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Aphids Infesting Medicinal Plants in Bihar, India

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Abstract: Aphids also known as plant lice constitute one of the most important group of phytophagous insects because of their polymorphism, host alternating heteroecious behavior and reproductive habits. They attack all parts of the plants and damage the crop directly by sucking sap from the plant tissue. They have also remarkable ability of transmitting plant viral diseases.

The healing power of traditional herbal medicines has been realized and documented since Rig Veda and Atharva Veda. According to WHO, Nearly 80% of populations of developing countries relies on traditional plant-based systems of medicine to provide them with primary health care. Medicinal plants are facing threats due to the infestation of aphids and other insects. In India, 1800 plant species are of medicinal importance. In Bihar, so far 41 species of aphids were recorded on more than 122 plant species which belong to 35 families. Among these, 32 aphids have been recorded on 82 species of medicinal plants belonging to 27 families. The maximum infestation was observed by *Aphis gossypii* (37 plants) followed by *Myzus persicae* (26 plants), *Aphis craccivora* (20 plants) and *Aphis nasturtii* (13 plants) and maximum number of aphid species infesting the medicinal plants belonging to family Poaceae and Solanaceae (10 aphid species each), Asteraceae (9 aphid species), Malvaceae (8 aphid species), Cucurbitaceae (7 aphid species) and Fabaceae (6 aphid species) and therefore need attention.

Keywords: Aphids, *Aphis*, *Myzus*, Medicinal plants, Infestation

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Introduction

In many countries around the world medicinal plants represent the most ancient form of medication and used for thousands of years in traditional medicine. Medicinal plants are blessings of nature for living ones (Agarwal and Upadhyaya, 2006). Out of 45,000 species of plants, 1800 plant species/sub-species are reported to possess medicinal properties in India (Singh *et al*., 2003). In different parts of India, the medical practitioners tried to utilize the locally growing plants which were found useful in treatment of various diseases. Now, the medicinal plants are facing threats by several insect pests. The aphids (Homoptera:Aphididae) are one of the most important pests of medicinal plants. The aphids are small sucking plant bugs and constitute one of the most important group of phytophagous insects because of their polymorphism, host alternating

Table 1: List of aphids infesting medicinal plants in Bihar with their rate of infestation

Aphids/infected Plants	Common name of plant	Family	Intensity of infestation
1. *Acyrthosiphon pisum*			
Trigonella foenumgraecum	Sickle fruit fenugreek	Fabaceae	++
Vicia faba	Broad bean	Fabaceae	+
2. *Aphis affinis*			
Mentha spicata	Mint	Lamiaceae	+++
3. *Aphis aurantii*			
Artocarpus sp.	Jackfruit /breadfruit	Moraceae	+
Citrus limon	Lemon	Rutaceae	++
Hibiscus rosasinensis	Shoeblack plant /Orhul	Malvaceae	+
4. *Aphis citricdus*			
Citrus limon	Lemon	Rutaceae	++++
5. *Aphis craccivora*			
Abelmoschus esculentus	Okra	Malvaceae	++++
Ageratum conyzoides	Billygoat weed	Asteraceae	++
Cajanus cajan	Pigeon pea	Fabaceae	+++
Canavalia ensiformis	Jack bean	Fabaceae	+++
Chrysanthemum sp.	Guldaudi	Asteraceae	++
Cicer arietenum	Chick pea	Fabaceae	+
Citrus limon	Lemon	Rutaceae	+
Cucumis sativus	Cucumber	Cucurbitaceae	+
Hibiscus rosasinensis	Orhul	Malvaceae	++
Lagenaria siceraria	Bottle gourd	Cucurbitaceae	+
Lathyrus sativus	Grasspea, cicerchia	Fabaceae	+
Lycopersicon esculentum	Tomato	Solanaceae	+
Mangifera sp.	Mango	Anacardiaceae	++
Mirabilis jalapa	Four o' clock flower	Nyctaginaceae	+++
Phaseolus sp.	Wild bean	Fabaceae	++++
Pisum sativum	Pea	Fabaceae	++
Raphanus sativus	Radish	Brassicaceae	+
Solanum sp.	-	Solanaceae	+++
Trigonella foenumgraecum	Fenugreeks	Fabaceae	++
Vicia faba	Broad bean	Fabaceae	++++
6. *Aphis fabae*			
Datura fastuosa	Datura metel	Solanaceae	++
Hibiscus rosasinensis	Orhul	Malvaceae	++
Lagenaria siceraria	Bottle gourd	Cucurbitaceae	+++
Luffa cylindrica	Sponge gourd	Cucurbitaceae	++
Rumex hastatus	Arrowleaf dock	Polygonaceae	++
Solanum sp.	-	Solanaceae	+++
Tagetes sp.	Marigold	Asteraceae	++++
Vicia faba	Broad bean	Fabaceae	+++
7 . *Aphis glycine*			
Catharanthus roseus	Graveyard plant	Apocynaceae	+

