Fauna of India

HOMOPTERA : APHIDOIDEA

Subfamily APHIDINAE
Tribe Aphidini

Part–7 (I)

A. K. GHOSH

L. K. GHOSH

Born in 1938 at Rourkella, Orissa, India, Dr. A.K. Ghosh (Ashis Kumar Ghosh) had his education at the University of Calcutta and University of Wisconsin, Madison, USA. He started his research on Indian Aphidoidea at the University of Calcutta in 1958 and worked extensively in Northeast India till he left for U.S.A. in 1965 as a Fulbright Scholar to work on long range dispersal of aphid vector of plant viruses at the University of Wisconsin. On his return he led a team of researchers at the University of Calcutta from 1968 to 1972 when he joined the Zoological Survey of Inida. He has so far more than 200 research publications to his credit including 'Aphids of Economic Importance', (1974), 'Fauna of India : Aphidoidea' part 1, General Introduction and subfamily Chaitophorinae (1980), part 2, subfamily Lachninae (1982), part 3, subfamily Pemphiginae (1984), part 4, subfamilies Phloemyzinae, Anoeciinae and Hormaphidinae (1988), part 5, subfamily Drepanosiphina (1990), 'Oriental Aphidoidea' with B.K. Agarwala (1985), 'Aphids Parasitoids of India and adjacent countries' with P. Stary, Czechoslovakia (1983) besides contributions to the multiauthored volume on 'Aphids of Northeast India and Bhutan' edited by D.N. Roychaudhuri (1980). He retired as Director from Zoological Survey of India.

FAUNA OF INDIA
AND
THE ADJACENT COUNTRIES

Homoptera : Aphidoidea

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Subfamily **Aphidinae**
Tribe **Aphidini**

A. K. Ghosh
L. K. Ghosh
Zoological Survey of India, M-Block, New Alipore, Kolkata–700 053

Edited by the Director, Zoological Survey of India, Kolkata

Zoological Survey of India
Kolkata

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FOREWORD

Aphids constitute the largest group of insect-vectors of plant viruses and have worldwide importance as the most important group of crop pests. The Fauna of India and the adjacent countries, in this group, forms about 16% of the world fauna.

The "Fauna of India and the Adjacent countries" on Aphidoidea has been published in six parts (part I–Chaitophorinae, II–Lachninae, III–Pemphiginae, IV–Phloemyzinae, Anoeciinae and Hormaphidinae, V–Drepanosiptinae and VI–Greenideinae). This is the last part-7(1)–Tribe Aphidini of subfamily Aphidinae. In this part, a total of fiftyone species/subspecies in ten genera have been dealt. Besides taxonomic accounts of the species, information on host plant association, natural enemies of aphids, association with ants, distribution, biology/Lifecycle etc. are included in the present contribution.

The work is expected to be of use to the aphidologists in the subcontinental region and also to the specialists engaged in studies of insect-plant co-evolution, phylogeny and distribution of phylophagous group of insects.

J.R.B. Alfred
Director

AUTHORS' PREFACE

The present volume forms the 7th part (1) (Aphidinae : Aphidini) of Aphidoidea. The Tribe Aphidini is one of the little known tribes of Aphidoidea, largely restricted to south and southeast Asia. In this volume a total of ten genera and fifty one species and subspecies have been dealt with from this region. Information on biology for many of the species remains far from being complete and with a view to fill up this lacuna results of investigations from other regions have often been incorporated.

The material for the present work was obtained from several sources, both institutional and personal collections, besides from the collections of Zoological Survey of India. Our most sincere thanks are due to Dr. G. Remaudiere, Museum National D' Histoire Naturelle, Paris; Dr. R. L. Blackman, the Natural History Museum, London; Dr. V F. Eastop and the authorities of British Museum (National History), London; Dr. S. Chakrabarti, University of Kalyani, Kalyani, India; Dr. D. Raychaudhuri, University of Calcutta, Kolkata; Dr. T. K. Singh, Manipur University, Manipur; Dr. A. N. Basu, I.A.R.I., New Delhi; Dr. Rajendra Singh, Gorakhpur University, U.P.; Dr. B. K. Agarwala, Tripura University, Tripura, India; Dr. (Mrs.) A. S. Tamrakar, Tribhuban University, Nepal; Dr. T. P. Rajendran ADG (PP), I.C.A.R., New Delhi for their kind material help and numerous courtesies.

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A. K. Ghosh*
L. K. Ghosh**

* Centre for Environment and Development
Kolkata–700 068

** Zoological Survey of India
Kolkata–700 053

ABBREVIATIONS

The following abbreviations have been used in the text :

A	:	Anal vein in forewing
ANC	:	A.N. Chowdhury
Aptera/e	:	Apterous viviparous female/s
Alata/e	:	Alate viviparous female/s
a.s.	:	antennal segment
b.d.III	:	basal diameter of antennal segment III.
Coll.	:	Collector
C.U.	:	Calcutta University
CU	:	Cubitus vein in forewing
F.T.C.	:	First tarsal chaetotaxy
H.P.	:	Himachal Pradesh
h.t.2	:	2nd segment of hind tarsus
K.D.V.	:	K. D. Verma
l.a.t	:	lateral abdominal tubercle
L.K.G.	:	L.K. Ghosh
M	:	Medial vein of forewing
mm.	:	millimetre
M.R.G.	:	M.R. Ghosh
Ovipara/e	:	Apterous oviparous female/s
p.t.	:	processus terminalis
P.K.M.	:	P.K. Mondal
Sc	:	Subcostal vein in forewing
S.C.	:	S. Chakrabarti
S.P.M.	:	S.P. Maity
U.r.s.	:	Ultimate rostral segment
U.P.	:	Uttar Pradesh
Y.P.T.	:	Yellow Pan Trap
Z.S.I.	:	Zoological Survey of India.
X	:	times as long as
1,2,3.....8	:	abdominal segments 1,2,3.....8
I, II, III.....VI	:	Antennal segments I, II, III, ...VI

CONTENTS

INTRODUCTION

The Aphidini constitute a large group of aphids, being represented by more than 750 described species in the world. This group of aphid is considered to be of rather recent origin and it appears that explosive evolution is in progress in this group; these insects are highly divergent in both morphology and biology. The members of this tribe Aphidini live on various kinds of dicotyledonous and of monocotyledonous plants growing in the diverse ecological conditions in India.

From the economic viewpoint the members of this tribe are of much importance because some are pests of major crops. They not only interfere with the growth of the host plants by sucking cell sap but also transmit many a plant viral diseases. As for example, *Aphis spiraecola* Patch acts as a vector of citrus tristeza virus; Bean common mosaic, Beet citrus tristeza virus, Beet mosaic, Peeper mosaic etc.

The taxonomic studies on the Aphidini of India have been made mainly by Raychaudhuri, D.N. and his school, Chakrabarti and his school, David and his school, Ghosh, A.K., Ghosh, L.K., Agarwala, B.K. etc. Since about four decades, the authors made serious taxonomic studies on aphids. The main purpose of the present work is to offer a comprehensive account. In this work, detailed taxonomic studies of altogether 51 species belonging to 10 genera have been made. It includes present taxonomic position, synonymmy, keys, descriptions of all available morphs, host plant association, biology, taxonomic affinity with related species, economic importance including natural enemy complex, distribution etc.

Subfamily APHIDINAE

Body usually with lateral abdominal tubercles, sometimes with processi. Head usually without median suture; head, pronotum in apterae mutually free. Eyes of all forms large and with ocular tubercles, eyes in apterae of some groups of three facets only; processus terminalis may be shorter or longer than the base of last antennal segment. Siphunculi elongate, cylindrical, clavate or cone-shaped or ring-like with or without hairs. Cauda of various shapes (elongate, triangular or tongue-shaped). Hairs on body and appendages very variable in length and shape, subanal plate never indented or bilobed; empodial hairs usually long, fine or conspicuous. First tarsal segment with 2-5 ventral hairs. On various plants, many are extremely polyphagous.

Key to the Tribes of the Subfamily APHIDINAE

1. Spiracles of abdominal segments 1 and 2 usually placed close together, if apart, then their mutual distance is never more than 3.0 x diameter of spiracular aperture; abdominal segments usually without lateral abdominal tubercles though these may be variably present on abdominal segments 2-5, if however, lateral abdominal tubercles present on abdominal segments 1 and 7, then these are not larger than those on abdominal segments 2-5; lateral frontal tubercles usually

pronounced; apterae sometimes with secondary rhinaria on antennal segment III; antennal hairs usually not with fine apices ..... **Macrosiphini**

– Spiracles of abdominal segments 1 and 2 placed far apart; abdominal segments 1 and 7 usually with lateral abdominal tubercles, other abdominal segments with or without these; lateral frontal tubercles not or hardly developed; antennal hairs usually fine. 2

2. Antennae and body densely pilose ; apterae sometimes with secondary rhinaria; usually on Salicaceae. ..... **Pterocommatini**

– Antennae and body never densely pilose; apterae usually without secondary rhinaria. Not known on Salicaceae. ..... **Aphidini**

Tribe **Aphidini**
(Figs. 1-6)

Takahashi (1931) used the character of the lateral frontal tubercles for distinguishing the two sub tribes *viz.,* Aphidina and Rhopalosiphina. But Bodenheimer and Swirski (1957) and Eastop (1958-1966) used the relative position of the lateral abdominal tubercle on spiracle of the abdominal segment 7 for separating them. Remaudiere and Remaudiere (1997) who considered two subtribes, Aphidina and Rhopalosiphina under Aphidini have been followed here.

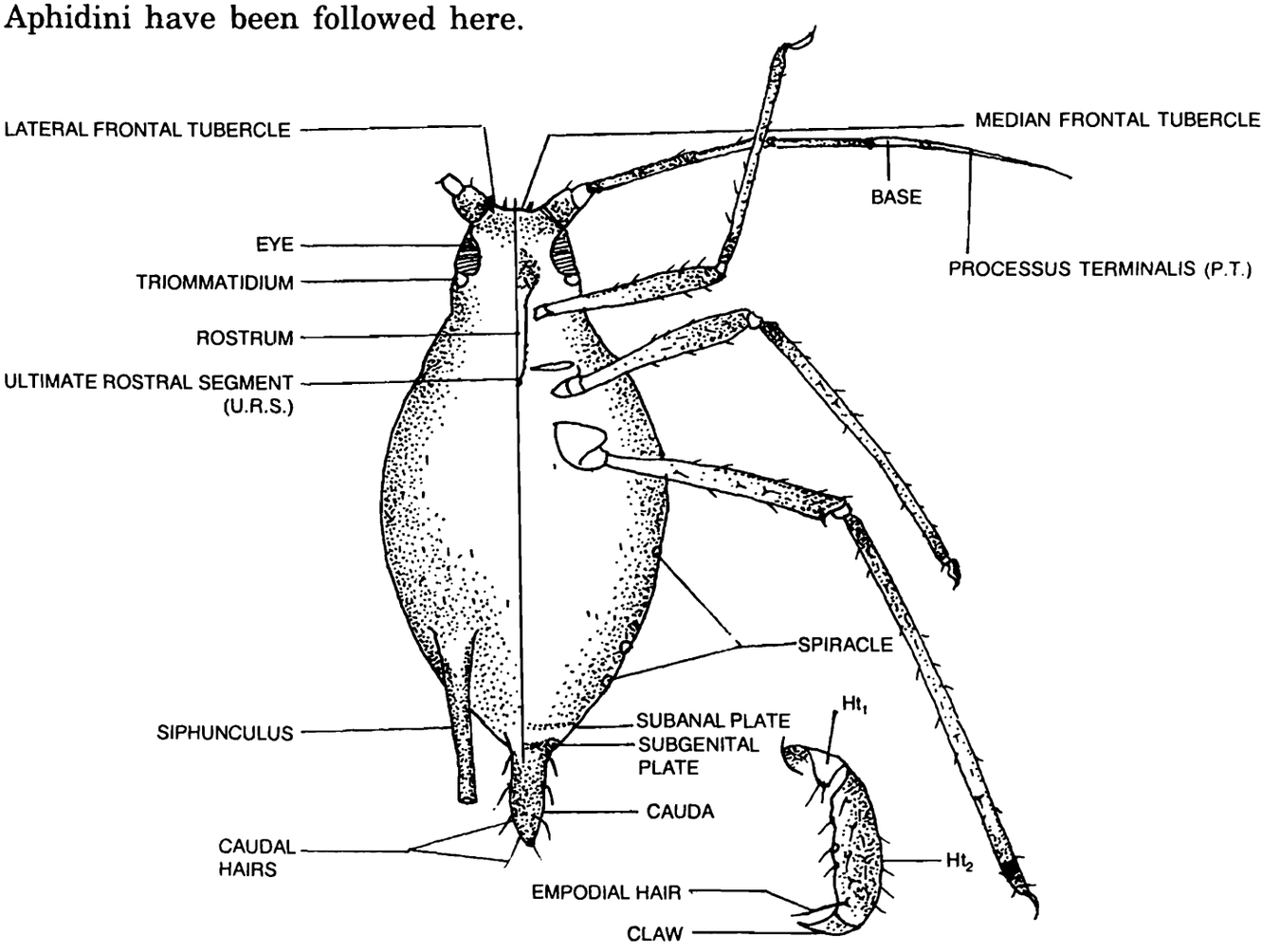


Fig. 1. External morphology of a Typical Aphid, Apterous viviparous female.

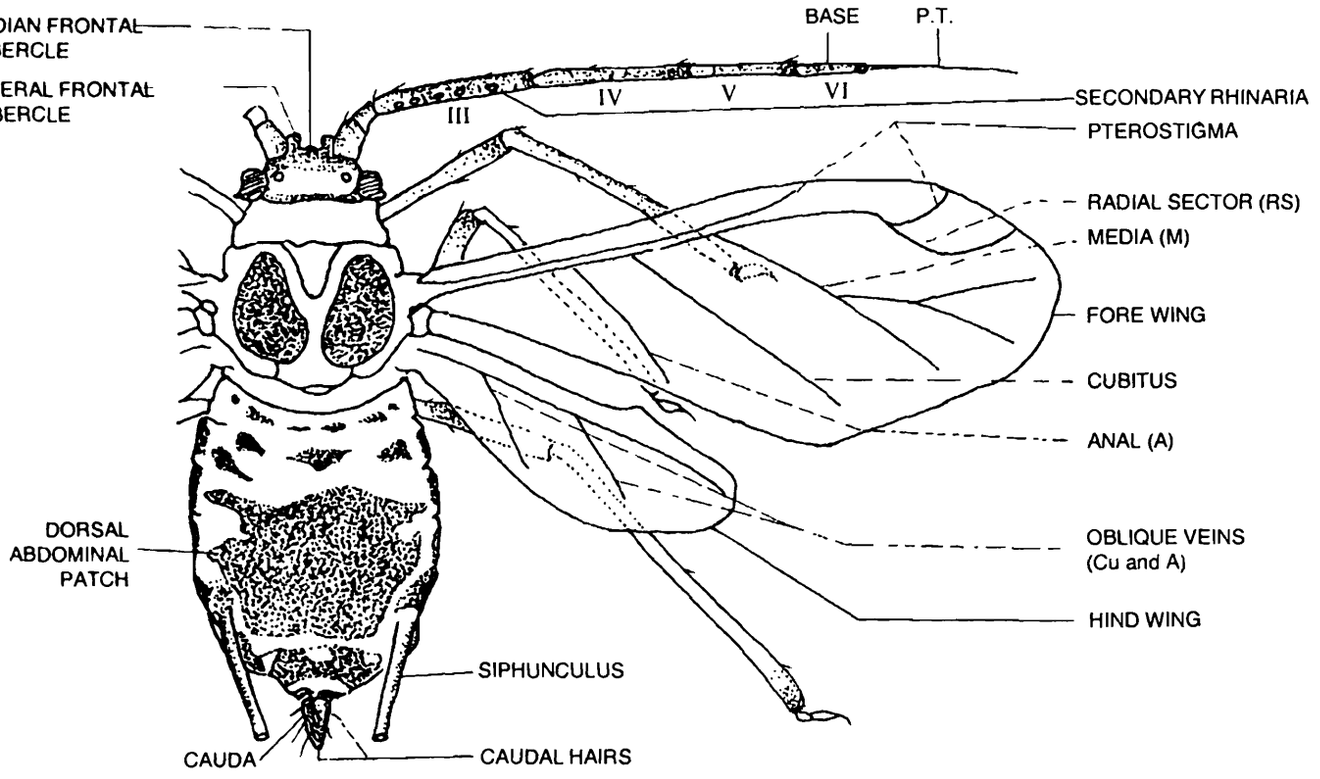


Fig. 2. A typical Alate viviparous female

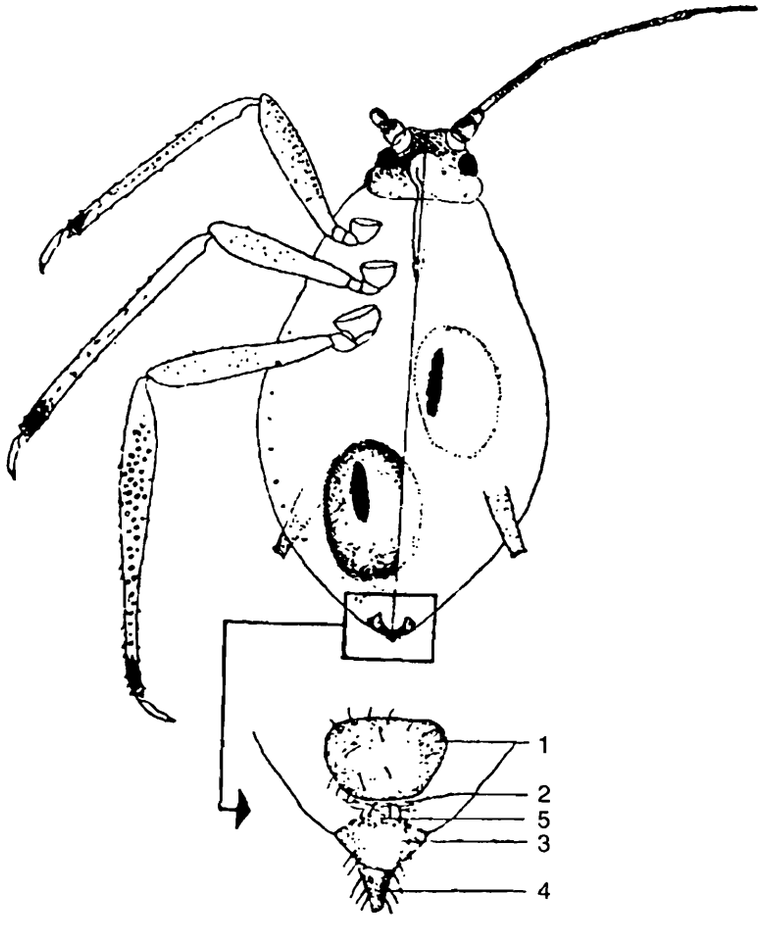


Fig. 3. A Typical Apterous oviparous female : 1, Genital or subgenital plate; 2, Vulva or genital pore; 3, Anal plate; 4, Cauda; 5, Rudimentary gonapophyses.

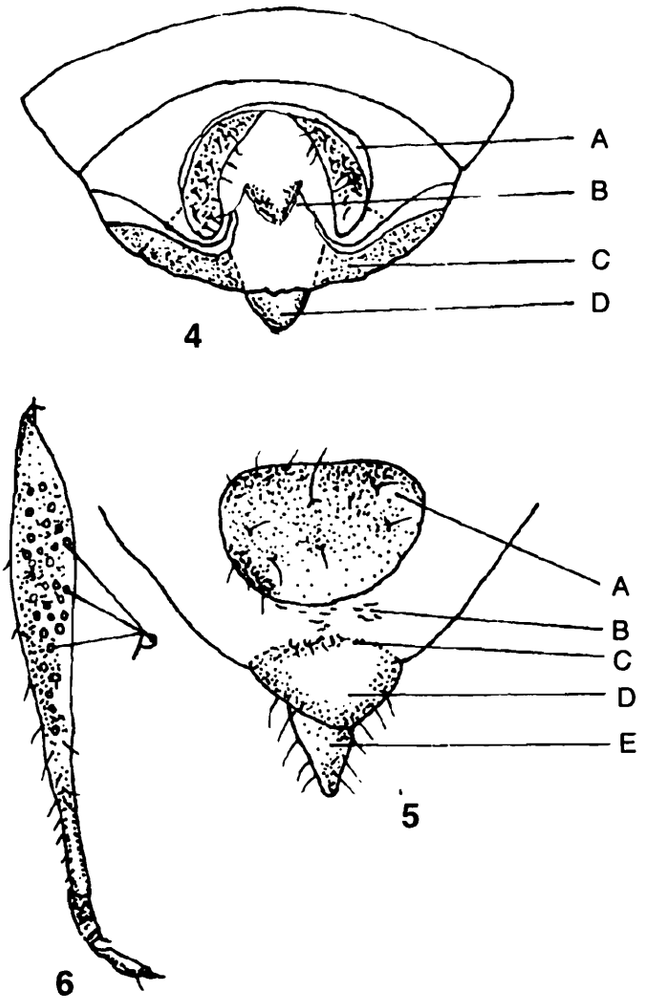


Fig. 4-6. 4. Typical male appendages of *Aphis* Linn. : A, Opercula; B, Penis; C, Anal plate; D, Cauda; 5. Typical female genitalia of apterous oviparous female of *Aphis* Linn. : A, Genital or Subgenital plate; B, Genital pore; C, Rudimentary gonapophyses; D, Anal plate; E, Cauda; 6. Hind tibia showing pseudosensoria in apterous oviparous female of *Aphis* Linn. : P, Pseudosensaria.

Tribe **Aphidini**

Key to the Subtribes

Lateral tubercles on abdominal segments 1 and 7 posterodorsal to spiracles of those segments; frons with a "rhopalosiphine" type of small projection just inner to the anterior sockets ..... **Rhopalosiphina**

– Lateral tubercles on abdominal segments 1 and 7 postero ventral to the spiracles of those segments; frons normal and without any projection as above .... **Aphidina**

Subtribe **Aphidina**

Key to the genera

1. Hind tibiae with a series of peg-like projections along with normal hairs (Fig. 361);

venter of abdominal segments 5 and 6 with dense spinules arranged in rows ..... ***Toxoptera*** Koch

– Hind tibiae with normal hairs only, without any peg-like projection; venter of abdominal segments 5 and 6 without such spinules. 2

2. Siphunculi very short, wider than long; cauda usually oval (Fig. 254) .... ***Cryptosiphnm*** Buckton

– Siphunculi rather long; cauda usually elongated 3

3. F.T.C. 2 : 2 : 2; abdominal tergite 7 without lateral tubercle .... ***Casimira*** Eastop

– F.T.C. 3, 3, 3 or 3, 3, 2; abdominal tergite 7 usually with lateral tubercle 4

4. Processus terminalis usually distinctly longer (Fig. 96) than base of a.s.vi; apterae usually without secondary rhinaria on a.s.III ..... ***Aphis*** Linn.

– Processus terminalis usually shorter (Fig. 243) than base of a.s.vi; apterae with secondary rhinaria on a.s.III ..... ***Brachyunguis*** Das

Subtribe **Rhopalosiphina**

Key to the genera

1. Abdominal dorsum of both apterae and alatae with spinules, those in apterae form distinct polygonal pattern, and each polygon encloses a few spinules; alatae with or without dorsal abdominal pigmentation ..... ***Rhopalosiphum*** Koch

– Abdominal dorsum in apterae and alatae usually lacking spinules which, if present, never form polygons as above 24

2. Alate viviparae with M in forewing once-branched, hindwing with 2 oblique veins; siphunculi and cauda either both dark or both pale, former without well developed flange ..... ***Schizaphis*** Börner

– Alate viviparae with M in forewing twice-branched, hind wing with one oblique vein on both 3

3. Hindwing with one oblique vein; cauda pale, with constriction and with 4 medial hairs ..... ***Hysteroneura*** Davis

– Hind wing with both oblique veins 4

4. Secondary rhinaria in alatae protuberant; head with typical small inwardly.... directed projection from inner apex of ill-developed lateral frontal tubercle .... ***Melanaphis*** v.d. Goot

– Secondary rhinaria in alatae not protuberant; head without any projection as above; siphunculi short, at most upto 0.06 times as long as body and without any flange apically ..... ***Hyalopterus*** Koch

SYSTEMATIC LIST

Subfamily II. APHIDINAE

Tribe **Aphidini**

Subtribe **Aphidina**

Genus I ***Aphis*** Linnaeus, 1758

1. *Aphis achyranthi* Theobold, 1929
2. *A. affinis* del Guercio, 1911
3. *A. clematidis simlaensis* Kumar and Burkhardt, 1970
4. *A. craccivora* Koch, 1854
5. *A. eugeniae* v.d. Goot, 1917
6. *A. euphorbiae* Kaltenbach, 1843
7. *A. fabe* scopoli complex
8. *A. farinosa* Gmelin, 1970
9. *A. glycines* Matsumura, 1917
10. *A. gossypii* Glover, 1877
11. *A. kurosawai* Takahashi, 1921
12. *A. longisetosa* Basu, (1969) 1970
13. *A. nasturtii* Kaltenbach, 1843
14. *A. nerii* B.d.F., 1841
15. *A. paraverbasci* Chakrabarti, 1976
16. *A. pollinosa* Walker, 1849
17. *A. polygonacea* Matsumura, 1917
18. *A. pomi* de Geer, 1773
19. *A. punicae* Passerini, 1863
20. *A. rajii* (Kumar E' Burkhardt, 1970)
21. *A. rhamnifila* David, Narayanan and Rajasingh, 1971
22. *A. rhoicola* Hille Ris Lambers, 1954
23. *A. rubifolii* (Thomas, 1879)
24. *A. rumicis* Linnaeus, 1758
25. *A. spiraecola* Patch, 1914
26. *A. verbasci* Schrank, 1801
27. *A. (Protaphis) carthami* (Das, 1918)

Genus 2. ***Brachyunguis*** B. Das, 1918

28. *Brachyunguis calotropicus* Menon and Pawar, 1958

Genus 3. ***Casimira*** Eastop, 1966

29. *Casimira bhutanensis* A. K. Ghosh, R. C. Basu and D. N. Raychaudhuri, 1971

Genus 4. ***Cryptosiphum*** Buckton, 1875

30. *Cryptosiphum artemisiae* Buckton, 1879

Genus 5. ***Toxoptera*** Koch, 1856

31. *Toxoptera aurantii* (Boyer de Fonscolombe, 1841)
32. *Toxoptera citricidus* (Kirkaldy, 1907)
33. *T odinae* (van der Goot, 1917)

APHIDINAE : APHIDINI : RHOPALOSIPHINA

Genus 6. ***Hyalopterus*** Koch, 1854

34. *Hyalopterus pruni* (Geoffroy, 1762)

Genus 7. ***Hysteroneura*** Davis, 1914

35. *Hysteroneura setariae* (Thomas)

Genus 8. ***Melanaphis*** van der Goot, 1917

36. *Melanaphis arundinariae* (Takahashi, 1937)
37. *M. bambusae* (Fullaway, 1910)
38. *M. donacis* (Passerini, 1862)
39. *M. meghalayensis meghalayensis* D. N. Raychaudhuri and C. Banerjee, 1974.
40. *M.meghalayensis bengalensis* D. N. Raychaudhuri and C. Banerjee, 1974
41. *Melanaphis pahanensis* (Takahashi, 1950)
42. *M. saccheri* (Zehntner, 1897)
43. *M. strobilanthi* Medda and Chakrabarti, 1992
44. *M. vandergooti* Raychaudhuri and Banerjee, 1974

Genus 9. ***Rhopalosiphum*** Koch, 1854

45. *Rhopalosiphum maidis* (Fitch, 1856)
46. *R. nymphaeae* (Linnaeus, 1761)
47. *R. padi* (Linnaeus, 1758)
48. *R. rufiabdominalis* (Sasaki, 1899)

Genus 10. ***Schizaphis*** Börner, 1931

49. *Schizaphis graminum* (Rondani 1847) (1852)
50. *Schizaphis hypersiphonata* Basu
51. *S. rotundiventris* (Signoret, 1860)

Genus 1. ***Aphis*** Linnaeus, 1758

1758. *Aphis* Linnaeus, *Syst. Nat.* (10th ed.), **1** : 451.

Body oval to elongate. Head smooth and usually without any lateral frontal tubercle; frons smooth, straight or slightly concave. Antennae usually 6-segmented (Fig. 96) sometimes 5-segmented (Fig. 161) in apterae, shorter to longer than body; flagellum imbricated, pale or pigmented; true apterae usually without secondary rhinaria, alatae with roundish secondary rhinaria on segment III, sometimes also on segments IV & V; flagellar hairs short and sparse, with acute to acuminate or blunt apices; p.t. shorter than or up to 4.3 times as long as base VI; primary rhinaria ciliated. Compound eyes with distinct or indistinct triommatidia. Rostrum sometimes reaching up to hind coxae ; u.r.s. normal in shape, sometimes heart-shaped, or stiletto-shaped (Fig. 147), shorter to slightly longer than ht_2 and usually bearing 2 to 4 secondary hairs, which may be upto 9 (Fig. 162) and shorter or longer than primary ones. Midthoracic furca sessile or consisting of two separate arms. Abdominal dorsum smooth or rugose and sometimes with usual aphidine polygonal reticulation, very rarely with dorsal sclerotic patch in apterae, and usually with scattered segmental sclerites in alatae. Spiracle normal. Post siphuncular sclerite rarely present; dorsal hairs often short with acuminate or blunt spines, sometimes being quite long with acute apices. Siphunculi subcylindrical or tapering, imbricated, dark, rarely smooth, pale and with only a small flange. Cauda usually elangate, pale or dark, shorter than siphunculi, with a basal constriction and with 4-20 hairs. Legs pale to dark, sometimes distal parts of femora darker and tibiae and tarsi always brown, with normal imbricatious; alatae offen with darker legs ; F T. C. 3, 3, 2 or 3, 3, 3. Wing venation normal.

Distribution : Cosmopolitan

Key to the species of the genus *Aphis* Linnaeus

Apterae viviparae female :

1. Processus terminalis a little shorter than or as long as base of antennal segment VI (Fig. 239) ; cauda somewhat triangular and with 14-16 hairs (Fig. 241) ; 8th abdominal tergite with 2 hairs being 2x b.d.III; u.r.s. 1.3-1.5xht2 ; greyish white or white in life ..... *carthami* (Das)

– Processus terminalis always longer than base of antennal segment VI; cauda may be variously shaped and bearing 4–20 hairs; other characters variable..... 2

2. Ultimate rostral segment stiletto-shaped (Figs. 117. 156. 187.) 3

– Ultimate rostral segment may be of various shapes but never stiletto-shaped 5

3. First tarsal chaetotaxy 3, 3, 3; p.t. less than 1.5 × base of antennal segment VI; u.r.s. 1.9-2.2× ht_2; longest hair on anterior tergites 1.50-3.0 × b.d III ; cauda dark brown, nearly triangular and with about 8 hairs; life colour not known .... *paraverbasci* Chakrabarti

– First tarsal chaetotaxy 3, 3, 2, ; p.t. more than 1.5× base of antennal segment VI 4

4. Ultimate rostral segment never more than 1.7× ht_2 ; dorsal abdominal hairs upto about 55 μ long, abdominal dorsum with polygonal reticulation, longest hair on anterior tergites 0.7-1.2 ×b.d. III ..... *kurosawai* Takahashi

– Ultimate rostral segment always more than 2 × ht_2 ; dorsal abdominal hairs much longer, upto about 105 μ long, longest hair on anterior abdominal tergites at least 1.5 × b.d. III; lateral abdominal tubercles absent on abdominal segment VIII; creamy white to light yellowish in life .....

..... *raji* Kumar and Burkhardt (=*leptorhyncha* David *et al.)*

5. First segment of hind tarsus usually with 3 hairs; dorsum of abdomen with a black patch (except in *nerii* which has polygonal reticulations only)..... 6

– First segment of hind tarsus always with 2 haris; dorsum of abdomen usually without such black patch but rather pale 7

6. Siphunculi usually shorter than cauda bearing 5-8 hairs; u.r.s. about 0.8-1.01× ht_2 ; p.t. 1.5-2.0 × base of antennal segment VI; longest hair on anterior tergites about 0.6-0.7 × b.d. III; siphunculi about 0.09-0.11 × body; dark brown in life ..... *euphorbiae* Kaltenbach

– Siphunculi longer than cauda bearing 10-12 hairs; u.r.s. about 1.2-1.4× ht_2 ; p.t. about 3.8-4.3× base of antennal segment VI ; siphunculi 0.20-0.23× body; yellow to dark yellow in life ..... *nerii* B.d.F

7. 8th abdominal tergite with 3-8 hairs 8

– 8th abdominal tergite with only 2 hairs 12

8. Dorsal hairs flagellate ; caudal hairs about 20; p.t. 1.3-1.6× base of antennal segment vi; u.r.s. as long as or a little longer than ht_2 ; siphunculi black, about 1.5× dark cauda; dorsal abdominal hairs half as long as b.d.III. .....
..... *rhoicola* Hille Ris Lambers

– Body hairs never flagellate but variable, very small to moderately long with acute to acuminate or bluntish to spatulate apices; caudal hairs never more than 18 9

9. Dorsal abdominal hairs shorter, those on anterior abdominal tergites about 0.5-0.7× b.d. III; siphunculi much longer, about 1.7-2.0× cauda bearing 14-18 hairs; abdomen pale ; p.t. about 2.8-3.1× base VI ; u.r.s. 1.1-1.4× ht_2; siphunculi 0.15-0.18× body; blackish in life ..... *fabae* complex

– Dorsal abdominal hairs longer, those on anterior abdominal tergites about 1.0-2.5× b.d. III. 10

10. Cauda dusky and with only 5 hairs; slphunculi pigmented on distal 0.3-0.4

portion (Fig. 39) and always more than 1.4× cauda (usually 2× cauda); pale yellow to brown in life ..... *clematidis simlaensis* Kumar and Burkhardt

– Cauda always dark and with more than 5 hairs, (may be up to 14); siphunculi always dark throughout 11

11. Cauda with 9-11 hairs; posterior abdominal dorsum always pale; 8th abdominal tergite with 4-6 hairs; post-siphuncular sclerite present; siphunculi about 1.1-1.3× cauda ..... *achyranthi* Theobald

– Cauda normally with more than 11 hairs; posterior abdominal dorsum pale but with a few honeycomb-like sclerotic areas ; 8th abdominal tergite usually with 4 hairs ; dorsal hairs on anterior tergites as long as to a little longer than b.d. III; siphunculi subequal to cauda ..... *rumicis* Linnaeus

12. Abdominal dorsum usually completely sclerotic (Fig 47) 13

– Abdominal dorsum pale and smooth 14

13. Posterior abdominal dorsum with a pale area around siphunculi and with distinct "aphidine" type of polygonal reticulation (Fig. 47). siphunculi longer (1.4-2.0 times) than black and somewhat pointed cauda bearing 5-7 hairs; secondary hairs on u.r.s. as long as to longer than primary hairs; shiny black in life .... *craccivora* Koch

14. Hairs on posterior abdominal tergites longer, never less than 3.0×b.d. III and may be up to 4.0× b.d.III; secondary hairs on u.r.s. as long as to longer than primary ones (Fig. 124) ; u.r.s. 1.30-1.50× ht_2; p.t. about 2.5-3.0× base VI; cauda with 7-9 hairs; brown to reddish brown in life ..... *longisetosa* A.N. Basu

– Hairs on posterior abdominal tergites shorter, about 0.5-1.8×b.d. III 15

15. Siphunculi pale, smooth dusky near apices (Fig. 85) 16

– Siphunculi brown to blackish, imbricated 17

16. Processus terminalis about 2.5-3.1× base of antennal segment VI; u.r.s. 1.2-1.4×ht_2 ; a.s. III subequal to siphunculi; cauda (Fig. 188) pale to blackish, about 0.6-1.1× siphunculi (Fig. 187) and bearing 6-10 hairs; siphunculi about 0.10-0.15×body; pale greenish in life ..... *punicae* Passerini

– Processus terminalis about 1.8× base of a.s. VI; u.r.s. shorter than or a little longer (at most 1.1 times) than ht_2; a.s. III much shorter (about 0.5×) than siphunculi; cauda dark, (Fig. 86) about 0.4× flangeless siphunculi and bearing about 14 hairs; siphunculi 0.25-0.33×body; green, sometimes reddish yellow in life ..... *farinosa* Gmelin

17. Longest hair on hind femora as long as or longer than its maximum width (Fig. 30); abdominal tergite 7 with 4 hairs being 0.85-1.35× b.d. III; p.t. subequal to a.s. III and about 2.0-2.4×base VI; u.r.s. 1.0-1.1×ht_2 ; siphunculi 0.9-1.8× blackish

cauda bearing 8-15 hairs (Fig. 28) ; pale-brown to brown in life ..... *spiraecola* Patch

– Longest hair on hind femora appreciably shorter than its maximum width 18

18. Second tarsal segment with only primary hairs 19

– Second tarsal segment with both primary and secondary hairs 21

19. Hairs on anterior abdominal tergites about 2×b.d. III ; abdominal dorsum with polygonal reticulations ..... *rhamnifila* David *et al.*

– Hairs on anterior abdominal tergites at most as long as b.d.III. abdominal dorsum apparently without such polygonal reticulations 20

20. Cauda usually with 5 hairs; hairs on anterior abdominal tergites about as long as b.d. III; p.t. 1.8-2.4×base VI; siphunculi 1.1-1.5×cauda; dusky to brownish .. .. *nasturtii* Kaltenbach

– Cauda always with more than 5; hairs on anterior abdominal tergites about 0.5× b.d. III; p.t. always more than 2.5× base VI; siphunculi more than 1.5× cauda; u.r.s. as long as or a little longer than ht_2 ; cauda dark ..... *eugeniae* v.d.Goot

21. Cauda dark brown to black, rarely pale (small in apterae of *gossypii)* ; secondary hairs on u.r.s. never more than 4 22

– Cauda normally pale to dusky but never dark; secondary hairs on u.r.s. variable (2-9) 27

22. Cauda with 5-8 hairs 23

– Cauda always with more than 8 (10-16) hairs, tongue-shaped to triangular (Fig. 233); dorsal abdominal hairs nearly as long as b.d. III; u.r.s. about 1.7-2.0 x ht_2; siphunculi much longer (2.3-2.8 x) than cauda ; dorsum pale, smooth but occasionally with 2-3 scattered sclerotic areas (Fig. 360); bright yellowish in life ..... *verbasci* Schrank

23. Siphunculi shorter than to almost as long as cauda ; p.t. at least 3× base of a.s. VI ..... *rubifolli* (Thomas)

– Siphunculi always longer, even upto 2×cauda; p.t. usually less than 3 x base of a.s. VI 24

24. Hairs on 8th tergite much longer (at least 2× b.d. III); dorsal hairs much longer (1.5-1.8× b.d. III) 2 ..... *polygonacea* Matsumura

– Hairs on 8th tergite shorter, hardly as long as b.d. III; dorsal hairs much shorter (0.5-0.8×b.d. III) 25

25. Siphunculi strongly tapering, about 2× cauda; cauda with 7-20 (usually 8) hairs; u.r.s. somewhat elongated, about 1.5× ht_2 ; green in life ..... *pomi* de Geer

– Siphunculi comparatively shorter and relatively thicker but not as above; cauda bears fewer (5-7) hairs 26

26. Ultimate rostral segment somewhat pointed (Fig. 18), 1.4-1.5×ht_2 ; siphunculi longer, 2.0-2.2× cauda bearing 5 hairs ..... *affinis* del Guercio

– Ultimate rostral segment normal, 1.0-1.3 × ht2; siphunculi shorter, 1.2-1.8× cauda bearing 4-7 hairs; colour much variable .....*gossypii* Glover

27. Antennae always 6-segmented; cauda with fewer (usually 7) hairs; secondary hairs on u.r.s. usually 2; hairs on posterior abdominal tergites at most as long as b.d. III; colour in life yellowish ..... *glycines* Matsumura.

