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AN ACCOUNT OF THE GENUS *BREVICORYNE* VAN DER GOOT (HOMOPTERA : APHIDIDAE) IN INDIA WITH DESCRIPTION OF A SEXUAL MORPH OF *BREVICORYNE BARBAREAE* NEVSKY

L. K. Ghosh,[1] D. Raychaudhuri, D. N. Raychaudhuri and S. K. Raha

Entomology Laboratory, Department of Zoology, University of Calcutta, Calcutta 700 019

ABSTRACT

The paper provides an account of the genus *Brevicoryne* van der Goot infesting the cruciferous plants and its toxonomic affinity with other related genera like *Lipaphis* Mordvilko, affecting also cruciferous plants and *Hyadaphis* Kirkaldy affecting plants of Umbelliferae, a family related to Cruciferae, is discussed. A key to the identification of the species is also given. The hitherto unknown alate male of *Brevicoryne barbareae* Nevsky has been described for the first time. A discussion on the ecological aspect of the species is also incorporated in the paper.

Introduction

Only two species, *Brevicoryne barbareae* Nevsky and *B. brassicae* (L.) in the genus *Brevicoryne* van der Goot are so far known from India where they normally occur on the plants belonging to the family Cruciferae. In the present paper, details of each species including a key to the species based on Indian material of both parthenogenetic and sexual forms are provided. Besides, re-examination of the material reported as *B. brassicae* by Banerjee *et al.* (1969) from Kuti valley (*c* 11,613′—11,886′) reveals that those are alatiform apterae of *B. barbareae* Nevsky, the alate males of which are described for the first time.

Genus *Brevicoryne* van der Goot

Brevicoryne van der Goot, 1915, *Bietr. Z. Kenntider Holland*, Blattlause : 245.

Body elongated oval, pale to brown in colour. Head smooth or slightly wrinkled. Frons with low lateral frontal tubercles; median frontal prominence well developed. Antennae 6-segmented and shorter than body, antennal segment I imbricated, shorter than wide, segment II as long as segment I; flagellum strongly imbricated, without secondary rhinaria in apterae viviparae, intermediate forms, however, with up to 20 circular protuberant secondary rhinaria, alatae with numerous such rhinaria distributed irregularly on segment III, segment IV with 7-15, V with 5-19, VI with 0-2, primary rhinaria ciliated; flagellar hairs sparse, short with acute to acuminate apices; p.t. longer than base of segment VI. Rostrum normal, reaches midcoxae shorter than h.t. 2 and bears 4 secondary hairs. Prothorax in apterae viviparae with marginal brown patches and in alatae

1 Zoological Survey of India, 34, Chittaranjan Avenue, Calcutta.

with a transverse pigmented band ; meso—and metathorax in apterae viviparae with such marginal patches in addition to the scattered pigmented patches and muscle-plates arranged pleurally ; mesothoracic furca with separate arms. Abdominal dorsum in apterae with pigmented irregular shaped wrinkled patches pleurally, these showing various degrees of coalescence with those occurring spinally on segments 1-7 and segment 8 with a spino-pleural band besides scattered muscle-plates on the antesiphuncular segments, in alate viviparae with spinopleural segmental bars on each segment, sometimes these on anterior segments broken, besides, marginal spinular pigmented patches occur on segments 2-5 along with muscle-plates ; dorsal hairs thick with blunt apices in apterae viviparae and with acuminate apices in alate viviparae placed on slightly raised bases. Siphunculi at most up to 0.14 of body length, usually barrel-shaped, in alate viviparae basal portion much constricted and wrinkled, faintly imbricated, almost without any apical flange. Cauda dark, triangular to elongate, shorter than siphunculus, bearing 5-7 hairs. Subgenital plate broadly oval, with 10 hairs in two groups posteriorly and 2 hairs anteriorly. Legs smooth with hairs having acute to subacute apices or faintly imbricated, tarsi with normal imbrications, F.T.C. 3,3,3 or 3,3,2. Wing venation normal. Nymphs with hindtibiae smooth.

Distribution : Cosmopolitan.

