

APHIDS AND THEIR HOST AFFINITY- III: *BREVICORYNE* AND *PSEUDOBREVICORYNE* SPP.

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Abstract: Host plant affinity of 9 species of *Brevicoryne* and 3 species of *Pseudobrevicoryne* revealed that *B. arctica*, *B. barbareae*, *B. jiyuguanensis* were monophagous on Brassicaceae; *B. fraterna* on Salicaceae and *B. lonicerina* and *B. shaposhnikovi* on Caprifoliaceae. *B. crambe*, *B. nigrisiphunculata* and *Brevicoryne* sp. were oligophagous, whereas *B. brassicae* was categorized as polyphagous feeding on 78 plant species. All the three *Pseudobrevicoryne* species were *Brassica* feeders.

Keywords: Aphids, *Brevicoryne*, *Pseudobrevicoryne*, dicotyledons, monocotyledons, lignosae, herbaceae.

INTRODUCTION

Aphis species which belong to genera *Brevicoryne* and *Pseudobrevicoryne* (Aphidini: Macrosiphini) are mostly of palaeartic origin except *B. arctica* which is found in arctic region of northern Canada. Both the genera are closely related except species of *Pseudobrassicae* possess short siphunculi, first tarsal segment with 3, 3, 2 hairs and secondary shinnaria in apterae [1]. Genus *Brevicoryne* contains 9 species and *Pseudobrevicoryne* 3 species. These aphid species suck the plant sap from phloem and devitalize the plant, secrete honeydew which adversely affects photosynthesis and some of them act as vector of several viruses. We have tried to study their host relationships based on the information published in the literature.

MATERIALS AND METHODS

Host plant species for each aphid species were aligned to families and orders following the taxonomic classification of Hutchinson [2], who divided angiosperms in dicotyledons and monocotyledons. Dicotyledons were further divided into lignosae (fundamentally woody plants) and herbaceae (fundamentally herbaceous plants). Similarly, monocots were partitioned into calyciferae, corolliferae and glumifolrae. Aphid species were designated as

mono-, oligo-, or polyphagous following the definitions of Barnays and Chapman [3]. General Affiliation Index (GAI) was used following the method described by Rathore and Tiwari [4]. Details on methodology are given in the first publication on Aphids and their host affinity-I by Rathore and Tiwari (In press). Most of the information on aphid species and their host plants were extracted from various publications of Blackman and Eastop [5, 6].

RESULTS AND DISCUSSION

There are 9 species in the genus *Brevicoryne* (Table 1) and 3 species in the genus *Pseudobrevicoryne* (Table 3). *Brevicoryne crambinistataricae* reported in the literature [7] is the same species as *B. crambe* (= *B. crambinistataricae*) as per taxonomic characters considered by Blackman and Eastop [6]. Out of 9 species, *B. arctica*, *B. barbareae*, *B. jiayuguanensis* were monophagous on Brassicaceae; *B. fraterna* on Salicaceae and *B. lonicerina* and *B. shaposhnikovi* on Caprifoliaceae. General Affiliation Index (GAI) values ranging from 1.000 to 1.333 and in most of the cases it was 1.000 indicating greater affinity to the preferred hosts. Three oligophagous species (Table 1) also indicated their GAI values in the range of 1.000-1.250 again demonstrating their close affiliation to their host species. Only *B. brassicae* observed to be polyphagous and reported to feed on 78 host species. Out of these 79.49% were cruciferous plants belonging to family Brassicaceae.

Table 1. Showing affinity of host groups to *Brevicoryne* species

<i>Brevicoryne</i> spp.	Host plants with taxonomic group	No. of host	GAI	Status
<i>B. arctica</i>	Dicot-herbaceae: Brassicaceae (1) (<i>Lesquerella arctica</i>)	1	1.000	Monophagous
<i>B. barbareae</i>	Dicot-herbaceae: Brassicaceae (1) (<i>Barbarea vulgaris</i>)	1	1.000	Monophagous
<i>B. brassicae</i>	Dicot-lignosae: Cucurbitaceae (1), Linaceae (1) Dicot-herbaceae: Asteraceae (2), Brassicaceae (62), Chenopodiaceae (1), Crassulaceae (1), Lamiaceae (2), Limnanthaceae (1), Resedaceae (1), Scrophulariaceae (1), Solanaceae (4), Tropaeolaceae (1)	78	1.111	Polyphagous
<i>B. crambe</i>	Dicot-herbaceae: Brassicaceae (2) (<i>Barbarea vulgaris</i> , <i>Crambe tatarica</i> , <i>Diplotaxis</i> sp., <i>Isatis</i> sp., <i>Sisymbrium</i> sp.)	5	1.000	Oligophagous
<i>B. fraterna</i>	Dicot-lignosae: Salicaceae (1) (<i>Salix</i> sp.)	1	1.000	Monophagous
<i>B. jiayuguanensis</i>	Dicot-herbaceae: Brassicaceae (1) (<i>Armoracia rusticana</i>)	1	1.000	Monophagous
<i>B. lonicerina</i>	Dicot-lignosae: Caprifoliaceae (1) (<i>Lonicera anisotricha</i>)	1	1.000	Monophagous
<i>B. nigrisiphunculata</i>	Dicot-herbaceae: Brassicaceae (3) (<i>Brassica</i> spp., <i>Crambe orientalis</i> , <i>C. tatarica</i>)	3	1.250	Oligophagous
<i>B. shaposhnikovi</i>	Dicot-lignosae: Caprifoliaceae (2) (<i>Lonicera altmannii</i> , <i>L. bracteolaris</i>)	2	1.333	Monophagous
<i>Brevicoryne</i> sp.	Dicot-herbaceae: Brassicaceae (2) (<i>Barbarea vulgaris</i> , <i>Rorippa</i> spp.)	2	1.000	Oligophagous