– Antennae usually 5-segmented; cauda with more hairs (normally 12) (Fig. 164); secondary hairs on u.r.s. variable, may be upto 9; hairs on posterior abdominal tergites long, about 1.6 × b.d III ; colour in life greenish..... *pollinosa*Walker

Alate viviparous female :

1. Ultimate rostral segment stiletto-shaped 2

– Ultimate rostral segment not stiletto-shaped, may be of various shapes 4

2. Processus terminalis 1.3×base VI ; cauda bears 6 hairs; u.r.s. 2.3 × ht_2..... ..... *paraverbasci* Chakrabarti

– Processus terminals 1.5-2.4× base VI; cauda bears 8-14 hairs ; u.r.s. 1.5-2.0× ht_2 3

3. Wings densely scaly; secondary rhinaria distributed : a.s.III 3-7; IV 0, 0; V 0, 0; siphunculi shorter, 1.2-1.3×cauda ; cauda thumb-shaped (Fig. 118); u.r.s. 1.5×ht_2 ..... *kurosawai* Takahashi

– Wings not as above ; secondary rhinaria distributed : a.s. III 19-28, IV 3-9, V 0, 0; siphunculi longer, 1.8-2.0×cauda; cauda rather elongate (Fig. 233); u.r.s.2× ht_2 ..... *verbasci* schrank

4. First tarsal chaetotaxy 3, 3, 3; u.r.s. 1.2-1.5× ht2 ; dorsum of abdomen pale with well developed post siphuncular sclerites ; longest hair on anterior tergites 1.0-1.4 × b.d.III; siphunculi about 0.18-0.20× body and 1.7-2.0× cauda bearing 10-11 hairs; secondary rhinaria distributed : III 9-10, IV 0-2, V 0, 0 ..... *nerii* B.d.F

– First tarsal chaetotaxy 3, 3, 2 5

5. Eighth abdominal tergite with 3-8 hairs 6

– Eighth abdominal tergite with only 2 haris 7

6. Siphunculi longer, 0.13-0.18×body and 1.3-2.0× cauda; abdominal dorsum dark, with segmentally arranged transverse black bands, marginal and post siphuncular sclerites distinct, very often ante-siphuncular sclerites fuse together to encircle

the base of siphunculi (Fig. 344); secondary rhinaria distributed : a.s. III 8-20, IV 0-8, V 0, 0; caudal hairs many (12-18) ..... *fabae* complex

– Siphunculi shorter, about 0.09× body and 1.2× cauda; abdominal dorsum pale brown, with segmental sclerotic patches but not as above; secondary rhinaria distributed : a.s. III 8-9, IV 0, 0, V 0, 0; caudal hairs rather less (about 12) ... . *rumicis* Linnaeus

7. Femoral hairs long and fine ; longest hair on fore femora as long as or longer than diameter of the segment at its base; secondary rhinaria distributed a s. : III 4-10, IV 0-4, V 0, 0 ; p.t. 2.0-2.7× base VI ; u.r.s. 1.0-1.1× ht_2; dorsum of abdomen pale, longest hair on abdominal dorsum 0.8-1.0× b.d. III; siphunculi 0.11-0.12×body and 1.1-1.4×cauda bearing 7-14 hairs ..... *spiraecola* Patch

– Femoral hairs short; longest hair on the fore femora distinctly shorter than diameter of the segment at its base; secondary rhinaria distributed : a s. III 24-28, IV 0-9, V 0, 0 8

8. Antennal hairs long (2.5-4.0× b.d. III) ; post siphuncular sclerite very faint or indistinct; wing veins stout and slightly bordered brown; A in forewing with a brownish blotch at base; p.t. 2.7-3.3× base VI; u.r.s. 1.1-1.4×ht_2; abdominal dorsum pale, with scattered pale brown sclerites; siphunculi pale, about as long as cauda bearing 11 hairs; secondary rhinaria distributed : a.s. III 4-8, IV 0-1, V 0, 0 .. .. *longisetosa* A.N. Basu

– Antennal hairs much shorter (0.3-1.6× b.d. III); post-siphuncular sclerite distinct 9

9. Longest hair on a.s. III less than half (0.40-0.45)× b.d. III; cauda dark; secondary rhinaria distributed : a.s. III 4-8, IV 0-1, V 0, 0; u.r.s. 0.80-0.90× ht_2; siphunculi 0.10-0.15× body and about 1.5× cauda bearing 7 hairs ..... *craccivora* Koch

– Longest hair on a.s. III always more than half as long as b.d. III; cauda pale to dusky 10

10. Second tarsal segment only with primary hairs; p.t. about 2.0× base of segment VI; abdominal dorsum pale, with scattered brown sclerites; longest hair on anterior abdominal tergites as long as b.d. III; siphunculi 0.1× body and 1.4-1.7× cauda which is pointed and bears 4-6 hairs; secondary rhnaria distributed : a.s.III 5-9, IV 0-1 V 0, 0 ..... *nasturtii* Kalt

– Second tarsal segment with both primary and secondary hairs ; p.t. always more than 2.0 (2.5-3.7) × base of segment VI 11

11. Siphunculi less than 1.5 (usually 1.4) × cauda; cauda pale, with 7-9 hairs; secondary rhinaria distributed : a.s. III 6-7, IV 0, 0, V 0, 0 ..... *glycines* Mats

– Siphunculi more than 1.5× cauda (1.5-1.9 times); cauda dusky, rounded apically, with 4-6 (normally 5-6) hairs; abdominal dorsum pale with scattered segmental

sclerites, post-siphuncular sclerites present; siphunculi 0.10-0.13× body and 1.5-1.9× cauda with 4-7 hairs; secondary rhinaria distributed : a.s. III 5-7, IV 0, 0, V 0, 0 ..... *gossypii* Glover

Key to the species of sexuales

Apterous oviparous females

1. Presence of more than 2 hairs on 8th abdominal tergite 2

– Usually 2 hairs present on 8th abdominal tergite 4

2. First tarsal chaetotaxy 3 : 3 : 3; cauda with 10-12 hairs; longest hair on anterior abdominal tergites 3.0-4.0 × b.d. III ..... *paraverbasci* Chakrabarti

– First tarsal chaetotaxy 3 : 3 : 2; cauda with only 5-8 hairs; longest hair on anterior abdominal tergites about as long as b.d. III 3

3. Siphunculi 2× cauda; pseudosensoria distributed on basal 0.5 portion of hind tibiae ..... *clematidis simlaensis* Kumar and Burkhardt

– Siphunculi only 0.70-0.80 times as long as thumb-shaped cauda bearing 6-8 hairs; pseudosensoria distributed over basal 0.80 portion ..... *fabae* complex

4. Hairs on anterior abdominal tergites longer, about 1.5 × b.d. 111; cauda bears more than 10 hairs ..... *pollinosa* Walker

– Hairs on anterior abdominal tergites shorter, about 0.5-1.0 × b.d. III; cauda with less than 10 hairs 5

5. Longest hair on hind femora about as long as its maximum width ..... *spiraecola* Patch

– Longest hair on hind femora much shorter 6

6. Abdominal dorsum blackish brown muskel-platten; second segment of hind tarsus with both dorsal and ventral secondary hairs besides primary ones; siphunculi subequal to cauda ..... *craccivora* Koch

– Abdominal dorsum pale brown, segment of hind tarsus with only ventral secondary hairs besides primary ones 7

7. Siphunculi as long as or longer than cauda, antennae 5-segmented ..... *nasturtii* Kalt.

– Siphunculi distinctly shorter than cauda; antennae usually 6-segmented ..... *gossypii Glover*

Alate male

1. Distal half of siphunculi distinctly pigmented; secondary rhinaria distributed : III 12-14, IV 5-8, V 2-8 ..... *clematidis simlaensis* Kumar and Burkhardt

– Siphunculi uniformly brown, secondary rhinaria distributed III 18-40, IV 15-27, V 7-19 2

2. Caudal hairs more than 7; secondary rhinaria distributed : III 25-30. IV 22-26, V 8-16 ..... *fabae* complex

– Caudal hairs not more than 7, 8th abdominal tergite never with more than 2 hairs 3

Second tarsal segment with only primary hairs; p. t. at most 2 x base VI, secondary rhinaria distributed : III 25-40, IV 15-27, V 7-14 ..... *nasturtii* Kalt.

– Second tarsal segment with both primary and secondary hairs; p.t. more than 2 × base VI 4

4. Secondary rhinaria distributed : III 18-24, IV 15-20, V 11-19 ..... *craccivora* Koch

– Secondary rhinaria distributed : III 31-37, IV 21-26, V 12-18 ..... *gossypii* Glover

1. ***Aphis achyranthi*** Theobald
(Figs. 7-14, 340)

1929. *Aphis achyranthi* Theobald. *Entomologist,* **62** : 177-181; 196-201.

1958. David. *Indian J. Ent.,* **19** : 171-180 (1957).

1963. Behura, *Proc. 1st summer school of Zoology (Simla, 1861)* Govt. of India publ. : 25-78.

1969. Bindra and Sekhon, *Bull. Ent.,* **10** : 103-104.

1971. Bhalla, *Himachal J. Agric. Res.,* **1** : 51-52.

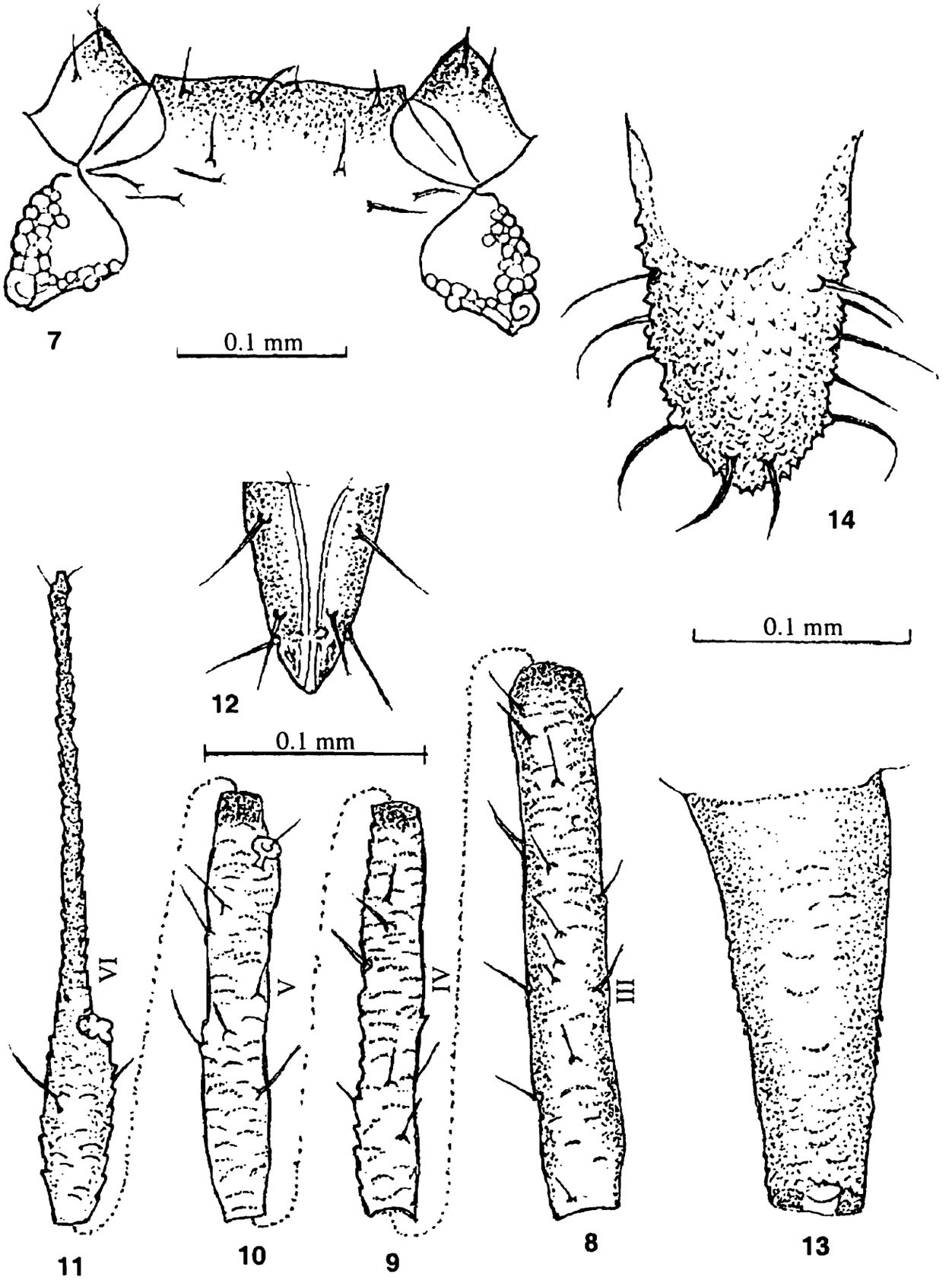
1972. Chakrabarti, Aphids of North Western India with special reference to Kumaon range, Uttar Pradesh, Ph. D. Thesis, University of Calcutta : 1-435.

1972. Chakrabarti, Ghosh, A. K. and Raychaudhuri, D. N., *Oriental Ins.* : 387-400.

1980. Bhalla and Pawar, *A survey of insect and noninsect pests of economic importance in Himachal Pradesh publ. by Dept. Zoology-Entomology, college of Agriculture,* Chambaghat, Solan (H. P.) : 18.

1990. Ghosh, L. K. *Mem. zool. Surv. India,* **17**(3) : 14-15.

Apterous viviparous female : Body 1.6-2.5 mm long with 0.8-1.0 mm as the maximum width near the middle of abdomen. Antennae 6–segmented, 0.5-0.7 times as long as body, p.t. shorter than to a little longer than a.s. III and 2.0-2.5 times as long as base VI, antennal hairs about as long as or a little longer than b.d. III; u.r.s. (Fig. 12) as long as or a little longer than ht_2. Abdominal dorsum pale, with post siphuncular sclerites, longest hair on anterior abdominal tergites about 1.0-1.3 times as long as b.d. III. Siphunculi (Fig. 13) dark, 0.08-0.12 times as long body and 1.0-1.3 times as



Figs. 7-14. *Aphis achyranthi* Theobald : Aptera 7, Head, 8, a.s.III; 9, a.s.IV; 10, a.s.V; 11, a.s.VI; 12, u.r.s; 13, siphunculus; 14, cauda.

long as cauda. Cauda (Fig. 14) concolourous with siphunculi, bearing 9-10 hairs. 8th tergite with 4-6 hairs being 46μ long and about 1.3 times as long as antennal hairs. Femoral hairs about 36μ long; ht2 with both primary and secondary hairs, F. T. C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 1.81; width of body 0.90; antenna 1.32, a.s. III 0.32, IV 0.22, V 0.22, VI (0.10 + 0.24); u.r.s. 0.10; ht_2 0.09; siphunculus 0.20; cauda 0.18.

Material examined : 3 apterae and nymphs, on *Punica granatum,* Panuwanaula (U. P.), 10.iv.1970, Coll S. C.; 3 apterae, on *Achyranthes bidentata,* Solan, date(?), Coll S. P. Kurl.

Biological notes : Brown to dark brown insects were found in undersurface of leaves, growing shoots and inflorescence of host plant.

Distribution : India : Northwestern and Southern parts.

2. ***Aphis affinis*** del Guercio
(Figs. 15-20, 341)

1911. *Aphis affinis* del Guercio, *Redia,* **7** : 315.

1974. *Aphis affinis* del Guercio : David and Ghorpade, *Oriental Ins.,* **8**(2) : 196.

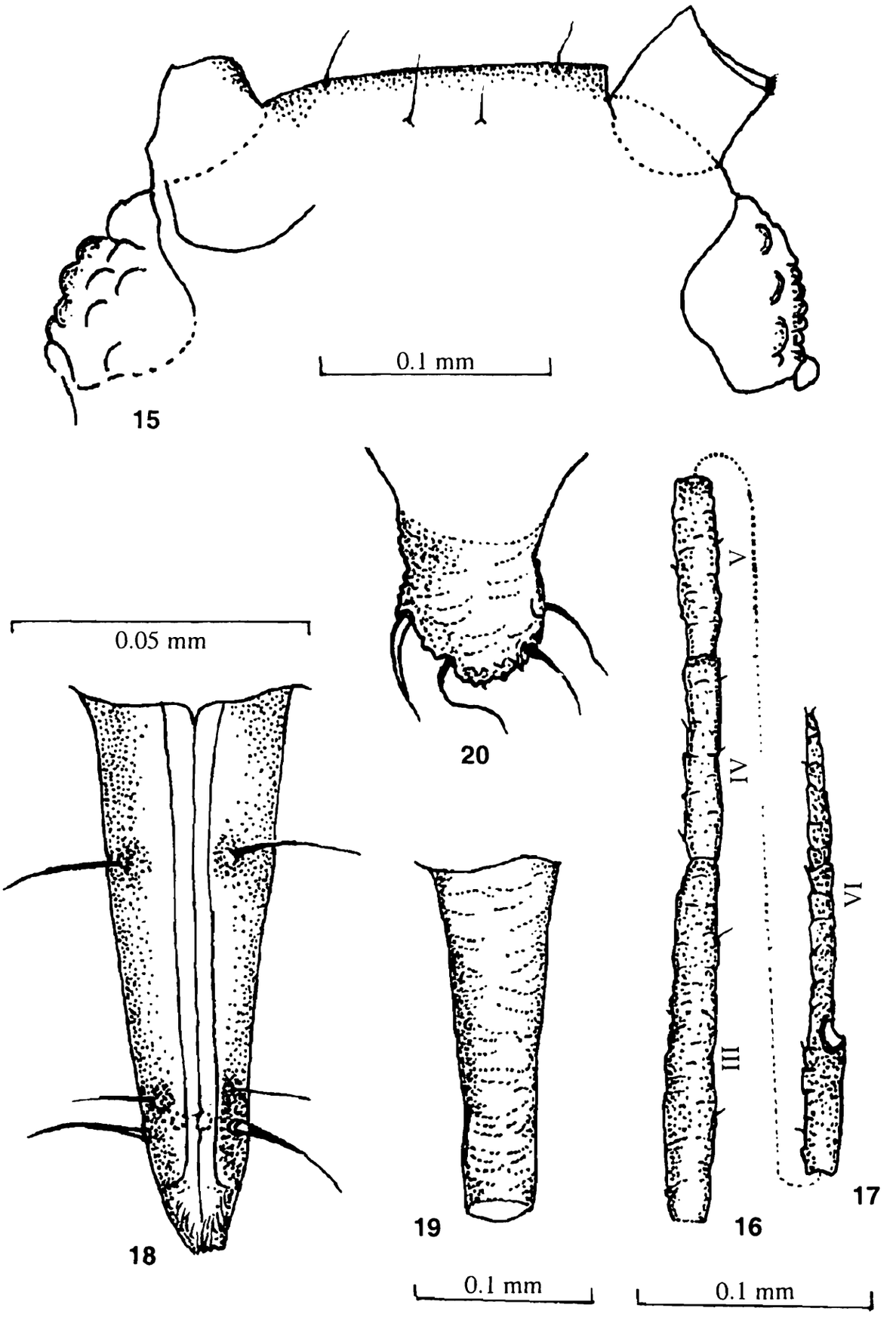
1981. *Aphis affinis* del Guercio : Bhagat, *Sci. and Cult.,* **47** : 134-136

1990. *Aphis affiris* del Gunercio, *Mem. zool. Surv. India,* **17**(3) : 15-16

2001. *Aphis affiris* del Gunercio, *J. Aphidol.,* **15**(1 & 2) : 11.

Apterous viviparous female : Body 1.26 mm long with 0.75 mm as its maximum width. Dorsum smooth. Head (Fig. 15) with small antennal tubercles not exceeding beyond vertex width. Antennae 0.4-0.6 × as long as body, a.s. IV + V as long as or a little shorter than segment VI ; p.t. a little longer than twice as long as base VI (Fig. 17). Rostrum reaches beyond mid coxae; u.r.s. (Fig. 18) somewhat pointed, longer than ht_2, about 1.4–1.5 × as long as ht_2 and with 2 secondary hairs besides 3 preapical pairs. Abdominal dorsum pale to light brown, with reticulated pattern and scattered brown sclerites; longest hair on anterior tergites about as long as b.d. III. 8th tergite with 2 hairs having blunt to acuminate apices, and being about 1.2 × the b.d. III. Siphunculi (Fig. 19) dark, imbricated, cylindrical, tapering towards apex, 0.15-0.17 × as long as body and 2.0-2.2 × the length of cauda. Cauda (Fig. 20) spinose, paler than siphunculi or somewhat dusky, slightly constricted medially and bearing 5 hairs. Legs brown, tarsi blackish, F. T. C. 3, 3, 2; ht2 with both primary and secondary hairs.

Measurements (in mm) of one specimen : Length of body 1.26; width of body 0.75; antenna 0.75; a.s. III 0.22, IV 0.II, V 0.10, VI (0.07+0.15); u.r.s. 0.09; ht_2 0.06; siphunculus 0.22; cauda 0.10.



Figs. 15-20. *Aphis affinis* del Guercio : Aptera. 15, Head; 16, a.s.III–V; 17, a.s.VI; 18, u.r.s.; 19, siphunculus; 20, cauda.

Material examined : 4 apterae, on *Mentha sylvestris,* Kulu valley, Manali (H.P.), 18.v.1969, Coll. *K. Narayanan.*

Colour in life : Greyish black (David and Ghorpade, 1974).

Remarks : David and Ghorpade *(op. cit.)* recorded the species collected from *Mentha* spp. for the first time from India. In the Punjab, the aphid was first observed on Japanese mint in 1974 (Anonymous, 1977). Dark grey-green to blackish aphids usually cluster on apical shoot of *Mentha.* The aphid colonies suck the cell sap from the leaves and thus, yield of the crop is reduced. In addition to direct losses to the crop, the aphid also acts as vector of Cucumber mosaic virus (Heinze, 1959); The species shows much affinity with *frangulae gossypii* group but can be differentiated from it by the shorter processus terminalis and by a comparatively longer ultimate rostral segment. Tuatay and Remaudiere (1964) described the sexuales in Turkey. Sagar and Singh (1981) compared control by various insecticides in India.

Distribution : India : Himachal Pradesh, Jammu and Kashmir, Karnataka, the Punjab; Central Asia; Southern Europe, European part of U.S.S.R., Middle East; Pakistan and Spain.

3. ***Aphis clematidis simlaensis*** Kumar and Burkhardt
(Figs. 33-40)

1970. *Aphis clematidis simlaensis* Kumar and Burkhard : *J. Kansas. Ent. Soc.,* **43** (4) : 463.

1980. Basu, R. C. and Raychaudhuri, D. N., *Rec. zool. Surv. India, Occ. Paper,* **18** : 7.

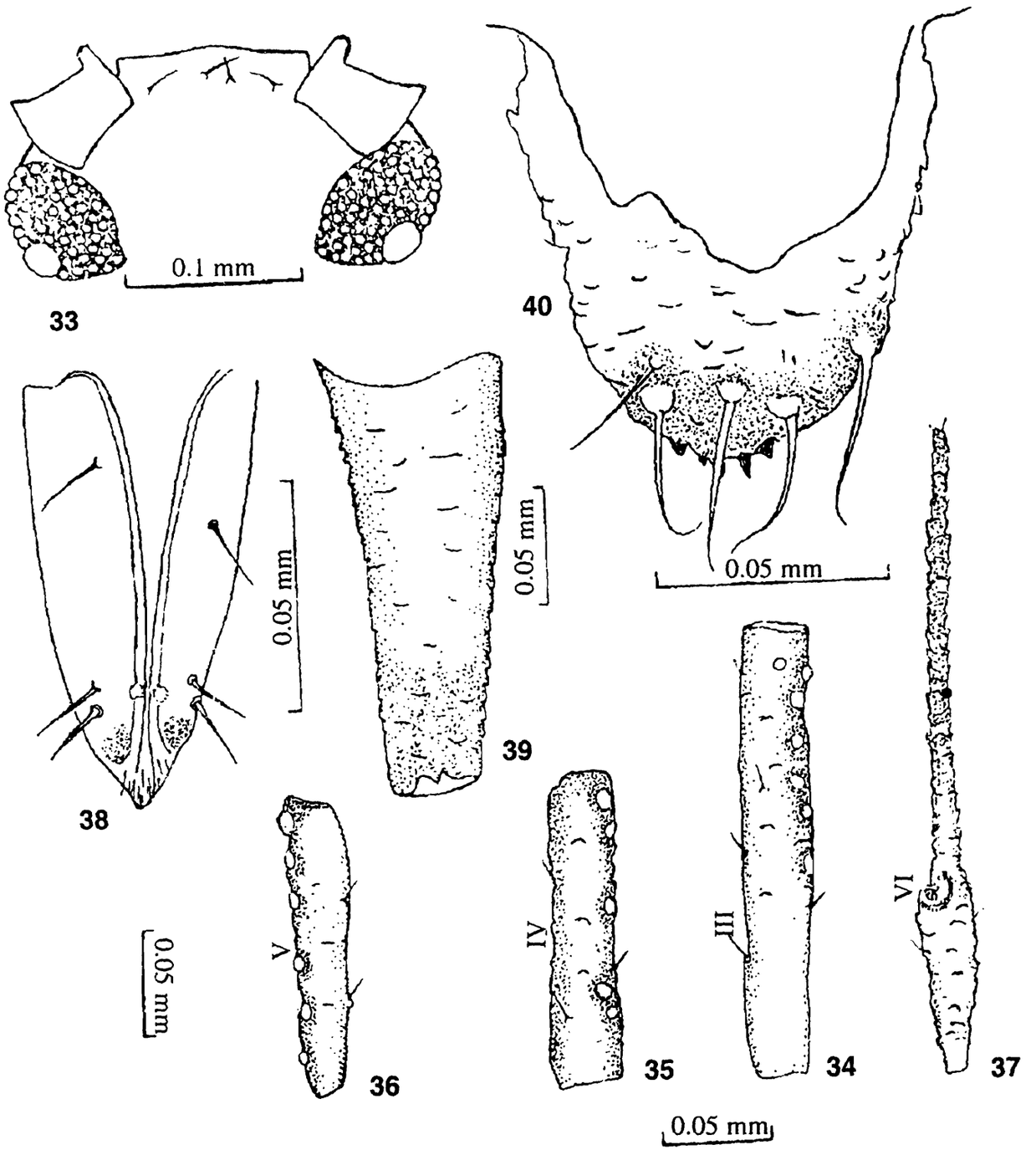
1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 20-21.

2001. *Aphis clematidis* koch, Chakrabarti and Sarkar, *J. Aphidol.,* **15**(1&2) : 11.

Apterous viviparous female : Body rather oval, 1.14 mm long with 0.60 mm as maximum width near the middle of abdomen. Head (Fig. 34) brown, without frontal tubercles. Antennae 6-segmented, about half as long as body, longest hair on a.s. III 0.4 × as long as b.d.III, p.t. 2.1 × as long as base VI. Rostrum reaches near 3rd coxae, u.r.s. (Fig. 38) 1.4 × as long as ht_2 and with 2 secondary hairs. Abdominal dorsum pale, dorsal hairs about 10 μ long, sclerites absent, 8th tergite with 4 hairs. Siphunculi (Fig. 39) light to dark brownish, cylindrical, lightly imbricated, with small but distinct apical flange, 2.1 × as long as bluntish cauda (Fig. 40) bearing 5 hairs. F T. C. 3, 3, 2.

Measurements (in mm) of the aptera : Length of body 1.14; width of body 0.60; antenna 0.66; a.s. III 0.15, IV 0.10, V 0.10, VI (0.07 + 0.87); u.r.s. 0.09; ht_2 0.06; siphunculus 0.17; cauda 0.07.

Apterous oviparous female : Body oval, 1.14–1.23 mm long with 0.50–0.84 mm as maximum width near at the middle. Head brown. Antennae 6-segmented, 0.48–0.50× as long as body; flagellar hairs 6-9μ long, the longest hair on a.s. III about 2.0–2.5 × base of a.s.VI. Rostrum short, reaching base of 2nd coxae; u.r.s. about 1.4 × as long



Figs. 33-40. *Aphis clematidis simlaensis* Kr. & Burkhardt : Aptera : 33, Head; 34, a.s.III; 35, a.s.IV; 36, a.s.V; 37, a.s.VI; 38, u.r.s.; 39, siphunculus; 40, cauda.

as h.t.2. and with 2 secondary hairs besides 3 apical pairs. Abdominal dorsum pale; longest hair on posterior abdominal dorsum about 9 μ long and about as long as longest hair on a.s.III; 8th tergite with 4 hairs, up to 30μ long, the longest one about 2.0–3.1 × as long as longest hair on a.s.III. Siphununli cylindical, pigmented, imbricated on distal 0.3-0.4 portion, about twice as long as dusky and blackish cauda which bears 5 hairs. Subgenital plate with many small and fine hairs. Hind tibiae swollen with many psleudosensoria, its maximum width about 2 x mid width of other tibiae. Other characters as in apterous viviparous female.

Measurements in (mm) :

	Length	Width	Antenna	Antennal segments			
				III	IV	V	VI
1.	1.23	0.84	0.71	0.19	0.10	0.11	(0.07+0.19)
2.	1.14	0.54	0.60	0.18	0.09	0.89	(0.07+0.18)

	u.r.s.	ht2	Siphunculus	Cauda
1.	0.09	0.06	0.19	0.10
2.	0.09	0.06	0.18	0.09

(1-2, ex *Veronica agrestris,* Kalpa, Himachal Pradesh, India : 26.10.1975, coll. A.N. Chowdhury)

Biological notes : The yellowish aphids were found on the under surface of the leaf of the host plant. No attendant ants were, however, noticed to attend the aphids.

A perusal of literature reveals that there exists no record of the true apterous male of any *Aphis* species except that by Kumar and Burkhardt (1970) for this subspecies. Although the material was not available for examination one of the authors (LKG) collected some alatoid males of this subspecies from the same locality wherefrom Kumar and Burkhardt reported it.

Alatoid male : Body oval to elongated, 0.84-0.98mm long with 0.50-0.55 mm as maximum width near the middle of abdomun. Head brownish without frontal tubercles, cephalic hairs about 1.5 × as long as the longest hair on a.s.III; triommatidion distinct. Antennae smaller (0.86–0.88 times) than body, a.s.III with 5–9, IV with 2–5 and V with 6–9 secondary rhinaria of varied size; longest hair on a.s.III subequal to b.d.III; p.t. dark brown, about 2× as long as base VI. Rostrum reaches hind coxae, gradually tapering to apex; u.r.s. 1.38–1.40× as long as ht_2. Abdomen without distinct sclerites. Siphunculi cylindrical, brownish at base to dark brown at apex, about 2.5× as long as cauda. Cauda concolourons with basal part of siphunculi and bears 5 hairs. F.T.C. 3,3,2.

	Length of body	width	Antenna	Antennal Segments				u.r.s.	ht_2	Siph.	Cauda
				III	IV	V	VI				
1.	0.84	0.51	0.78	0.19	0.14	0.10	(0.09+ 0.16)	0.07	0.05	0.16	0.06
2.	0.92	0.50	0.80	0.20	0.15	0.11	(0.09+ 0.17)	0.09	0.05	0.17	0.06
3.	0.98	0.55	0.82	0.20	0.14	0.11	-do-	0.09	0.05	0.18	0.07

(1-3, on *Veronica agrestis,* Kalpa, H.P., 26.10.1975, Coll. A.N. Chowdhury)

Measurements (in mm) of an alatoid male : Length of body 0.91; width of body 0.50; antenna 0.80; a.s. III 0.20, IV 0.15, V 0.11, VI (0.09 + 0.17); u.r.s. 0.09; ht_2 0.05; siphunculus 0.17; cauda 0.06.

Material examined : 1 aptera, 3 alatoid males and 2 oviparae, in *Veronica agrestris,* Kalpa (H.P.), 26.x.1975, coll. *A. N. C.*

Biological notes : The yellowish aphids were found singly underneath the leaf of the host plant. No ants were noticed to attend the aphids.

Remarks : Kumar and Burkhardt (1970) described the new subspecies as apterous male, apterous viviparous female and alate viviparous females collected on *Clematis* sp. at Simla. Oviparous morph was described by Ghosh, L. K. (1986).

The subspecies is characterised by the longer u.r.s. in relation to h.t.2 (shorter in case of *Aphis clematidis).*

Apparently no record of true apterous male of *Aphis* Linn. is known. Kumar and Burkhardt *(op. cit.),* however, collected apterous male which the authors could not examine in spite of sincere efforts. The present material of sexual male collected from the same area proves to be only alatoid apterous male. Therefore, identification of Kumar and Burkhardt seems to be doubtful as to true apterae males.

Distribution : India : Himachal Pradesh.

4. ***Aphis craccivora*** Koch
(Figs. 41-50, 342, 343, 367-368)

1854. *Aphis craccivora* Koch. *Die Pflanzenlause Aphiden,* Nnnburg, **1** : 124.

1909. Lefroy and Howlett, *Indian Insect life* : 1-786.

1917. Goot., P. van der, *Rec. Indian Mus.,* **13** : 175-183.

1919. Krishnamurti, *J. Bombay nat, Hist. Soc.,* **33** : 211-215.

1919. Kulkarni and Kacker, *Bull. zool. Surv. India,* **2** : 12.

1927. George, *J. Asiat, Soc. Bengal* (N. S.), **23** : 1-12.

1938. Deshpande, *J. Bombay nat. Hist. Soc.,* **39** : 740-744.

1940. Ghulamullah, *Indian J. Ent.,* **2** : 13-25.

1948. Krishnamurti, *Indian J. Ent.,* **10** : 51-53.

1954. Krishnamurti and Usman, *Indian J. Ent.,* **16** : 327-344.

1956. Banerjee and Basu, *A.N. Curr. Sci.,* **24** : 61.

1956. David, *Madras agric. J.,* **43** : 103-107.

1958. Basheer, *Indian J. Ent.,* **20** : 66-67.

1958. Raychaudhuri, D.N. and Ghosh, A.K., *Curr. Sci.,* **27** : 402.

1958. Basu, A.N. and Banerjee, *Indian Agric.,* **2** : 89-112.

1958. David, *Indian J. Ent.,* **19** : 171-180.

1958. David, *J. Bombay nat. Hist. Soc.,* **55** : 110-116.

1959. Ghosh, A.K. and Raychaudhuri, D.N., *Ibid.* **56** : 660-664.

1959. Raychaudhuri, D.N. and Ghosh, A.K. *Indian Agric.,* **3** : 17-22.

1961. Chatterjee, Ghosh, A.K. and Raychaudhuri, D.N., *Ibid.* **5** : 87-88.

1962. Batra and Wadhi, *Indian J. Ent.,* **24** : 135-136.

1962. Sengupta, Das and Behura, *Prakruti Utkal Univ. J. Sci.,* **2** : 33-39.

1962. Ghosh, A.K. and Raychaudhuri, D.N., *J. Asiat. Soc. Bengal (N. S.),* **4** : 101-113.

1963. Behura, *Proc. 1st summer school of Zoology* (Simla, 1961) Govt. of India Publ., : 25-78.

1963. Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **29** : 104.

1964. Sharma and Bhalla, *Indian J. Ent.,* **26** : 318-331.

1965. Behura. *Prakruti Utkal Univ. J. Sci.,* **3** : 40-65.

1965. Ganguli and Ghosh, M.R., *Sci. Cult.,* **31** : 541-542.

1965. Verma, Rao and Capoor, *Indian J. Ent.,* **27** : 67-71.

1965. Kareem and Basheer, *Indian J. Ent.,* **27** : 234-236.

1966. Dorge, Dalaya and Kaul, *Lavdav J. Sci, Technol. Kanpur,* **4** : 165-167.

1967. Joshi and Mathur, *Madras agric. J.,* **54** : 239-243.

1968. Basu, R.C., Chakrabarti and Raychaudhuri, D.N., *Oriental. Ins.,* **2** : 349-351.

1969. Ramaseshiah and Dharmadhikari, *CIBC Tech. Bull.,* No. **11** : 156-164.

1969. Ghosh, L.K., *Sci. Cult.,* **35** : 493-494.

1970. Ghosh, L.K. *Sci. Cult.,* **36** : 419-420.

1970. Rizvi and Paulkhurana, *Sci. Cult.* **36** : 49.

1970. *CIBC Tech. Bull.,* No. **13** : 83-89.

1971. Patel, R.M. and Patel, C.B. *Indian J. Ent.,* **33** : 404-410.

1971. Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D. N., *Proc. zool. Soc. Calcutta,* **24** : 163-168.

1972. Rao and Kulkarni; *Marathwada Univ. J. (Nat. Sci.),* **11** : 287-288.

1973. Raychaudhuri, D.N., *U. S. PL* 480 *Project Tech. report* : 107.

1975. Verma and Singh, *Curr. Sci.,* **44** : 368.

1975. Verma and Singh, *Curr. Sci.,* **44** : 368.

1975. Verma, A.N., Khuraua, A. D. and Bhanot, *Haryana agric. Univ. J. Res.,* **5** : 11-14.

1976. Ghosh, L.K., *Newsl. zool. Surv. India,* **2** : 239-242.

1977. Raha, Singh, Raychaudhuri, D. and Raychaudhuri, D.N., *Sci. Cult.,* **43** : 452-453.

1978. Raychaudhuri, D.N., Dutta, Agarwala, Raychaudhuri, D. and Raha, *Entomon,* **3** : 93-94.

1978. Stary and Bhagat, *Acta ent. behemoslov,* **75** : 387-393.

1979. Chhabra, Kooner and Mahal, *Symp. on recent trends in aphidological studies, Bhubaneswar* : 33.

1979. Gargav. Verma, S.N. and Menon, *Symp. on recent trends in aphidological studies, Bhnbaneswar* : 21.

1979. Kurl and Misra, *Geobios,* **6** : 286-287.

1979. Raychaudhuri, D.N., Datta, Agarwala, Raha and Raychaudhuri, D., *Entomon,* **4** : 163-166.

1980. Bhalla and Pawar, A survey of insect and non insect pests of economic Importance in Himachal Pradesh. publ. by Deptt. Entomology Zoology, College of Agriculture, Chambaghat, Solan (H. P.) : 19.

1980. Ghosh, A.K. Agarwala, *Indian agric.,* **24** : 101-107.

1980. Raychaudhuri, D.N. *(ed.)* Aphids of North East India and Bhutan : 1-521.

1981. Agarwala, Ghosh, D., Das, S.K., Poddar and Raychaudhuri, D. N. *Entomon,* **6** : 233-238.

1981. Agarwala, Raychaudhuri, D. and Raychaudhuri, D. N., *Akitu* (n.s,) **39** : 1-16.

1981. Agarwala and Raychaudhuri, D.N. *Indian agric,* **25** : 101-107.

1981. Raychaudhuri, D.N., Ghosh, D., Raychaudhuri, D. and Agarwala, *Insecta matsum.,* (N. S.), **23** : 1-20.

1984. Agarwala, Laska and Raychaudhuri, D.N. *Acta ent. bohemoslov.,* **81** : 15-21.

1854. *Aphis medicaginis* Koch. *Die Pflanzenlause Aphiden,* **1** : 124-125.

1917. Van der Goot, *Rec. Indian Mus.,* **14** : 49-58.

1927. George, *J. Asiat. Soc. Beng. (N. S.),* **23** : 1-12.

1929. Krishnamurti, *J. Bombay nat. Hist. Soc.,* 23 : 211-215.

1948. Krishnamurti, *Indian J. Ent.,* **10** : 51-53.

1938. Deshpande, *J. Bombay nat. Hist. Soc.,* **39** : 740-744.

1758. *Aphis rumicis* Linnaeus, *Syst. Nat.* (10th ed.), 1 : 451.