Lycopersicon esculentum	Tomato	Solanaceae	+
8 . *Aphis gossypii*			
Abelmoschus esculentus	Okra	Malvaceae	+++
Ageratum conyzoides	Billygoat weed	Asteraceae	+++
Amaranthus tricolor	Edible amaranth	Amaranthaceae	+
Basella alba	Malabar spinach	Basellaceae	+
Brassica oleracea	Cabbage	Brassicaceae	++
Cajanus cajan	Pigeon pea	Fabaceae	++
Calendula sp.	Pot marigold	Asteraceae	+
Calotropis gigantea	Crown flower, giant milkweed	Apocynaceae	++
Capsicum annuum	Chilli padi	Solanaceae	++
Catheranthus rosesus	Graveyard plant	Apocynaceae	+
Chrysanthemum indicum	Guldaudi	Asteraceae	+++
Citrus limon	Lemon	Rutaceae	++
Clerodendrum infortunatum	Bhat or hill glory bower	Lamiaceae	++++
Coccinia grandis	Ivy gourd	Cucurbitaceae	+++
Colocasia sp.	Taro	Araceae	+
Cucumis sativus	Cucumber	Cucurbitaceae	++
Cucurbita maxima	Giant pumpkin	Cucurbitaceae	++
Helianthus annuus	Sunflower	Asteraceae	++
Hibiscus rosasinensis	Orhul	Malvaceae	++
Hibiscus sabdariffa	Roselle	Malvaceae	+++
Hordeum vulgare	Barley	Cyperaceae	+
Lagenaria siceraria	Bottle gourd	Cucurbitaceae	++++
Lawsonia inermis	Henna tree	Lythraceae	+++
Luffa acutangula	Chinese okra	Cucurbitaceae	+++
Luffa cylindrica	Sponge gourd	Cucurbitaceae	+
Lycopersicon esculentum	Tomato	Solanaceae	+++
Momordica charantia	Bitter melon	Cucurbitaceae	++
Ocimum tenuiflorum	Tulsi	Lamiaceae	+++
Psiduim guajava	Guava	Myrtaceae	++
Punica granatum	Pomegranate	Punicaceae	++
Raphanus sativus	Radish	Brassicaceae	+
Rosa sp.	Rose	Rosaceae	+
Rumex sp.	Bitter dock	Polygonaceae	+
Solanum melongena	Brinjal	Solanaceae	++
Solanum tuberosum	Potato	Solanaceae	++
Tagetes sp.	Marigold	Asteraceae	++++
Trichosanthes diocea	Pointed gourd	Cucurbitaceae	+++
9. *Aphis nasturtii*			
Ageratum conyzoides	Billygoat weed	Asteraceae	+++
Capsicum annuum	Chilli padi	Solanaceae	++
Chrysanthemum indicum	Guldaudi	Asteraceae	+++