Remarks : The genus is mostly restricted to the plants of Cruciferae. Another aphid genus affecting only the cruciferous plants is *Lipaphis* Mordv. So, apart from the view point of host association, these two genera

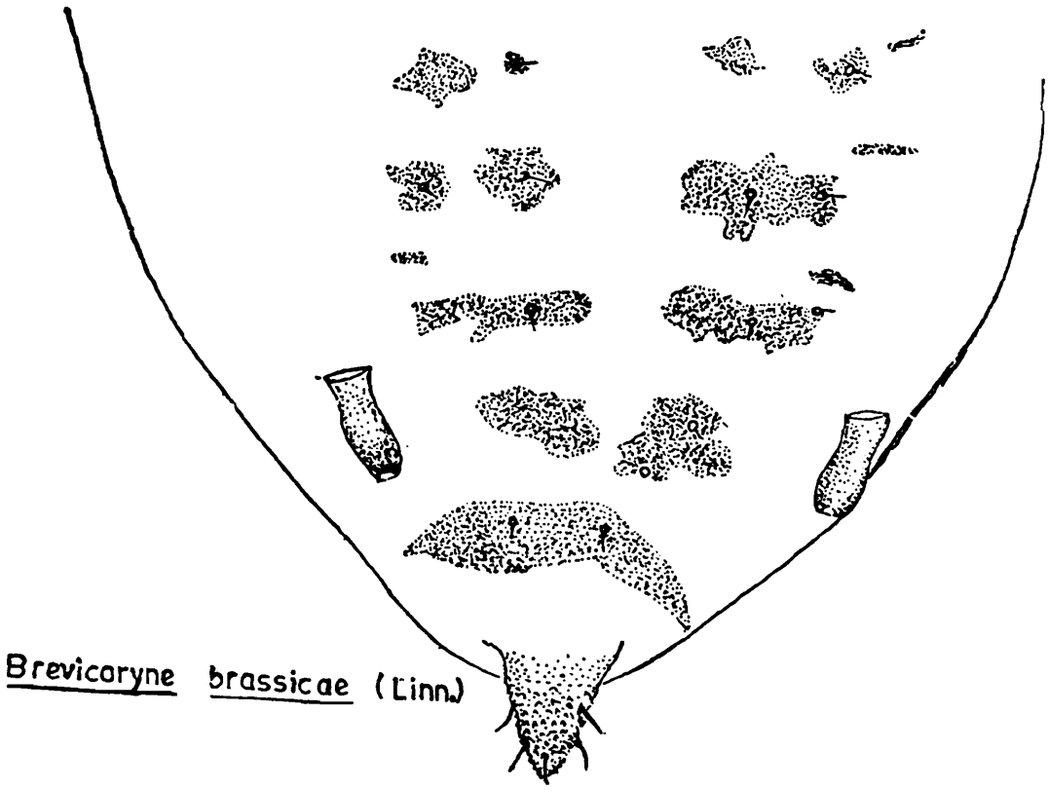

Fig. 1. *Brevicoryne brossicae* (Linn) ; posterior abdominal dorsum showing pigmentation, siphunculi and cauda.

also show close morphological resemblance excepting in the nature of siphunculi and cauda.

With regard to the nature of siphunculi, *Brevicoryne*, *Hyadaphis* and *Lipaphis* are very closaly related genera. But *Brevicoryne* differs from *Hyadaphis* in having triangular to elongated cauda and barrel-shaped to slightly clavate siphunculi (Fig. 1). In *Hyadaphis* cauda though elongated is with a median constriction and siphunculi distinctly clavate (Fig. 2A). Again, *Brevicoryne* differs from *Hyadaphis* in host association, i.e. the former infests cruciferous plants while the latter plants of Caprifoliaceae and Umbelliferae. Further, by the clavate nature of siphunculi, dorsal abdominal pattern, (Fig. 1) wax covered body in life and host-plant association with Cruciferae, *Brevicoryne* resembles closely with *Lipaphis* Mordvilko. But *Brevicoryne* can be easily separated from *Lipaphis* (Fig. 2B) by the length of siphunculi which is always shorter than cauda in *Brevicoryne*.