Information presented in Table 2 revealed that aphid species in the genus *Brevicoryne* exclusively feed on dicotyledons as no monocotyledonous plant so far reported as a host of any of the species in this genus. Among dicotyledonous hosts preference was greater to plants in herbaceae. Comparatively less number of genera, families and orders contributed higher number of plant species in herbaceae, whereas the trend was reverse in the case of lignosae.

Table 2. Affinity of *Brevicoryne* species to host taxonomic groups

Parameters	Host plants					Total
	Dicotyledons		Monocotyledons			
	Lignosae	Herbaceae	Calyciferae	Corolliferae	Glumiflorae	
Species	6 (6.32)	89 (93.68)	0	0	0	95
Genera	5 (7.81)	59 (92.19)	0	0	0	64
Families	5 (23.80)	16 (76.20)	0	0	0	21
Orders	5 (25.00)	15 (75.00)	0	0	0	20
Total	21 (10.50)	179 (89.50)	0	0	0	200

Figures in parentheses are % values

B. brassicae is the key species in the genus and is commonly known as cabbage aphid or cabbage aphid. Its host range encompasses large number of host species. Although many host plants are from Brassicaceae (cruciferous plants) but host range of this aphid goes beyond this and attacks plants from 11 families other than Brassicaceae. However, this information is not in accordance with Influential Point [8] who reported this aphid does not feed on plants other than those from Brassicaceae family. The chemical basis of this restriction is presence of sinigrin (a mustard oil glucoside) [9]. Aphid recognizes its host by presence of glucosinolates in the mesophyll tissues before it starts ingestion from phloem vessels [10]. Kazana [11] showed that aphids produce a myrosinase enzyme. The combinations of glucosinolates and myrosinase produces a mustard chemical allyl isothiocyanate. This chemical has negative effect on the survival of larvae of ladybird predator *Adalia bipunctata* [11]. This defense mechanism of aphid has been linked to “walking mustard bomb”. Brassica plants also produce myrosinase which is different from aphid myrosinase. Aphid myrosinase has greater similarity to animal beta-o-glucosinolate than plant myrosinase [12].

B. brassicae is a destructive species and is native of Europe and found in many areas of the world [13]. Colonies of this aphid are found on both sides of leaves, leaf folds, leaf stalks and leaf axles and is a vector of 23 virus diseases of crucifers [14].

Both apterae and alates are able to transmit virus but the apterae demonstrate a higher rate of transmission [15]. Mode of transmission is non-persistent. Aphid causes major loss to broccoli by reducing yield and contamination of harvested heads [16, 17] and may cause rejection of entire harvest [17].

Aphid harbour endosymbionts which are essential for their performance and survival. The primary obligate endosymbiont is *Buchnera aphidicola* [18] (Hays et al 2002), however, a wide diversity of secondary symbiont bacteria are associated with it [19].

The *Pseudobrevicoryne* species are exclusively brassica feeders and *P. erysimi* and *P. leclantia* are monophagous with GAI 1.000. *P. buhri* is oligophagous and feeds on plants from genus *Barbarea* and *Brassica* with GAI of 1.666 (Table 3). Both *Brevicoryne* and *Pseudobrevicoryne* species are specialized feeders and very close to each other.

Table 3. Host taxonomic relationships with *Pseudobrevicoryne* species

<i>Pseudobrevicoryne</i> species	Host taxonomic groups	No. of plant	GAI	Status
<i>P. buhri</i>	Dicot-herbaceae: Brassicaceae (3) (<i>Barbarea arcuata</i> , <i>B. vulgaris</i> , <i>Brassica campestris</i>)	3	1.666	Oligophagous
<i>P. erysimi</i>	Dicot-herbaceae: Brassicaceae (1) (<i>Erysimum</i> spp.)	1	1.000	Monophagous
<i>P. leclantia</i>	Dicot-herbaceae: Brassicaceae (1) (<i>Arabis alpina</i>)	1	1.000	Monophagous

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