Clerodendrum infortunatum	Bhat or hillglory bower	Lamiaceae	++++
Colocasia sp.	Taro	Araceae	+++
Hibiscus sp.	Orhul	Malvaceae	+++
Lagenaria vulgaris	Calabash	Cucurbitaceae	++
Luffa cylindrica	Sponge gourd	Cucurbitaceae	++
Lycopersicon esculentum	Tomato	Solonaceae	+++
Mentha arvensis	Wild mint	Lamiaceae	++
Momordica charantia	Bitter melon	Cucurbitaceae	+
Psidium guajava	Guava	Myrtaceae	++
Solanum melongena	Brinjal	Solanaceae	++
10. *Aphis nerii*			
Calotropis gigantean	Crown flower, giant milkweed	Apocynaceae	+++
Coccinia grandis	Ivy gourd	Cucurbitaceae	+++
Solanum melongena	Brinjal	Solanaceae	+
11. *Aphis odinae*			
Hibiscus rosasinensis	Shoeblack plant /Orhul	Malvaceae	+++
12. *Aphis punicae*			
Colocasia sp.	Taro	Araceae	+
Punica granatum	Pomegranate	Punicaceae	+++
13. *Aphis spiraecola*			
Ageratum conyzoides	Billy goat weeds	Asteraceae	++
Cajanus cajan	Pigeon pea	Fabaceae	+++
Chrysanthemum indicum	Guldaudi	Asteraceae	+++
Clerodendrum infortunatum	Bhat or hillglory bower	Lamiaceae	++
Coriandrum sativum	Coriander	Umbelliferae	+++
Hibiscus sabdariffa	Roselle	Malvaceae	++
Lagenaria siceraria	Bottle gourd	Cucurbitaceae	+++
Lawsonia inermis	Heena	Lythraceae	++
Solanum melongena	Brinjal	Solanaceae	++
14. *Brachycaudus helichrysi*			
Chrysanthemum indicum	Guldaudi	Asteraceae	++++
15. *Brevicoryne brassicae*			
Brassica rapa	Field mustard	Brassicaceae	+++
Brassica oleracea	Cabbage	Brassicaceae	+++
Raphanus sativus	Radish	Brassicaceae	++
16.*Greenidea formosana*			
Psidium guajava	Guava	Myrtaceae	++
17. *Hyadaphis coriandri*			
Coriandrum sativum	Coriander	Umbelliferae	++
18. *Hyalopterus pruni*			
Pharagmites karka	Weed plant	Poaceae	+
19. *Hysteroneura setariae*			
Andropogon vulgare	Beard grass	Poaceae	++
Cynodon dactylon	Scutch grass/ Durva	Poaceae	+++
Cyperus rotundus	Java grass	Cyperaceae	++
Hordeum vulgare	Barley	Cyperaceae	++

Sorghum vulgare	Great millet	Poaceae	++++
Triticum aestivum	Wheat	Poaceae	++++
Zea mays	Maize	Poaceae	++++
20. *Lipaphis erysimi*			
Allium sp.		Alliaceae	+
Beta vulgaris	Beet	Brassicaceae	++++
Brassica rapa	Field mustard	Brassicaceae	+++
Brassica oleracea	Cabbage	Brassicaceae	+++
Raphanus sativus	Radish	Brassicaceae	++++
Zea mays	Maize	Poaceae	++++
21. *Macrosiphoniella sanborni*			
Chrysanthemum indicum	Guldaudi	Asteraceae	++++
22. *Melanaphis sacchari*			
Saccharum officinarum	Sugarcane	Poaceae	++++
Zea mays	Maize	Poaceae	++++
Pennisetum glaucum	Pearl millet	Poaceae	++
Sorghum vulgare	Great millet	Poaceae	++++
Sorghum bicolor	Great millet	Poaceae	++++
23. *Myzus persicae*			
Ageratum conyzoides	Billy goat weeds	Asteraceae	++
Allium sativum	Garlic	Amaryllidaceae	+
Amaranthus spinosus	Spiny amaranth	Amaranthaceae	+
Basella sp.	Spinach	Basellaceae	++
Beta vulgaris	Beet	Brassicaceae	++++
Brassica rapa	Field mustard	Brassicaceae	+++
Brassica oleracea	Cabbage	Brassicaceae	+++
Capsicum annuum	Chilli padi	Solanaceae	++
Carthamus tinctorius	Safflower	Asteraceae	+++
Cucurbita maxima	Giant pumpkin	Cucurbitaceae	+
Coriandrum sativum	Coriander	Umbelliferae	+++
Citrus sp.	Lemon	Rutaceae	++
Datura stramonium	Jimson weed	Solanaceae	++
Helianthus annuus	Sunflower	Asteraceae	+
Hibiscus rosasinensis	Shoeblack plant /Orhul	Malvaceae	++
Lycopersicon esculentum	Tomato	Solonaceae	++
Momordica charantia	Bitter melon	Cucurbitaceae	+
Nicotiana tabacum	Tobacco	Solanaceae	+++
Pisum sativum	Pea	Fabaceae	++
Rumex sp.	-	Polygonaceae	+++

