented. Antennal tubercles are weakly developed and with divergent inner faces. Siphunculi is as dark as cauda or black. Cauda is tongue shaped, longer than its base and with 5-7 hairs. Dorsal abdomen usually with an extensive solid black patch with polygonal reticulations.

### *Aphis fabae* Scopoli, 1763

Live appearance: Apteræ dull black sometimes white with wax markings. Colonies spread over most of the aerial parts of the plant.

Diagnostic characters: Antennae pale to dark. Rostrum reaches beyond mid coxae. Abdominal dorsum with polygonal reticulations with post-siphuncular sclerites besides

some other dark sclerites and scattered like structure, cauda as dark as siphunculi.

### *Aphis gossypii* Glover, 1877

Live appearance: Apteræ vary in colour from dark blackish green or green mottled with dark green to pale yellow.

Diagnostic characters: Body with the maximum width at the middle of Antenna 6 segmented. Alatae with secondary rhinaria distributed on antennal segment III 5-15, IV always 0. Siphunculi is uniformly dark. Cauda dusky or darker but paler than siphunculi usually slightly constricted in the middle, bearing 5-7 hairs arranged wholly on each side. Hind tibia pale for more than half of length.

### *Aphis spiraeicola* Patch, 1914

Live appearance: Apteræ bright greenish yellow to apple green. Alatae are yellow with dark wing veins and pigmented thorax. Dense colonies formed on the ventral surface of the

leaves, younger stems and tendrils and along leaf midribs of host plants. Ant attended.

Diagnostic characters: Antennae 6 segmented. Siphunculi dark and tapering, Cauda dark, broad with a slight constriction, bears 7-12 hairs. Hind tibia pale for more than half of length. Abdominal dorsum pale, without sclerotic pigmentation.

#### **Aphis (Toxoptera) auruntii Boyer de Fonscolombe, 1841**

Live appearance: Apteræ oval, shiny, brown-black or black, with dark and dull banded antennae. Siphunculi and cauda are black. Forewing with a black pterostigma and normally once-branched media, unusual for Aphidinae. Found often in dense colonies on young shoots and undersides of young leaves of host plants, causing slight rolling, twisting or bending of the mid rib.

Diagnostic characters: Sclerotic ridges on abdominal sternites V and VII and a row of short stridulatory apparatus. Peg-like hairs on each hind tibia. Forewing of alatae with dark pterostigma and median vein once branched. Siphunculi almost twice as long as cauda.

#### **Hysteronera setariae (Thomas, 1878)**

Live appearance: Small, rusty brown aphids. Present in colonies at the bases of the spikelets of many genera and species of Poaceae sometimes on unripe fruits. Alatae have a greenish-grey abdomen.

Diagnostic characters: Dark siphunculi and notably pale cauda, cauda with only four hairs, Antennae 0.9 times as long as the body.

#### **Rhopalosiphum padi (Linnaeus, 1758)**

Live appearance: Apteræ are pale green to dark green, brown or nearly black with a red rust patch around the base of siphunculi and a coating of mealy coat wax. It has a very hairy appearance.

Diagnostic characters: Body 1.4-1.5 times as long as antennae. Process terminalis is more than three-four times the base of last antennal segment. Siphunculi more than 1.5 times as long as cauda, usually slightly swollen proximal to the subapical constriction. Siphunculi uniformly dark, but in specimens which were black in colour, it was paler at the base. Short spino-pleural hairs on abdominal tergite 1-4 and blunt or slightly capitate.

#### **Subfamily: Tribe- Aphidinae: Macrosiphini**

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

Live appearance: Green or occasionally pink, often with a darker dorsal stripe. Body spindle or pear-shaped with reddish eyes. The siphunculi are pale coloured, cylindrical with dark tips and about one third the length of the body. The cauda is sword-shaped and bears 6 to 12 hairs and much shorter than the siphunculi.

Diagnostic characters: Body 2.96-3.60 mm long with 1.50-1.72 mm as maximum width. Head with antennal tubercles prominent, smooth. Rostrum extending to between second and third coxae. Ultimate rostral segment as long as hind tarsus II. Antennae 6 segmented, as long as or little longer than the body. Each segment with several medium hairs, segment III with 0 to 8 secondary rhinaria, all medium circular or sub-circular in a line on the basal part of the segment. Processus terminalis 4.5 to 5 times as long as the base of the last antennal segment. Siphunculi pale at least on basal half, sometimes dusky towards apices and with sub-apical reticulation. Siphunculi cylindrical narrowed just

before the apex and with a slight lip. The cauda is sword-shaped and bears 8 to 12 hairs and is shorter than the siphunculi.

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

Live appearance: Apteræ 1.7-3.6 mm long, green or deep pink to red-brown with shiny black head and prothorax. Antennae and legs bicoloured, yellow and black. Siphunculi is black, and cauda pale yellow. Alatae have very distinct black sclerites along sides of the abdomen.

Diagnostic characters: Head black. Body 2.29 to 3.64 mm long with 1.08-1.52 mm as maximum width. Prominent antennal tubercles. Rostrum extending to between second and third coxae or to third coxae, ultimate rostral segment 0.93-1.28 times the length of hind tarsus II, with 6-9 secondary hairs. Segment III with 6 to 21 very small to medium secondary rhinaria, circular or sub-circular scattered on basal third to half. Processus terminalis 4.5 to 5 times as long as the base of the last antennal segment. Siphunculi long, cylindrical, tapering, constricted with a lip at the apex. Siphunculi with a reticulation consisting of less than 12 rows of large polygonal cells on distal 0.1-0.2 of length.