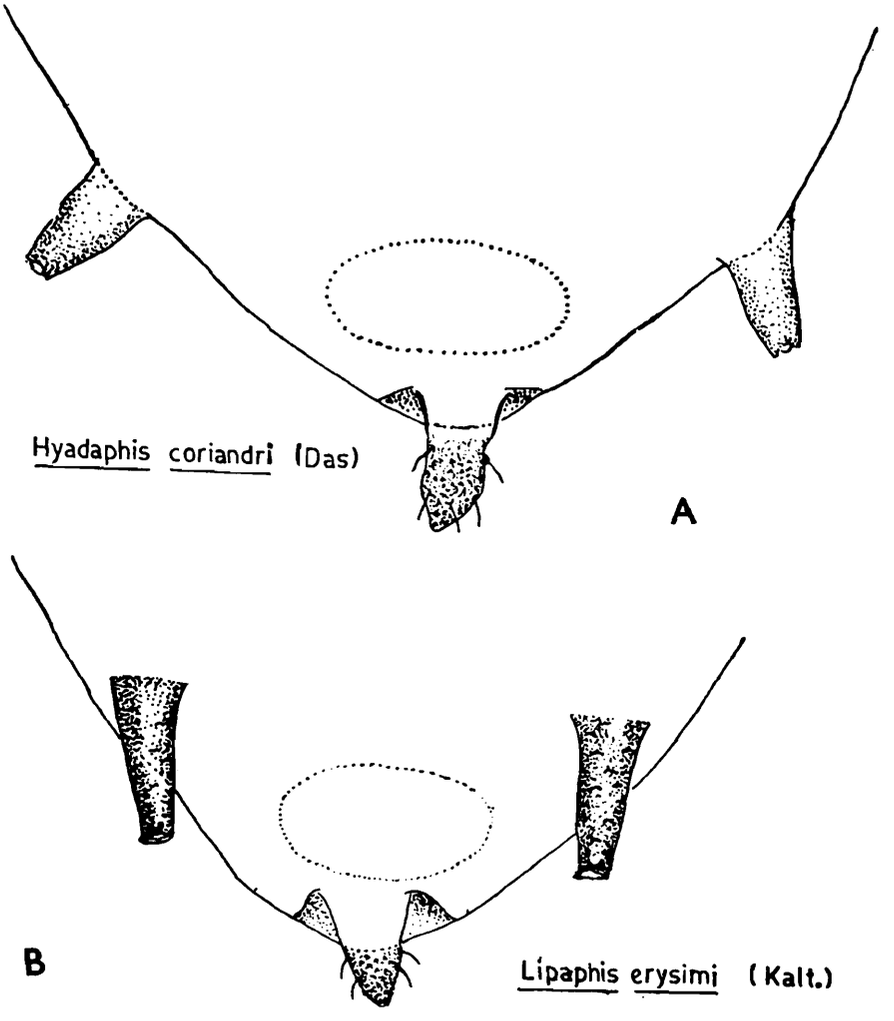

Fig. 2. A. *Hyadaphis coriandri* (Das) ; posterior abdominal dorsum showing siphunculi and cauda. B. *Lipaphis erysimi* (Kaltenbach) ; posterior abdominal dorsum showing siphunculi and cauda.

Though all the workers have given a separate generic status for *Brevicoryne*, Eastop (1966) states "*Hyadaphis* and *Brevicoryne* are difficult to separate from *Lipaphis* when the world fauna is considered" and possibly for this reason, he, under the genus *Brevicoryne* writes "the genus is closely related to *Lipaphis* and these two genera can at best be treated as subgenera of *Hyadaphis* Kirkaldy which is oldest of the three genera". Even with this comment, he writes in the same publication "Regarded as distinct here principally to preserve the well known name *B. brassicae*". It may be pointed out here that *Hyadaphis* infests the plants of Caprifoliaceae and Umbelliferae. So, from the view point of host plant association, it is difficult to reconsile Eastop's idea of considering *Brevicoryne* and *Lipaphis* as subgenera of *Hyadaphis*. Only transfer experiment in future can prove Eastop's contention. Morphologically also, *Brevicoryne* and *Hyadaphis* differ much too much in the shape of the cauda.

From the foregoing account, it is obvious that the generic status given to *Brevicoryne* can hardly be denied.