Solanum melongena	Brinjal	Solanaceae	++
Solanum tuberosum	Potato	Solanaceae	++
Solanum nigrum	Blackberry nightshade	Solanaceae	++
Spinacia oleracea	Spinach	Amaranthaceae	+++
Tagetes sp.	Marigold	Asteraceae	++++
Withania sp.	Ashwagandha	Asteraceae	++++
24. *Pentalonia nigronervosa*			
Musa paradisiaca	Bananas	Musaceae	+++
25. *Phorodon* sp.			
Cannabis sativa	Hemp	Cannaceae	+
26. *Rhopalosiphum maidis*			
Hordeum vulgare	Barley	Cyperaceae	+++
Lycopersicon esculentum	Tomato	Solonaceae	+
Pennisetum glaucum	Pearl millet	Poaceae	++
Sorghum vulgare	Great millet	Poaceae	++++
Triticum aestivum	Wheat	Poaceae	++
Zea mays	Maize	Poaceae	+++
27. *Rhopalosiphum padi*			
Triticum aestivum	Wheat	Poaceae	+
28. *Rhopalosiphum rufiabdominalis*			
Cyperus rotundus	Java grass	Poaceae	++
Lycopersicon esculentum	Tomato	Solonaceae	+
29. *Schizaphis graminum*			
Cynodon dactylon	Scutch grass/ Durva	Poaceae	+++
Hordeum vulgare	Barley	Cyperaceae	++++
Oryza sativa	Rice	Poaceae	++++
Pennisetum glaucum	Pearl millet	Poaceae	++
Triticum aestivum	Wheat	Poaceae	+
Zea mays	Maize	Poaceae	++
30. *Sitobion avenae*			
Triticum aestivum	Wheat	Poaceae	++
31. *Sitobion miscanthi*			
Hordeum vulgare	Barley	Cyperaceae	++++
Triticum aestivum	Wheat	Poaceae	++++
32. *Uroleucon compositae*			
Carthemus tinctorius	Safflower	Asteraceae	++
Intensity of infestation-- + = Low ++ =Moderate +++ = High ++++ = Very High			