1927. George, *J. Asiat. Soc. Beng. (N. S.),* **23** : 1-12.

1843. *Aphis laburni* Kaltenbach, *Monographic der Familen der Pflanzenlause (Phytophthires)* Aachen : 1-122.

1940. Ullah, *Indian J. Ent.,* **2** : 13-25.

1948. Krishnamurti, *Ibid.,* **10** : 51-53.

1954. Krishnamurti and Ushman, *Ibid.,* 16 : 327-344.

1915. *Anuraphis cymariella* Theobald, *Bull. ent. Res.,* **6** : 103-153.

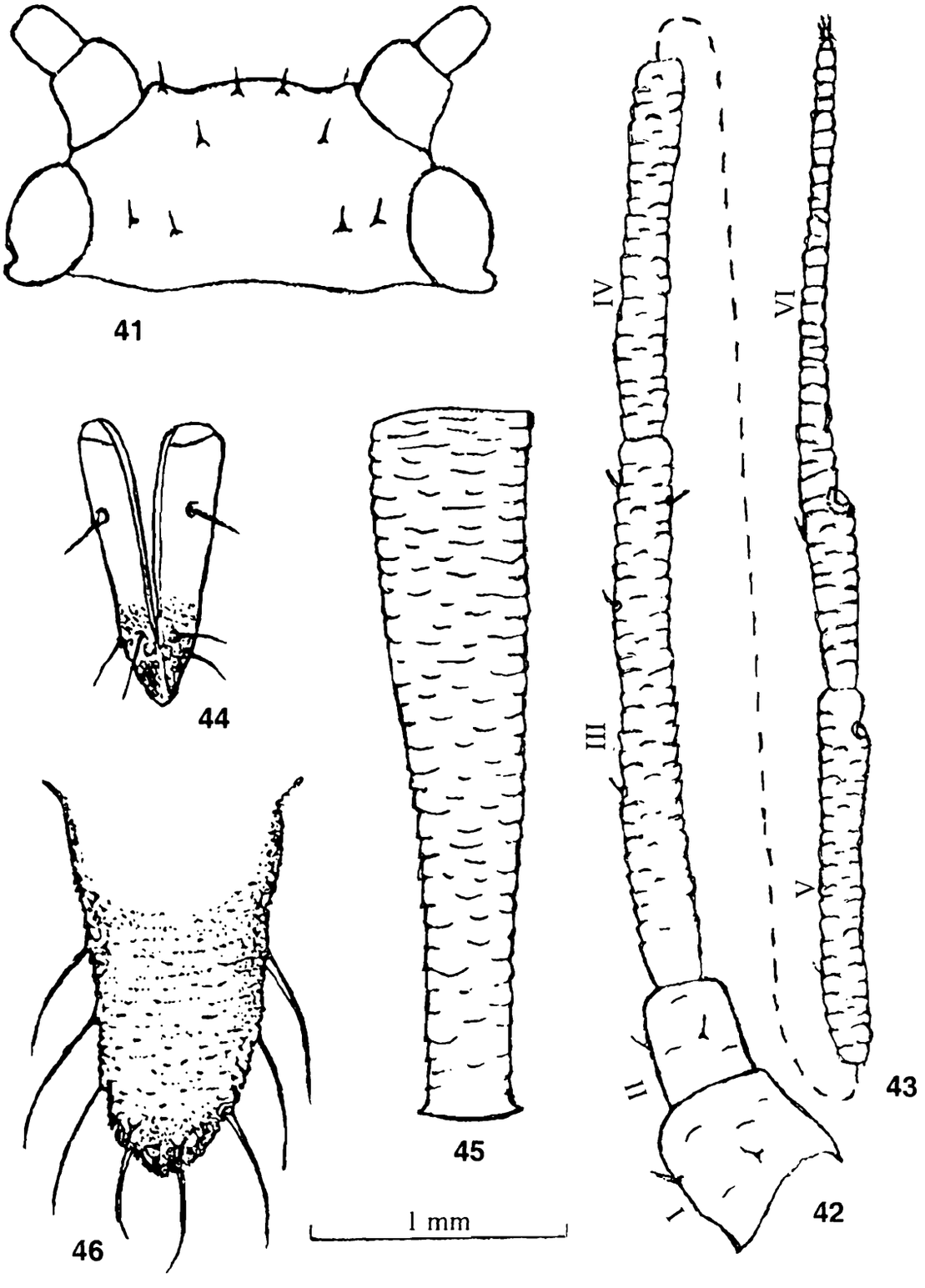
1948. Krishnamiurti, *Indian J. Ent.,* **10** : 51-53.

1990. Ghosh, L. K. *Aphis craccivora* koch, *Mem zool. Surv. India,* **17**(3) : 22-28.

1997. *Rhopalosiphum esculentum* Raychaudhuri and Raychaudhuri, 1978 : Remaudiere and Remaudiere, catalogue of the world's Aphididae : 61.

2001. Chakrabarti and Sarkar, *J. Aphidol.,* **15** (1&2) : 11

Material examined : Apterae, on *Dolichos* sp., New forest (U. P.), 18.vi.1976, coll. S. C. ; Apterae and alatae, on *Polygonum* sp. date, coll. "C. U." ; 6 apterae and 1 alata, on *Phaseolus* sp., Saproon (H. P.), 2.ix.1969, coll. O.B. Chhotani; Apterae and alatae, on *Dolichos lablab,* 12.i.1975, coll. L.K.G.; many apterae and alatae, on *Lagenaria vulgaris,* Kalamber, Nanded Distt. (Maharashtra) 6.xii.1974, coll. P. P. Kulkarni; Apterae, on *Hibiscus rosasinensis,* Tocklai, Shillong (Assam), 18.1.1969, coll. Ten



Figs. 41-46. *Aphis craccivora* Koch : Aptera : 41, Head; 42, a.s.i-iv; 43, a.s.v-vi; 44, u.r.s.; 45, siphunculus; 46, cauda.

aptarae and two nymphs, on undet. Leguminosae; 3 apterae & 8 nymphs, on *Crotolaria juncea,* Singtam, 24.xii.1970, coll. M. R. G. ; apterae & nymphs, on undet. Leguminosae, Kathmundu (Nepal), 4.x.1971, coll. B. C. Das. ; Apterae, alatae & nymphs on *Cajanus cajan,* Rautara, 24 Pgs., (West Bengal), 15.ii.1981, coll. L. K. G.; 4 Apterae, on *Phaseolus* sp., Solan (H. P.), 2.ix.1969, coll. O. B. Chhotani; 5 apterae and 2 alatae, Andaman Survey (ZSI No. 45/71), coll. B. K. Tikader; 4 apterae, on *Vigna catjang,* Burma Nallah, Andaman Islands, 15-iv-1964, coll. B. S. Lamba; 4 alatae, on Thisil, Aligarh, U. P., 20.3.71, coll. *S. Uddin (*ZSI lot No. 61/73); 2 apterae, on *Phaseolus* sp., I.S.I. Campus, 24 Parganas, W. B. 22.iv.1967, coll. M. Koshy; 2 ♂♂, 5 apt. ovip, ♀♀, *Tinospora cordifolia,* 6.ii.1268, 'C. U. coll.

Apterous viviparous female : Body rather oval, 1.74-2.45 mm. long with 1.02-1.6 mm. as maximum width near the middle of abdomen. Head (Fig. 41) smooth with small antennal tubercles not extending beyond vertex. Antennae (Fig. 42) 6- segmented about 0.5-0.8 times as long as body, a.s.I somewhat rounded with small wrinkles, particularly on inner side; a. s. II with some imbrications especially on ventral and inner sides; rest of antennae progressively more distinctly imbricated from base towards apex, flagellum with several fairly short to medium hairs, secondary rhinaria absent; p.t. (Fig. 43) about 2.1–2.8 times as long as base of segment VI. Rostrum extending between second and thrid coxae, u.r.s. about 0.85–1.0 times as long as h.t.2. Abdominal dorsum blackish with a dark continuous medium patch with polygonal reticulations, hairs on dorsum with acuminate apices, longest hair on anterior tergits about 0.5-0.8 times as long as b.d.III. Siphunculi (Fig. 45) blackish, cylindrical strongly imbricated, flanged, about 0.14–0.2 times as long as body and 1.5–2.3 times as long as cauda; cauda (Fig. 46) elongate, spinose, black, tapering to apex and somewhat constricted at basal 0.3-0.5 portion, bearing 5–9 hairs including dorsal subapical one. Subgenital plate with up to about 16 hairs of moderate length. Femora light brown on proximal 0.3 portion, apical portion dusky to black, apical half of hind femora darker than that of fore and mid-fumora, tibiae black on apical portion, tarsi black. First tarsal chaetotaxy 3, 3, 2.

Measurements (in mm) :

	Length	*Width*	*Antenna*	*Antennal segments*			
				III	IV	V	VI
1.	1.89	1.23	1.32	0.33	0.24	0.19	(0.13 + 0.30)
2.	1.86	1.11	1.32	0.33	0.22	0.22	(0.13 + 0.32)
3.	1.71	0.93	0.99	0.30	0.19	0.19	(0.11 + 0.30)
4.	1.74	1.05	0.92	0.28	0.18	0.18	(0.11 + 0.32)
5.	1.70	1.02	1.00	0.29	0.18	0.18	(0.11 + 0.30)
6.	2.10	1.26	1.13	0.32	0.20	0.16	(0.13 + 0.33)

u.r.s.	h.t.2	Siphunculus	Cauda
0.10	0.13	0.36	0.15
0.09	0.13	0.39	0.16
0.06	0.09	0.32	0.13
0.07	0.10	0.22	0.13
0.09	0.10	0.28	0.13
0.09	0.09	0.35	0.15

(1–2, on *Phaseolus* sp., India : H.P., Saproon, Solan, 2-ix-1969, O. B. Chhotani; 3, on unknown host, India : NEFA, Tezpur (Assam) 28.xii.1965, S.K. Bhattacharya; 4-6, on *Pisum sativum,* India; Izatnagar, U.P., 5.iii. 1968, L.K. Ghosh)

Alate viviparons female : Body somewhat elongated, 1.60-2.56 mm. long and 0.95–1.40 mm. as its maximum width near at the middle of abdomen. Head smooth; brown; with antennal tubercles not projecting beyond vertex, antennae (Fig. 50) about 0.7–0.8 times as long as body; p.t. 1.50–2.8 times as long as base VI; a.s. III with 3-8 midium to large circular or oval secondary rhinaria in a line near at the base (Fig. 54). Rostrum reaches mid coxae; u.r.s. (Fig. 55) 0.80-0.85 times as long as h.t.2; dorsum of abdomen (Fig. 48) frequently with rather long dark segmental bar across the abdominal tergites besides distinct postsiphuncular sclerites; longest hair on anterior abdominal tergites about 0.7–1.0 times as long as b.d.III. Siphunculi (Fig. 56) blackish, cylindrical, tapering, strongly imbricated, 0.10–0.20 times as long as body and 1.5–2.7 times as long as cauda. Cauda (Fig. 57) blackish, strongly spinose, somewhat constricted at the middle or basal third and bears 5–9 hairs including 1 dorsoapical one. Fore and hind femora light brown on proximal half to 2/3 portion, remainder dusky to black; mid femora almost wholly black except for a small light area at base; tibiae pale, usually lightly tinged with brown; distal half black; tarsi wholly black. F.T.C. 3.3.2; wing venation normal (Fig. 50).

Measurements (in mm) :

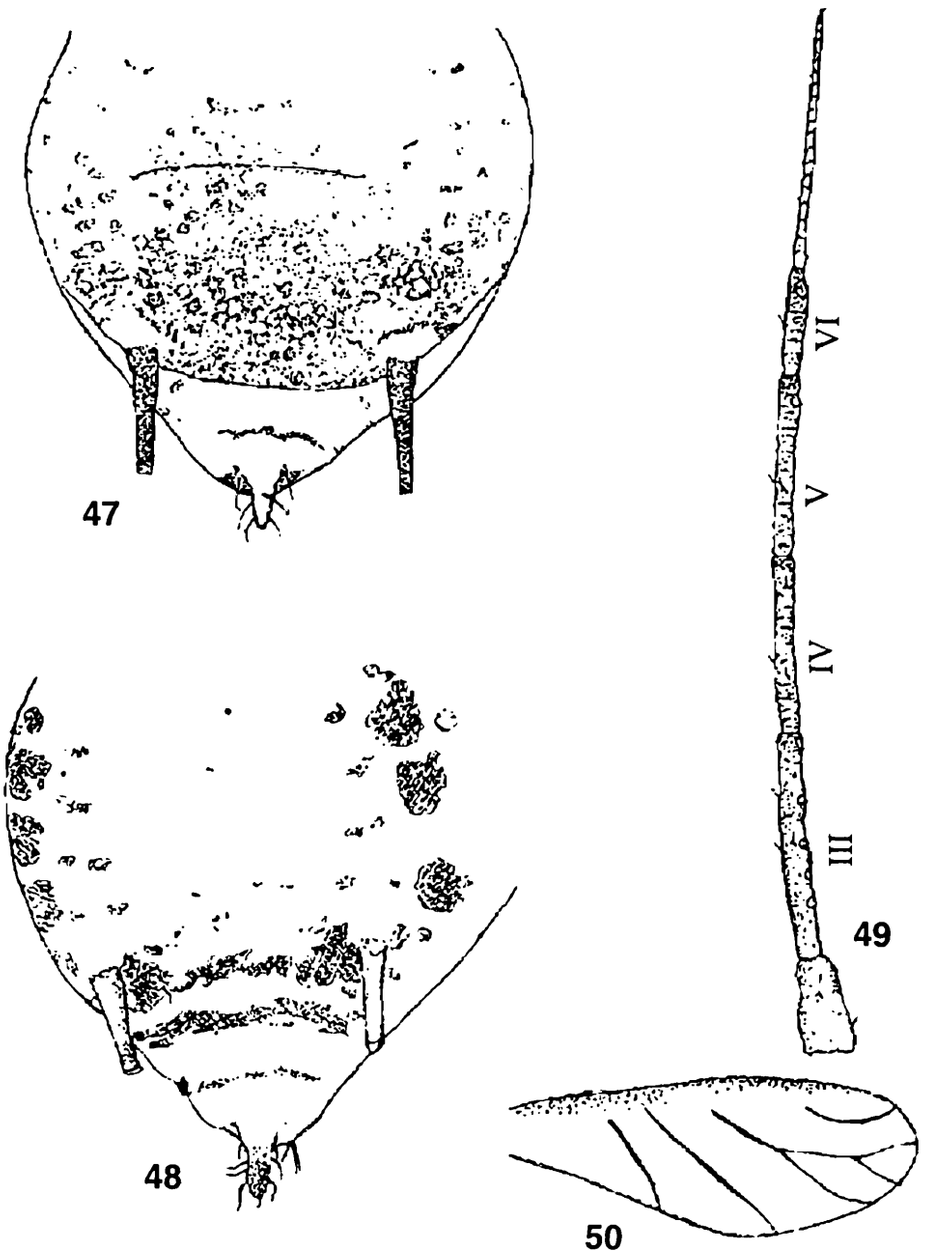
	Length	Width	Antenna	Antennal segments			
				III	IV	V	VI
1.	1.68	0.75	1.17	0.27	0.22	0.20	(0.15 + 0.36)
2.	2.04	0.90	1.31	0.34	0.26	0.22	(0.15 + 0.38)
3.	1.95	0.90	1.29	0.29	0.22	0.21	(0.14 + 0.36)
4.	1.83	0.81	1.15	0.24	0.21	0.20	(0.14 + 0.35)

U.r.s.	h.t.2	Siphunculus	Cauda
0.14	0.17	0.24	0.09
0.11	0.13	0.26	0.11
0.08	0.13	0.26	0.13
0.10	0.10	0.21	0.10

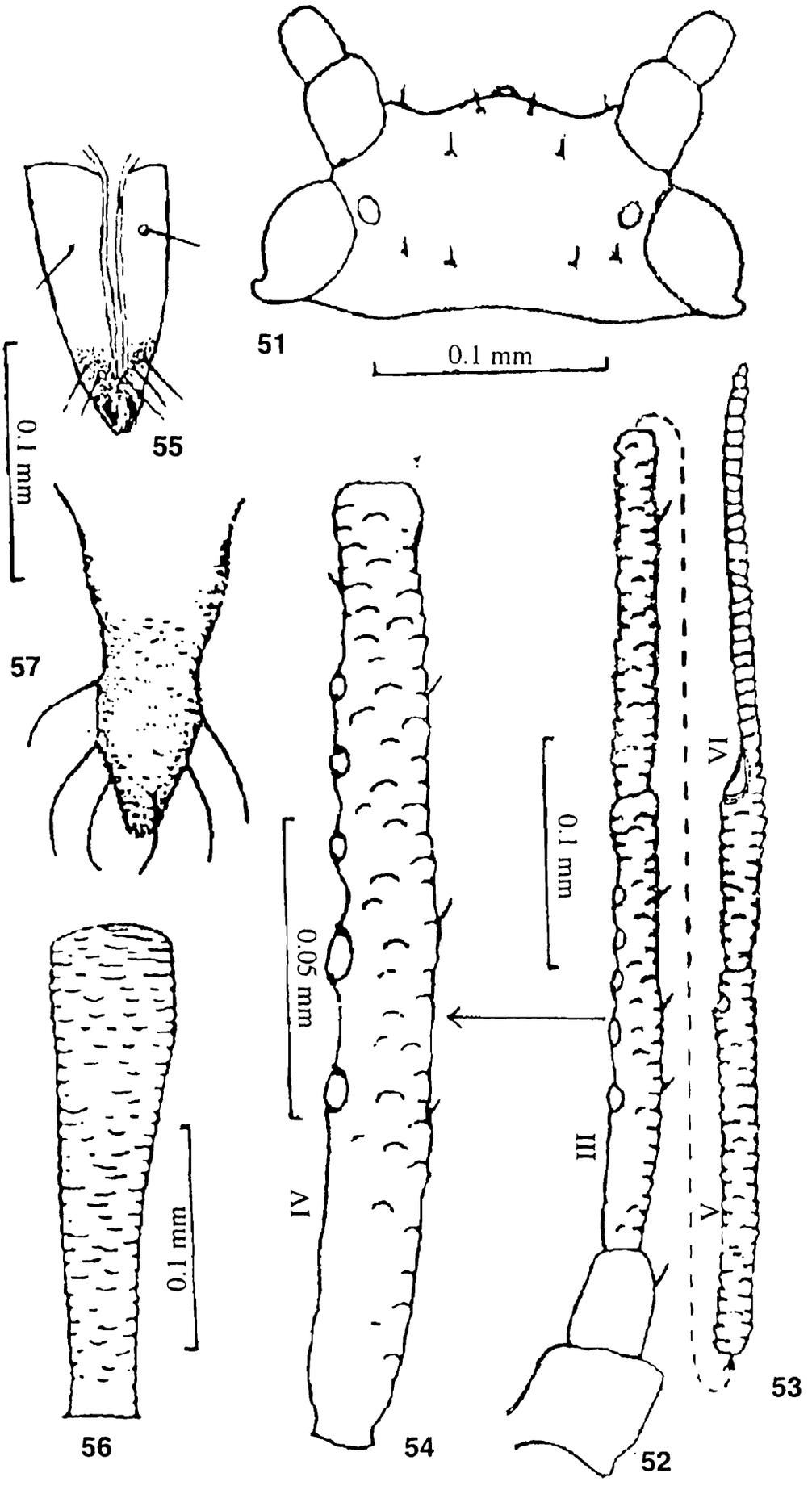
(1, Host unknown, India : NEFA, 28.xii.1965, S. K. Bhattacharya; 2–4, on *Pisum sativum,* India : Izatnagar, U.P., 5.III–1968, L.K. Ghosh)

Colour : In life, dark blackish to brownish green, abdominal dorsum shiny black.

Apterous oviparous female : Body oval, 1.6-1.7 mm long with 0.90–0.95 mm as maximum width. Head dark brown, with antennal tubercles, a.s. I and II concolourous with head, flagellum distinctly imbricated with a few short hairs (about 9μ long) being 0.3 times as long as b.d.III, a.s.V and VI dark, p.t. nearly 3 times as long as base VI. Rostrum reaches mid coxae, u.r.s. as long as or just a longer than ht_2. Thorax with brown patches between 1st and 2nd and 2nd and 3rd thoracic tergites. Abdominal dorsum with scattered blackish brown muskel-platten and not with typical dorsal abdominal pattern and continuous deep brown patches as in apterous viviparous female; two paler bloches present beyond siphunculi much shorter, 0.05-0.07 times as long as body. Cauda dark, as long as or a little longer than siphunculi, about 0.85



Figs. 47-50. *Aphis craccivona* Koch : Aptera, 47, posterior abdominal dorsum; Alata. 48, posterior abdominal dorsum; 49, Antenna; 50, Hind wing.



Figs. 51-57. *Aphis craccivora* Koch : Alata; 51, Head; 52, a.s.I-IV; 53, a.s.V and VI; 54, a.s. III enlarged; 55, u.r.s.; 56, siphunculus; 57, cauda.

times as long as body, elongate, without basal constriction. Hind tibiae evenly swollen to a maximum width being twice as long as maximum width of middle tibiae, thrice as long as longest hair on hind tibiae, with 45-56 pseudosensoria extending over almost the entire length excepting the base and apical 0.25 portion. F.T.C. 3, 3, 3.

Measurements (in mm) of an ovipara : Length of body 1.70; width of body 0.95; length of antenna 0.90; a.s. III 0.20, IV 0.15, V 0.13, VI (0.08 + 0.25); u.r.s. 0.08; siphunculus 0.13; cauda 0.14 ; width at the middle of hind tibia 0.05; ht_2 0.078.

Alate Male : Body rather oval. Head dark brown. Antennae also dark brown, imbricated, about 0.85 times as long as body; a.s. III with 20-25 circular secondary rhinaria distributed irregularly almost over the entire length except the very base; a.s. IV with 15-20 and V with 15-18 similar rhinaria; p.t. 3 times as long as base VI; ultimate rostral segment extending beyond midcoxae, 0.09 times as long as ht_2. Abdominal dorsum pale, with marginal brown blotches upto 7th abdominal segment, with a narrow elongated transverse band in the 7th abdominal tergite. Siphunculi dark brown, with less pronounced imbrications, about 0.09 times as long as body. Cauda concolorous with siphunculi, short, about 0.07 times as long as body and 0.8 times as long as siphunculi. Claspers with a process at their base. Other characters as in alate viviparous female.

Measurements (in mm) of an alate male : Length of body 1.60; width of body 0.70; antenna 1.35; a.s. III 0.30, IV 0.25, V 0.23, VI (0.11 + 0.33); u.r.s. 0.10; ht_2 0.11; siphunculus 0.15; cauda 0.12.

Remarks : *Aphis craccivora* Koch, commonly knwon as black aphid, attacks many plants and most often fabaceous crops. It is a major pest of bean and cowpea. Leaves, stems and fruits of peas, beans are often severely infested and suffer heavy injury. It also infests a large number of ornamental plants, attacking leaves, flowers and other young growth and sometimes causing severe damage. Considering the phytophagous nature of the pest, much work has been done on its biology, host preference and chemical control (Bernard 1969 ; Bakhetia & Sidhu, 1977). According to Reddy *et al.* (1983) bean is the most preferred host plant. The species is recorded as a vector of about 14 plant virus disease. Sexuales of the species has so far been reported on fabaceous plants in Germany (Falk, 1957/58) and on *Tinospora cordifolia* (Family Fabaceae) in Calcutta (Basu, R. C. *et al.* 1968). Verma and Khurana (1974) reported males and oviparous females on *Phaseolus aureus* during December, 1973 at Haryana (India).

Sometimes alatae of *A. craccivora* and *A. gossypii* are confused particularly if small, lightly coloured specimens are involved. However, both can be separated by the relative lengths of u.r.s. and ht_2. Also, it differs from *gossypii* in the transverse sclerites on the individual tergites much longer, particularly on the posterior segments, when they often extened along the entire width of the tergites, uniting with the postsiphuncular and marginal sclerites. An excellent morphological account has been given by Cottier (1953).

Distribution : India : all over; virtually cosmopolitan.

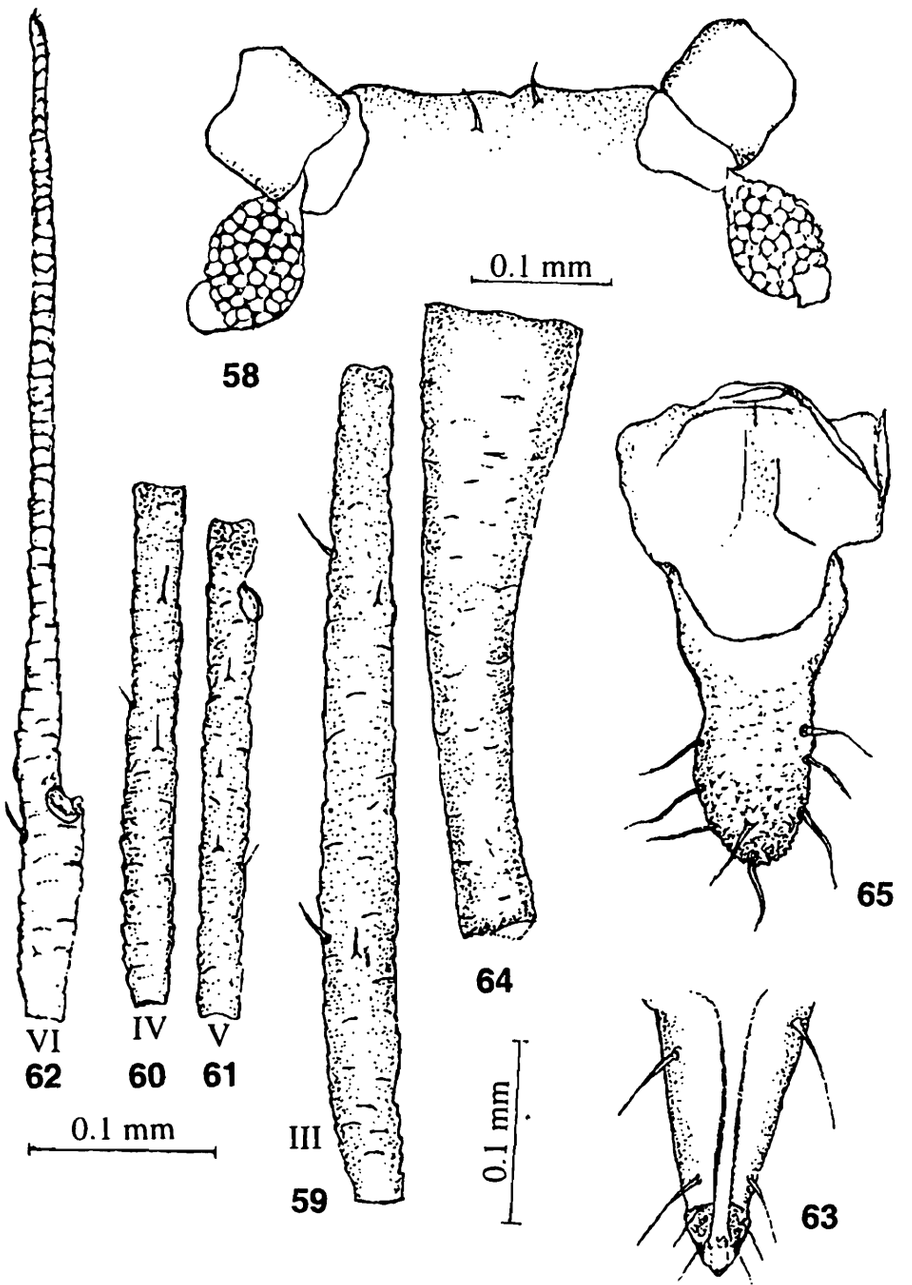
5. ***Aphis eugeniae*** van der Goot
(Figs. 58-65)

1917. *Aphis eugeniae* van der Goot, *Contr. Faune Ind. neerl.*, **3** : 250.

1969. David, Narayanan and Rajasingh, *Bull. Ent.*, **10** (2) : 158.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17** (3) : 28.

Material examined : 3 apterae and nymphs, on *Dipsacus inermis,* Simla Hills, 12.xii.1973, Coll. L.K. G.; 5 apterae, on *Glochidon* (Euphorbiaceae), New South Wales, 27.ix.1975, J. M. E. Anderson (272/76); 1 aptera, on Weed, Kufri (Simla), 14.viii.1967, Coll. K. Narayanan.



Figs. 58-65. *A. egeniae* V.D.G. : Aptera, 58, Head; 59, a.s.III; 60, a.s.IV 61, a.s.V; 62, a.s.VI; 63, u.r.s.; 64, siphunculus; 65, cauda.

Apterous viviparous female : Body 1.50-2.0 mm long with 0.80-0.90 mm as its maximum width near the middle of abdomen. Antennae about 0.6 times as long as body ; p.t. (Fig. 62) about 3.0 times as long as base of a.s. VI; a.s. III, (Fig. 59) shorter (0.9 times) than p.t.; u.r.s. (Fig. 63) reaching mid coxae and just a longer than ht_2. Abdominal dorsum rather pale, dorsal hairs on anterior abdominal tergite about as long as the longest hair on a.s. III and about half as long as b.d.III; 8th tergite with 2 hairs longer than b.d. III; siphunculi (Fig. 64) dark, 1.6 times as long as elongated cauda (Fig. 65) being concolorous with siphunculi and bearing 6-16 hairs ; 2nd segment of hind tarsus with a pair of secondary hairs on lower surface and sometimes also on upper; legs pale brown except the apices of tibiae and tarsi blackish; F.T.C. 3,3,3.

Measurements (in mm) of an aptera : Length of body 1.50; width of body 0.90; a.s. III 0.19, IV 0.14, V 0.14, VI (0.07 + 0.22); u.r.s. 0.09; ht_2 0.07; siphunculus 0.22; cauda 0.14.

Distribution : India : Himachal Pradesh; Nepal and Thailand.

6. ***Aphis euphorbiae*** Kaltenbach
(Figs. 66-72)

1843. *Aphis euphorbiae* Kaltenbeach, *Mon, Fam. Pfianz.* : **94**.

1971. *Aphis euphorbiae* kalt. : Chakrabarti, Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.*, **37** : 248.

1990. *Aphis euphorbiae* kalt. : Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 28.

2001. *Aphis euphorbiae* kalt. : Chakrabartti and Sarkar, *J. Aphidol.,* **15**(1&2) : 11.

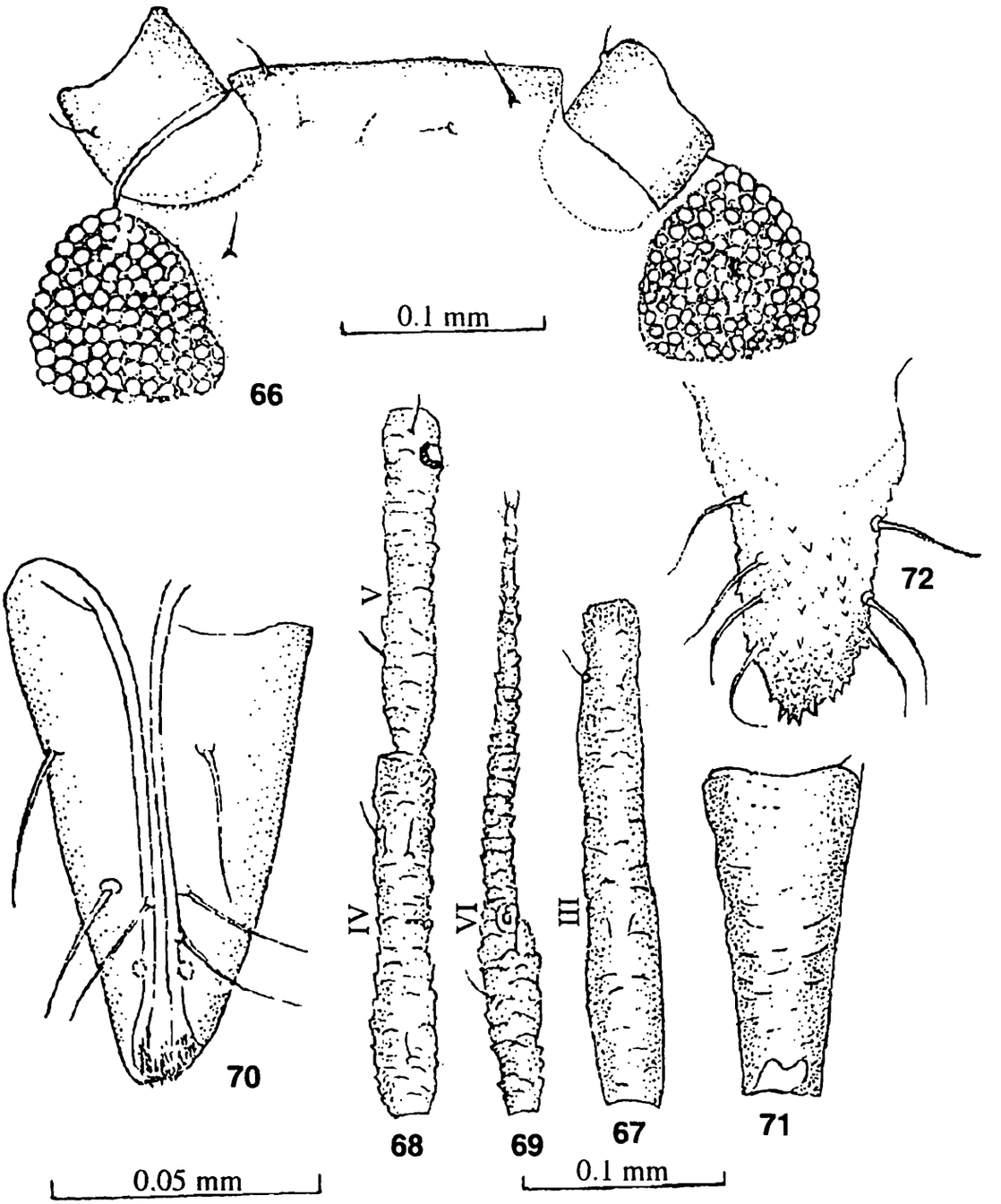
Apterous viviparous female : Body about 1.6-2.0 mm long with 0.8-1.2 mm as its maximum width near the middle of abdomen. Antennae long.; p.t. (Fig. 69) 1.6–1.9 times as long as base of a.s. VI ; u r.s. (Fig. 70) 0.7-0.8 times as long as ht2. Abdominal dorsum pigmented with a dorsal patch and with polygonal reticulations; longest hair on anterior tergites about 0.6-0.8 times as long as b.d. III; 8th tergite with 2 hairs. Siphunculi (Fig.71) darker, 0.09-0.11 times as long as body and 0.89-0.95 times as long as dark cauda (Fig. 72) bearing 5-8 hairs. F.T.C. 3, 3, 3.

Measurements (in mm) of an aptera : Length of body 1.90; width of body 1.10; antenna 1.14, a.s. III 0.33, IV 0.21, V 0.19, VI (0.12 + 0.20); u.r.s.0.10; ht_2 0.12; siphunculus 0.18; cauda 0.19.

Colour : Dark brown in life.

Material examined : Many apterae, on undet. Compositae, Uttar Pradesh, 3.xii.1970, coll. S.C., 2 apterae and 3 nymphs on undet. host, Kousani, (U. P.) 26.v.1969, coll. S.C.

Distribution : India : Uttar Pradesh; Australia; England; Germany; Nepal; South Africa and Spain.



Figs. 66-72. *A. euphorbiae* Kalt. : Aptera 66, Head; 67, a.s.III; 68, a.s. IV and V; 69, a.s. VI; 70, u.r.s.; 71, siphunculus; 72, cauda.

7. ***Aphis fabae*** Scopoli
(Figs. 73-78, 344)

1763. *Aphis fabae* Scopoli, *Entomologia carnioiica* : 139.

1958. David, *indian J. Ent.*, **19** : 171-180.

1958. David *J. South Indian Hort.*, **6** : 67-74.

1963. Behura, *Proc. First Summer School of Zoology :* 25-78.

1965. Ganguli and Ghosh, M.R., *Sci. Cult.*, **81** : 541-542.

1965. Kareem & Basheer, *Indian J. Ent.* : **234**-236.

1969. Chowdhuri, Basu, R.C. and Raychaudhuri, D.N., *Sci. Cult.,* **35** : 334-335.

1969. Ghosh L.K., *Sci Cult.,* **35** : 493-494.

1969. Basu, A.N., *Oriental. Ins.* **3** : 355-57.

1969. Rao, *Final Tech. Rep.* : 93.

1970. Ghosh, L.K., *Sci. Cult.,* **36** : 562-563.

1970. Ghosh, A.K., Basu, R. C. and Raychaudhuri, D.N., *Oriental Ins.,* **4** : 64-76.

1971. Bhalla, *Himachal J. Agric. Res.,* **1** : 51-52.

1971. Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N. *Proc. zool. Soc, Calcutta,* **24** : 47-51.

1971. Chakrabarti, S., Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **97** : 247-248.

1972. Basu, R.C., Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **38** : 494-495.

1973. Raychaudhuri, D.N., *USPL* 480 *Project Tech. Report* : 107 pp.

1974. Basu, R.C., Ghosh, M.R. and Raychaudhuri, D.N., *Sci. Cult.,* **40** : 41-43.

1975. Ghosh, A.K., Biswas, Lahiri, A.R. & Rhynth, M.R., *Sci. Cult.* **41** : 386-388.

1980. Raychaudhuri, D.N., Ghosh, L.K. and Das, S.K., *Ins. matsum.,* **20** : 1-42.

1980. Raychaudhuri, D.N. (ed.) Aphids of N.E. *India and Bhutan, The Zoological Society, Calcutta* : 521pp.

1980. Agarwala and Raychaudhuri, D.N. *Entomon,* **5** : 39-42.

1981. Agarwala and Raychaudhuri, D.N., *Entomon,* **6** : 207-209.

1981. Agarwala, Ghosh, D., Das, S.K., Poddar and Raychaudhurl, D.N., *Entomon,* **6** : 233-238.

1984. Agarwala, Laska and Raychaudhuri, D.N. *Acta ent. bohemoslov,* **81** : 15-21.

1775. *Aphis euonymi* Fabricius, *Systema Entomologiae,* : 733-740.

1963. Behura, *Proc. First Summer School Zoology (Simla, 1961)* : 25-78.

1958. David, *J. Bombay nat. Hist. Soc.,* **55** : 110-119.

1914. *Aphis fabae solanella* Theobald, *Bull. ent. Res.,* **4** : 325.

1969. Basu A.N., *Oriental. Ins.,* **3** : 335-371.

1970. Ghosh, A.K., Basu, R.C. and Raychaudhuri, D.N., *Oriental Ins.,* **4** : 65-76.

1970. Ghosh, A.K., Ghosh, M.R. and Raychaudhuri, D.N., *Oriental Ins.,* **4** : 193-203.

1970. Ghosh, L. K., *Sci. Cult.,* **36** : 362-363.

1971. Chakrabarti, Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **37** : 247-248.

1971. Ghosh, M. R., Ghosh, A.K., and Raychaudhuri, D.N., *Proc. zool. Soc., Calcutta,* **24** : 47-51.

1974. Ghosh, A.K., *Indian J. Hort.,* **31** : 104-109.

1979. Maity, and Chakrabarti, *Sci. Cult.,* **45** : 160-162.

1979. Raychaudhuri, D.N. Dutta, Agarwala, Raha and Raychaudhuri, D., *Entomon,* **4** : 163-166.

1914. *Aphis solanella* Theobald, *Bull.ent. Res.,* **4** : 313-337.