Key to the species of *Brevicoryne* van der Goot in India

Apterous viviparous female :

Siphunculi not typically barrel-shaped, but cylindrical to slightly swollen at the middle; cauda elongate, with 7-9 hairs ; abdominal dorsum with broad separated spinopleural and marginal sclerites ... *barbareae* Nevsky

Siphunculi typically barrel-shaped ; cauda triangular, with 5-7 hairs ; abdominal dorsum with pleural irregular wrinkled sclerites ... *brassicae* (L.)

Alate male :

Cauda elongate, with 7-9 hairs ; siphunculi cylindrical to slightly swollen at the middle ; antennal segment III with at most 46 secondary rhinaria, IV with 7-11, V with 5-11 and VI with 0-2 such rhinaria ... *barbareae* Nevsky

Cauda triangular, with 5-7 hairs ; siphunculi typically barrel-shaped ; antennal segment III with never less than 60 secondary rhinaria, IV with 15, V with 19 and VI without any such rhinaria ... *brassicae* (L.)

Brevicoryne barbareae Nevsky

Brevicoryne barbareae Nevsky, 1929. *Zool. Anz.*, 82 : 210.

Brevicoryne brassicae (L.) (misdet.) : Banerjee, Ghosh and Raychaudhuri, 1969, *Orient. Insects*, 3 (3) : 257.

Brevicoryne barbareae Nevsky : David and Hameed, 1975, *Orient. Insects*, 9 (2) : 216.

Material examined : 6 alate males, India : Uttar Pradesh : Kuti, on *Raphanus sativus*, 24. ix. 1968, coll. H. Banerjee ; 6 apterous viviparous females, 3 alate viviparous females, 2 nymphs and 4 alate males, India : U.P. : Sangtang, on *Brassica* sp., 19. ix. 1968, coll. H. Banerjee.

Alate male :

Body elongate, about 1.26-1.44 mm long with 0.45-0.57 mm as its maximum width near the middle of abdomen. Head dark brown, frons smooth ; cephalic hairs short, about 18 μ long. Antennæ 6-segmented, imbricated, dark brown except very base of segment III which is pale, about 0.85-0.95 x body ; flagellar hairs short with almost acuminate apices, longest hair on antennal segment III about 0.44 x basal diameter of segment III ; antennal segment III with 36-46 small, round secondary rhinaria distributed over its entire length, segment IV with 7-11, V with 5-11 similar rhinaria irregularly scattered on the segments, base of segment VI with 0-2 secondary

rhinaria ; p. t. about 4.8-6.4 x base of segment VI. Rostrum normal ; u. r. s. reaching midcoxæ, with 2-4 secondary hairs, about 0.8-0.9 x h. t. 2. Abdominal tergites with broad, separate dorsal and marginal sclerites, dorsal sclerites sometimes coalescing, dorsal hairs short, about 15 μ long, about 0.55 x basal diameter of antennal segment III, hairs on 8th tergite about 0.66 x the mentioned diameter. Siphunculi about 0.75-0.88 x cauda which is 1.3-1.5 x its basal width and with about 7 hairs. F. T. C. 3, 3, 3. Wing-venation normal. Other characters much like apterous viviparous female.

Measurements (in mm) : Length of body 1.26-1.44, width 0.45-0.57 ; antennæ 1.08-1.11 ; antennal segment III 0.36-0.41, IV 0.16-0.20, V 0.15-0.19, VI (0.08 + 0.41 to 0.08 + 0.51) ; ultimate rostral segment 0.09-0.11 ; second joint of hind tarsus 0.11-0.12 ; siphunculi 0.08-0.9 ; cauda 0.09-0.12.

Host-plants : *Barbarea vulgaris, Brassica* sp., *Nasturtium* sp. and *Raphanus sativus* (Cruciferæ).

Distribution ; India : Himachal Pradesh, Uttar Pradesh and Turkestan.

Remark : David and Hemeed (1975) have reported the species from India. Males were hitherto unknown.

Brevicoryne brassicae (Linnneus)

Aphis brassicae Linnaeus, 1758, *Syst. Nat.*. 10 : 452.

Brevicoryne brassicae : Das, 1918, *Mem. Indian Mus.*, 6(4) ; 187-188.