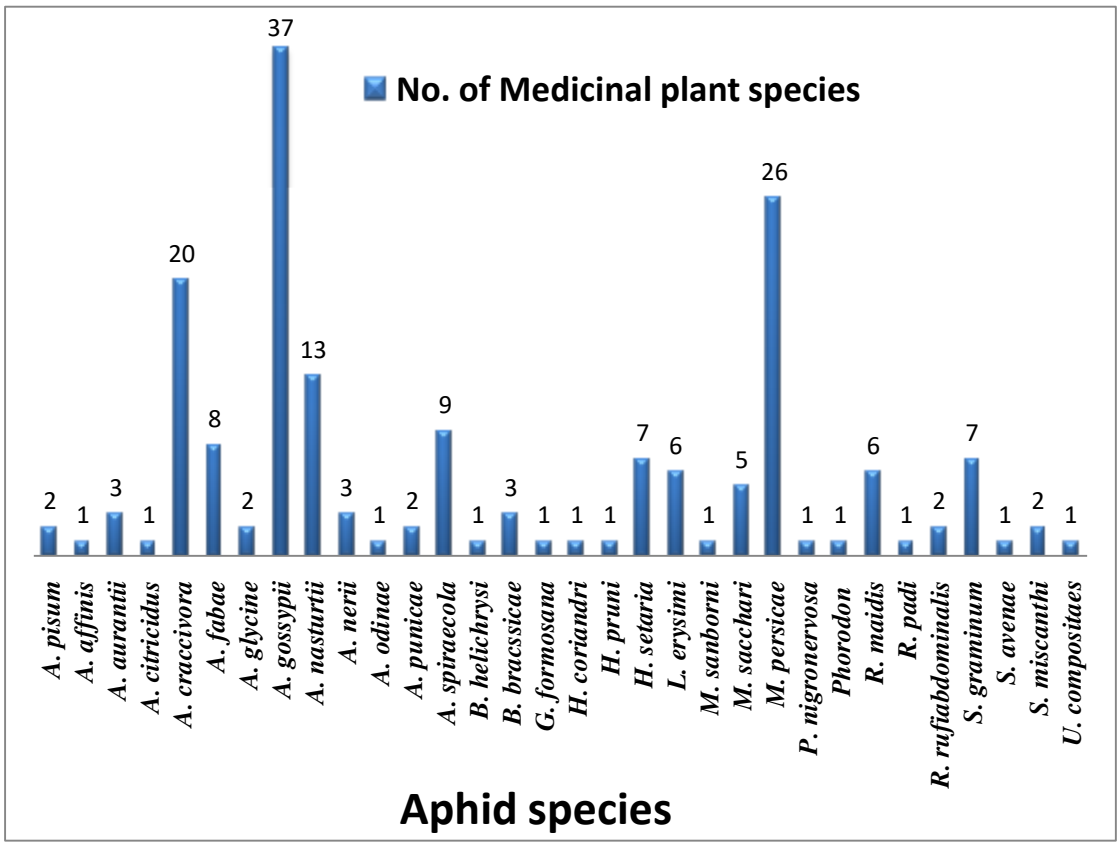

Fig. 1: No. of medicinal plants infested by aphid species.

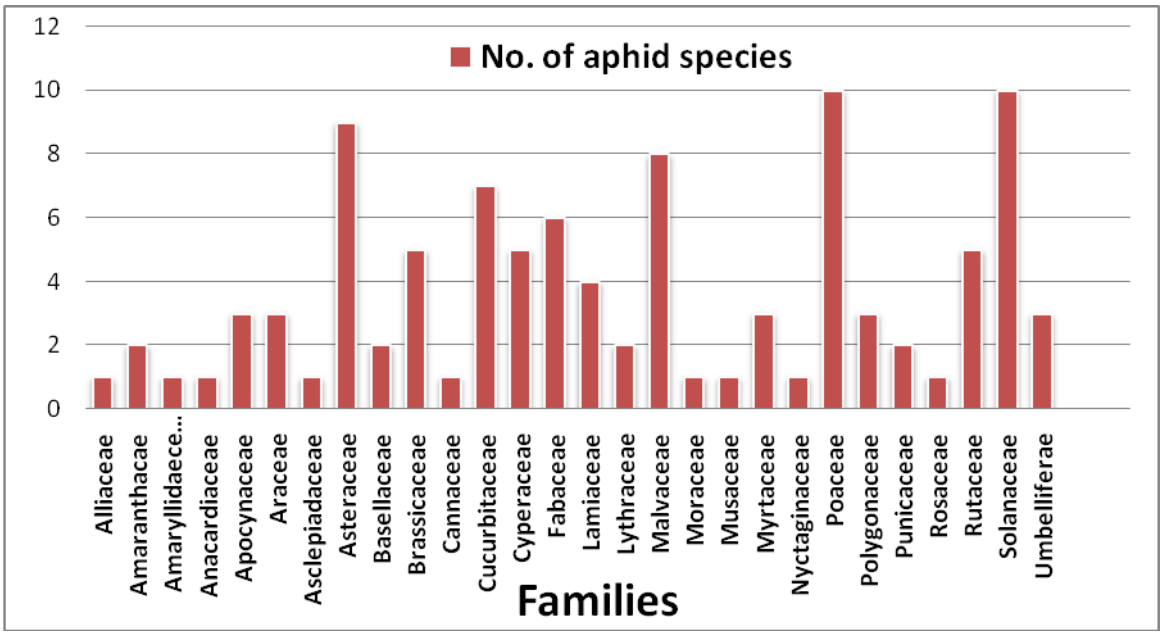

Fig. 2 : Medicinal plants of different families infested by aphid species.

heteroecious behaviour and reproductive habits (Singh and Singh, 2021, 2022). They are remarkable for their role as largest group of insect vector of plant viral diseases (Singh and Singh, 2016). Various damage symptoms are noticed in plants as a result of aphid infestation. Nearly about 1250 species of plants belonging to 700 genera and 175 plant families are used as food plants by 794 species belonging to 208 genera of aphids in India (Raychaudhuri, 1983; Chakrabarti and