1969. Ramaseshiah and Dharmadhikari, *CIBC Tech. Bull. No.* **11** : 156-164.

1969. Rao, *CIBCU.*s.PL 480 Project. *Final Tech. Rep.* : 1-93.

1970. Dharmadhikari and Ramaseshiah, *CIBC Tech. Bul.* No. 13 : 83-89.

1971. Bhalla, *Himachal J. Agric. Res.,* **1** : 51-52.

1975. Verma and Singh, *Curr. Sci.,* **44** : 368.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17** (3) : 29-33.

2001. Chakrabarti and Sarkar, *J. Aphidology.,* **15** (1&2) : 11.

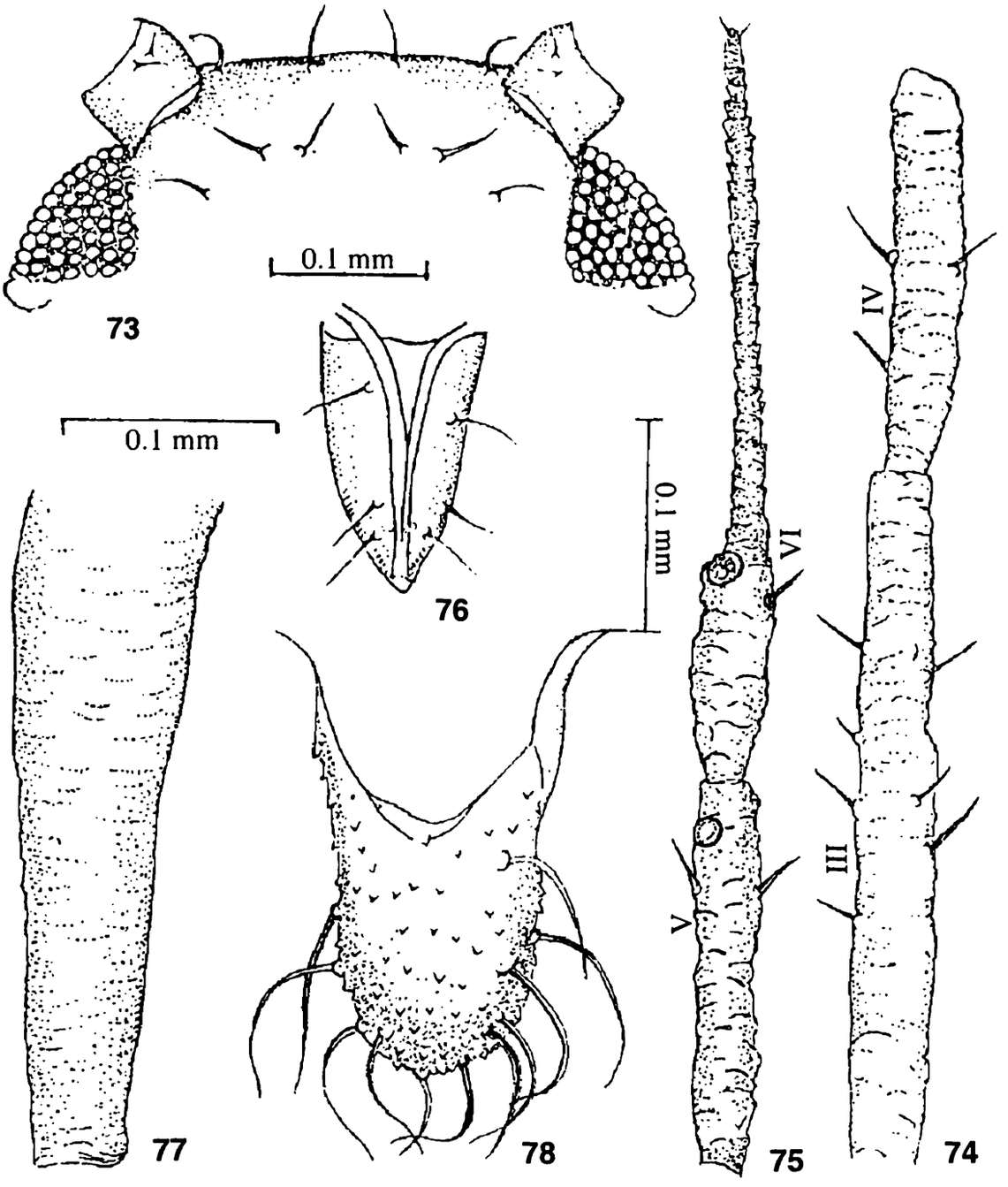
Apterous viviparous female : Body blackish, about 1.70-2.8 mm long with 1.1-1.6 mm as its maximum width. Antennae (Figs. 74-75) pale to dark, about 0.56-0.8 times as long as body, p.t. (Fig. 75) 2.3-3.5 times as long as base of a.s. VI, flagellar hairs 18μ-25μ long and 1.0-1.4 times as long as b.d. III. Rostrum reaches beyond mid coxae, u.r.s. (Fig. 76) 0.9-1.4 times as long as ht_2. Abdominal dorsum with polygonal reticulations with post-siphuncular sclerites besides some other dark sclerites and scattered muskel-platten like structure, the sclerites may sometimes form segmentelly arranged transverse bands on segments vi-viii. longest hair on anterior tergites upto about 1.6-1.7 times as long as b.d. III. 8th tergite with 3-5 hairs, upto about 2.0-2.5 times as long as b.d. III. Siphunculi (Fig. 77) dark, cylindrical, about 0.15-0.18 times as long as body and 1.5-2.0 times the length of broad and blackish cauda (Fig. 78) bearing 12-18 hairs. Distal 0.65 portion of femora, apices of tibiae and tarsi dark brownish; F T. C. 3, 3, 2.

Measurements (in mm) :

	Length	*Width*	*Antenna*	*Antennal segments.*			
				III	IV	V	VI
1.	1.86	1.20	1.23	.29	.19	.18	(.13 + .30)
2.	1.62	0.93	1.07	.26	.18	.16	(.12 + .29)
3.	2.27	1.38	1.50	.38	.20	.18	(.14 + .30)
4.	2.53	1.56	2.00	.40	.28	.20	(.14 + .32)

u.r.s.	h.t.2	Siphunculus	Cauda
.13	.12	.32	.20
.13	.11	.30	.20
.13	.12	.33	.23
.13	.12	.35	.24

(1–2, on *Sonchus* sp., India : H.P., Solan, I-vi-1969, L. K. Ghosh; 3–4, undet Compositae, Simla, 2.IV-1969, M.R. Ghosh)



Figs. 73-78. *A. fabae* Scopoli complex : Aptera 73, Head; 74, a.s. III & IV; 75, a.s.V & VI; 76, u.r.s; 77, siphunculus; 78, cauda.

Measurements (in mm) of an aptera : Length of body 2.29; width of body 1.4; antenna 1.52; a.s. III 0.36, IV 0.27, V 0.27, VI (0.11 + 0.40); u.r.s. 0.13; ht_2 0.11, Siphunculus 0.41; cauda 0.21.

Colour : Body dull black, with blackish siphunculi and cauda. The two basal segments and the tip of antennae blackish, the remainder whitish, distal protion of femora dark, tibiae whitish, blackish only at the apices, tarsi dark.

Alate viviparous female : Body blackish, 1.8-2.4 mm long with 0.8-1.4 mm as maximum width. Antennae about 0.6-0.7 times as long as body; a.s. III with 8-20, IV with 0-8 secondary rhinaria; p.t. about 2.5-3.5 times as long as base of a.s. VI and

distinctly longer than a.s. III. u.r.s. 1.0-1.1 times as long as ht_2. Abdominal dorsum with segmentally arranged transverse black bands, marginal and post-siphuncular sclerites distinct, sometimes ante-and post siphuncular sclerites may fuse together to encircle the base of siphunculi. Siphunculi dark, about 0.13-0.18 times as long as body and 1.3-2.0 times as long as broad, dark cauda bearing 12-18 haris. Other characters as in apterae.

Measurements (in mm) :

	Length	*Width*	*Antenna*	*Antennal segments.*			
				III	IV	V	VI
1.	2.21	0.90	1.56	0.36	0.27	0.25	(0.13 + 0.40)
2.	2.25	1.11	1.37	0.29	0.25	0.22	(0.12 + 0.33)
3.	1.70	0.80	1.00	0.22	0.17	0.15	(0.10 + 0.27)

u.r.s.	h.t.2	Siphuncnlus	Cauda
0.13	0.12	0.33	0.19
0.12	0.10	0.27	0.18
0.18	0.17	0.40	0.20

(1–2, on *Spiraea bella,* India : H. P., Chail, 27.x.1978, L. K. Ghosh ; 3, on *Rhamnus* sp., Jakhu, 28-x-1071, L. K. Ghosh)

Measurements (in mm) of an alata : Length of body 2.21; width of body 0.90; antenna 1.56, a.s. III 0.36, IV 0.27, V 0.25, VI (0.13 + 0.40); secondary rhinaria on III 14 & 21, IV 1 & 0; u.r.s. 0.13; ht_2 0.12; siphunculus 0.33; cauda 0.19.

Colour : Head and thorax blackish, abdomen dusky brown, siphunculi and cauda black.

Apterous oviparous female : Body 1.10-1.35 mm long with 0.70-0.80 mm as the maximum width near the middle of abdomen. Head brown, longest dorsal cephalic hair about 1.7-2.0 times as long as b.d. III. Antennae 5-6 segmented, about half as body; p.t. 2.0-2.5 times as long as base VI. Rostrum reaches just past 2nd coxae; u.r.s. 1.10-1.25 times as long as ht_2 and bears 2 secondary hairs. Abdominal dorsum pale, longest hair on anterior abdominal tergite 1.50-2.0 times as long as b.d. III. Siphunculi cylindrical, brownish, 0.70-0.80 times as long as cauda. Cauda rather thumb-shaped, concolorous with siphunculi and bears 6-8 hairs. Hind tibiae swollen with numerous pseudosensoria distributed over basal 0.80 portion. Fore and mid legs pale brown except distal half of femora, apices of tibiae and tarsi dark brownish; hind legs darker; F. T. C. 3, 3, 2.

Measurements (in mm) of an ovipara : Length of body 1.10; width of body 0.70; antenna 0.70; a.s. III 0.12, IV 0.10, V 0.10, VI (0.09 + 0.20); u.r.s. 0.09; ht_2 0.08; siphunculus 0.08; cauda 0.10.

Alate male : Body 1.38 mm long with 0.60 mm as the maximum width near the middle of abdomen. Head dark brown. Antennae 6-segmented, about 0.80 times as long as body, p.t. 2.3 times as long as base VI; a.s. III with 20-25, IV with 20-22 and V with 8-10 round secondary rhinaria distributed irregularly over almost entire length. Rostrum reaches a little beyond mid coxae, u.r.s. a little longer than ht_2 and bears 2 secondary hairs. Abdomen with segmentally arranged spinal and marginal dark brown sclerites ; dorsal hairs on anterior abdominal tergites about twice as long as b.d. III. Siphunculi a little longer than cauda. Other characters as in alate viviparous female.

Measurements (in mm) of the male : Length of body 1.38; width of body 0.60; antenna 1.10; a.s. III 0.24, IV 0.20, V 0.20, VI (0.12 + 0.28); u.r.s. 0.08; ht_2 0.07; siphunculus 0.10; cauda 0.09.

Material examined : 3 apterae and 2 alatae, Chail (H. P.), on *Spiraea bella,* 27.x.1978; 7 apterae, Mussourie (U. P.), on *Cestrum* sp., coll. M. R. G.; 8 apterae oviparae, on *Strobilanthes atropurpurens*, Mashobra (H. P.), 28.x.1078; 1 aptera, 1 alata and 11 nymphs, Jakhu (H. P.), C 2400 m., on *Rhamnus* sp., 28.x.1971; 4 apterae, Javli (H.P.), on undet. Gramineae, 29.x.1978, 8 apterae, 1 alate male and 13 nymphs, Kasauli (H.P.), 30.x.1978; many apterae, Kemphy (U. P.), on *Anaphalis* sp., 4.xi.1978, coll. M. R. G.

Remarks : The infestation by this species can be easily recognised by the badly crumpled leaves of the host plant. The species is attended by ants. Raychaudhuri, D. N. (1980) has discussed the affinity between *fabae* Scopoli and *fabae salanella* Theobald. However, this aphid differs from typical *fabae* Scopoli in longer siphunculi. It has a wide range of host plants (Solanaceae, Polygonaceae, Asteraceae and Brassicaceae). It sometimes causes serious damage to beans and peas. Raychaudhuri, D. N. *et al.* (1980) described oviparous female and alate male from northwest India. The species usually reproduces parthenogenetically in Indian conditions. But find of both oviparous females and alate male from N. W. Himalaya suggests that it may enjoy both anholocylic and holocylic life in the area.

Distribution : India : all over; virtually cosmopolitan.

8. ***Aphis farinosa*** Gmelin
(Figs. 79-86)

1788. *Aphis farinosa* Gmelin, *Syst. Nat.,* ed. **12** : 2210.

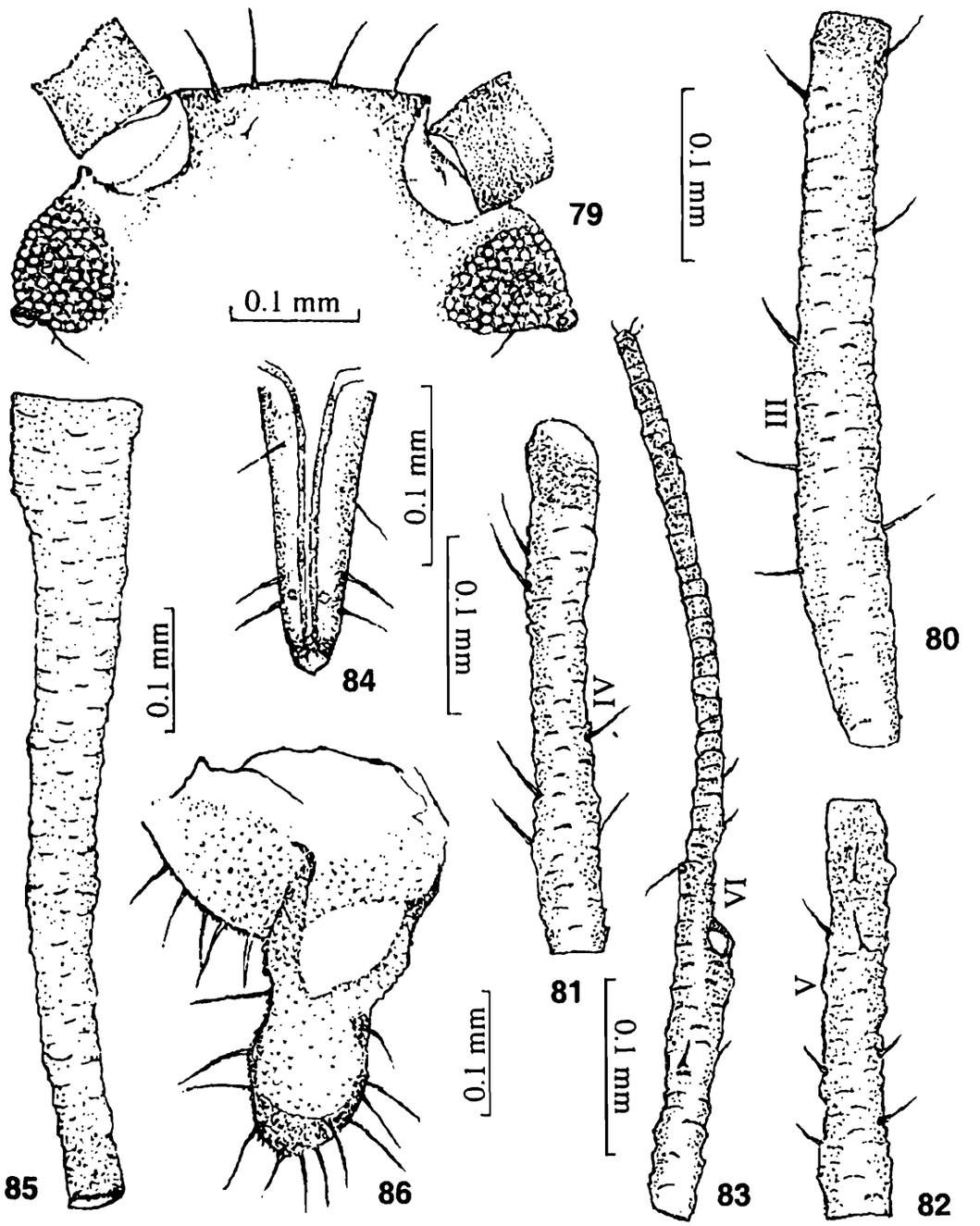
1843. *Aphis saliceti* Kaltenbach, *Monographic der Familen der pfianzen.* : 103.

1917. *Aphis yanagicola* Matsumura, *J. coll. agr. Sapporo,* **7** : 390.

1969. *Aphis farinosa* ; Verma, *Sci. Cult.,* **35** : 28.

1990. *Aphis farinosa* Gmelin : Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 33-34.

2001. *Aphis farinosa yanagicola* Mastsumwra : Chakrabarti and Sarkar, *J. Aphidol.,* **15**(1&2) : 12.



Figs. 79-86. *A. farinosa* Gmelin : Aptera. 79, Head; 80, a.s. III; 81, a.s. IV; 82, a.s. V; 83, a.s. VI; 84, u.r.s.; 85, siphunculus; 86, cauda.

Material examined : 1 aptera, on *Salix capra,* Wadoora (J. & K.), 1.vi.1970, A-62, CIEA 64-49.

Apterous viviparous female : Body rather ovate, 2.8 mm long with 1.08 mm as the maximum width near the middle of abdomen. Antennae 6-segmented, about half as long as body, a.s. I, II, distal part of III, IV, V and VI dark, (Figs. 80-83) longest hair on a.s. III about twice as long as b.d. III; p.t. about 1.8 times as long as base of a.s. VI. Rostrum reaches mid coxae; u.r.s. (Fig. 84) just a longer than ht_2; dorsum of abdomen pale, smooth, abdomen with submarginal integumental sclerites, 8th tergite with 2 hairs. Siphunculi (Fig. 85) imbricated, pale, with darker apex, long, 0.25-0.33

times as long as body, about 2.5 times as long as cauda and without any distinct flange. Cauda (Fig. 86) rather dark slightly constricted near at the middle, with about 14 hairs. Legs pale brown except coxae, trochanters, distal half of femora, apices of tibiae and tarsi dark; F. T. C. 3, 3, 2 ; hind tibiae with hairs longer than mid diameter of the tibia.

Measurements (in mm) of the aptera : Length of body 2.28; width of body 1.08; antenna 1.11; a.s. III. 0.35, IV 0.20, V 0.20, VI (0.14 + 0.26); u.r.s. 0.13; ht_2 0.11; siphunculus 0.54; cauda 0.22.

Distribution : India : Jammu & Kashmir; Central Asia; Europe; Formosa, Middle East; North America; Thailand.

9. ***Aphis glycines*** Malsumura
(Figs. 87-94)

1917. *Aphis glycines* Matsumura, *Jour. Coll. Agric. Tohoku Imp. Univ.,* **6** : 360.

1980. Raychaudhuri, D. N. (ed.), *Aphids of Northeast India and Bhutun.* The Zoological society, Calcutta : 54.

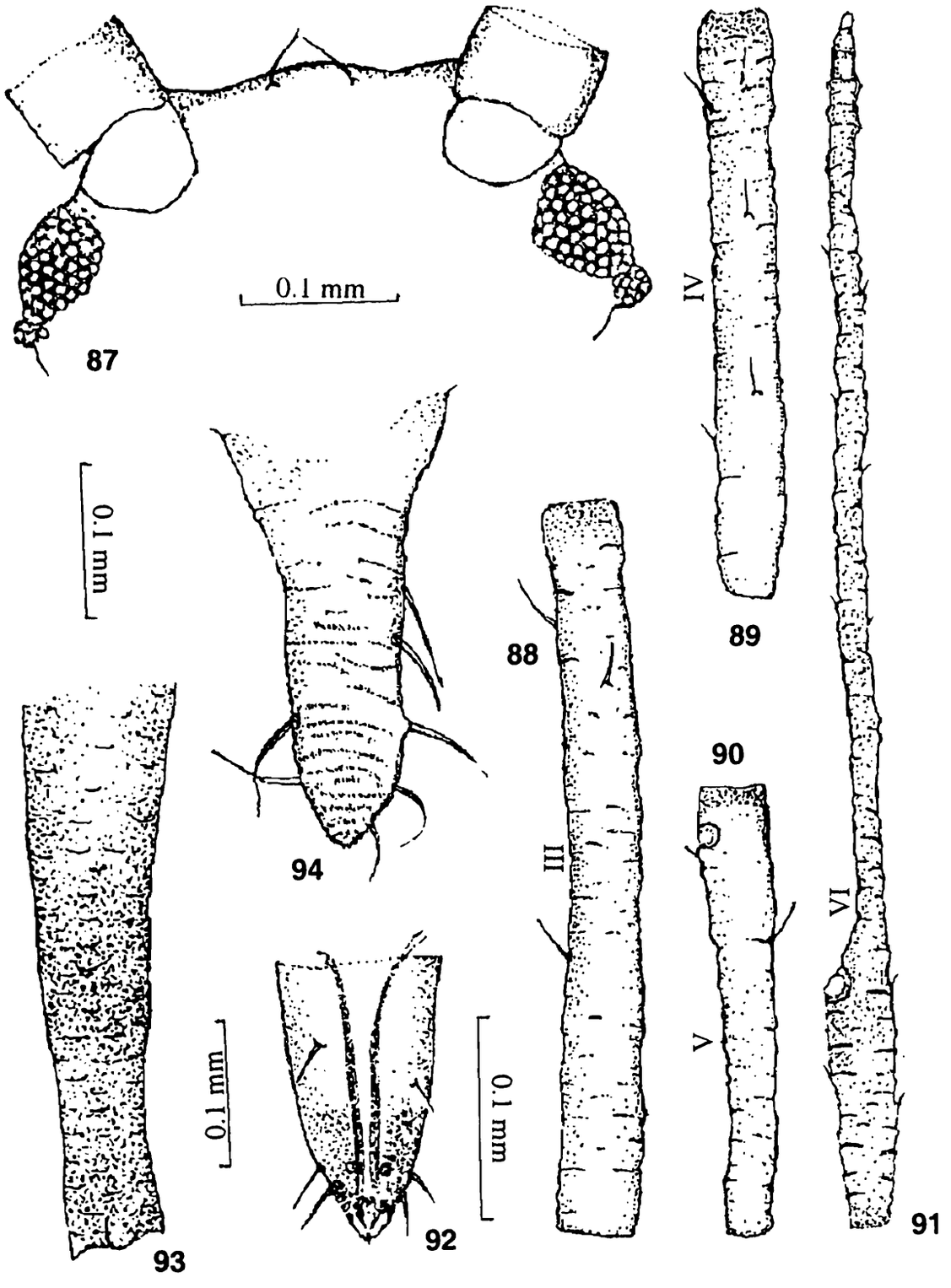
1990. Ghosh, L. K. *Mem. zool. Surv. India,* **17** (3) : 34.

Material examined : Many apterae on undet. Plant, Simla (H.P.), 12.xi.1968, coll. A. N. C., 2 alatae, on *Glaxiona maxima,* Tronglaubi (Manipur), 9.vii.1971, coll. T.K. Singh.

Apterous viviparous female : Body 1.28-1.38 mm long with 0.70-0.75 mm as maximum width near the middle of abdomen. Cephalic hairs blunt to slightly dialated at tip; antennae about 0.75 times as long as body, p.t. (Fig. 91) 2.1–2.5 times as long as base of a.s. VI; a.s. III (Fig. 88) shorter (about 0.8 times) than p.t.; u.r.s. (Fig. 92) 1.2-1.4 times as long as ht_2. Abdominal dorsum not pigmented, dorsal hairs on anterior abdominal tergite a little shorter (0.6-0.8 times) than middle diameter of a.s. III and about twice as long as longest hair of the segment, those on 8th tergite a little longer than b.d. III; siphunculi (Fig. 93) dark, about as long as pale cauda bearing 7-10 haris (Fig. 94); 2nd segment of hind tarsus with a pair of secondary hairs on lower surface and sometimes also on upper side; F T. C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 1.35; width of body 0.75; antenna 1.05; a.s. III 0.22, IV 0.15, V 0.17, VI (0.11 + 0.26); u.r.s. 0.10; ht_2 0.88; siphunculus 0.21; cauda 0.20.

Alate viviparous female : Body 1.55-1.65 mm long with about 0.66 mm as the maximum width near the middle of abdomen. Antennae about 0.75 times as long as body; p.t. about 1.2 times as long as a.s. III and about thrice as long as base VI ; a.s. III with 6-7 secondary rhinaria; u.r.s. a little longer than ht_2 and bears 2 secondary hairs; longest hair on 8th tergite about 1.4 times as long as the longest hair on a.s. III. Otherwise, as in aptera.



Figs. 87-94. *A. A. glycines* Mats : Aptera. 87. Head; 88. a. s. III; 89. a.s. IV; 90. a.s. V; 91. a.s. VI; 92. u.r.s.; 93. siphunculus; 94. cauda.

Measurements (in mm) of an alata : Length of body 1.65; width of body 0.66; antenna 1.22; a.s. III 0.26, IV 0.19, V 0.19, VI (0.11 + 0.32); u.r.s. 0.10; ht_2 0.09; siphunculus 0.22; cauda 0.15.

Distribution : India : Manipur, West Bengal; China; Japan; Korea; Malayasia; Manchuria; Nepal; Philippines; Taiwan and Thailand.

10. ***Aphis gossypii*** Glover
(Figs. 95-110, 345, 346, 369)

1877. *Aphis gossypii* Glover, *Rep. Comm. Agric. U.S.A.* for 1816; 36.

1909. Lefroy and Howlett, *Indian Insect Life* : 786.

1914. Fletcher, Govt. Press Madras, (Aphids) : 499-501.

1917. van der Goot. *Rec. Indian Mus.,* **13** : 175-183.

1919. Krishnamurti, *J. Bombay nat. Hist. Soc.,* **33** : 211-215.

1927. George, *J. Asiat. Soc. Bengal (N.S.),* **23** : 1-12.

1931. Krishnamurti, *J. Bombay nat. Hist. Soc.,* **34** : 411-419.

1938. Deshpande, *J. Bombay nat. Hist. Soc,* **39** : 740-744.

1939. Behura, *Proc. First Summer School of Zoology* : 25-78.

1940. Ghulamullah. *Indian J. Ent.,* **2** : 13-25.

1948. Krishnamurti, *Indian J. Ent.,* **10** : 51-53.

1955. Banerjee, S.N. and Basu, A. N., *Curr. Sci.,* **24** : 61.

1956. David, *Madras Agric. J.,* **43** : 103-107.

1958. Basu, A.N. and Banerjee, S.N., *Indian Agric.,* **3** : 89-112.

1958. David, *J. Bombay nat. Hist. Soc.,* **55** : 110-116.

1958. David, *Indian J. Ent.,* **19** : 171-180.

1959. Raychaudhuri, D.N. and Ghosh, A.K., *Indian Agric.,* **3** : 17-22.

1961. Chatterjee, Ghosh, A.K. and Raychaudhuri, D.N., *Indian Agric.,* **5** : 87-88.

1962. Ghosh, A.K. and Raychaudhuri, D.N., *Indian Agric.,* **4** : 228-229.

1962. Ghosh, A.K. and Raychaudhuri, D.N., *J. Bombay nat. Hist. Soc.,* **59** : 238-253.

1962. Ghosh, A.K. and Raychaudhuri, D.N., *J. Asiat. Soc.,* **4** : 101-113.

1962. Sengupta, Das and Behura. Prakruti *Utkal Univ.J. Sci.,* **2** : 33-39.

1963. Ghosh, A.K. and Raychaudhrui, D.N., *Sci. Cult.,* **29** : 104.

1965. Behura, *Prakruti Utkal Univ. J. Sci,* **3** : 40-65.

1965. Ganguli and Ghosh, M.R., *Sci. Cult.* **31** : 541-542.

1965. Kareem and Basheer, *Indian J. Ent.,* **27** : 934-236.

1967. Joshi and Mathur, *Madras agric. J.,* **54** : 239-243.

1968. Ghosh, A.K. and Raychaudhuri, D.N., *Proc. zool. Soc. Calcutta,* **21** : 179-195.

1969. Rameseshiah and Dharmadhikari, CIBC *Tech. Bull.* **11** : 156-164.

1969. Rao., *First Tech. Rep.* : 1-93.

1970. Dharmadhikari and Ramaseshiah, *CIBC Tech. Bull.* **13** : 83-89.

1970. Ghosh, L.K., *Sci. Cult.,* **36** : 419-420.

1970. Rizvi and Paul Khurana, S. M., *Sci. Cult.,* **36** : 49.

1971. Bhalla, *Himachal J. agric. Res.,* **1** : 51-52.

1972. Chakrabarti, Ghosh, A.K. and Raychaudhuri, D.N., *Oriental. Ins.* **6** : 387-400.

1972. Hayat, *Entomophaga,* **17** : 49-58.

1973. Raychaudhuri, D.N., *USPL 480 Project Tech. Rep.* : 1-107.

1973. Shuja Uddin ; *Indian J. Ent.,* **35** : 9-14.

1975. Ghosh, A.K., Biswas, Lahiri and Rhynth, *Sci. Cult.,* **41** : 386-388.

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Material examined : 20 apterae, on undet. host, Badkhal Lake (Haryana), 22.x.1978, coll. M. R. G. & P. K. M.; 1 aptera, on *Anaphalis contorta,* Solan (H.P.), 20.x.78, coll. M. R. G. & P. K. M.; apterae and 1 nymph, on *Goldfussia dlhoussiana ;* Solan, 25.x.78; coll. M. R. G. & P. K. M.; 4 apterae, on *Polygonum* sp., Solan (H.P.), 25.x.78, coll. M. R. G. & P.K. M.; 3 apterae, on *Prunus* sp., Solan ; 25.x.78 ; coll. M. R. G. & P. K. M.; 1 aptera and 3 nymphs on an unidentified host (Acanthaceae), Solan (H.P.), 26.x.78, coll, M. R. G. & P. K. M.; 8 apterae and 12 nymphs, on *Polygonum* sp., Kufri (H.P.), 26.x.78, coll. M. R. G. & P. K. M. ; 5 apterae and 11 nymphs, on *Anaphalis* sp., Sadhupul (H. P.), 27.x.78, coll. M. R. G. & P. K. M.; 7 alatae, on *Hypericum ablongifolium,* Chail (H. P.), 27.x.78, coll. M. R. & P. K. M.; 2 apterae, on *Smilax* sp., Sadhupul 27.x.78, coll. M. R. G. & P. K. M. ; 3 apterae and 9 nymphs, on *Polygonum* sp., Sadhupul, 27.x.78, coll. M. R. G. & P. K. M.; 1 alata from *Pyrus* sp., Sadhupul, 27.x.78, coll. M. R. G. & P. K. M.; 20 apterae, alata and 51 nymphs, on *Gynura nepalensis,* Mashobra (H.P.), 28.x.78, coll. M. R. G. & P. K. M.; 8 apterae and 29 nymphs, on *Polygonum* sp., Mashobra, 28.x.78, coll. M. R. G. & P. K. M.; 4 apterae, 3 alatae and 16 nymphs, on *Rhamnus* sp., Jakhu (H.P.), 21.x.78; coll. M. R. G. & P.

K. M.; 3 apterae and 2 nymphs, on *Ipomoea* sp., Dharampur (H.P.), 53.x.78, coll. M. R. G. & P. K. M.; 1 aptera, on *Polyanthia* sp., Badkhal Lake (Haryana), 22.x.78, coll. M. R. G. & P. K. M.; 1 alata, on *Ageratum* sp., Mussourie, 3.xi.78., coll. M. R. G. & P. K. M.; 1 alata, on *Ageratum conyzoides,* Dehra Dun (U. P.), 2.xi.78, coll. M. R. G. & P. K. M.; 6 apterae, 1 alata and 1 nymph, on *Strobianthes atropurpureus,* Simla, viii.1966. 10 apterae and 8 alatae, host unknown, Andaman (ZSI lot no. 45/71), coll. B. K. Tikader; many apterae and alatae, host unknown, Andaman Survey, 1972 (ZSI lot no. 46/72), coll. B. Datta ; 2 alatae, host unknown, Aligarh (U. P.), 20.iii.1971, coll. S. Uddin (ZSI lot no. 61/73); many apterae and alatae, on *Rubus* sp., Kashmir, Wadoora, 29.v.1970, coll. S. Uddin; 5 apterae, host unknown, Andaman Is., 4 km. East of Ferrarganj, 17.iii.1975, coll. G. K. Srivastava & Party; 1 alate ♂, on *Comellia sinensis,* Toklai, (Assam), 18.i.1960, "C. U." coll.; 4 apterae ovip. ♀♀, on *Citrus decumana*, Rautara, 24 Parganas (N), W. B., 23.i.1967, coll. L. K. G.

Apterous viviparous female : Body pale yellowish green, greyish green or almost black, rather short, about 1.21–1.95 mm long with the maximum width 0.70-1.09 mm near at the middle of abdomen; head (Fig. 95) pale yellowish green to dusky green with small antennal tubercles, antennae (Fig. 96) 5-6 segmented, about 0.7–1.1 times as long as body, a. s. IV + V shorter than a. s. VI, p.t.2.1–3 times as long as base of a.s.VI. Eyes dark red to almost black. Rostrum reaches beyond 2nd coxae; u.r.s. (Fig. 97) 1.0–1.3 times as long as ht_2. Abdominal dorsum (Fig. 100) somewhat roughened on front, pale brown with scattered brown sclerites, longest hair on anterior tergites about 0.6–0.8 hairs as long as b.d. III, 1 small to large tubercle each side of prothorax and 1 small to medium on each side of abdominal segment 1 or VII, 8th tergite with 2 hairs having blunt to acuminate apices and shorter than b.d.III. Siphunculi (Fig. 98) light brown to dark brown, imbricated, cylindrical, tapering to apex or tapering from base to basal 3rd, 0.10-0.20 times as long as body and 1.2-1.8 times as long as cauda; cauda (Fig. 99) dusky usually slightly constricted near at the middle, bearing 5-6 hairs arranged wholly on each side but may be 2 on one and 3 the other. Femora yellowish brown to light brown; hind femora dusky over apical half, the duskiness being less intense on fore and mid femora; tibiae yellowish brown to light brown black on apical portions; tarsi black; F. T. C. 3, 3, 2, second tarsal segment with secondary hairs ventrally.

Measurements (in mm) :

Length	Width	Antenna	Antennal segments.			
			III	IV	V	VI
1.95	1.05	1.14	.299	.182	.169	(.110 + .247)
1.89	.93	1.05	.260	.169	.156	(.10 + .241)
1.35	.93	1.08	.208	.156	.140	(.11 + .169)
1.32	.81	0.87	.140	.117	.130	(.08 + .22)
1.29	72	0.88	.221	.140	.130	(.08 + .224)

U.r.s.	h.t.2	Siphunculus	Cauda
0.078	.130	.224	.104
0.078	.091	.221	.104
0.091	.078	.260	.117
0.078	0.78	.208	.104
0.078	.078	.224	.104

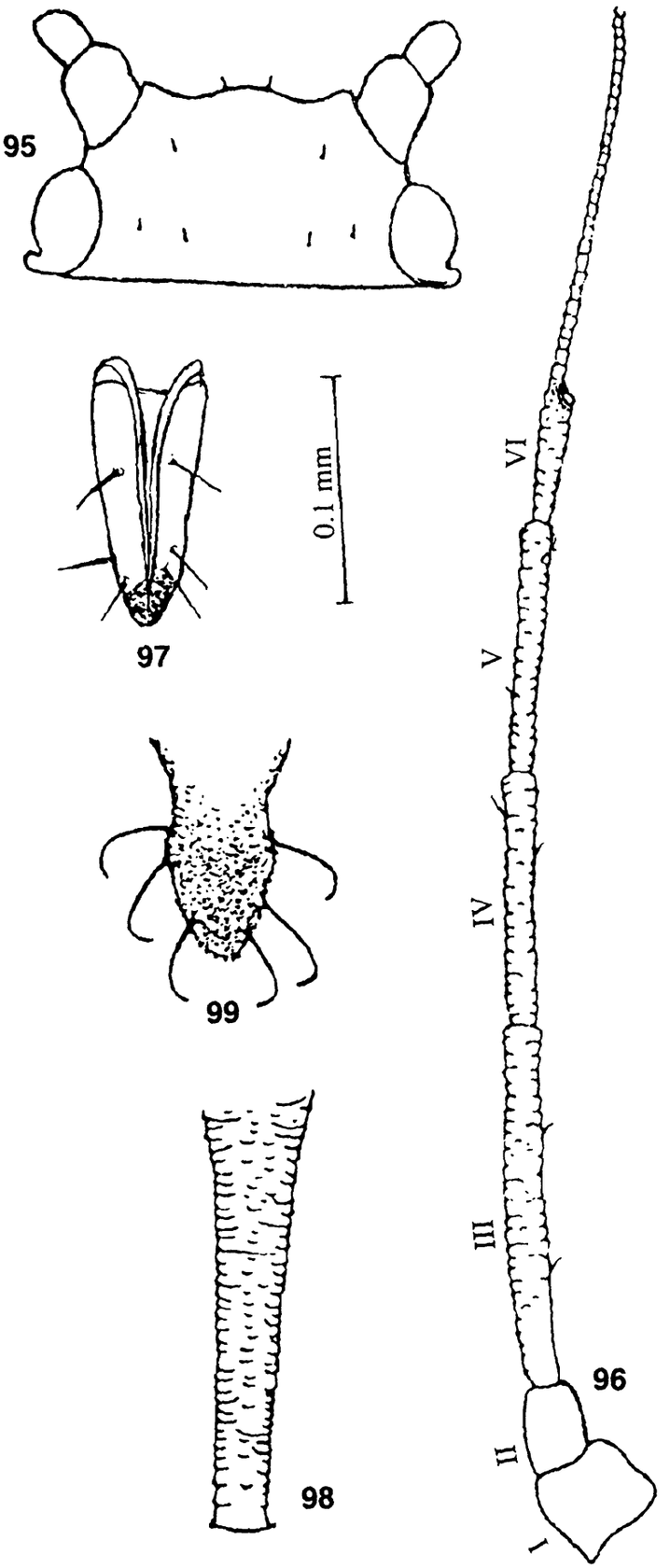
(1–2, on *Verbena cinalis*, Mashobra, Himachal Pradesh, 12-xii-1973, L. K. Ghosh; 3, on undet. Creeper, Solan (H.P.) 1-vi-1973, L. K. Ghosh; 4, on undet host, Andaman, date?, B. Datta; 5, on undet host, Solan (H. P.), 2.vi-1969, L. K. Ghosh).

Alate viviparous female : Body pale brownish, about 1.2–1.6 mm. long with the maximum width 0.7–0.9 mm near the middle of abdomen. Head (Fig. 103) blackish with antennal tubercles, Antennae (Fig. 102) black, about 0.7–0.8 times as long as body, segment I smooth, with some imbrications, particularly on inner side; a.s. II with a number of imbrications; remainder of antennae imbricated, each segment with moderately long hairs; a.s. III with about 5-7 secondary rhinaria in a row distributed over its almost length (Fig. 106), p.t. subequal to a.s. III, and 2.1–2.3 times as long as base VI. Rostrum pale greenish or yellowish brown on proximal half, apical portion dusky, extending to second coxae, u.r.s. (Fig. 107) 1.0–1.2 times as long as h.t.2. Abdomen green or dark green often with one or two thin black, short transverse marks on dorsum of apical two abdominal segments. A series of dark lateral patches on each side of abdomen (Fig. 101), with distinct post siphuncular sclerites; longest hair on anterior abdominal tergites about 0.6–1.0 times as long as b.d. III. siphunculi (Fig. 108) brownish, cylindrical, tapering from base to basal third to half, imbricated, with apical flange, about 0.11–0.14 times as long as body, about 4–4.5 times as long as its width at apex, and 1.5–1.59 times as long as cauda. Cauda (Fig. 109) slightly constricted at middle, with 4–7 hairs. Wing venation (Fig. 110) normal.