##### **Myzus persicae (Sulzer, 1776)**

Live appearance: Apteræ vary from whitish or pale yellowish green to mid-green, rose-pink or red, rather uniformly coloured, not shiny, often darker in cold conditions. Reddish eyes, tarsi and distal segments of antennae blackish.

Diagnostic characters: Alatae have a black central dorsal patch on the abdomen. Body length 1.79-2.12 mm. Antennal tubercles moderately prominent, parallel, scabrous. Processus terminalis three times or more than three times as long as the base of the last antennal segment. Rostrum reaches hind coxae. Siphunculi pale or slightly dusky, less than two times the cauda.

##### **Sitobion avenae Fabricius, 1775**

Live appearance: Apteræ yellowish green - reddish brown, sometimes rather shiny, with black antennae and siphunculi. The legs are mostly yellow but with the distal parts of the femora, and the tips of the tarsi and tibiae dark.

Diagnostic characters: The body length of the aptera is 1.3-3.3 mm long. Rostral segment IV+V with 6-7 accessory hairs. Siphunculi cylindrical, uniformly black and sub apical reticulation on distal 0.19-0.35 of length. Longest hairs on abdominal tergite 8 with 3-6 hairs.

#### **Subfamily: Tribe- Greenideinae: Greenideini**

##### **Greenidea (Greenidea) ficicola Takashi, 1921**

Live appearance: Apteræ are pear-shaped yellowish brown to dark brown. Siphunculi are yellowish brown to dark brown, long and hairy. Resides on the underside of the young leaves and shoots or concentrated on the fruits. Sometimes ant attended.

Diagnostic characters: Body length 1.7-2.5 mm. Siphunculi with a pattern of pale reticulation, curved distally.

#### **Per cent infestation of aphids**

Per cent infestation was in the range of 40.0-72.5 per cent. Out of 12 collected species higher per cent infestation of 72.5, 67.5, 67.5 and 67.5 per cent was caused by *A. gossypii* and *M. persicae*, respectively followed by *A. craccivora*, *A. spiraeicola*, *M. euphorbiae*, *H. setariae*, *S. avenae*, *A. fabae*, *A. (Toxoptera) citricida*, *A. (Toxoptera) aurantii*, *G. (Greenidea) ficicola*, *R. padi*, and *M. rosae*.

## Discussion

The present findings that Aphidinae is the most dominant subfamily is in congruence with the findings of earlier studies done by Joshi (2005) [5] with 65.15 per cent of total species recorded in Karnataka.

Krishnamurti (1950) [6], Gadiyappanavar (1970) [4] and Joshi (2005) [5] recorded 20, 30 and 66 aphid species from Karnataka, respectively irrespective of crops. A review of these reports revealed that the present study recorded *Aphis craccivora* on *Hibiscus rosa-sinensis*, *Jasminum auriculatum* and *Solanum nigrum*, *A. fabae* on *S. nigrum*, *A. gossypii* on

*Costus productus*, *Rauwolfia serpentina*, and *Withania somnifera*, *A. spiraecola* on *Lawsonia alba*, *Hysteroneura setariae* on *Cynodon dactylon*, *Cyperus rotundus* and *Digitaria longiflora*, *Rhopalosiphum padi* on *C. rotundus* and *Scirpus* sp., *A. (Toxoptera) aurantii* on *Orchis* sp., *Macrosiphum euphorbiae* and *M. rosae* on *Rosa chinensis*, *R. damascena* and *R. kordesii*, *Myzus persicae* on *S. nigrum*, *Greenidea (Greenidea) ficicola* on *Syzigium cumini* as a new report from the Chikkamagaluru district and *Sitobion avenae* as a new report for Karnataka on *Cymbopogon* sp. and *Cynodon dactylon* (L.).

**Table 2:** Per cent aphid infestation on different medicinal and aromatic crops in selected talukas of Chikkamagaluru district.

Sl No.	Aphid Species	Host	Aphid infestation (%)	Period of Prevalence
1	<i>Aphis craccivora</i>	<i>Solanum nigrum</i> (L.)	67.5	Throughout the year
2	<i>Aphis fabae</i>	<i>Solanum nigrum</i> (L.)	52.5	Rainy and spring season
3	<i>Aphis gossypii</i>	<i>Henna</i>	72.5	Throughout the year
4	<i>Aphis spiraecola</i>	<i>Lawsonia alba</i> Lam.	57.5	Throughout the year
5	<i>Aphis (Toxoptera) aurantii</i>	<i>Eucalyptus</i>	42.5	September to October
6	<i>Hysteroneura setariae</i>	<i>Cyperus rotundus</i> Miq.	55.0	June to September and January to March
7	<i>Rhopalosiphum padi</i>	<i>Cynodon dactylon</i> (L.)	40.0	November to December.
8	<i>Macrosiphum euphorbiae</i>	<i>Rosa chinensis</i> Jacq.	55.5	January - March, June - July & September-October
9	<i>Macrosiphum rosae</i>	<i>Rosa damascena</i> Mill.	40.0	January -March, June -July & September- October
10	<i>Myzus persicae</i>	<i>Solanum nigrum</i> L.	72.5	Winter & early summer; September-March
11	<i>Sitobion avenae</i>	<i>Cymbopogon</i> sp.	55.0	Winter months
12	<i>Greenidea ficicola</i>	<i>Syzigium cumini</i> (L.)	42.5	Winter months

## Conclusion

The present investigation recorded 12 aphid species from 22 species of medicinal and aromatic host plants in selected talukas of Chikkamagaluru district. Most of the aphid species belonged to the subfamily Aphidinae which was represented by two tribes, Aphidini and Macrosiphini. The per cent infestation of these aphid species on medicinal and aromatic plants indicated that *Aphis gossypii* and *Myzus persicae* were very common and their infestation was high compared to other species of aphids.

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