Brevicoryne brassicae (Linn.) : David, 1958, *J. Bombay nat. Hist. Soc.*, 55(1) : 115.

Brevicoryne brassicae (Linn.) : Ullah, 1940. *Indian J. Ent.*, 2(1) : 13-25.

Brevicoryne brassicae(Linn.) : Gupta and Joshi, 1959, *Proc.* 46th *Indian Sci. Cong.* Pt. 3 : 503.

Brevicoryne brassicae (Linn.) : Ghosh, A. K., Chakrabarti, Chowdhuri and Raychaudhuri, 1969. *Orient. Insects*, 3(4) : 330.

Brevicoryne brassicae (Linn.) : Ghosh, A. K. 1974. *Indian Agric.*, 18(2) : 97.

Material examined : Many apterous and alate viviparous females and nymphs ; one alate male, India : Himachal Pradesh : Kusumuti on *Brassica oleracea*, 10.i.1969, coll.S. Chakrabarti, 5 apteræ and a few nymphs ; Garhwal Himalaya, Uttar Kashi, Bhujbus, on *Brassica* sp., 10. x. 1975, coll. H. Ghosh.

Host-plants : *Beta vulgaris* (Chenopodiaceæ), *Brassica campestris, Brassica juneca, Brassica napus, Brassica oleraceae, Brassica rapa, Capsella bursapastoris, Cardamine hirsuta, Iberis* sp., *Raphanus sativus* (Cruciferæ) ; Unidentified plants of Labiatæ ; unidentified plants of Moraceæ and unidentified plants of Solanaceæ.

Distribution : India : Himachal Pradesh, Uttar Pradesh, Punjab, West Bengal, South India and virtually cosmopolitan.

DISCUSSION

Of the two Indian species of the genus *Brevicoryne* v. d. Goot, *B. brassicae* (Linn.) is more sporadic on cruciferous plants than *B. barbareae* Nevsky which is a palaearctic species and so far reported only once from each of *Nasturtium* sp. and *Barbarea vulgaris* (Cruciferæ) from *H*imachal Pradesh and *Raphanus sativus* (Cruciferæ) from Kuti valley (Uttar Pradesh).

The cruciferous crops are widely cultivated in different parts of India. The plants are

visited by a number of aphid species including *Lipaphis erysimi* Kaltenbach, *Brevicoryne brassicae* Linnaeus and *Brevicoryne barbareae* Nevsky.

Of the 3 above named aphid species, *B. barbareae* is so far restricted to areas lying at an altitude of *c* 12,282′ or above it in the Central and northwest Himalaya. But *L. erysimi* is reported from different parts of India while *B. brassicae* is known from northeastern, central and northwestern states of India. Only once it has been reported from the Nilgiri Hills in South India (David and Ghorpade, 1974). Interestingly enough, *B. brassicae* could never be found in places having altitude less than *c* 3,000′ and on the contrary, *L. erysimi* does never occur in places lying in altitude above *c* 8,000′

The above facts lead to the conclusion that the *Brevicoryne* species show preference for more cool climate while *L. erysimi* prefer less cool climate to thrive. Moreover, in view of limitations in vertical distribution the chances of competition for food is minimised. Here, *B. brassicae* perhaps avoids competition and overcrowding on the same host. As a result, *B. brassicae* possibly makes its abode at higher elevations.

Further, according to Gause's rule, no two or more species can build up peak population simultaneously on the same ecological niche where they occur.

Perhaps due to the facts stated above *B. brassicae* is found in the higher altitudes under Indian conditions where there is a chance of overlapping of *L. erysimi* and *B. brassicae*. Similar reasons may be put forward to account for occurrence of *B. barbareae* in very high altitudinal areas.

Sexuales of aphids which play significant role in the biology of aphid occur usually at the higher altitudes where cold climate prevails and day length is short. David (1958) and Ghosh *et al.* (1969) recorded male and female of *B. brassicae* occurring on Cruciferae at an elevation of above *c* 5,000′ in the Western Himalaya. This suggests that *B. brassicae* reproduces holocyclically at the higher elevations. This observation also accounts for the presence of this species at the higher elevations.

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