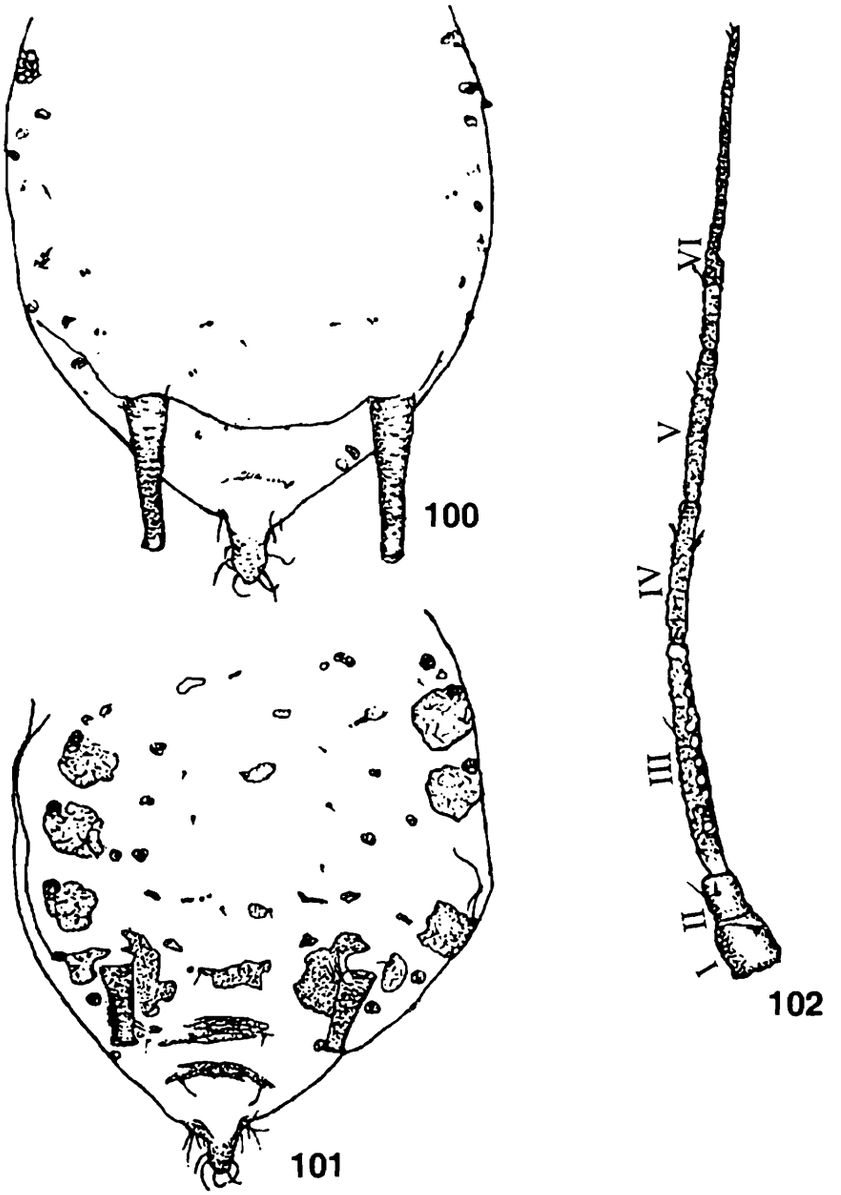
Measurements (in mm) :

Length	Width	Antenna	Antennal segments.			
			III	IV	V	VI
1.44	.63	1.05	.224	.169	.182	(0.09 + 0.286)
1.65	.69	1.09	.247	.169	.156	(0.11 + 0.299)
1.32	.60	1.08	.221	.156	.156	(0.09 + 0.261)
1.65	.72	1.03	.221	.169	.156	(0.10 + 0.286)
1.32	.66	0.73	.195	.130	.104	(0.09 + 0.140)

(1–2, on *Hibiscus* sp., India : Orissa, Bhubaneswar, 25.xi-1966, L. K. Ghosh; 3, host ?, Himachal Pradesh, Solan, 2.vi.1969, L. K. Ghosh; 4, on Piper betle, ZSI Lost No. 54/77; 5, host -? Andaman Is., 1972, B. Datta).



Figs. 95-99. *A. gossypii* Glover : Aptera 95, Head; 96, antenna; 97, u.r.s.; 98, siphunculus; 99, cauda.

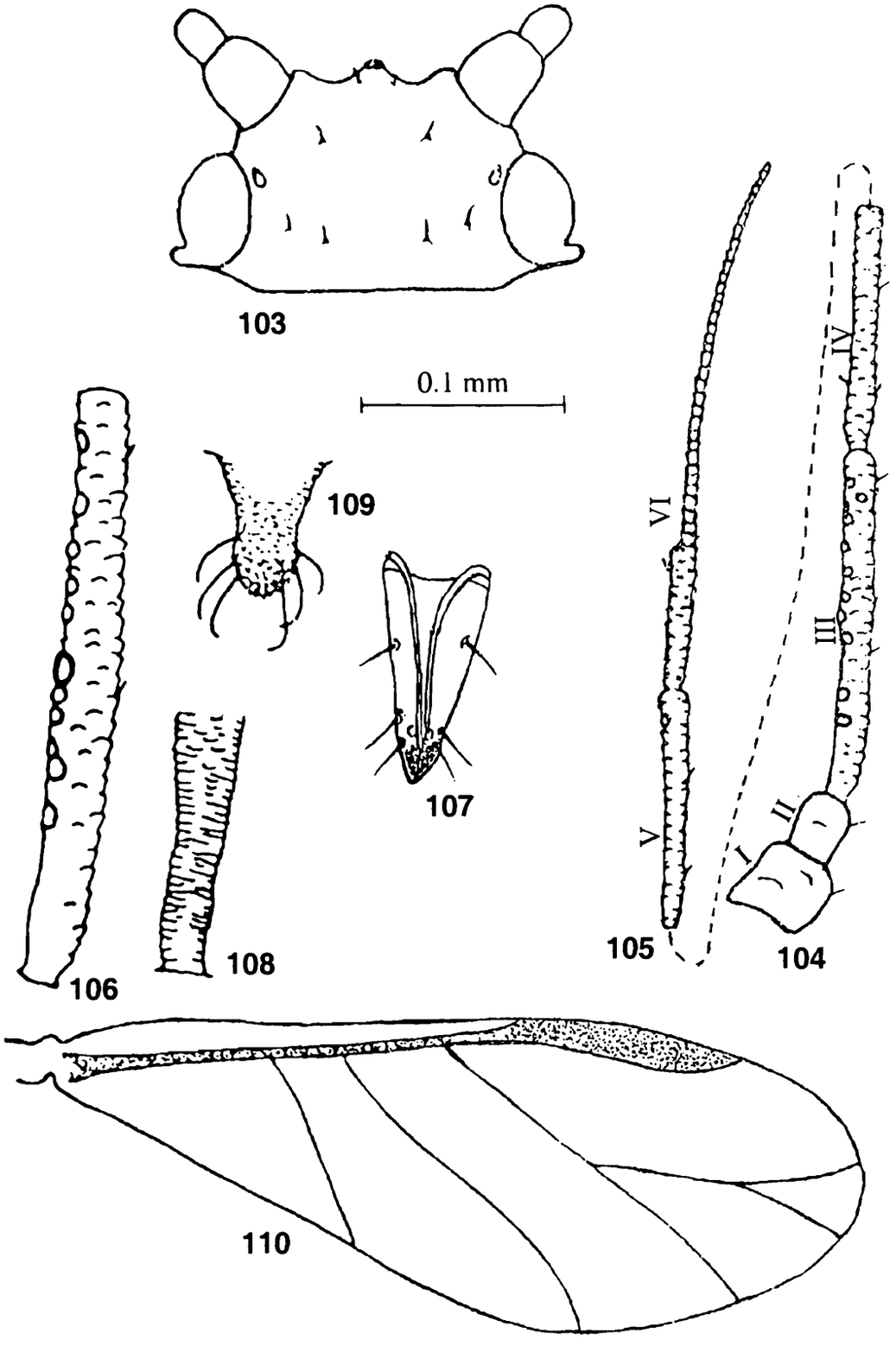


Figs. 100-102. *A. gossypii* : Aptera 100, posterior abdominal dorsum; 101, Alata. posterior abdominal dorsum; 102, antenna.

Apterous oviparous female : Body rather oval, 1.35-1.38 mm long with 0.70–0.80 mm as maximum diameter near the middle of abdomen. Head dark sclerotic. Front smooth. Antennae 6-segmented, basal two segments concolorous with head, shorter than body, flagellum pale with dusky apex, imbricated; a.s. III without secondary rhinaria, p.t. 2.1 times as long as base of VI, flagellar hairs acute, stiff, about 0.50 times as long as b.d. III; Rostrum reaches up to hind coxae, u.r.s. with 2 secondary hairs and 1.2 times as long as ht_2. Dorsal hairs scarce, short, straight with acute apices, the longest hair about 20μ. Tergite VIII with 2 hairs. Siphunculi short, somewhat cylindrical, dark brown, imbricated with poorly developed flange at the tip, 1.2 times as maximum diameter of hind tibiae near at the middle. Cauda short bluntish, concolorous with siphunculi, sclerotic, 1.5 times as long as siphunculi and with 5 hairs. The egg in the mounted specimen ovoid, 0.49 mm long, the maximum diameter of its middle being 0.37 mm. Hind tibiae evenly swollen to a maximum

width being 1.7-1.8 times the middle tibiae, with 54-61 pseudosensoria extending over almost the entire length except the very base and apical 0.2 portion; F T. C. 3, 3, 2.

Measurements (in mm) of an ovipara : Length of body 1.38; width of body 0.85; antenna 0.78; a.s. III 0.14, IV 0.10, V 0.14, VI (0.09 + 0.19); u.r.s. 0.11 ; ht_2 0.09; siphunculus 0.08; cauda 0.11.



Figs. 103-110. *A. gossypii* : Alata. 103, Head; 104, a.s.I-IV; 105, a.s.v & VI; 106, a.s.III magnified; 107, u.r.s.; 108, siphunculus; 109, cauda; 110, hindwing.

Alate male : Body elongated oval, 1.58 mm long with 0.75 mm as maximum width. Head and thorax dark brown, abdomen pale. Dorsum of abdomen with two rows of marginal sclerites and a row of median sclerite of irregular shape : marginal sclerite with irregular rows of spinules : Hairs on the dorsum sparse, short, straight and with acute apices. Antennae dark brown, imbricated, a little longer than the body; segment III with 33-34 circular rhinaria of very different sizes, distributed almost over the entire length, except the very base; segment IV with 21, V with 13-14 similar rhinaria distributed irregularly; p.t. nearly thrice as long as the base of a.s.VI, and subequal to a.s. III. Apical segment of the rostrum bluntish, reaching mid coxae, 1.2 times as long as h.t.2. Siphunculi dark brown short, stout, imbricated, broadest at base. Cauda short with about five hairs. Claspers with a process at their base. Femora and tibiae smooth; apices of femora and tibiae dark brown, rest pale yellow. First tarsal chaetotaxy 3 : 3 : 2.

Measurements (in mm) of the alate male : Length of body 1.58; width of body 0.75; antenna 1.60; a.s. III 0.30, IV 0.28, V 0.24, VI (0.13 + 0.39); u.r.s. 0.10; h.t.2 0.09; siphunculus 0.16; cauda 0.11.

Remarks : This is the commonest and highly polyphagous species widely distributed throughout the world. In India, the species infests nearly 459 species of plants belonging to 76 families. It is interesting to note that the sexuales are recorded both from hills and plains in Indian conditions. This hints at the possibility that the species reproduces by both holocycly (sexual) and anholocycly (asexual). Basu, A.N. and Banerjee S. N. (1958) found that the species is of importance in case of pear. Ghosh, M. R. and Raychaudhuri, D. N. have dealt with seasonal history and incidence of the species on rosaceous plants. According to them also, its occurrence was always of negligible proportion, apparently with direct injury to the plants. The species is very injurious to cucurbits. The aphids infest the lower side of leaves, heavily infested plants wilt and die. It causes several losses to cotton by sucking on the leaves and shoots. It often also covers the flowers of *Chrysanthemum* during autumn and winter. *A. gossypii* occurs on *Chrysanthemum* along with *Macrosiphoniella sanborni* (Gillette) and *Coloradoa rufomaculata* Wilson. The species is found in large number along with *Lipaphis erysimi* (Kalt.) and *Myzus persicae* (Sulzer) occurring on brassicaceous plants. It is found to transmit about 44 viruses of plants (Eastop 1958).

Agarwala and Raychaudhuri, D. N. (1979) discuss on the potentiality of a weed *Gynura angutosa* as an alternative host plant of *Aphis gossypii* Glover. Kandoria and Jamwal (1988) studied comparative biology on okra, brinjal and chilli at Ludhiana (Punjab).

The species exhibits great range of morphological variation even on the same host (Behura *et al.* 1973). It's colour in life is extremely variable, greyish green to dark green, marbled with paler green and often tinged with yellow; adults and nymphs are dull.

Taxonomically, much confusion exists about the identity of the species. Paddock (1919), Patch (1925), Batchelder 1927, Wall (1933) and Cottier (1953) have dealt with

the morphology, variability and synonymy of *Aphis gossypii.* Roy and Behura (1983) have studied seasonal variation in morphological structures.

Distribution : Cosmopolitan.

11. ***Aphis kurosawai*** Takahashi
(Figs. 111-118)

1921. ***Aphis kurosawai*** Takahashi, *Aphididae of Formosa.* **1** : 53.

1969. Basu, A.N. *Oriental. Ins.,* **3** : 355-371.

1969. David and Rajasingh, *Proc. zool. Soc. Calcutta,* **22** : 151-157.

1969. David, *J. Bombay nat. Hist. Soc.,* **66** : 323-326.

1969. Rao, *CIBC, U.S. PL* 480 *Project* : 1-93.

1971. Ghosh, A. K. Banerjee, H. and Raychaudhuri, D.N., *Proc. zool. Soc., Calcutta,* **24** : 99-111.

1973. Raychaudhuri, D.N. *USPL 480 Project. Tech.* report 1-107.

1975. Chakrabarti, Raychaudhuri, D. N. *Oriental. Ins.,* **9** : 195-211.

1977. Ghosh, L.K. *Oriental. Ins.,* **6** : 169-178.

1977. Raha, Singh, Raychaudhuri, D. and Raychaudhuri, D. N., *Sci. Cult.,* **43** : 452-453.

1978. Mondal, Agarwala and Raychaudhuri, D.N., *Sci. Cuit.,* **44** : 89-92.

1979. Rishi, *Symp. on recent trends in aphidological studies. Bhubaneswar* : 52.

1980. Raychaudhuri, D. N., Aphids of Northeast India and Bhutan. The Zoological Society, Calcutta : 1-521.

1980. Raychaudhuri, D. N., Ghosh, L. K. and Das, S. K., *Insecta matsum.,* **20** : 1-42.

1980. Maity, Bhattacharya and Chakrabarti, *Sci. Cult.,* **46** : 311-312.

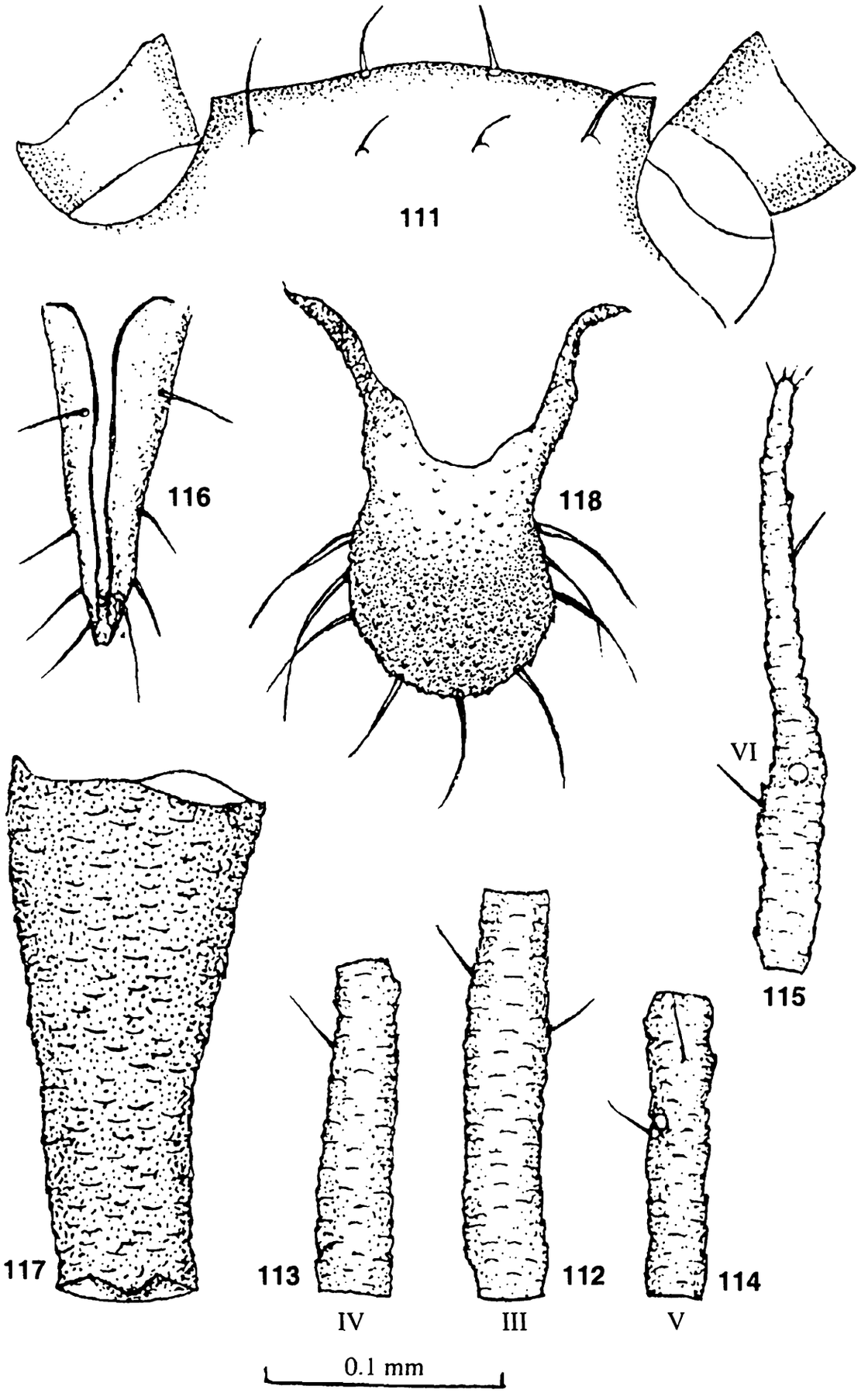
1981. Agarwala and Raychaudhuri, D. N., *Entomon,* 6 : 207-209.

1981. Bhagat, *Sci. Cult.,* **47** : 134-136.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 41-43.

2001. Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) : 14.

Apterous viviparous female : Body pale, 1.5-2.0 mm long with 0.9-1.25 mm as its maximum width near the middle of the abdomen. Antennae (Figs. 112-115) 0.3-0.6 times as long as body, p.t. (Fig. 115) 1.6-2.4 times as long as base VI. Rostrum reaching beyond hind coxae; u.r.s. (Fig. 116) somewhat stiletto-shaped, 1.4-1.6 times as long as ht_2. Abdomen pale, dorsum of the abdomen with polygonal reticulations, longest hair on anterior abdominal tergites 0.6-1.3 times as long as b.d. III; Siphunculi (Fig. 117) 0.10-0.12 times as long as body and 1.02-1.4 times as long as dusky cauda which bears 7-11 hairs (Fig. 118).



Figs. 111-118. *A. kurosawai* Takahashi : Aptera. 111, Head; 112, a.s.III; 113, a.s.IV; 114, a.s.V; 115, a.s.VI; 116, u.r.s.; 117, siphunculus; 118, cauda.

Measurements (in mm) of an aptera : Length of body 1.60, width of body 0.90; antenna 0.82; a.s. III 0.19, IV 0.14, V 0.14, VI (0.07 + 0.17); u.r.s. 0.12; ht_2 0.08; siphunculus 0.17; cauda 0.14.

Alate viviparous female : Body pale, 1.5-2.4 mm long with 0.4-0.9 mm as the maximum width near the middle of the abdomen. Head brownish. Antennae 0.4–0.9 times as long as the body, p.t. shorter than a.s. III and hardly twice the base of a.s. VI, a.s. III with 3-7 secondary rhinaria in a row. Rostrum reaches mid coxae, u.r.s. 1.5-1.6 times as long as ht_2 ; Abdominal dorsum pale and with pale brownish sclerites; longest hair or anterior abdominal tergite 1.1-1.5 times as long as b.d. III. Siphunculi brownish, 0.09-0.11 times as long as body and 1.1-1.3 times as long as elongated cauda which bears 9 hairs.

Measurements (in mm) of an alata : Length of body 1.50; width of body 0.60; antenna 0.75; a.s. III 0.18, IV 0.13, V 0.13, VI (0.07 + 0.15); u.r.s. 0.11 ; ht_2 0.07; cauda 0.13; secondary rhinaria distributed : III, 4-6.

Colour : Brown.

Material examined : 9 apterae, on *Artemisia* sp., Kemphy (U. P.), 4.xi.78, coll. *M.R. G. & P. K. M.*; 1 aptera and many nymphs, on *Rhododendron* sp., Solan (H.P.), 2.vi.1979, coll. *L. K. G.*; 3 apterae and 3 alatae, on *Artemesia vulgaris,* Tashiding, 7.iv.1970, coll. *M. R. G.;* 4 alatae, on *Artemesia* sp. Tashiding, 3.vi.1971, coll.?; 4 apterae and 1 alata, on *Artemsia* sp., Kalimpong, 30.1.1970, coll. ?

Remarks : The species is one of the typical imhabitants of *Artemesia* and characterised by stiletto-shaped ultimate rostral segment. According to Basu, A. N. (1969) the aphid is quite common in the hills of the Darjeeling district, being most abundant from March to May and again from September to November. The species leads anholocyclic life cycle throughout the year.

Distribution : India : Assam, Himachal Pradesh, Kashmir, Manipur, Nagaland, Sikkim, Uttar Pradesh, West Bengal; Bhutan; China; Japan; Nepal; Taiwan and Thailand.

12. ***Aphis longisetosa*** Basu
(Figs. 119-127)

1969. *Aphis ruborum longisetosus* Basu, A. N. *Oriental. Ins.,* **3**(4) : 356.

1961. Basu, A.N., *Curr. Sci.,* **30** : 390-391.

1969. Basu, A.N., *Oriental. Ins.* **3** : 355-371.

1971. Ghosh, M.R., Ghosh, A.K. and Raychaudhuri, D.N., *Proc. zool. Scc., Calcutta,* **24** : 163-168.

1972. Chakrabarti, Ghosh, A.K. and Raychaudhuri, D.N., *Curr. Sci.,* **41** : 70-71.

1972. Basu, R.C., Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **38** : 494-495.

1973. Basu, R.C., Ghosh, A.K. and Raychaudhuri, D.N. *Proc. zool. Soc., Calcutta,* **26** : 89-101.

1973. Raychaudhuri, D.N., *USPL 480 Project Tech. Report* : 1-107.

1975. Chakrabarti and Raychaudhuri, D.N. *Oriental. Ins.*, **9** : 195-211.

1978. Mondal, Agarwala and Raychaudhuri, D.N., *Sci. Cult.*, 44 : 89-92.

1979. Maity and Chakrabarti, *Sci. Cult.*, **45** : 160-162.

1980. Raychaudhuri, D. N., *(ed.)*. Aphids of Northeast India and Bhutan : 1-521.

1980. Raychaudhuri, D.N., Ghosh, L.K. and Das, S.K., *Insecta matsum.*, **20** : 1-42.

1981. Agarwala, Ghosh, D., Das, S.K., Poddar and Raychaudhuri, D.N., *Entomon*, **6** : 233-238.

1981. Raychaudhuri, D.N., Ghosh, D., Raychaudhuri, D. and Agarwala, *Insecta matsum.*, **23** : 1-20.

1981. Agarwala and Raychaudhuri, D. and Raychaudhuri, D.N., *Akitu* n.s. **39** 1-16.

1932. *Aphis ruborum* Borner, *Mitt. Blattl. Anr. Schad.*, **8** : 33.

1981. Basu, A.N., *Curr. Sci.*, **30** : 390-391.

1976. *Aphis rubifolii* Thomas ; Chakrabarti, Ghosh, A.K. and Raychaudhuri, D. N. *Sci. Cult.*, **37**(5) : 247-248.

1990. *Aphis longisetosa* Basu : Ghosh, L. K. *Mem. zool. Surv. India*, **17**(3) : 43-45.

2001. Chakrabarti and Sarkar, *J. Aphidology*, **15**(1&2) : 14.

Apterous viviparous female : Body 1.4-2.0 mm long with 0.8-1.4 mm as its maximum width near the middle of the abdomen. Head (Fig. 119) dark brown, eyes dark with distinct triommatidia. Antennae 6-segmented, 0.40-0.60 times as long as body; p.t. (Fig. 123) 2.5-3.0 times as long as base VI ; u.r.s. (Fig. 124) 1.3-1.5 times the length of ht_2. Abdominal dorsum pale, dorsal hairs long on prominent bases, those on head warty, twice as long as b.d. III, hairs (Fig. 125) on anterior abdominal tergites never less than thrice as long as b.d. III, these may be about 4-5 times as long as b.d. III. Lateral tubercle present on prothorax and on the abdominal tergites 1-7. Siphunculi (Fig. 126) pale brown with hardly any apical flange, 0.09-0.10 times as long as body and about as long as cauda. Cauda (Fig. 127) dark brown with 7-9 hairs. Femoral and tibial hairs long, about 1.05-2.0 times as long as b.d. III.

Measurements (in mm) of an aptera : Length of body 1.75; width of body 1.05; antenna 0.92; a.s. III 0.17, IV 0.11, V 0.11, VI (0.10 + 0.23); u.r.s. 0.12; ht_2 0.09; siphunculus 0.16; cauda 0.17

Colour : Pale whitish with pale legs.

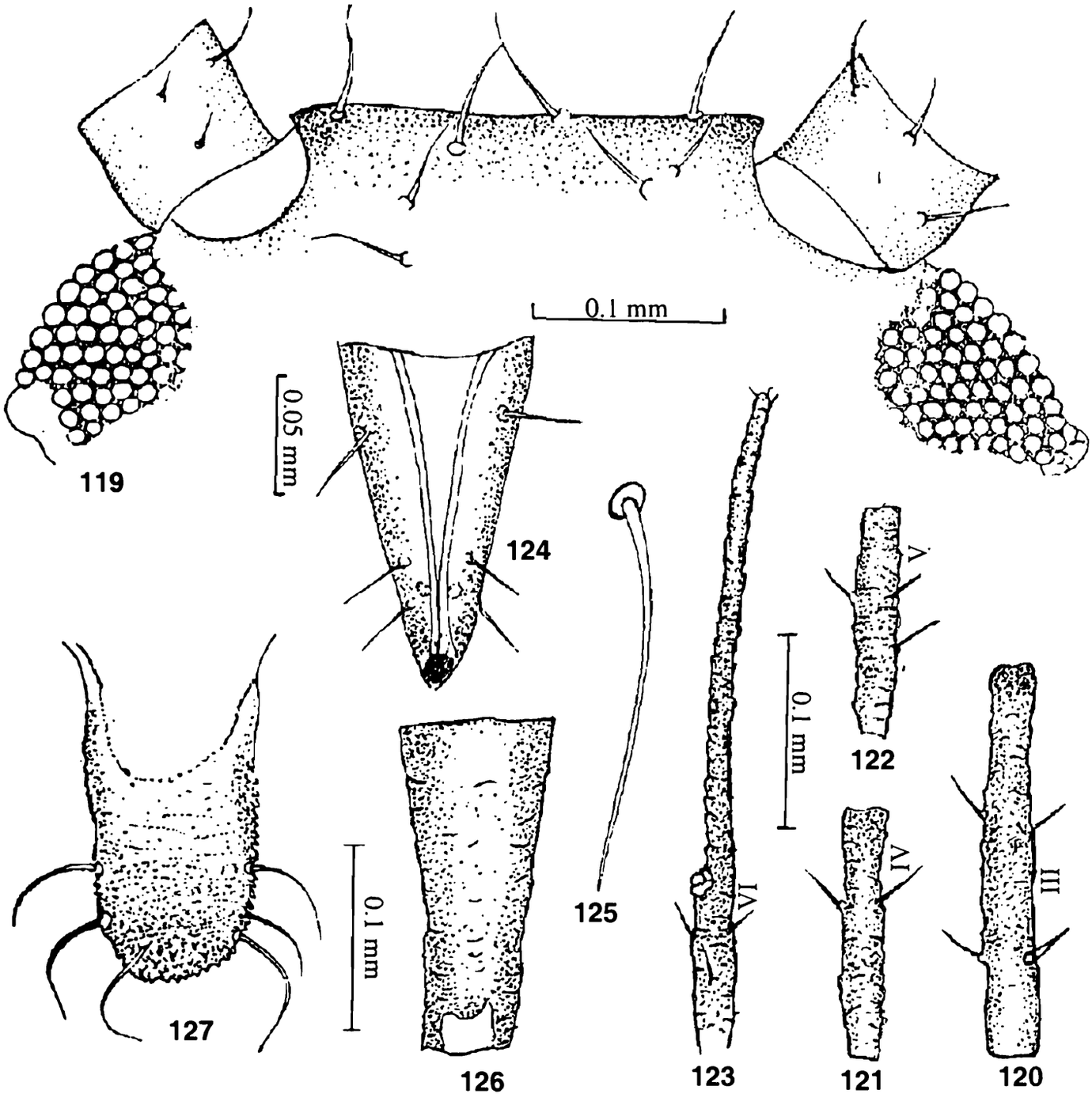
Biological notes : Colony occurs on lower surface of leaf of the host plant without any visible injury to it. No attendant ant could be found.

Alate viviparous female :

Body 1.2-1.8 mm long with 0.5-0.7 mm as its maximum width near the middle of abdomen. Head brown. Antennae 0.50-0.80 times as long as body; flagellum imbricated,

a.s. III with 4-8 secondary rhinaria; longest hair on a.s. III about 2.8-3.1 times as long as b.d. III. U.r.s. 1.1-1.4 times as long as ht_2. Abdominal dorsum pale, with irregular pale brown sclerites; post-siphuncular sclerite hardly discernible, longest hair on anterior abdominal tergites 2.0-3.5 times as long as b.d.III. Siphunculi pale brown, rather cylindrical, about 0.08-0.10 times as long as body and about as long as cauda bearing 8-11 hairs.

Measurements (in mm) of an alata : Length of body 0.74; antenna 0.53; a.s. III 0.18, IV 0.11, V 0.10, VI (0.09 + 0.25); u.r.s. 0.13; ht_2 0.10; siphunculus 0.14; cauda 0.13.



Figs. 119-127. *A. longisetosa* Basu : Aptera. 119, Head; 120, a.s. III; 121, a.s. IV; 122, a.s. V; 123, a.s. VI; 124, u.r.s.; 125, dorsal hair; 126, siphunculus; 127, cauda.

Material examined : 3 apterae, on *Rubus ellipticus,* Sadhupul (H.P.), 27.x.78; 2 apterae, on *Rubus* sp., Kasauli (H.P.), 30.x.78; 1 aptera, 3 alatae and nymphs, on *Rubus ellipticus,* Solan (H.P.), 25.x.78; coll. *M.R.G. & P.K.M.*; 3 apterae and 1 nymph, on *Rubus ellipticus,* Kalimpong, 12.viii.1970, PLK 2794; 3 alatae, host ? PLK 408, 28.iv.1969, coll. *M.R.G.*; 1 aptera and 2 alatae, on *Rubus ellipticus,* Solan, date ? coll. *S.P. Kurl.*

Remark : The species is characterised by its longer dorsal body hairs about 2.0-2.5 times as long as b.d. III.

Distribution : India : Arunachal Pradesh, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, Uttar Pradesh, West Bengal.

13. ***Aphis nasturtii*** Kaltenbach
(Figs. 128-135, 347, 348, 349)

1843. *Aphis nasturtii* Kaltenbach, *Morgr. Fam. Pflanz.* : 76.

1918. Das, B., *Mem. Indian Mus.,* **6**(4) : 220-222.

1963. Behura, *First Summer School of Zoology* : 25-78.

1968. Chowdhuri, A.N., Basu, R.C., Chakrabarti, S. and Raychaudhuri, D.N., *Sci. Cult.,* **84** : 133-134.

1969. Ghosh, A. K., Chakrabarti, S., Chowdhuri, A. N. and Raychaudhuri, D. N. ; *Oriental. Ins.,* **3** : 327-334.

1969. Chowdhuri, A.N., Basu, R.C., Chakrabarti, S. and Raychaudhuri, D.N., *Oriental. Ins.,* **3** : 83-92.

1969. Rao, *CIBC U.S.P.L 480 Project Final Tech. Rep.* : 1-93.

1970. Basu, R.C., Ghosh, A.K. and Raychaudhuri, D.N., *Proc. zool. Soc., Calcutta,* **23** : 83-91.

1970. Ghosh, A.K., Basu, R.C. and Raychaudhuri, D.N., *Oriental. Ins.,* **4** : 64-76.

1971. Chakrabarti *et al., Proc. zool. Soc, Calcutta.,* **24**(2) : 99-111.

1971. Chakrabarti, S., Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.,* **37** : 247-248.

1971. Ghosh, A.K., Banerjee, H. and Raychaudhuri, D.N., *Gavesana.,* **3** : 10.

1971. Ghosh, A.K., Banerjee, H. and Raychaudhuri, D.N, *Proc. zool. Soc., Calcutta.,* **24** : 99-111.

1972. Rao, S.N. and Kulkarni, P.P., *Marathwada Univ. J. (Nat. Sci.),* **16** : 141-150.

1973. Raychaudhuri, D. N., *U.S.PL. 480 Project Tech. Report.* : 1-107.

1975. Chakrabarti, S. and Raychaudhuri, D.N., *Oriental. Ins.,* **9** : 195-211.

1978. Mondal, Agarwala and Raychaudhuri, D.N., *Sci. Cult.,* **44** : 89-92.

1979. Kurl and Misra, *Geobios,* **6** : 286-287.

1980. Maity. Bhattacharyya and Chakrabarti, *Sci. Cult.,* **46** : 34-312.

1980. Raychaudhuri, D.N. *(ed.)* Aphids of Northeast India and Bhutan. The Zoological Society, Calcutta : 1-521.

1981. Basu, R.C., Raychaudhuri, D.N., *Rec. zool. Surv. India, Occ. Paper,* **18** : 7-54.

1990. Ghosh, L. K. *Mem. zool. Surv. India,* **17**(3) : 45-48.

2001. Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) : 14.

Apterous viviparous female : Body pale, 0.8-1.6 mm long with 0.4-1.0 mm as its maximum width near the middle of abdomen. Antennae mostly 5-segmented sometimes may be 6-segmented, about 0.50-0.80 times as long as body; p.t. (Fig. 132) 1.8-2.4 times as long as base of a.s.VI. Rostrum reaching midcoxae, u.r.s. (Fig. 133) 1.0-1.20 times the length of ht_2. Abdomen pale, without polygonal reticulation and post siphuncular sclerite; Siphunculi (Fig. 134) 0.11-0.14 times as long as body and 1.1-1.5 times the length of cauda (Fig. 135) bearing 4-5 hairs. Tibial hairs short, longest hair on tibiae at most 0.5 times as long as middiameter of the tibia.

Measurements (in mm) of one specimen : Length of body 0.95; width of body 0.65; antenna 0.75; a.s. III 0.14, IV 0.15, V 0.14, VI (0.07 + 0.13); u.r.s. 0.08; siphunculus 0.10; cauda 0.08.

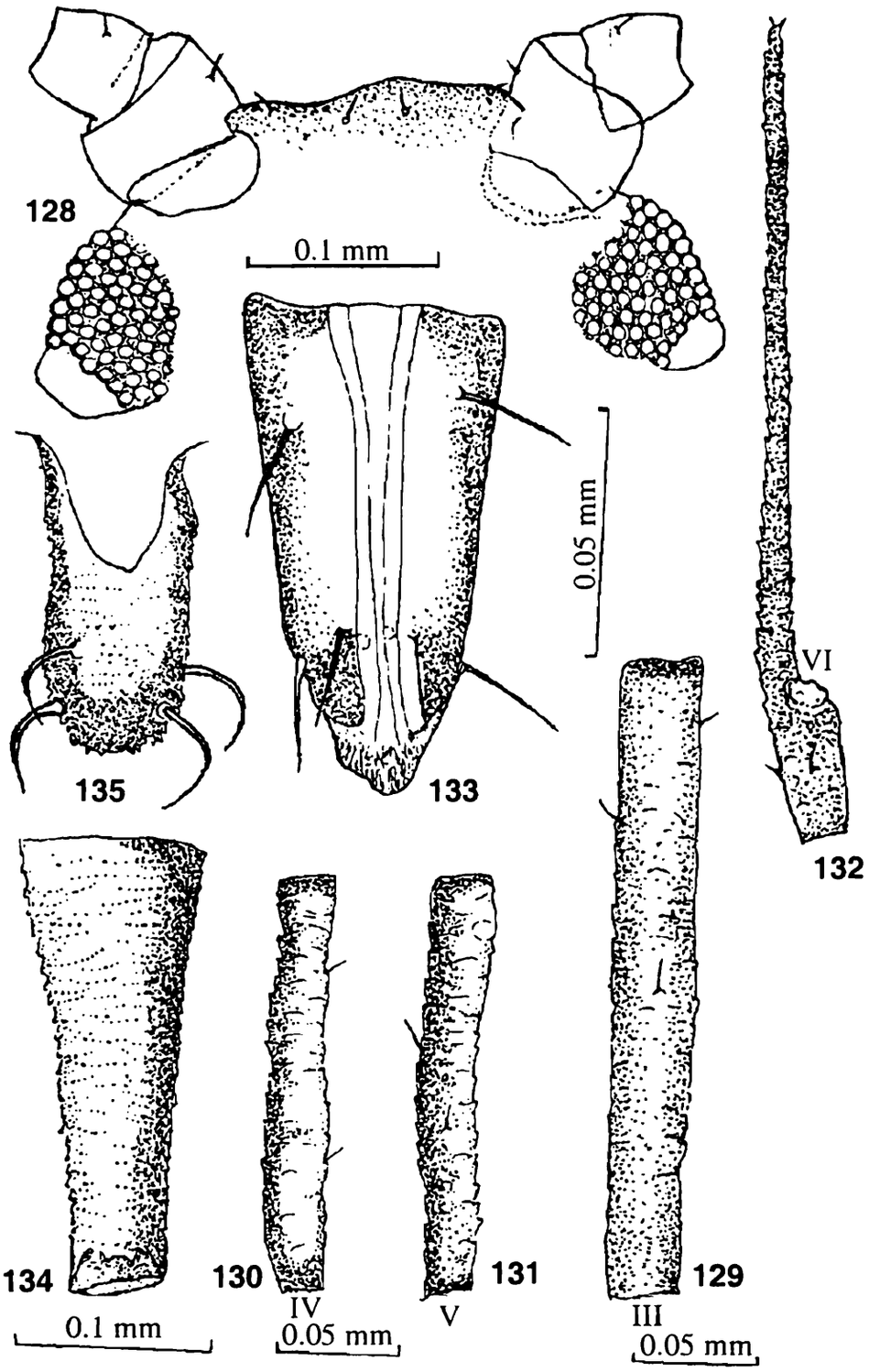
Alate viviparous female : Body pale to dark brownish, 0.9-1.9 mm as its maximum width. Antennae 6–segmented, 0.6-0.7 times as long as body; p.t. 2.0-3.5 times as long as base of a.s. VI; a.s. III with 5-9, IV with 0-1 secondary rhinaria; u.r.s. 1.2-1.3 times as long as ht_2. Abdominal dorsum pale with scattered brown sclerite; siphuncular sclerites distinct; longest hair on anterior tergites about as long as b.d.III. Siphunculi nearly 0.1 times as long as body and 1.4-1.7 times the length of cauda bearing 4-5 hairs. Femoral hairs nearly of equal lengths, longest one slightly longer than b.d.III; F.T.C. 3, 3, 2, second tarsal segments usually with three pairs of primary hairs.