Table 2: Aphids infesting medicinal plants in Bihar

Aphid species	No. of plants species
Acyrthosiphon pisum	2
Aphis affinis	1
Aphis aurantii	3
Aphis craccivora	20
Aphis citricdus	1
Aphis fabae	8
Aphis glycine	2
Aphis gossypii	37
Aphis nasturtii	13
Aphis nerii	3
Aphis odinae	1
Aphis punicae	2
Aphis spiraecola	9
Brachycaudus helichrysi	1
Brevicoryne brassicae	4
Greenidea formosana	1
Hyadaphis coriandri	1
Hyalopterus pruni	1
Hysteroneura setariae	7
Lipaphis erysimi	6
Macrosiphoniella sanborni	1
Melanaphis sacchari	5
Myzus persicae	26
Pentalonia nigronervosa	1
Phorodon sp.	1
Rhopalosiphum maidis	6
Rhopalosiphum padi	1
Rhopalosiphum rufiabdominalis	2
Schizaphis graminum	7
Sitobion avenae	1
Sitobion miscanthi	2
Uroleucon compositae	1

Table 3: Medicinal plants of different families infested by aphids

Plant families	No. of aphid species
Alliaceae	1
Amaranthaceae	2
Amaryllidaeceae	1
Anacardiaceae	1
Apocynaceae	3
Araceae	3
Asteraceae	9
Basellaceae	2
Brassicaceae	5
Cannaceae	1
Cucurbitaceae	7
Cyperaceae	5
Fabaceae	6
Lamiaceae	4
Lythraceae	2
Malvaceae	8
Moraceae	1
Musaceae	1
Myrtaceae	3
Nyctaginaceae	1
Poaceae	10
Polygonaceae	3
Punicaceae	2
Rosaceae	1
Rutaceae	5
Solanaceae	10
Umbelliferae	3

Sarkar, 2001; Singh and Singh, 2019). Earlier, Ghosh and Singh (2004) enlisted 94 species/sub-species of aphids on 115 plant species belonging to 52 plant families in north east India. Singh *et al*. (2003) revised the list of aphids infesting medicinal plants and reported 428 species/sub-species of aphids infesting on 530 species of medicinal plants belonging to 117 plant families in India.

Bihar has rich agricultural land, where the systematic cultivation of high value of medicinal and aromatic plants is done for economy but farmer faces lot of problems due to heavy infestation of medicinal plants by aphids and other insects. In Bihar, considerable amount of research has been conducted on the taxonomy, biology, and ecology of aphids by several workers (Ahmad and Singh, 1996, 1997, 2003, 2005; Ahmad and Kumar, 2007; Ahmad and Parween, 2009; Ahmad *et al*., 2005, 2009, 2012, 2020; Kumar and Ahmad, 2017; Rakhshan and Ahmad, 2019).

As per literature survey, 32 species of aphids infesting 82 species of medicinal plants belonging to 27 families were recorded in Bihar (Table 1). The maximum infestation was observed by *Aphis gossypii* (37 plants) followed by *Myzus persicae* (26 plants), *Aphis craccivora* (20 plants) and *Aphis nasturtii* (13 plants) (Table 2). Maximum number

of aphid species infesting the medicinal plants belong to family Poaceae and Solanaceae (10 species each), followed by Asteraceae (9 aphid species), Malvaceae (8 aphid species), Cucurbitaceae (7 aphid species) and Fabaceae (6 aphid species) (Table 3, Figs. 1, 2). Most suffered plants are *Abelmoschus esculentus, Ageratum conyzoides, Beta vulgaris, Cajanus cajan, Coccinia grandis, Coriandrum sativum, Chrysanthemum indicum, Hordeum vulgare, Tagetes* sp., *Triticum aestivum, Sorghum vulgare, Zea mays* followed by *Brassica rapa, Brassica oleracea, Carthamus tinctorius, Cynodon dactylon, Rumex* sp., *Spinacia oleracea.*

The list of aphid species infesting medicinal plants with common name and intensity of infestation is given in Table 1.

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