Measurements (in mm) of an alata : Length of body 1.80; width of body 0.69; antenna 1.35; a.s. III 0.25, IV 0.18, V 0.18, VI (0.09 + 0.25), u.r.s. 0.15; ht_2 0.10; siphunculus 0.18; cauda 0.10.

Apterous oviparous female : Body pale, 1.4-1.5 mm long with 0.86-0.9 mm as its maximum width near the middle of abdomen. Antennae 5-segmented, about 0.6 times as long as body, p.t. 2.5-2.7 times as long as base of a.s.VI. Rostrum reaching hind coxae, u.r.s. 1.2-1.3 times as long as ht_2. Abdominal dorsum absolutely pale. Siphunculi 0.10-0.11 times as long as body and 1.0-1.2 times as long as cauda which bears 4-5 hairs. Hind tibiae enlarged and bears numerous pseudosensoria, Otherwise, as in apterous viviparous female.

Measurements (in mm) of an ovipara : Length of body 1.43; width of body 0.86; antenna 0.83; a.s. III 0.29, IV 0.14, V (0.08 + 0.22); u.r.s. 0.09; ht_2 0.07; siphunculus 0.15; cauda 0.13.

Alate male : Body 1.4-1.58 mm long with 0.60-0.68 mm as its maximum width near the middle of abdomen : Head dark brown. Antennae 6-segmented, 0.75-0.85 times as



Figs. 128-135. *A. nasturtii* Kalt. : Aptera. 128, Head; 129, a.s.III; 130, a.s. IV; 131, a.s. V; 132, a.s. VI; 133, u.r.s.; 134, siphunculus; 135, cauda.

long as body, antennal segment III with 25-26, IV with 15-18 and V with 10-12 secondary rhinaria; p.t. 2.0-2.4 times as long as base of a.s. VI. Rostrum extends beyond midcoxae, u.r.s. 1.1-1.2 times as long as ht_2. Abdominal dorsum pale with segmentally arranged marginal sclerite and with post siphuncular sclerites. Siphunculi cylindrical, about 0.8 times as long as body and 1.4-2.0 times as long as cauda which bears 4-5 hairs. Genitalia with distinct opercula and penis.

Measurements (in mm) an alate male : Length of body ; 1.35; width of body 0.65; antenna 1.25; a.s. III 0.39, IV 0.23, V 0.25, VI (0.13 + 0.26) ; u.r.s. 0.08; ht_2 0.06; siphunculus 0.14; cauda 0.07

Material examined : 8 apterae, 2 alatae and many nymphs, on *Solanum nigrum,* Pinjore (Haryana), 29.x.78, coll. *M.R.G. & P.K.M. ; 5 apterae,* 1 alata and 2 nymphs, on *Mentha arvensis,* Simla (H.P.), 1.x.1966, coll, *A.N.C. ;* 2 apterae, on *Clematis* sp., Simla (H.P.), 30.x.1968, coll, *A.N.C.* : *1 alate* ♂, on undet. Shrub, Khadrala (H.P.), 29.xii.1968, coll. *A.N.C.* ; 2 alate ♂♂, in Y.P.T., Shillong (Meghalaya), 2.ii.1969 and 4.11.69 in Y.P.T., coll. *R.C. Basu ;* 3 apterae oviparae and 1 aptera, on undet. host (? Rhamnaceae), 18.xii. 1968, coll *R. C. Basu.*

Remarks : Gleiss (1966) described viviparous and sexuales from Germany. Ghosh A. K. *et al.* (1970) described alate male taken on a shrub from Himachal Pradesh, India. Basu, R. C. *et al.* (1970) recorded apterae oviparae and alate males collected in yellow pan trap at Shillong during January-February, 1969. In India, the species infests about 74 species belonging to 64 genera under 37 plant families.

Distribution : India : Arunachal Pradesh, Haryana, Himachal Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Uttar Pradesh, West Bengal; America; Europe; Great Britain; Middle East; Nepal; Pakistan; Taiwan; U.S.A.

14. ***Aphis nerii*** Boyer de Fonscolombe
(Figs. 136-141, 350-351, 370)

1841. *Aphis nerii* Boyer de Fonscolombe, *Annls. Soc. Ent. Fr.,* **10** : 179.

1851. *Aphis asclepiad**is*** Fitch, *Ann. Rep. N.Y. State Cab. Nature. Hist.,* **4** : 65–69.

1918. Das, B., *Mem, Indian Mus.,* **6**(4) : 220-222.

1919. Krishnamurti, *J. Bombay nat. Hist. Soc.,* **33** : 211-215.

1927. George, *J. Asiat. Soc. Bengal,* **23** : 1-12.

1938. Deshpande, *J. Bombay nat. Hist. Soc.,* **39** : 740-744.

1940. Ghulamullah, *Indian J. Ent.,* **2** : 13-25.

1947. Mukherjee and Behura, *J. Bombay nat. Hist. Soc.,* **47** : 774-775.

1955. Banerjee and Basu, A.N., *Curr. Sci.,* **24** : 61.

1958. David, *Indian J. Ent.,* **19** : 171-180.

1959. Ghosh, A.K. and Raychaudhuri, D. N., *J. Bombay nat. Hist. Soc.,* **56** : 660-664.

1962. Sengupta, Das, J. N. and Behura, *Prakruti Utkal Univ, J. Sci.,* **2** : 33-39.

1963. Behura, *Proc. First Summer School of Zoology,* **25** : 78.

1965. Behura, *Prakruti Utkal Univ. J. Sci.,* **3** : 40-65.

1968. Ghosh, A. K. and Raychaudhuri, D. N., *Proc. zool. Soc., Calcutta* **21** : 179-195.

1969. Misra and Behura, *Pakruti Utkal Univ. J. Sci.,* **6** : 79-93.

1969. Rao, *CIBC. U.S. Pl. 480 Project Final Tech. Rep.* : 1-93.

1970. Dharmadhikari and Ramaseshiah, *CIBC Tech. Bull. let.*, **13** : 83-89.

1970. Ghosh, L.K., *Sci. Cult.*, **36** : 419-420.

1971. Verma, *Sci. Cult.*, **37** : 248-249.

1973. Behura and Dash, M.M., *Prakruti Utkal Univ. J. Sci.*, **8** : 53-64.

1974. Basu, R. C., Ghosh, M.R. and Raychaudhuri, D.N., *Sci. Cult.* **40** : 41-43.

1974. Chakrabarti, Chowdhuri and Raychaudhuri, D.N. *Sci. Cult.*, **40** : 461-462.

1975. Chakrabarti and Raychaudhuri, D.N. *Oriental. Ins.*, **9** : 195-211.

1978. Mondal, Agarwala and Raychaudhuri, D.N., *Sci Cult.*, **44** : 89-92.

1978. Misra and Kurl, *Geobios,* **5** : 83.

1979. Kurl and Misra, *Geobios,* **6** : 286-287.

1980. Chattapadhyay and Raychaudhuri, D.N., *Sci. Cult.*, **46** : 326-328.

1980. Raychaudhuri, D.N. *(ed)*, Aphids of Northeast India and Bhutan, The Zoological Society, Calcutta : 1-521.

1980. Kulkarny and Kacker, *Bull. zool. surv. India.* **3** : 103-105.

1981. Agarwala, Raychaudhuri, D. and Raychaudhuri, D.N., *Akitu,* new series, **39** : 1.16.

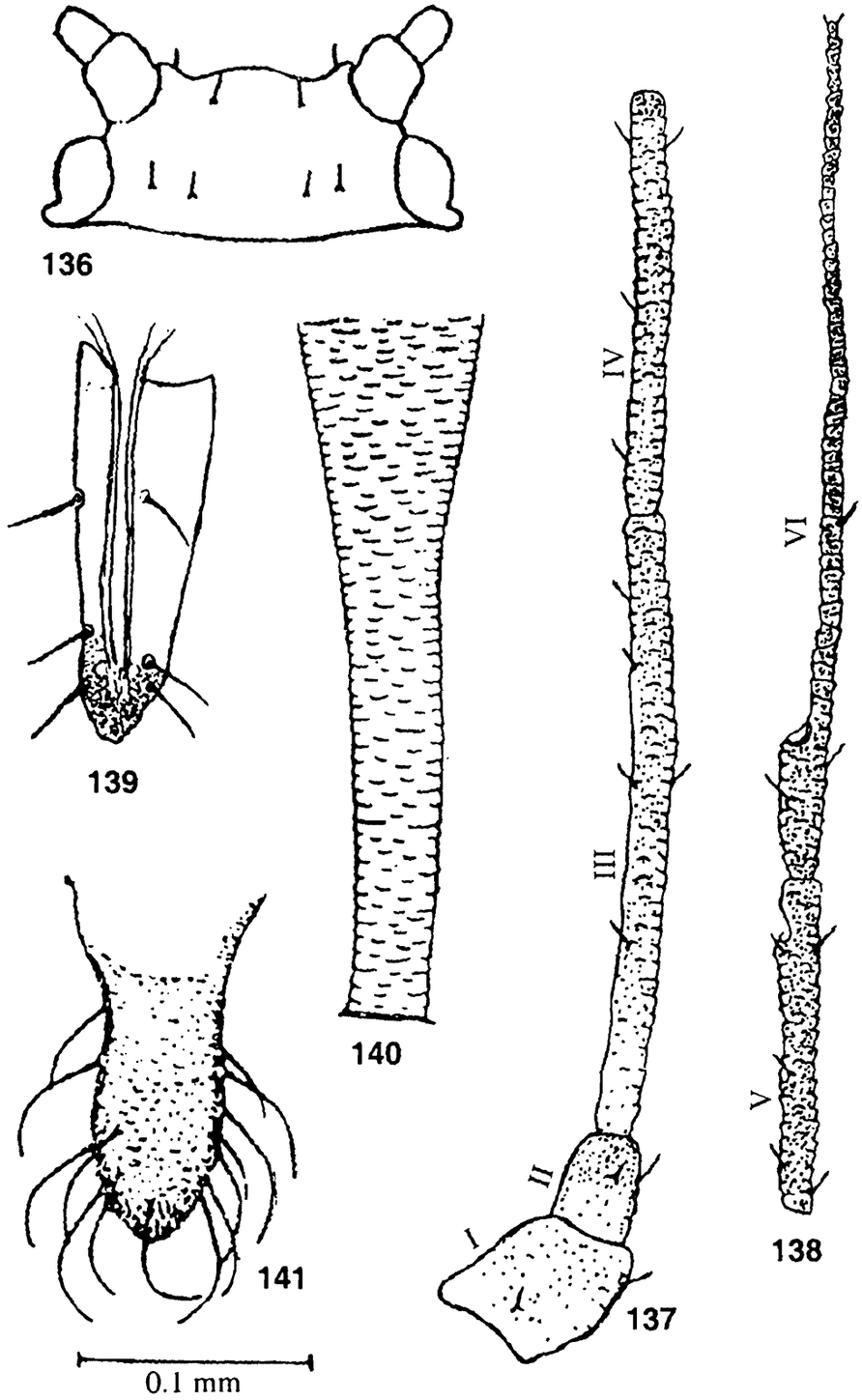
1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 48-51.

2001. Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) : 14.

Material examined : 8 apterae, on undet. Asclepiadaceae, Mashobra (H.P.), 28.iv.1970, coll. ANC. Many apterae and alatae, on *Calotropis* sp., Rautara, 24 pargs., 15.xii. 1985, coll. L.K.G.; Apterae and alatae, on *Calotropis procera,* Barhi, Hazaribagh (Bihar), 9.xii. 1998, coll. L.K.G.; Apterae, alatae and nymphs on *Nerium odorum,* Canara forest, Hazaribagh (Bihar), 25.xi. 1968., 1 alata, on *Inula auspidata,* Solan, date ? coll. S. P. Kurl.

Apterous vivparous female : Body pale brownish, 1.75-2.7 mm long with 0.9-1.7 mm as its maximum width. Head (Fig. 136) broader than long. Antennae (Figs. 137-138) 6-segmented, 1.0-1.8 mm as long, as body, p.t. 3.8-4.3 times as long as base of a.s. VI. Rostrum reaching upto the hind coxae or beyond, u.r.s. (Fig. 139) 1.2-1.6 times as long as ht_2. Abdominal dorsum with polygonal reticulations, hairs on abdomen arranged in rows across the abdominal segments, longest hair on anterior abdominal tergites about 0.9-1.2 times as long as b.d. III. 8th tergite with 2 hairs. Siphunculi (Fig. 140) stout, broad, brown to dark brown, cylindrically tapering towards apex, about 0.2-0.23 times as long as body and 2.0-2.20 times the length of cauda. Cauda (Fig. 141) spinose, rather broad, thumb-shaped, and bearing 9-11 hairs. Anal plate dark spinose, bearing about 11 pairs of hairs (40μ to 90μ long); genital plate entire, oval and bears about 15-20 hairs. F.T.C. 3, 3, 3; second tarsal segment with both dorsal and ventral secondary hairs.

Alate viviparous female : Body pale, 1.6-2.4 mm long and with 0.6-1.0 mm as its maximum width. Head brownish, broader than long. Antennae 6-segmented, about 0.7-0.9 times as long as body, a.s. III. with 6-14 small to large more or less circular secondary rhinaria distributed over entire length, a.s. IV with 0-2 secondary rhinaria. Rostrum extends beyond hind coxae, u.r.s. 1.20-1.25 times as long as ht_2. Abdominal dorsum pale, smooth with well developed postsiphuncular sclerite and scattered pale



Figs. 136-141. *A. nerii* B.d.F. : Aptera. 136, Head; 137, a.s.I-IV; 138, a.s.V-VI; 139, u.r.s.; 140, siphunculus; 141, cauda.

brownish patches, bearing hairs in transverse rows; longest hair on anterior tergites 1.1-1.5 times as long as b.d. III. Siphunculi stubby, cylindrical, dark brown, tapering, inbricated and 0.18-0.20 times as long as body and about 1.7-2.0 times the length of cauda. Cauda dark somewhat conical, strongly spinose imbricated and bearing 10-11 hairs, anal plate spinose and bearing about 16 hairs; wing venation normal.

Remarks : This is a bright yellow species which is distinguished both from *craccivora* and *gossypii* in the colour and number of caudal hairs (9-11). It differs from *A. spiraecola* in the length and structure of the anterior hairs of the femora, which are normal with easily observed apices, and not more than 0.75 times as long as the minimum diameter of the femora; and in the ratio of u.r.s. to ht_2, which is about 1.2-1.6 times in *nerii* and usually less than 1.25 times in *spiraecola.*

Although the species is not so polyphagous one like *gossypii, spiraecola* etc. there is no record of occurrence of any sexual form in the Indian plains and hills which suggests that it enjoys an anholocyclic life cycle in the Indian conditions. However, extensive and intensive surveys in the alternate hosts may reveal interesting result.

The species is normally found on Asclepiadaceae and Apocynaceae. In India, it infests 15 species belonging to 11 genera under 6 plant families.

An excellent description of *A. nerii* has been provided by Cottier (1953).

Distribution : India : all over; Africa; America; Australia; Bhutan; Burma; British Guinea; China; Europe; Fiji; Formosa; Japan; Java; Korea; Malaya; Middle East; Nepal; New Zealand; Siam; Solomon Is., Spain; Sri Lanka; Somaliland; Transvaal; U.S.A.

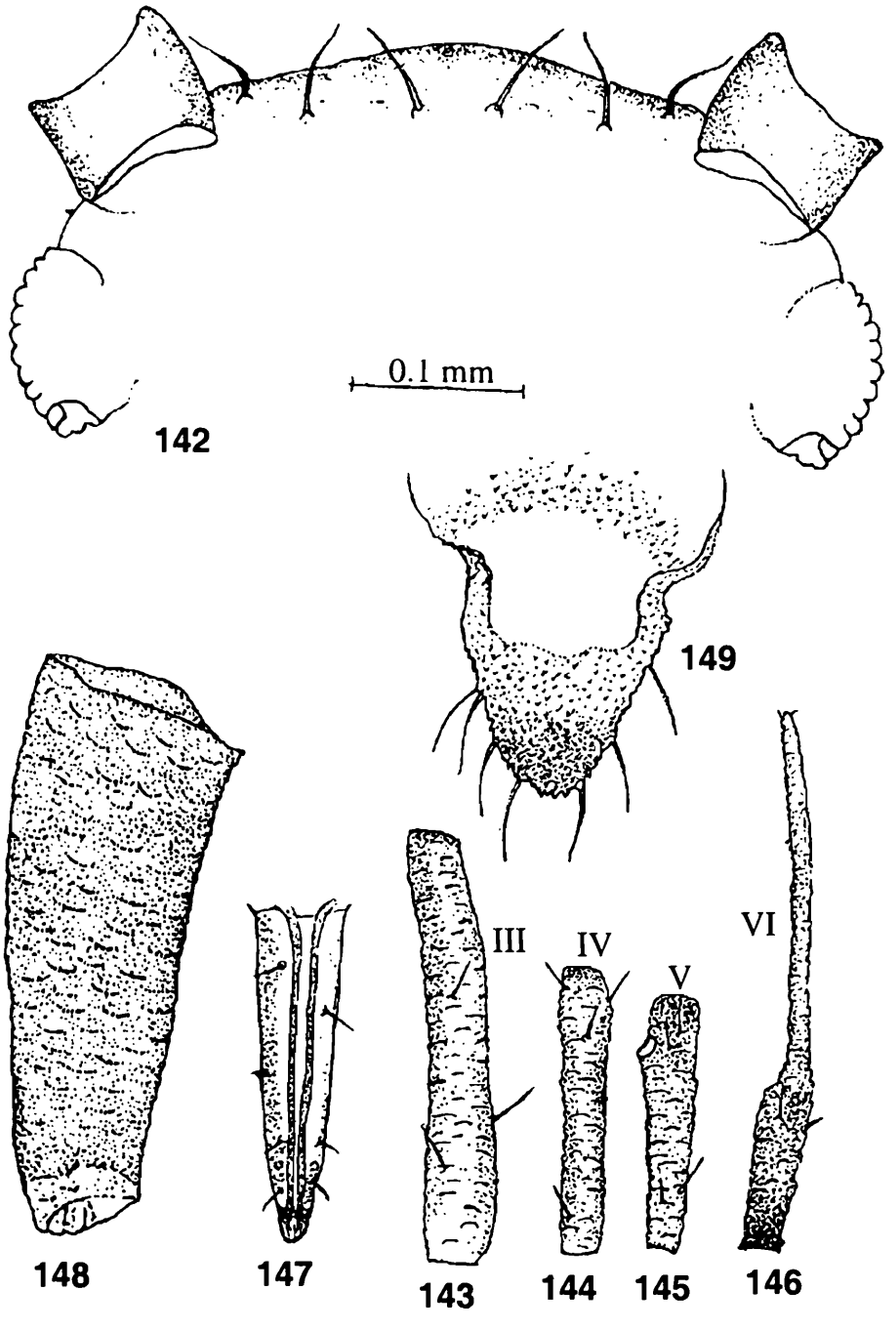
15. ***Aphis paraverbasci*** Chakrabarti
(Figs. 142-157)

1976. *Aphis paraverbasci* Chakrabarti, *Entomon,* **1**(2) : 171.

1981. Das, S. K., Raychaudhuri, D. N and Raychaudhuri, D., *Entomon,* **6**(1) : 50.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 51-53.

Apterous viviparous female : Body 1.70-1.90 mm long with 1.0-1.20 mm as maximum width. Dorsum of head (Fig. 142) smooth with long flagellate hairs, the longest hair on frons about twice as long as a.s. III. Antennae (Figs. 143-146) 6-segmented, about half as long as body, imbricated, flagellum more distinctly imbricated from base towards apex; p.t. (Fig. 146) just a longer than to 1.80 times the length of the base of a.s. VI; flagellar hairs long with flagellate apices, longest hair on a.s. III about 1.0-1.30 times as long as b.d. III. Rostrum extends up to hind coxae, u.r.s. (Fig. 147) rather long somewhat pointed, about twice as long as ht2 and with 2 secondary hairs. Midthoracic furca sessile. Abdominal dorsum pale except spinal area on 8th tergite being brown; hairs on anterior tergites stout, long with rather acuminate apices, longer hair 1.50-3.0 times as long as b.d. III; 7th and 8th tergite each with 6-8 hairs



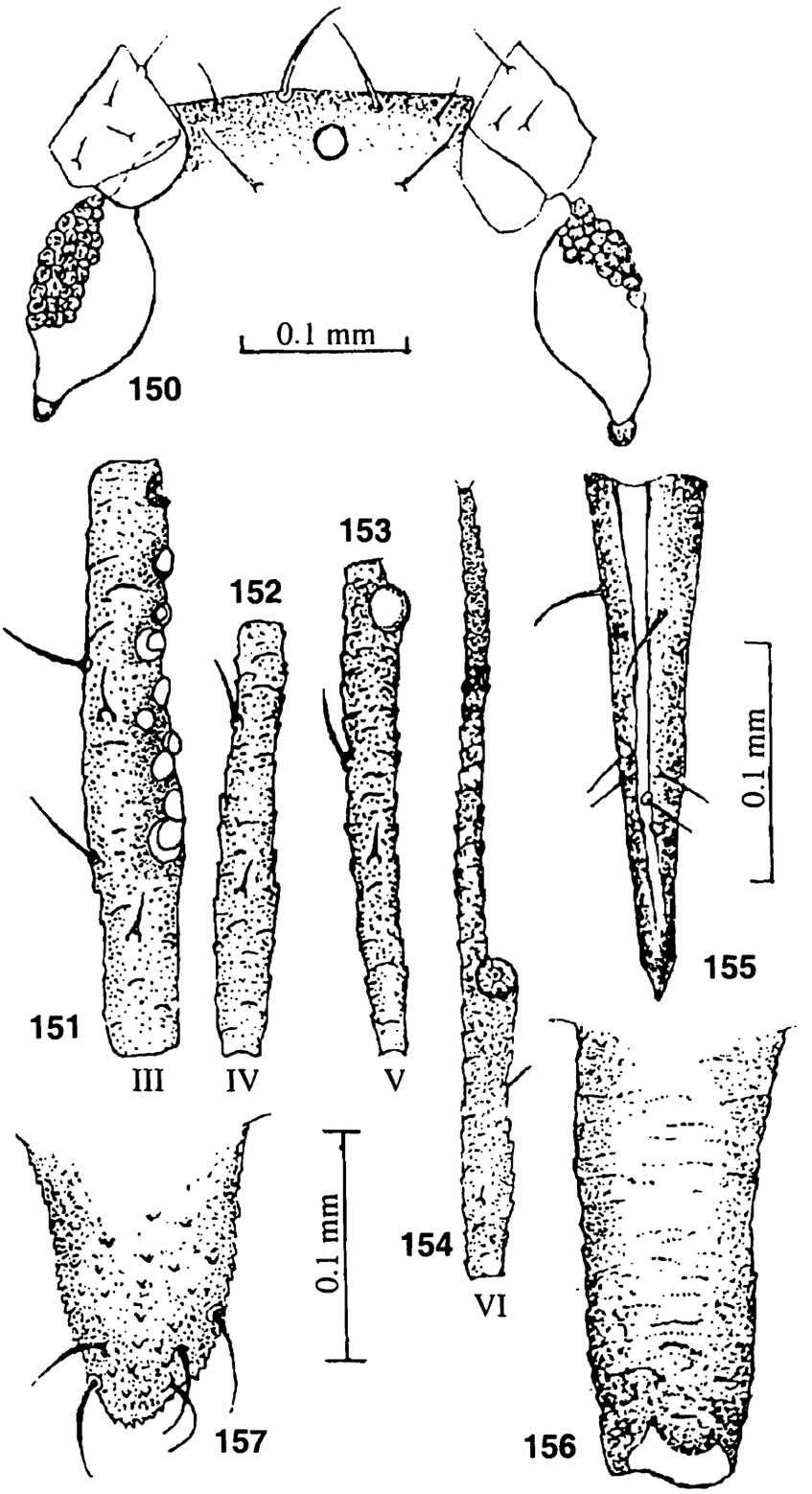
Figs. 142-149. *A. paraverbasci* Chakrabarti : Aptra, 142, Head; 143, a.s. III; 144, a.s. IV; 145, a.s.v; 146, a.s. VI; 147, u.r.s., 148, sipunculus; 149, cauda.

being 2.0-2.60 times as long as b.d. III. Siphunculi (Fig. 148) brown, sybcylindrical, about 0.10 times as body and 1.5 times the length of cauda and with distinct preapical flange. Cauda (Fig. 149) dark brown, somewhat triangular and with about 8 hairs. Legs pale except coxae, trochanter and tarsi which are pale brown. F.T.C. 3, 3, 3.

Measurements (in mm) of an aptera : Length of body 1.70; width of body 1.08; antenna 1.02; a.s. III 0.22, IV 0.15, V 0.14, VI (0.12 + 0.23); u.r.s. 0.20; ht_2 0.11; siphunculus 0.22; cauda 0.12.

Alate viviparous female : Body 1.80-1.95 mm long with 0.90 mm as its maximum width. Head (Fig. 150) dark brown, with flagellate hairs, cephalic hairs (Fig. 150) a little more than twice as long as b.d. III. Antennae concolorous with head, about half

as long as body, flagellum progressively more distinctly imbricated, p.t. (Fig. 154) 1.2-1.4 times as long base VI, a.s. III (Fig. 151) with 7-10 round somewhat protuberant secondary rhinaria distrubuted throughout the entire length except the basal 0.25 portion, flagellar hairs long, flatellate, longest one being 1.5 times as long as b.d. III (Fig. 151); u.r.s. (Fig. 155) pointed, about 2.3 times as long as ht_2 and with 2 secondary hairs. Abdomen pale with only the marginal sclerotic patches with a few short lines



Figs. 150-157. *A. paraverbasci Chakrabarti* : Alata. 150, Head; 151, a.s. III; 152, a.s. IV; 153, a.s.v; 154, a.s. VI; 155 u.r.s.; 156, siphunculus; 157, cauda.

of spinules and with broad postsiphuncular sclerites; hairs on anterior abdominal tergites with acuminate to flagellate apices, longest hair about 3 times as long as b.d. III; 7th and 8th tergites each apparently with 6 hairs. Siphunculi (Fig. 156) dark, sybcylindrical, imbricated, 0.09 times as long as body and 1.5 times as long as cauda (Fig. 157) which bears 6 hairs. Legs pale brown except coxae, trochanter, distal half of hind femora, apices of tibiae and whole tarsi dark brown; hairs on legs long and fine. F.T.C. 3, 3, 3.

Measurements (in mm) of an alata : Length of body 1.80; width of body 0.85; antenna 1.02; a.s. III 0.24, IV 0.17, V 0.18, VI (0.11 + 0.15); u.r.s. 0.20; ht_2 0.09; siphunculus 0.13; cauda 0.09.

Apterous oviparous female : Body 1.40-1.55 mm long with 0.75-0.90 mm as maximum width near the abdomen. Head smooth. P.t. about 1.70-2.2 times as long as base of segment VI; longest hair on a.s. III being 1.10-2.60 times as long as b.d. III. u.r.s. stiletto-shaped; about twice as long as ht_2 and bearing 2-3 secondary hairs. Dorsum of abdomen pale, abdominal hairs with acuminate apices; longest hair on anterior abdominal tergites 3.50-5.50 times as long as b.d. III and that on 7th tergites 3.30-5.90 times and on 8th tergite 2.60-4.20 times as long as b.d. III. Siphunculi rather dark, cylindrical, about 1.50 times as long as cauda bearing 10-12 hairs. Hind tibiae swollen with roundish pseudosensoria distributed over basal 0.66 portion. Other characters as in aptera.

Measurements (in mm) of an ovipara : Legnth of body 1.40; width of body 0.78; antenna 0.75; a.s. III 0.16, IV 0.12, V 0.10, VI (0.09 + 0.18); u.r.s. 0.18; ht_2 0.10; siphunculus 0.10; cauda 0.06.

Material examind : 10 apterae, on a plant of Labiatae, Kufri (H.P.), 27.xii.1972, coll. *S.C.*; 1 aptera and 1 alata, on *Buddelia* sp., Solan, date? coll. *S. P. Kurl;* 2 apterae and 1 alata, on *Debregearia,* Solan, date–? coll. *S. P. Kurl.*; 8 oviparae, on undet. plant, Manali, 22.x.1979, coll. *S. K. Das.*

Note : As to the shape of u.r.s., nature of dorsal hairs, siphunculi and cauda, *A.paravebasci* Chakrabarti shows affnity with *A. kurosawai* Takahashi, 1921, *A. raji* Kumar and Burkhardt, 1970 and *A. verbasci* (Schrank, 1801) but remains distinct by its short processus terminalis.

Remarks : Chakrabarti (1976) described apterous viviparous female of *Aphis paraverbasci* collected from undet Labiatae at Kufri (H.P.). Later on Das, S. K. *et al.* (1981) described and illustrated apterous oviparous female of the species collected from an unknwon plant at Manali (H.P.). Subsequently, Ghosh, L. K. and Kurl (1988) described the alate viviparous female collected from *Buddelia* sp. and *Debregearia* sp. again at H.P. However, the sexual male is yet to be discovered. The occurrence of apterae, alatae and oviparae in the Simla Himalayas suggests that the species leads holocyclic life cycle apart from parthenogenetic reproduction in the area.

16. ***Aphis pollinosa*** Walker
(Figs. 158-165)

1849. *Aphis pollinosa* Walker, *Zoologist,* **7**(Lii) : 217.

1977. Ghosh, L. K., A study on the Aphids (Homoptera : Aphididae) of Himachal Pradesh in Northwest Himalayas, India, Ph. d. Thesis, University of Calcutta : 52.

1986. Ghosh, L. K., *Zool. Surv. India, Tech. Mongr.,* **16** : 28.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 53-55.

Material examined : 1 aptera vivipara and 3 apterae oviparae, on *Epilobium hirsutum,* Simla Hills (H.P.), 30.v.1969, coll. L.K.G.

Apterous viviparous female : Body rather oval, 1.60 mm long with 0.70 mm as maximum width near the middle of abdomen. Antennae 5-segmented, about half as long as body; flagellum distinctly imbricated from base towards apex; flagellar hairs sparse, acute, upto about 25μ long; p.t. 2.5 times as base of a.s. VI. Eyes with triommatidia. Rostrum reaching base of hind coxae; u.r.s. with 2 secondary hairs. Abdomen rather pale, dorsal hairs acute, longer hair on anterior tergites about 1.5 times as long as b.d. III; 8th tergite with 2 hairs being about twice as long as b.d. III. Siphunculi pale with darker apex, cylindrical, about 0.10 times as long as body and 1.5 times as long as cauda. Cauda dusky, bearing 12 hairs. F.T.C. 3,3,2.

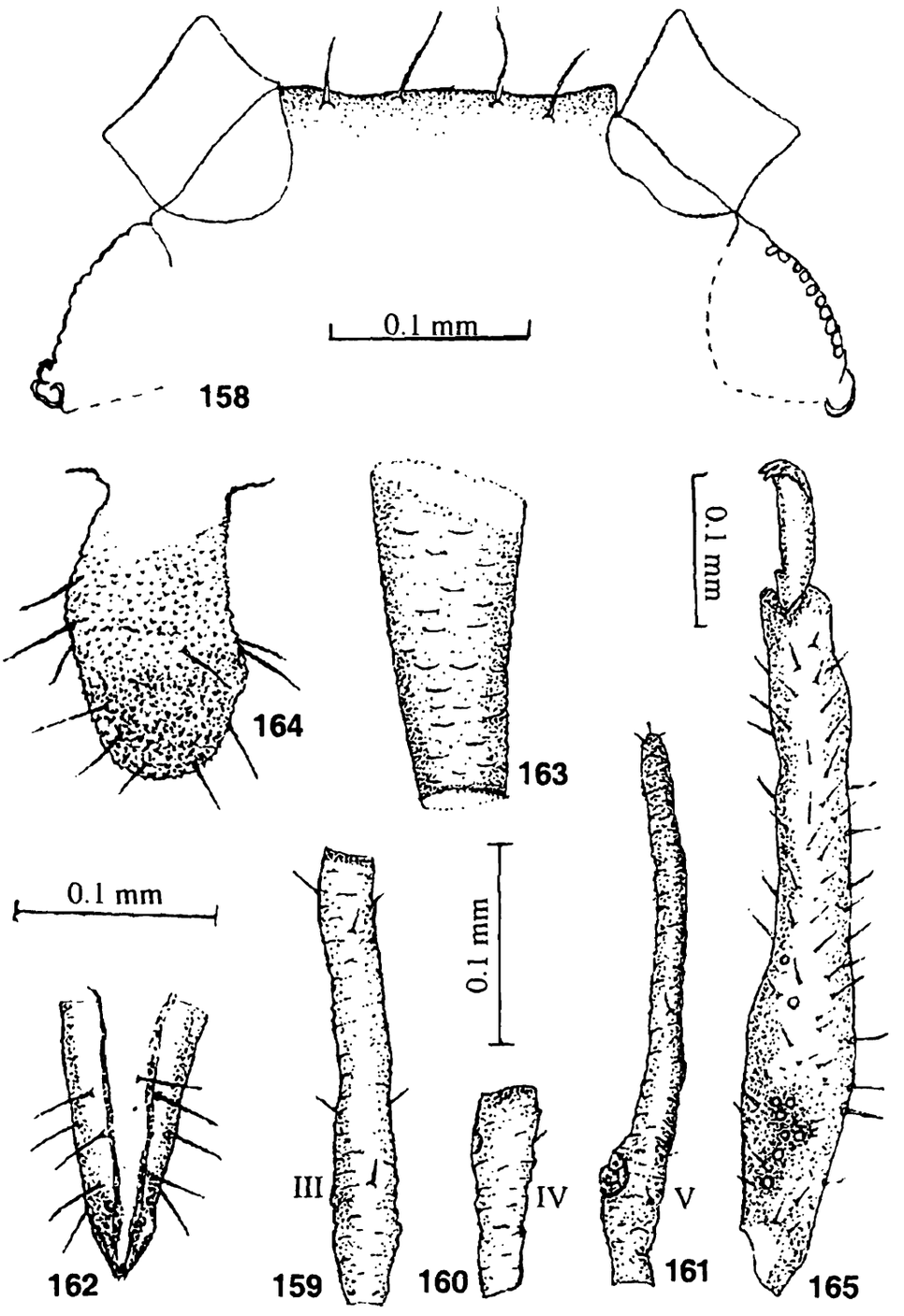
Measurements (in mm) of an aptera : Length of body 1.60; width of body 0.70; antenna 0.75; a.s. III 0.27, IV 0.10, V (0.06 + 0.15); u.r.s. 0.13; ht_2 0.09 siphunculus 0.22; cauda 0.14.

Apterous oviparous female : Body broadly oval, 1.59-1.7 mm long with 0.75–0.81 mm as maximum width. Head (Fig. 158) brown, dorsal cephalic hairs about twice as long as b.d. III. Antennae 5-segmented, 0.40-0.45 times as long as body; a.s. III (Fig. 159) faintly imbricated, rest of the flagellum (Figs. 159-161) progressively imbricated, flagellar hairs sparse, longer one on a.s. III about as long as b.d. III; p.t. (Fig. 161) 2-3 times as long as base of a.s. VI. Eyes with triommatidia (Fig. 158). Rostrum reaches base of 3rd coxae; u.r.s. (Fig. 162) about 1.4 times as long as ht_2 and bearing usually 2-9 secondary hairs. Abdomen pale, dorsal hairs acute, up to about 35 μ long, longest one on anterior tergites about 1.6 times as long as b.d. III : 8th tergite with 2 long hairs, about 2.1 times b.d. III. Siphunculi (Fig. 163) pale with the very tips blackish, cylindrical, imbricated, 0.09-0.13 times as long as body and 1.0-1.6 times the cauda. Cauda (Fig. 164) dusky or blackish with base somewhat constricted and apex rounded, with 12 hairs. Hind tibiae (Fig. 165) swollen with maximum width about 2.3 times middiameter of other tibiae, with numerous small round pseudosensoria distributed irregularly almost along basal half. Genital plate brown, with many small pointed hairs. F T. C. 3, 3, 2.

Measurements (in mm) of an ovipara : Length of body 1.59; width of body 0.81; antenna 0.72; a.s. III 0.26; IV 0.11; V (0.06 + 0.20); u.r.s. 0.13; ht_2 0.09; siphunculus 0.20; cauda 0.13.

Biological notes : The aphids were found in colony on the growing shoots of the host plant. No ant was found in association.

Remarks : This is a little known species which is characterised by its light brown to brownish-red colour with very marked white wax pattern, pale thick and long siphunculi with the very tips blackish and almost black cauda. Both apterae, alatae and oviparae were collected on *Epilobium hirsutum* at Shimla (H.P.) for the first time from India (L.K. Ghosh, 1986). The find of all the morphs suggests that the species



Figs. 158-165. *A pollinosa* Walker : Ovipara. 158, Head; 159, a.s. III; 160, a.s. IV; 161, a.s. V; 162, u.r.s.; 163, siphunculus; 164, cauda; 165, Hind tibia showing pseudosensoria.

enjoys holocyclic life cycle at least in the Northwest Himalaya. U.r.s. of the species belonging to genus *Aphis* bears usually 2-4 secondary hairs. But the oviparae of *A. pollinosa* unusually possess 9 secondary hairs on u.r.s.

Distribution : India : Himachal Pradesh; Anglia; Polska.

17. ***Aphis polygonacea*** Matsumura
(Figs. 166-173)

1917. *Aphis polygonaceae* Matsumura, *Journ. Coll. Agric. Tohoku Imp. Univ.,* **7** : 351.

1969. Chowdhuri, A. N., Basu, R. C., Chakrabarti and Raychaudhuri, D. N., *Sci. Cult.,* **34** : 133-134.

1973. Raychaudhuri, D. N., *USPL 480 Project Tech. Report* : 1-107.

1980. Raychaudhuri, D. N. *(ed.).* Aphids of Northeast India and Bhutan. The Zoological Society, Calcutta : 1-521.

1980. Bhalla and Pawar, *A Survey of Insect & noninsect pest of economic importance in Himachal Pradesh, Dept. of Entomology (Zoology), College of Agric. Chambaghat,* Solan.

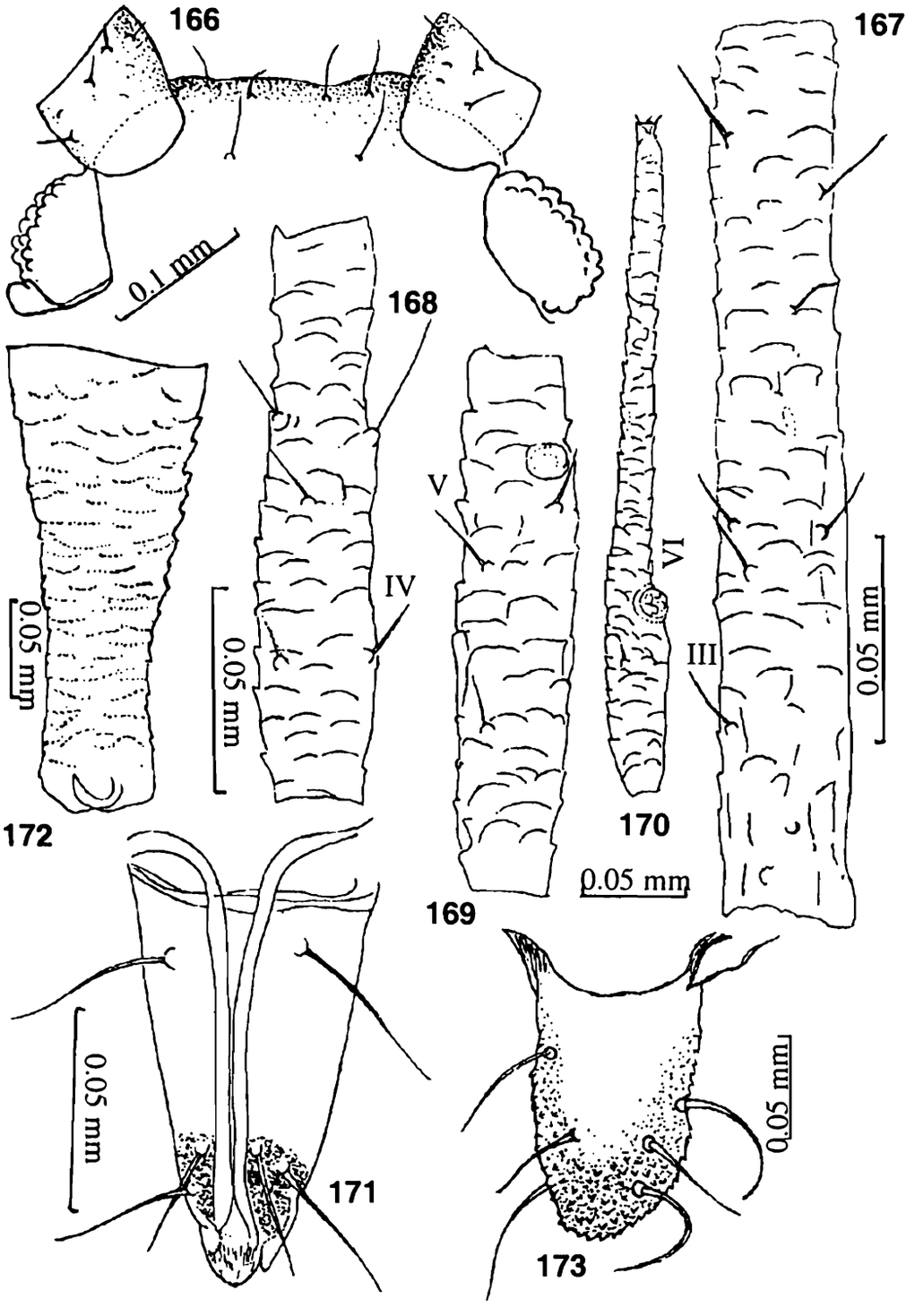
1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 55-56.

Material examined : Many apterae and nymphs, on *Rumex acetocella,* Simla Hills (H.P.), iv. 1966, coll. *A.N.C.*

Apterous oviparous female : Body 1.50-1.65 mm long with about 1 mm as maximum width near the middle of abdomen. Head (Fig. 166) dark brown. Eyes dark with distinct triommatidia. Antennae 6-segmented, about 0.60 times as long as body; a.s. IV (Fig. 168) + V (Fig. 169) always longer than a.s. VI (Fig. 170), p.t. (Fig. 170) about twice as long as base VI; flagellum progressively more distinctly imbricated from base towards apex, longest hairs on a.s. III with acuminate apices and being a little shorter (0.8-0.9 times) than b.d. III. Rostrum reaches just passed mid coxae; u.r.s (Fig. 171) with 2 secondary hairs. Abdominal dorsum pale to light brown, rather smooth; hairs on anterior abdominal tergites upto 1.3 times as long as b.d. III; 8th abdominal tergite with 2 long and fine hairs which are at least twice (mostly 2.4 times) as long as b.d. III. Siphunculi (Fig. 172) dark, cylindrical, imbricated, tapering from base towards apex, with flange, about 1.3 times as long as cauda. Cauda (Fig. 173) elongated, concolourous with siphunculi, spinose and bears 7-8 hairs. Legs pale brown except the coxae, apices of tibiae and tarsi dark brown; longest femoral hairs shorter than basal diameter of femora. F.T.C. 3,3,2; second tarsal segment with secondary hairs ventrally in addition to primary ones.

Measurements (in mm) of an aptera : Length of body 1.65; width of body 1.02; antenna 0.98; a.s. III 0.21, IV 0.16, V 0.14, VI (0.11 + 0.23); u.r.s. 0.11; ht_2 0.09; siphunculus 0.19; cauda 0.14.

Distribution : India : Himachal Pradesh, Meghalaya; Japan.



Figs. 166-173. *A. polygonacea* Mats. : Aptera. 166, Head; 167, a.s. III; 168, a.s. IV; 169, a.s. V; 170, a.s. VI; 171, u.r.s.; 172, siphunculus; 173, cauda.

18. ***Aphis pomi*** de Geer
(Figs. 174-181)

1773. *Aphis pomi* de Geer, *Memores Pour Servir a Histoire des Insectes Stockholm, Aphids,* **3** : 30.

1963. Behura, *Proc. First Summer School of Zoology, Govt. of India publ.* : 25-78.

1964. Sharma and Bhalla, *Indian J. Ent.,* **26** : 318-331.

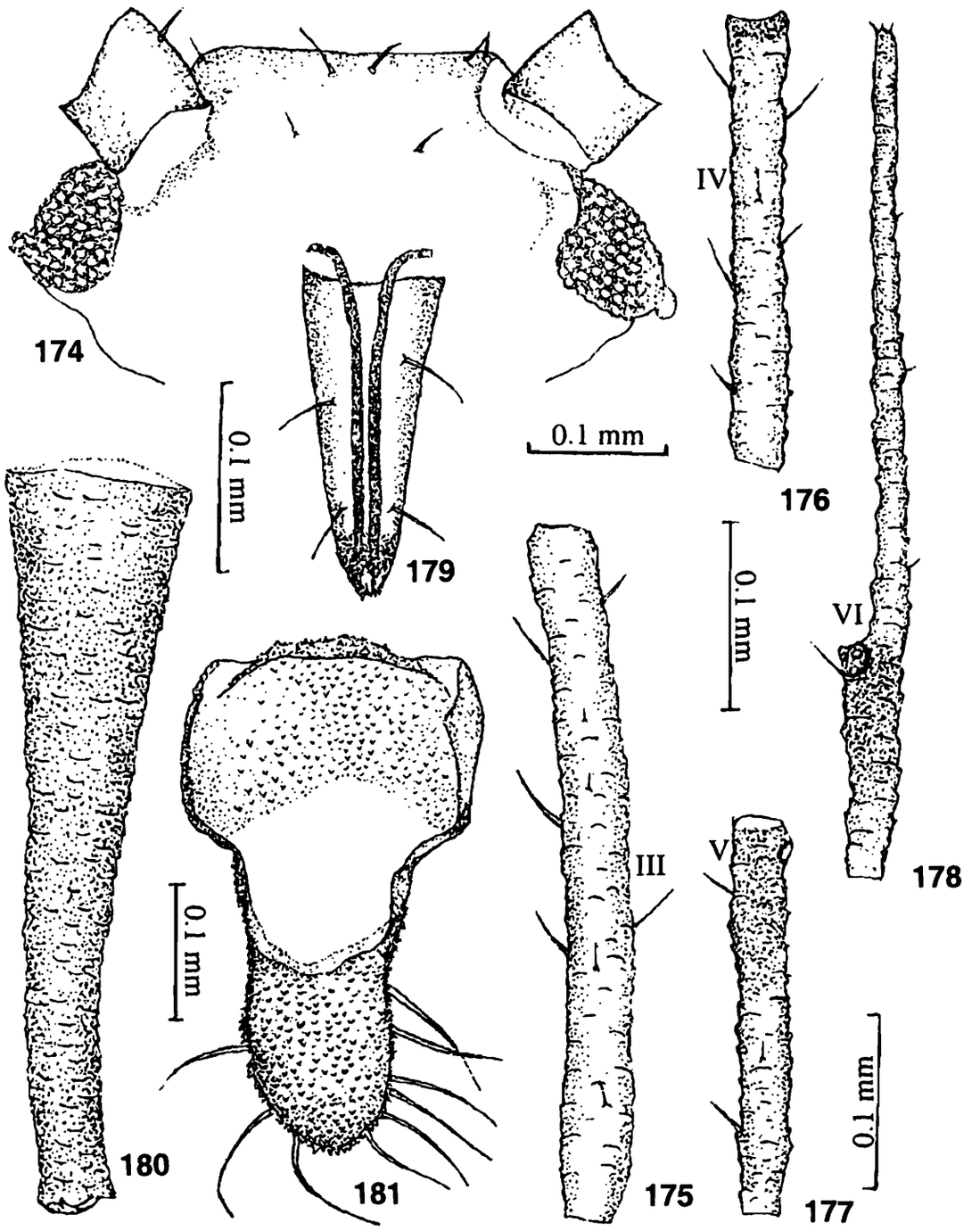
1972. Hayat, *Entomophaga,* **17** : 49-58.

1979. Rishi, additional records of Aphid Fauna of J. & K. *Symp. on recent trends in aphidological studies, Bhubaneswar* : 52.

1980. Bhalla and Pawar. *A Survey of Insect and noninsect pests of economic importance in H. P., Dept. of Entomology, Zoology, College of agriculture, Chambaghat,* Solan.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(3) : 57-58.

Material examined : Apterae, on *Malus* sp., Srinagar, 22.viii. 1973, No. 43, CIEA 6555, B. M. 1976-1.



Figs. 174-181. *A. pomi* de Geer : Aptera. 174, Head; 175, a.s. III; 176, a.s. IV; 177, a.s.v; 178, a.s. VI; 179, u.r.s.; 180, siphunculus; 181, cauda.

Apterous viviparous female : Body 1.80-1.97 mm long with nearly 1.08 mm as maximum width. Head (Fig.) brown with small antennal tubercle which hardly exceeds vertex; dorsum of head smooth, hairs on dorsum medium-sized. Antennae 6-segmented, nearly 0.75 times as long as body; a.s. I smooth with a little wrinkling, a.s. II also smooth but imbricated, flagellum (Fig 175-178) more distinctly imbricated from base towards apex, p.t. (Fig. 178) 2-3 times as long as base VI, longer hair on a.s. III about twice as long as b.d.III. Rostrum reaches upto mid coxae, u.r.s. (Fig.) a little longer than to 1.5 times the length of ht_2. Abdominal dorsum rather paler with reticulated pattern, hairs on anterior abdominal tergites about half as long as b.d. III. Lateral abdominal tergite with 2 hairs being about 0.7 times as long as b.d. III. Siphunculi (Fig. 180) dark, cylindrical, imbricated, tapering from base to apex, with moderately developed flanged at the tip, about 0.15 times as long as body and 1.3 times the length of dark cauda. Cauda (Fig. 181) elongated, concolourous with siphunculi, spinose, slightly constricted near at the middle or basal third, bearing 7-12 (usually 8) hairs. F.T.C. 3,3,2 : second segment of hind tarsus with both primary and secondary hairs, legs yellowish brown except the tarsi black.

Measurements (in mm) of an aptera : Length of body 1.95; width of body 1.08; antenna 1.05; a.s. III 0.24, IV 0.18, V 0.15, VI (0.10 + 0.26); u.r.s. 0.15; ht_2, 0.10; siphunculus 0.35; cauda 0.19.

Remarks : The aphid is an economically important pest of apple trees in most apple growing areas world wide (Oatman and Lenger 1961; Holdsworth 1970; Carroll and Hoyt 1984). Malik *et al.* (1972) reported the species infesting apple trees from Kashmir valley. The infested leaves curl and the tree may suffer in case of heavy infestation. Bhagat *et al.* (1988) made valuable observations on nature of damage caused by this aphid pest, its population density and natural enemy complex of this important succivorous pest.

Distribution : India : all over; China; Europe; France; Middle East and Taiwan.

19. ***Aphis punicae*** Passerini
(Figs. 182-188)

1853. *Aphis punicae* Passerini, *Arch. Zool. Anunt. Fisiol.* (Modena), **2** : 32.

1958. Basu, A. N. and Banerjee, S. N., *Indian agric.*, **2** : 80-112.

1958. David. *Indian J. Ent.*, **19** : 121-180.

1963. Behura, *Proc. First Summer School of Zoology* : 25-78.

1969. Chowdhuri, Basu, R.C. and Raychaudhuri, D.N., *Sci. Cult.*, **35** : 334-335.

1970. Ghosh, A.K., Basu, R.C. and Raychaudhuri, D.N. *Orental. Ins.*, **4** : 64-76.

1971. Bhalla, *Himachal J. Agric. Res.*, **1** : 51-52;

1973. Raychaudhuri, D.N., *USPL 480 Project Tech. Rep.* : 1-107.

1975. Verma, Khurana and Bhanot, *Haryana agric. Univ. J. Res.*, **5** : 11-14.

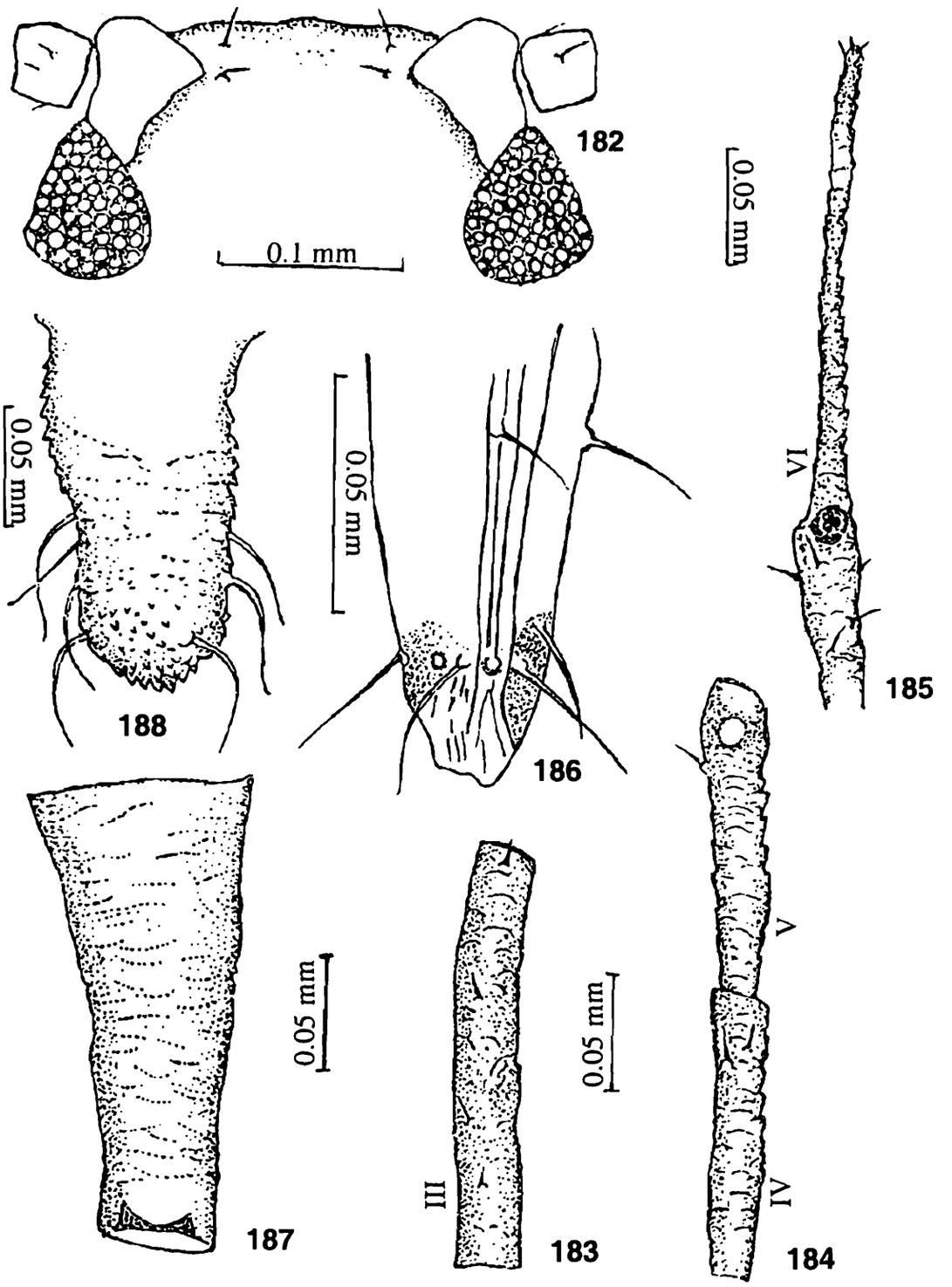
1980. Raychaudhuri, D. N. *(ed.)* Aphids of Northeast India and Bhutan, The Zoological Society, Calcutta : 1-521.

1980. Bhalla and Pawar. *A Survey of Insects & noninsect pests of economic importance in Himachal Pradesh, College of Agric. Chambaghat,* Solan.

1918. *Aphis duranti* Das, *Mem. Indian Mus.,* **6** : 135-274.

1963. Behura *Proc. 1st Summer School of Zoology* (Simla, 1961) : 25-78.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17** (3) : 57-58.



Figs. 182-188. *Aphis punicae* Passerini : Aptera. 182, Head; 183, a.s. III; 184, a.s. IV-V; 185, a.s. VI; 186, u.r.s.; 187, siphunculus; 188, cauda.

2001. Chakrabarti and Sarkar, *J. Aphidology,* **15** (1&2) : 14.

Apterous viviparous female : Body rather small about 1.2-1.56 mm long with 0.80-0.90 mm as the maximum width near the middle of the abdomen. Antennae pale, about half as long as the body; a.s. III (Fig. 183) subequal to or slightly longer than siphunculi; p.t. (Fig. 185) much shorter than a.s. III, about 2.5 times as long as base VI. Rostrum extends upto midcoxae, u.r.s. (Fig. 186) as long as or a little longer than ht_2, bearing 2 hairs near the base besides the preapical ones; dorsum of abdomen pale, without any pigmentation and polygonal reticulation; dorsal hairs appreciably shorter than b.d. III; 8th tergite with 2 hairs. Siphunculi (Fig. 187) smooth, pale, a little dusky near the apices, distinctly imbricated, 0.10-0.15 times as long as body and 1.1-1.3 times as long as pale and blunt cauda (Fig. 188) having bulbous base and bearing 8-9 hairs. Legs pale brown with the tarsi slightly darker; femoral and tibial hairs shorter than the diameter of hind tibiae near at the middle.

Measurements (in mm) of an aptera : Length of body 1.55; width of body 0.85; antenna 0.85; a.s. III 0.21, IV 0.13, V 0.12, VI (0.10 + 0.23); u.r.s 0.10; ht_2 0.08; siphunculus 0.22; cauda 0.17

Colour : Pale greenish; siphunculi and cauda pale.

Material examined : Many apterae, on *Punica granatum,* Nogwain (H.P.), 12.xi. 1968, coll. *ANC.*

Remarks : This aphid infests the leaves and inflorescence of *Punica* spp. (without any appreciable injury to the host plant). As a result of infestation, a sooty mould on the excretion develops. This covers twigs, leaves and fruits; it interferes with assimilation and renders the fruit unfit for market. The species can be distinguished from *A. gossypii* Glover (which also infests *Punica)* by its pale green body with pale siphunculi.

Distribution : India : Himachal Pradesh, Manipur, Meghalaya, West Bengal; Africa; Europe; France; Italy; Morocco; Pakistan; Spain; Switzerland; U.S.S.R.

20. ***Aphis raji*** (Kumar and Burkhardt)
(Figs. 189-194, 352)

1970. *Aphis raji* Kumar and Burkhardt, *J. Kans. ent. Soc.,* **43**(4) : 458-461.

1970. *Aphis leptrhyncha* David. Sekhon and Bindra, *Oriental. Ins.,* **4**(1) : 90 (new synonym).

1970. *Longirostrina raji* Kumar and Burkhardt, *J. Kans. ent. Soc.,* **43**(4) : 458-461.

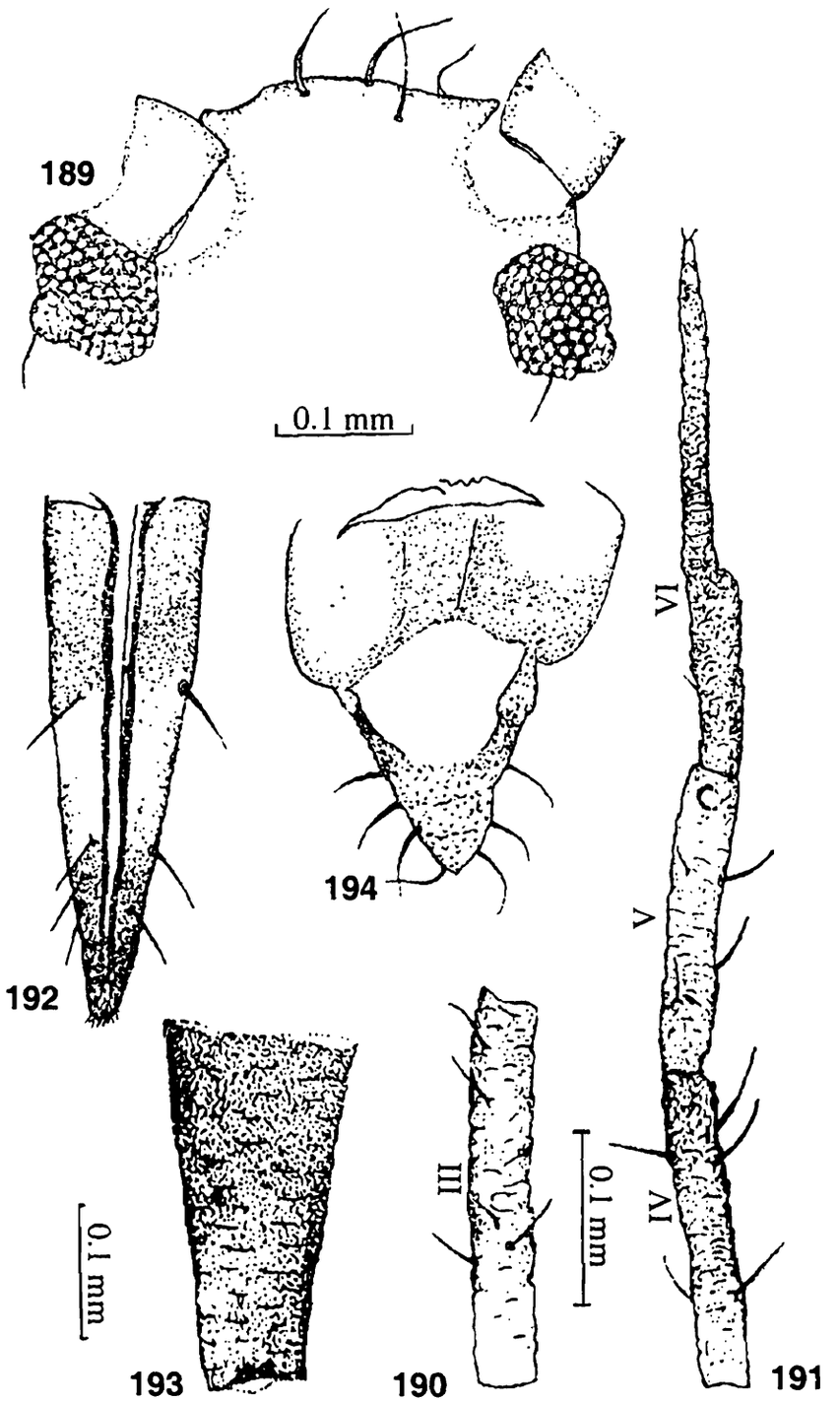
1971. *Longirostris raji* Kumar and Burkhardt, *Ibid.,* **44** : 172-180.

1990. *Aphis raji* Kr. & Burkhadt., *Mem. zool. Surv. India,* **17**(3) : 58-60.

1997. *Aphis raji* (Kr. & Burkhadt) : Remaudiere and Remaudiere, Cataloge of World's Aphididae : 46.

2001. Chakrabarti and sarkar, *J. Aphidology,* **15**(1 & 2) : 14.

Apterous viviparous female : Body broadly oval, 1.75-1.80 mm long with 1.00-1.05 mm as maximum width. Head (Fig. 189) brown, with frontal tubercles, hairs on vertex about 1.4 times as long as the longest antennal hair. Triommatidia visible from above (Fig. 189). Antennae pale to brownish, 0.57-0.60 times as long as body, progressively imbricated (Fig. 191), p. t. a little darker, 1.5-1.7 times as long as base VI, longer hair on a.s. III 1.6-1.8 times as long as b.d. III. Rostrum reaches beyond hind coxae; u.r.s. (Fig. 192) a little darker, tapers to apex, margins smooth, 3.2 times as long as its basal width and 2.3 times as long as ht_2, bearing 2 basal secondary



Figs. 189-194. *A. raji* Kr. and Burkhardt : Aptera. 189, Head; 190, a.s. III; 191, a.s. IV-VI; 192, u.r.s.; 193, siphunculus; 194, cauda.

hairs. Abdomen pale without sclerites, lateral abdominal tubercles absent on abdominal segment VII; hairs on anterior abdominal dorsum 93μ–105μ long and 1.7-1.9 times as long as b.d. III. 8th tergite apparently with 4 hairs upto about 100μ long and 3.2 times as long as b.d. III. Siphunculi (Fig. 193) dark brown, broad at base, about 1.8 times the basal width, margins smooth, with faint imbrication and indistinct apical flange, 0.14-0.15 times as long as body and 1.8 times as long as cauda. Cauda (Fig. 194) concolourous with siphunculi, warty, triangular, and bears 7-8 hairs on apical half. Legs light brown except the dark tarsi; F. T. C. 3,3,2.

Measurements in (mm) of an aptera : Length of body 1.80; width of body 1.05; antenna 1.02; a.s. III 0.24, IV 0.18, V 0.17, VI (0.13 +0.19); u.r.s. 0.20; ht_2 0.09; siphunculus 0.26; cauda 0.14.

Material examined : 4 apterae and 1 nymph, on *Salvia* sp., Dhali (H.P.), 13.vii.1966, *R. Kumar* 35, B. M. 1970-564.

Remarks : Kumar and Burkhardt (1970) while giving original description of *A. raji,* erroneously mention that u.r.s. is 1.3 times as long as ht_2 but as a result of reexamination of the material, it reveals that u.r.s. is twice as long as ht_2 in *leptorhyncha* David *et al.* Besides, lateral abdominal tubercle is usually absent both in *raji* and *leptorhyncha* (rarely present). Also, shape and size of u.r.s., number of secondary hairs on u.r.s., ratio of p.t./base, shape and colour of siphunculi, caudal shape and hairs, number of secondary rhinaria on a.s. III in apterae are in conformity with both the species. But according to law of priority *A. raji* Kumar and Burkhardt 1970 is the valid species and *A. leptorhyncha* David, Sekhon and Bindra, 1970 is synonym of the former.

Distribution : India : Himachal Pradesh and Uttar Pradesh.

21. ***Aphis rhamnifila*** David *et al.*
(Figs. 195-203, 353, 354)

1971. *Aphis rhamniphila* David, Narayanan and Rajasingh, *Oriental. Ins.,* **5** : 557-570.

1980. Maity, Bhattacharya and Chakrabarti, *Sci. Cult.,* **46** : 311-312.

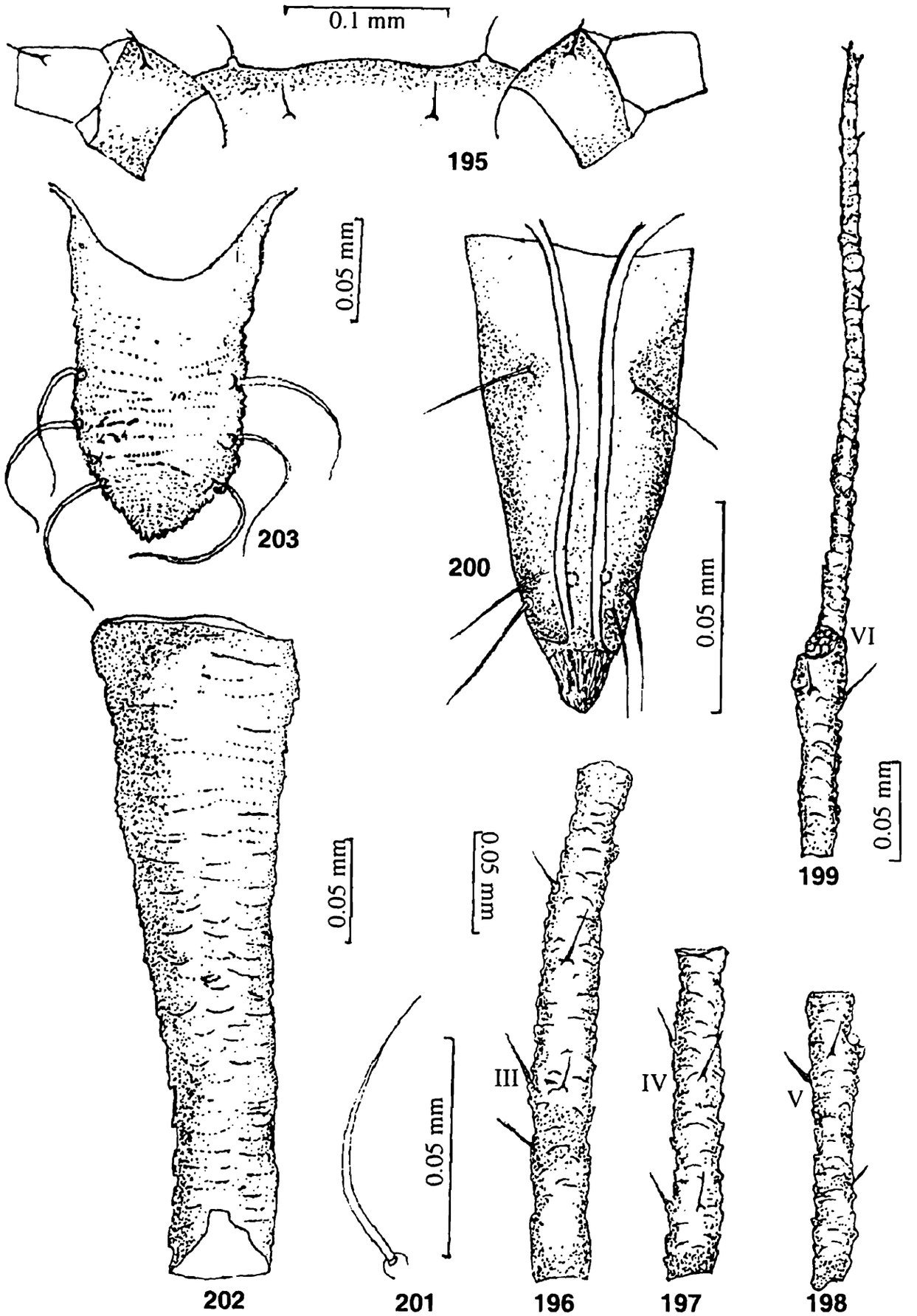
1990. *Aphis rhammiphila* David *etal., Mem. zool. Surv. India,* **17**(3) : 60.

2001. Chakrabarti and Sarkar, *J. Aphidol.,* **15**(1 & 2) : 14.

1997. Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 46.

Material examined : Apterae, on *Rhamnus virgatus,* Mussoorie, U. P., 24.v.1978, coll. *S.P.M.,* 4 apterae, on *Rhamnus* sp., Trijuginarayan, U. P., 5.vi.1978; coll. *S. C.*

Apterous viviparous female : Body rather oval, broad, 1.10-1.50 mm long with about 0.70 mm as maximum width. Head smooth, front sinuous, cephalic hairs 30-40μ. Antennae about 0.50-0.65 times as long as body, flagellum (Figs. 196-199) progressively imbricated, flagellar hairs sparse, acute 9-15μ, a.s. V and p.t. darker,



Figs. 195-203. *A. rhamnifila* David *et al.* : Aptera. 195, Head; 196, a.s. III; 197, a.s. IV; 198, a.s. V; 199, a.s. VI; 200, u.r.s.; 201, dorsal hair; 202, siphunculus; 203, cauda.

p.t. 2.0-2.6 times as long as b.d. III. Rostrum reaches the hind coxae, u.r.s. (Fig. 200) subequal to ht_2, with straight sides, tapering to half the basal diameter, with 2-3 secondary hairs. Abdomen smooth, dorsum of abdomen with polygonal reticulations, lateral tubercles on abdominal segment I and VII fairly large; hairs (Fig. 201) on anterior abdominal tergites long, (30μ-60μ) twice as long as or a little longer than b.d. III and 2.4 times as long as the longest antennal hairs. Siphunculi (Fig. 202) 0.12-0.15 times as long as body, tapering with spinular imbrications and poorly developed flange, 1.4-1.8 times as long as cauda. Cauda (Fig. 203) concolourous with siphunculi, slightly constricted near at the middle, apex rounded, with 6 lateral hairs on distal half. Legs pale brown with coxae, apices of tibiae and whole tarsi darker, second tarsal segment with only primary hair. F.T.C. 3,3,2.

Measurements (in mm) of an aptera : Length of body 1.26; width of body 0.72; antenna 0.85; a.s. III 0.19, IV 0.13, V 0.13, VI (0.09 + 0.19); u.r.s. 0.09; ht_2 0.07; siphunculus 0.16; cauda 0.11.

Distribution : Northwest part of India.

22. ***Aphis rhoicola*** Hille Ris Lambers
(Fig. 355)

1954. *Aphis rhoicola* Hille Ris Lambers. *Estr. Boll. Lab. Zoal. Gen. Agr. Port.*, **33** : 176.

1980. Rao, *CIBC, U.S.P.L. 480 Project Final Tech. Rep.*, : 1-93;

1971. David, Narayanan and Rajagsing, *Madras agric. J.*, **48**(5) : 373.

1990. Ghosh, L. K., *Mem. zool. Surv. India,* **17**(1&2) : 61.

1997. Remaudiere and Ramaudiere, Catalogue of the world's Aphididae : 46.

Material examined : 1 aptera, on *Rhus* sp., Simla (H.P.), 13.xii.1973, coll. *LKG.*

Apterous viviparous female (Fig. 272) : Body pale, 2.55 mm long with 1.50 mm as maximum width near the middle of abdomen. Head dark brown. Antennae 6-segmented, 0.65 times as long as body, a.s. IV + V about as long as a.s. VI, p.t. 3 times as long as base VI, flagellum more distinctly imbricated from base towards apex, flagellar hairs as long as or just longer than b.d. III. Rostrum reaches midcoxae, u.r.s. longer (1.2 times) than ht_2, with smooth margin, bearing 2 secondary hairs besides 3 preapical pairs. Abdominal dorsum light brown, longest hair on anterior abdominal tergites about twice as long as b.d. I. 8th tergite seemingly with 2 hairs. Siphunculi dark brown, cylindrical, imbricated, tapering to apex, 0.15 times as long as body and 1.5 times as long as cauda and with flange. Cauda concolourous with siphunculi, imbricated and bearing about 20 flagellate hairs. Legs light brown except the apices of tibiae and tarsi which are dark brown, hairs on legs rather thin, longer femoral hairs about 0.9 times basal diameter of femora, F.T.C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 2.55, width of body 1.59, antenna 1.65; a.s. III 0.41, IV 0.28, V 0.24, VI (0.13 + 0.39); u.r.s. 0.13; ht_2 0.11; siphunculus 0.39; cauda 0.26.

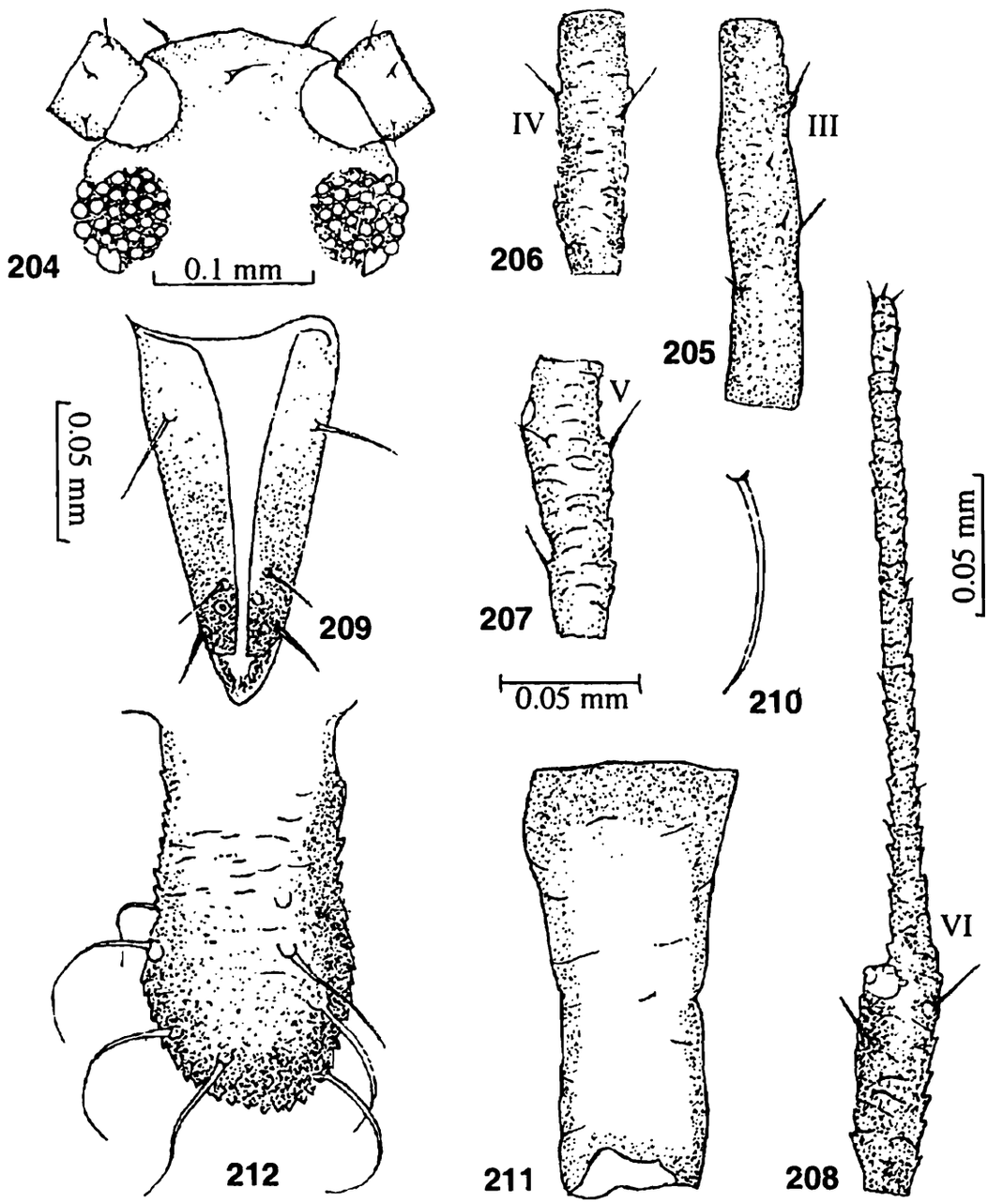
Remarks : Originally described from material from *Rhus abyssinice* at Asmara, Eritrea. The species shows much affinity with *Aphis gossypii* Glover from which *A. rhoicola* differs in the nature of hairs and in the shorter processus terminalis.

Distribution : India : Northwestern and Southern part; East Africa.

23. ***Aphis rubifolii*** Thomas
(Figs. 204-212, 356)

1879. *Aphis rubifolii* Thomas, *Rep, III. Ent.*, **8** : 160.

1976. *Aphis rubifolii;* Chakrabarti, Ghosh, A.K. and Raychaudhuri, D.N., *Sci. Cult.*, **37**(5) : 247-248.



Figs. 204-212. *A. rubifolii* (Thomas) : Aptera. 204, Head; 205, a.s. III; 206, a.s. IV; 207, a.s. V; 208, a.s. VI; 209, u.r.s.; 210, dorsal hair; 211, siphunculus; 212, cauda.

1990. *Aphis rubifolii* : Ghosh, L. K., *Mem.zool. Surv. India,* **17** (3) : 62.

1997. *Aphis rubifolii* (Thomas) : Remaudiere and Remaudiere, Catalogue of world's Aphididae : 47.

Material examined : Many apterae, on *Rubus* sp., Solan (H.P.), 23.xiii.1973, coll. LKG.; 2 apterae and 2 nymphs, on *Rubus ellipticus,* Ranikhet, (U.P.), 28.v.1969, coll. S. C.

Apterous viviparous female : Body oval, 1.40-1.60 mm long with 0.90-1.05 mm as maximum width near the middle of abdomen. Head (Fig. 204) deep brown, smooth, frontal hairs acute about 40μ long. Antennae about half as long as body; a.s. I and II concolourous with head, a.s. III and IV pale brown, V and VI darker, flagellum (Figs. 205-208) progressively imbricated; antennal hairs sparse, longest hair 7-20μ long and about 0.65 times as long as b.d.III; p.t. (Fig. 208) 3.0-3.2 times as long as base VI. Rostrum reaches hind coxae, u.r.s. deep brown with smooth margin, 1.5 times as long as ht_2, bearing 2 moderately long pointed secondary hairs besides three preapical pairs. Abdominal dorsum pale brown, dorsal hairs (Fig. 210) on anterior abdominal tergites 50μ-60μ long and about twice as long as b.d. III. 8th tergite with 2 hairs being about 3.5 times as long as the longest hair on a.s. III. Siphunculi (Fig. 211) a little darker than abdomen, cylindrical, margins rather smooth with spinular imbrications, 0.09-0.10 times as long as body and just a little longer than cauda (Fig. 212). Lags pale brown except the apices of tibiae and tarsi black. F.T.C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 1.50; width of body 1.05; antenna 0.18; a.s. III 0.16, IV 0.10, V 0.10, VI (0.16 + 0.20); u.r.s. 0.11; ht_2 0.07; siphunculus 0.15; cauda 0.14.

Distribution : India : Northeastern part including West Bengal, Uttar Pradesh; Nepal; North America.

24. ***Aphis rumicis*** Linnaeus
(Figs. 213-225)

1758. *Aphis rumicis* Linnaeus, *Systema Naturae,* **10** : 454.

1940. Ghulamullah, *Indian J. Ent.,* **2** : 13-25.

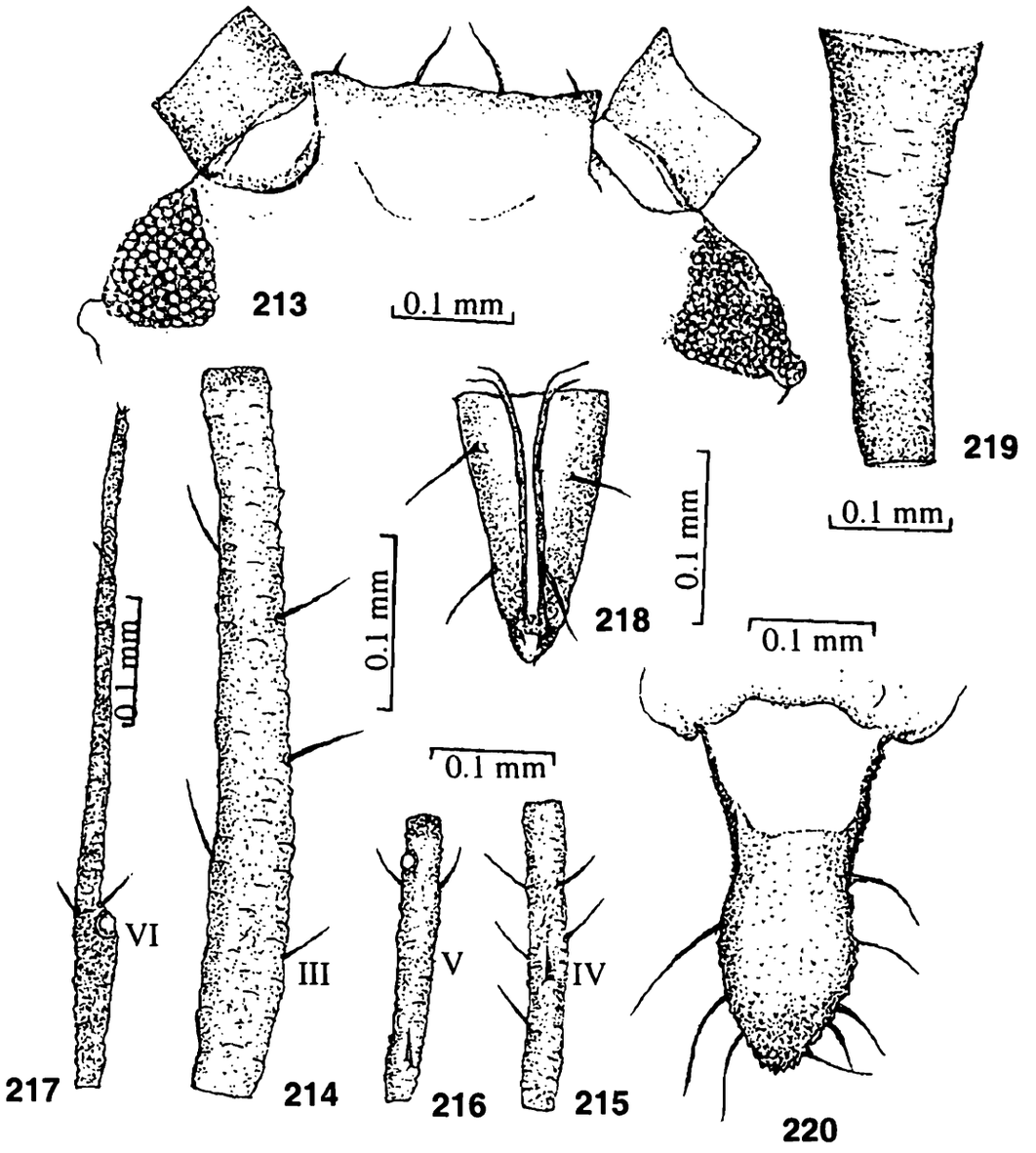
1970. Rizvi and Paulkhurana, *Sci. Cult.,* 36 : 49.

1990. Ghosh, L. K. *Mem. zool. Surv. India,* **17**(3) : 62-64.

1997. Remaudiere and Remaudiere, catalogue of the world's Aphididae : 47.

Material examined : 2 apterae, on *Rumex* sp., Pakistan, 22.viii.1975, No. 1748, CIEA 9197; 4 apterae and 1 alata, on *Rumex* Moor Park, Muddx, 15.vii.1962, VFE 91488.

Apterous viviparous female : Body oval, 1.95-2.50 mm long with 1.35-1.5 mm as its maximum width near the middle of abdomen. Head (Fig. 213) dark brown with small



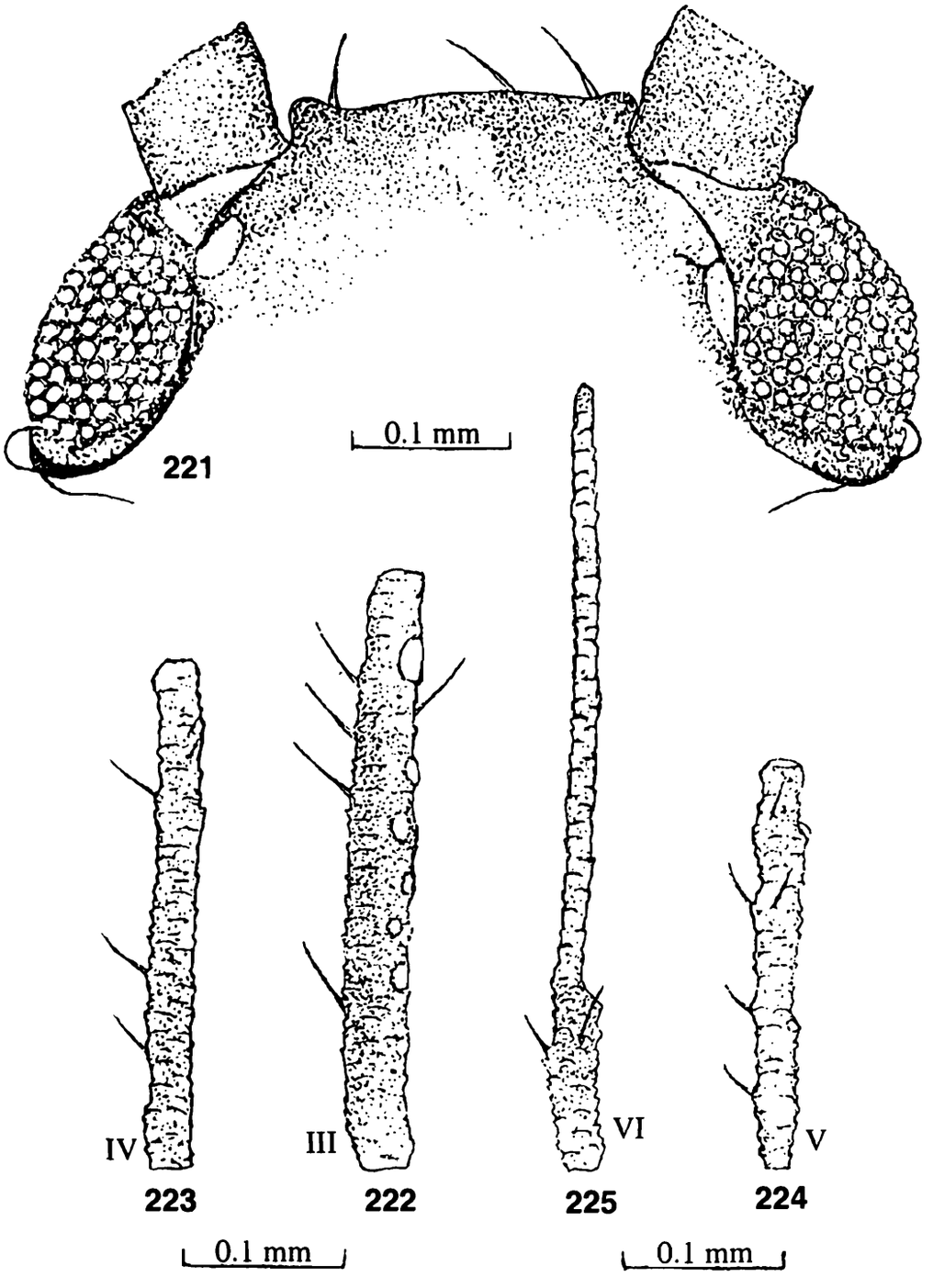
Figs. 213-220. *A. rumicis* Linn. : Aptera. 213, Head; 214, a.s. III; 215, a.s. IV; 216, a.s. V; 217, a.s. VI; 218, u.r.s.; 219, siphunculus; 220, cauda.

antennal tubercles not exceeding vertex. Dorsum smooth with slight roughening on front; Antennae 0.5-0.6 times as long as body, a.s. I and II concolourous with head; flagellum (Figs. 214-217) also darker except base of a.s. III pale, progressively more distinctly imbricated from base towards apex; antennal hairs about 1.5 times as long as b.d. III; p.t. 2.5-2.6 times as long as base VI. Rostrum reaches mid coxae, u.r.s. (Fig. 218) 1.0-1.1 times as long as ht_2, bearing 2 secondary hairs besides three preapical pairs. Abdominal dorsum pale with polygonal reticulations and scattered sclerites on I-VI segments and marginal sclerites on I-IV and VI abdominal segments, with small submarginal intersegmental sclerites, marginal tubercles absent on II-V segments, dorsal hairs on anterior abdominal tergites subequal to b.d. III. 8th tergite with 4 hairs being 1.5-2.0 times as long as antennal hairs. Siphunculi (Fig. 219) dark, imbricated, subcylindrical, margins rough about 0.10 times as long as body and as long as to 1.3 times as long as cauda. Cauda (Fig. 220) digitiform, concolourous with

siphunculi bearing 18-16 hairs. Legs pale brown except coxae, femora, apices of tibiae and tarsi dark, ht_2 with both primary and secondary hairs. F. T. C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 2.20; width of body 1.41; antenna 1.35; a.s. III 0.35, IV 0.24, V 0.22, VI (0.10 + 0.26); u.r.s. 0.13; ht_2 0.12; siphunculus 0.26; cauda 0.19.

Alate viviparous female : Body elongate, 2.40 mm long with 1.11 mm as its maximum width. Head (Fig. 221) blackish, a.s. I and II concolourous with head, flagellum (Figs. 222-225) dark brown with very base of a.s. III pale (Fig. 222). Antennae 0.60 times



Figs. 221-225. *A. rumicis* Linn. : Alata. 221, Head, 222, a.s. III; 223, a.s. IV; 224, a.s. V; 225, a.s. VI.

as long as body; longest hair on a.s. III about 1.5 times as long as b.d. III, a.s. III (Fig. 222) with 8-9 subcircular secondary rhinaria distributed along the margin throughout the entire length except basal and apical 0.2 portion. Abdomen pale brown with segmental sclerotic patches, hairs on anterior abdominal dorsum about as long as hairs on the a.s. III. Siphunculi cylindrical, blackish, imbricated, flanged, 0.09 times as long as body and 1.2 times as long as cauda bearing 12 hairs. Otherwise, as in apterous viviparous female.

Measurements (in mm) of an alata : Length of body 2.40; width of body 1.11; antenna 1.41; a.s. III 0.32, IV 0.28, V 0.22, VI (0.09 + 0.32); u.r.s. 0.13; ht_2 0.11; siphunculus 0.22; cauda 0.19.

Distribution : India : Northeastern part, Delhi, Uttar Pradesh; Afganisthan; Brazil; Canada; East Africa; Europe; Formosa; Greece; Middle East; Pakistan; Taiwan; U.S.A.

25. ***Aphis spiraecola*** Patch
(Figs. 21-32, 357-358)

1912. *Aphis citricola* van der Goot, *Rec. Indian Mus.*, **13** : 175-183; 1914. *A. spiraecola* Patch, *Bull. Me agric. exp. sin,* 233 : 270; 1931. Krishnamurti, *J. Bombay nat. Hist. Soc.*, **34** : 411-419; 1948. Krishnsmurti, *Indian J. Ent.*, **10** : 51-53.; 1956. Davis, *Indian. J. Ent.*, **18** : 141-145; 1958. David, *Indian J. Ent.*, **19** : 171-180; 1958. *J. Bombay nat. Hist. Soc.*, **55** : 110-116.; 1961. Basu, A. N., *Curr. Sci.*, 30 : 390-391; 1961. Basu A. N., *Sci & Cult.*, **27** : 456; 1969. Behura, *Proc. 1st Summer School of Zoology* : 25-78; 1965. Behura, *Prakruti Utkal Univ. J. Sci.*, **3** : 40-65.; 1965. Ganguli, R. N. and Ghosh, M. R., *Sci. Cult.*, **31** : 541-542; 1968. Sharma, *Nepal J. Agric.*, **3** : 110; 1968. Chowdhuri, Basu, R. C. Chakrabarti and Raychaudhruri, D. N., *Sci. Cult.*, **34** : 133-134; 1968. Ghosh, A. K. and Raychaudhuri, D. N., *Proc. zool. Soc., Calcutta* **21** : 179-195; 1969. Basu, A. N., Nath and Chatterjee, *Proc. zool. Soc., Calcutta* **22** : 169-178.; 1962. Banerjee, Ghosh, A. K. and Raychaudhuri, D. N., *Oriental. Ins.*, **3**; 255-264; 1969. Ramaseshiah and Dharmadhikari, *CIBC Tech. Bull.* **11** : 156-164; 1969. Rao, *Final Tech. Rep.* : 1-93; 1969. David and Rajasingh, *Proc. zool. Soc.* **22** : 151-157; 1969. Ghosh, L. K.; *Sci. E'Cult.*, 35 : 493-494; 1970. Dharmadhikari and Ramaseshiah, *CIBC Tech. Bull.*, **13** : 83-89; 1971. Bhalla, *Himachal J. Agric. Res.*, 151-52.; 1972. Ghosh, A. K., Ghosh, M. R. and Raychaudhuri, D. N.; *Oriental. Ins.*, **6** : 333-342; 1973. Raychaudhuri, D. N., USPL 480 project, *Tech. Report* : 1-107; 1975 Ghosh, A. K., Biswas, Chanda, Lahiri and Rhynth, *Sci. E'Cult.*, **41** : 502-594; 1975. Chakrabarti and Raychaudhuri, D. N., *Oriental. Ins.*, **9** : 195-21; 1978. Raychaudhuri, D. N., Dutta, Agarwala, Raychaudhuri, D. and Raha, *Entomon.* **3** : 93-94; 1979. Stary and Ghosh, A. K., *Oriental. Ins.*, **13** : 41-45.; 1979. Raychaudhuri, D. N., Dutta, Agarwala, Raha and Raychaudhuri, D., *Entomon,* 4 : 163-166; 1980. Raychaudhuri, D. N., Ghosh, L. K. and Das, S. K., *Insecta matsum.*, **20** : 1-42; 1980. Ghosh, A. K. and Agarwala, *Indian agric.*, 24 : 101-107.; 1980. Raychaudhuri, D. N., Aphids of N. E. India and Bhutan. The Zoological Society, Calcutta : 1-521,; 1980. Agarwala and Raychaudhuri, D. N., *Entomon,* **5** : 39-42.; 1981. Nayak, Basu, M and Raychaudhuri, D. N., *Pranikee,* **3** : ?; 1981. Agarwala and Raychaudhuri, D. N., *Entomon,* **6** : 207-209; 1981. Agarwala, Ghosh, D., Das, S.K., Poddar and Raychaudhuri, D. N., *Entomon,* **6** : 233-238; 1981. Raychaudhuri, D. N., Ghosh, D., Raychaudhuri, D. and Agarwala, *Insecta matsum.*, **23** : 1-20.

1986. *Aphis citricola* v.d. Goot; Ghosh, L. K. Tech. Mon. No. **16**, ZSI : 24.

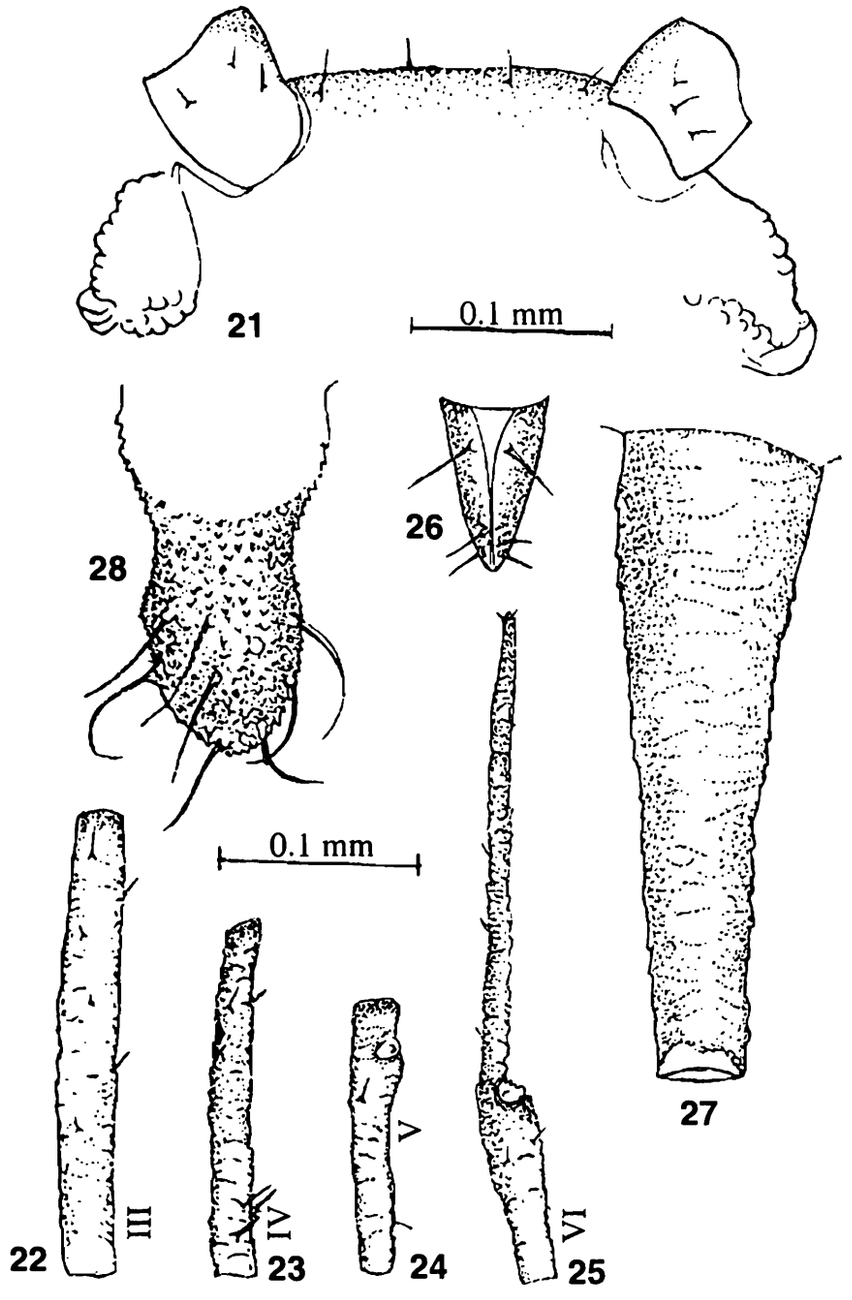
1990. *Aphis citricola* V.d. Goot; Ghosh, L. K. *Mem. zool. Surv. India,* **17**(3) : 16.

1994. *Aphis citricola* v.d. Goot : Ghosh, L. K. on Basu, R. C., *State Fauna Series* **3** : *Fauna of West Bengal*, Z.S.I. : 156.

1997. *Aphis spiraecola* Patch : Remaudiere and Remaudiere Catalogue of the World Aphididae : 48.

2001. *Aphis spiraecela* Patch : Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) : 14

Apterous viviparous female : Body pale, 1.5-2.4 mm. long with 0.8 to 1.4 mm. as maximum width near the middle of abdomen. Antennae 6-segmented, 0.40-0.60 times as long as body; p.t. (Fig. 25) 2.0-2.4 times as long as base VI. Rostrum reaches



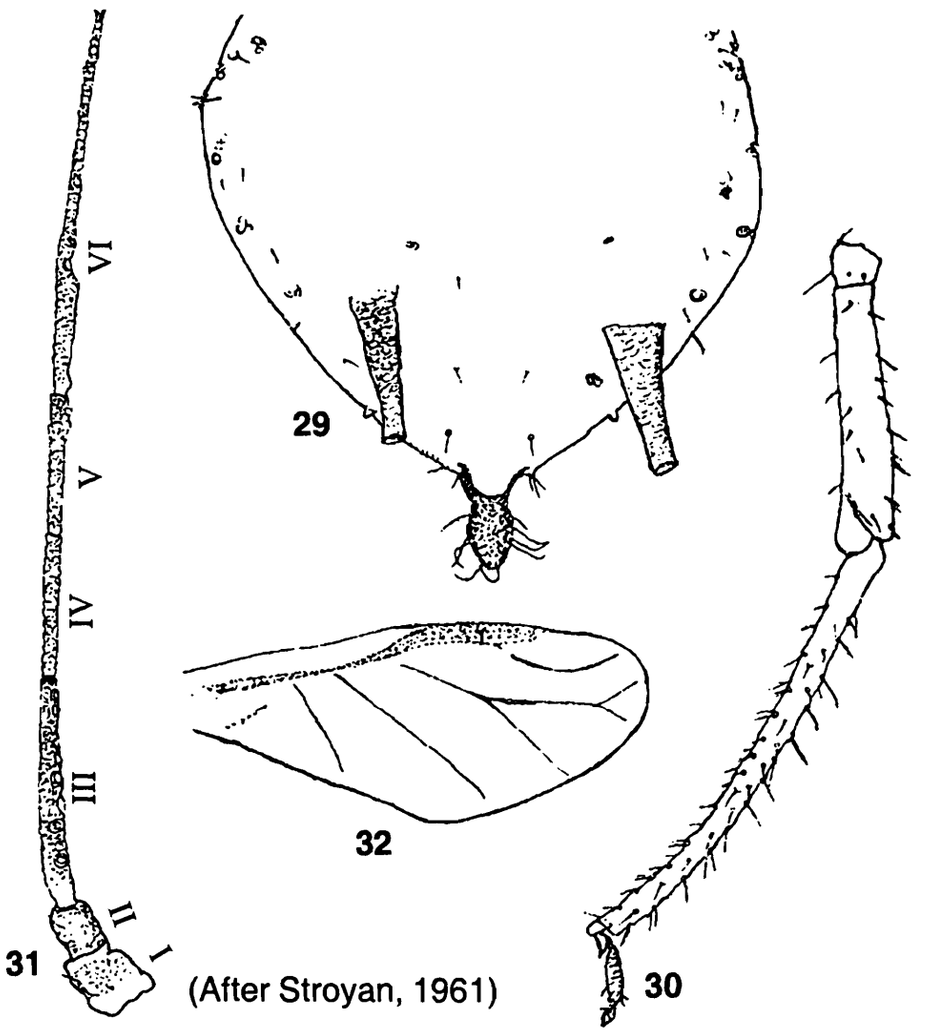
Figs. 21-28. *Aphis spiraecola* Patch : Aptera. 21, Head; 22, a.s. III; 23, a.s. IV; 24, a.s. V; 25, a.s. VI; 26, u.r.s.; 27, siphunculus; 28, cauda.

beyond midcoxae, u.r.s. (Fig. 26) 1.0-1.2 times as long as ht_2. Abdominal dorsum (Fig. 29) pale, without sclerotic pigmentation; 7th tergite with 4 hairs being about 0.80-1.30 times as long as b.d. III; siphunculi (Fig. 27) dark, tapering, 0.10-0.20 times as long as body and 0.9-1.8 times the length of cauda. Cauda (Fig. 28) dark, broad, with a narrow constriction near basal 0.4 portion and bearing 7-14 hairs. Femoral hairs (Fig. 30) at least in part, with finely drawn out apices, longer ones nearly as long as to longer than minimum width of the femur near the trochantro-femoral suture; F.T.C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 1.90; width of body 1.25; antenna 1.05; a.s. III 0.20, IV 0.15, V 0.14, VI (0.11 + 0.23); u.r.s. 0.10; ht_2 0.09; siphunculus 0.40; cauda 0.25.

Colour : Lemon yellow to apple green, body with dark siphunculi and cauda.

Alate viviparous female : Body brownish, 1.2-2.2 mm long with 0.5-1.0 mm as its maximum width. Head brown. Antennae (Fig. 31) 6-segmented, 0.5-0.6 times as long as body; p.t. about 2.0-2.7 times as long as base VI; a.s. III with 4-10, IV with 0-5



Figs. 29-32. *Aphis spiraecola* Patch : Aptera : 29, poserior abominal dorsum; 30, hind leg showing femoral hairs; Alata. 31, Antenna showing secondary rhinaria; 32, hindwing.

secondary rhinaria. Rostrum reaching midcoxae, u.r.s. 1.0-1.1 times as long as ht_2. Abdominal dorsum pale with segmentally arranged marginal sclerotic patches and distinct post-siphuncular sclerite, 8th abdominal segment having median sclerite between the bases of siphunculi; longest hair on anterior abdominal tergite about 0.8 to 1.0 times as long as b.d. III. Siphunculi dark brownish, 0.10 to 0.19 times as long as body and 1.1-1.4 times as long as cauda. Cauda dark, broad with a narrow constriction near basal 0.5 portion and bears 9-11 hairs. Wing venation normal (Fig. 32). Other characters as in aptera.

Measurements (in mm) of an alata : Length of body 1.70; width of body 0.83; antenna 1.05; a.s. III 0.25, IV 0.17, V 0.16, VI (0.09 + 0.24); u.r.s. 0.10; ht_2 0.09; siphunculus 0.21, cauda 0.16;

Colour : Head and thorax blackish brown, abdomen yellowish, siphunculi and cauda dark.

Apterous oviparous female : Body 1.60 mm long with 0.75 mm as its maximum width near the middle of abdomen. Antennae about 0.5 times as long as body, p.t. 1.6 times as long as base VI. Abdomen pale; siphunculi blackish, about as long as cauda bearing seemingly 10 hairs. Hind tibiae nearly concolorous with siphunculi, 3 times the middle of fore and mid tibiae, bearing numerous pseudosensoria. Other characters as in apterous viviparous female.

Measurements (in mm) of the ovipara : Length of body 1.60; width of body 0.75; antenna 0.82; a.s. III 0.16, IV 0.13, V 0.13, VI (0.08 + 0.14); u.r.s. 0.08; ht_2 0.08; siphunculus 0.16; cauda 0.14.

Material examined : Many apterae and alatae, on *Bidens pilosa,* Solan (H.P.); many apterae on undet. Compositae, Solan (H.P.), 4 apterae, on *Prunus* sp., Kemphy (H.P.); 30.x.78; coll. *M. R. G. and P. K. M.* 2 apterae, on *Amaranthus viridis,* Mashobra (H.P.), 12.xii.1973; coll. *M. R. G.* and *P. K. M;* 1 aptera, on *Anaphalis contorta,* Simla (H.P.), 20.x.1968, coll. *L. K. G.*; 1 aptera, 1 alata & 3 nymphs on *Bidens pilosa,* Tadong, Sikkim, 25.x.1962, coll. *A.K. Ghosh;* Apterae, Alatae, & Nymphs, on *Bidens pilosa,* Pangu (Kuti Valley), 12.ix.1968; coll. *H. Banerjee;* Many apterae & alatae, on *Cosmos bipinnatus,* Sankhola, 30.ix.1968, coll. *H. Banerjee;* and nymphs on *Bidens pilosa,* West Bengal, Pashoke, Darjeeling, 11-xii-1970, coll. *M.R.G.*

Host Plants : Highly polyphagous species infesting Acanthaceae, Amaranthaceae, Anacardiaceae, Apocynaceae, Araliaceae, Boraginaceae, Caesalpinae, Caprifoliaceae, Caryophyllaceae, Chenopodiaceae, Commelinaceae, Asteraceae (Compositae), Convolvulaceae, Crassulaceae, Cruciferae (Brassicaceae), Cucurbitaceae, Ericaceae, Euphorbiaceae, Labiatae, Lauraceae, Lythraceae, Malvaceae, Melastomaceae, Moraceae, Musaceae, Myrsinaceae, Myrtaceae, Nyctaginaceae, Oleaceae, Papilionaceae, Panifloraceae, Polygonaceae, Punicaceae, Ranunculaceae, Rhamnaceae, Rosaceae, Rubiaceae, Rutaceae, Saxifragaceae, Solanaceae, Styracaceae, Ternstroemiaceae, Umbelliferae, Urticaceae, Valeriniaceae and Verbenaceae.

Sympton and Damage : The pest species usually colonises the undersurface of leaves and tender buds of the host plats chiefly *citrus* group of fruit trees. The leaves become slightly curled as a result of heavy infestation. As soon as leaves harden in the early summer the number of the aphid population becomes greatly reduced.

Besides, the aphid also affects citrus plants by interfering the growth activity of the tender parts and resulting in malformation of leaves and fruits. Also, under heavy infestation the large amount of excreted honey dew serve as a medium for sooty fungus growth that stains the fruits and leaves. Newly planted ones are said to suffer the greatest injury.

Bionomics : The species is not host specific to *Citrus* plants, instead it has wide preference of alternate hosts. Thus, its association on *citrus* plants is only occasional. Emigrant alate normally initiates colony on the tender leaves and shoots during late monsoon and sizeable population is produced on apical twigs, branches and sometimes even on young fruits. Increase in population is accompained by the production of alatae and a large part of the aphid infestation migrates to other plants. *Citrus* plants support moderate to heavy aphid population for 2-3 months and it is preceded and suceeded by poor colonization for 15-20 days respectively. Ants are often associated with this aphid.

The species usually reproduces anholocyclically. However, Ghosh, A. K., Ghosh, M.R. & Raychaudhuri, D. N. (1972) reported sexual female of the species for the first time in India.

Natural enemies-complex :

Predators : *Ischiodon scutellaris* (Fabr.), *Pragus yoserratus* (Fabr.) *P. tibialis* Fall, *P. yerburyensis* Stack, *Syrphus balteatus* (De Geer) [Diptera : Syrphidae], *Ballia diane* Mulsant, *Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* (Linnaeus), *C. transversalis* Fabricius, *Henosepilachna vigintioctopunctata* (Fabricius), *Hyperaspis maindroni* Sicard, *Lemnia bisellata* (Mulsant), *Micraspis discolor* (Fabricius), *Platynaspis* sp., *Pseudospidimerus circumflexus* (Mots.), *Pullus pyrochellus* Mulsant, *Scymnus guimeti* (Mulsant), *S. pyrocheilus* Mulsant [Coleoptera : Coccinellidae].

Parasitoid : *Aphelinus flavipes* Fors. [Hymenoptera : Aphelinidae], *Aphidium matricariae* Haliday, *Ephedrus palgiator* (Nees), *Lipolexis scutellaris* Mackauer, *Praon myzopha_um* Mackauer, *Trioxyx (Binodoxys) indicus* Subba Rao and Sharma [Hymenoptera : Aphidiidae]

Fungus : *Entomopthora fresenii* (Nowakowskii), *Cephalosporium aphidicola* Petch.

Vector : Citrus tristeza virus disease; Bean common mosaic, Beet mosaic, Papaw mosaic.

Distribution : India : all over.

Elsewhere : Africa; Australia; Bhutan; Bermuda Is.; China; Java; Hawaii; Nepal; New Zealand; North America; Pakistan; Sri Lanka; Sumatra; Sytia; Taiwan; Thailand & Vietnam.

Remarks : These black aphids usually colonise the undersurface of leaves and tender buds. The leaves appear to be slightly curled as a result of heavy infestation. Ghosh, M. R. and Raychaudhuri, D. N. (1981) while discussing the aphids infesting rosaceous plants in Darjeeling district and Sikkim, comment that the occurrence of the species on the above plant is hardly of any economic importance.

The species shows affinity with *A. pomi* and the morphological difference between these two species are difficult to evalute. The main difference is rather shorter u.r.s. and in the absence of marginal tubercles on abdominal segments 2-5 in *spiraecola.* In *A. pomi* u.r.s. is about 3 times as long as wide at the base, while in *A. citricola* it is only twice as long as wide. Moreover, in *spiraecola* there are less hairs on the cauda (apterae 8-15, alatae 7-14) than in *pomi* which bears 14-20 in apterae in 13-20 in alatae.

Palmer (1952) reported the morphs of the species from North America. Ghosh, A. K., Ghosh, M. R. and Raychaudhuri, D. N. (1972) described the apterous oviparous female for the first time from India.

26. ***Aphis verbasci*** Schrank
(Figs. 226-233, 359-360)

1801. *Aphis verbasci* Schrank, Fauna Boica, II. *Ingtostadt,* **2** : 106.

1968. Chowdhuri, A. N., Basu, R. C., Chakrabarti and Raychaudhuri, D. N., *Sci. Cult.,* **34** : 133-134.

1969. Bindra and Sekhon, *Bull. Ent.,* **10** : 103-104.

1971. Chakrabarti, Ghosh, A. K. and Raychaudhuri, D. N., *Sci. Cult.,* **37** : 247-248.

1980. Bhalla and Pawar. *A survey of insects, Himachal Pradesh, Deptt. of Agric. Chambaghat.* Solan (H.P.) : 19.

1980. Raychaudhuri, D. N., Ghosh, L. K. and Das, S. K., *Insecta matsum.,* **20** : 1-42.

1980. Maity, Bhattacharya and Chakrabarti, *Sci. Cult.,* **46** : 311-312.

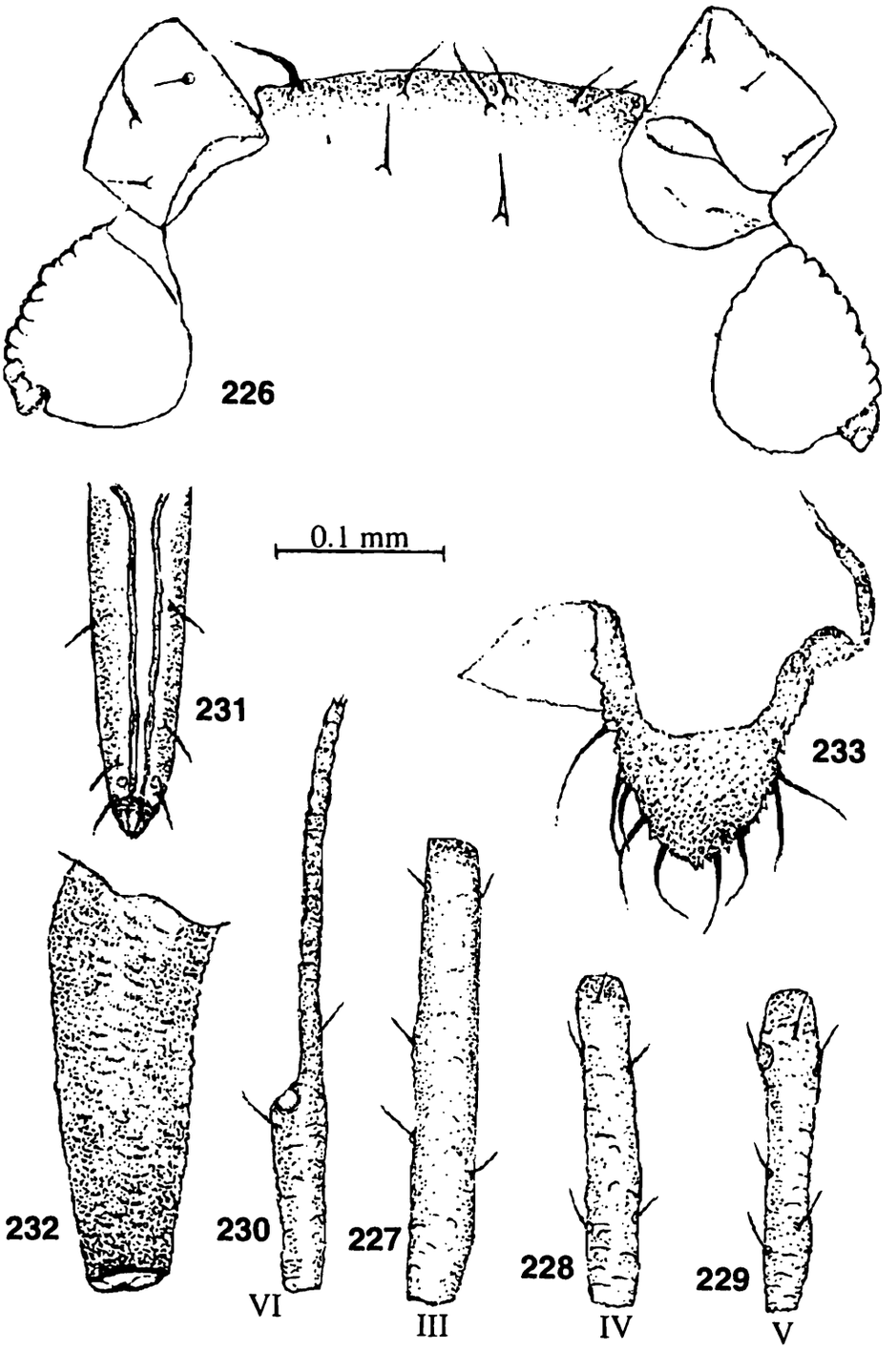
1981. Agarwala, Ghosh, D., Poddar and Raychaudhuri, D. N., *Entomon,* 6 : 233-238.

1990. Ghosh, L. K. Mem. *zool. Surv. India,* **17**(3) : 64-66.

1997. Remaudiere and Remaudiere, Catalogue of the World's Aphididae : 50.

2001. Chakrabarti and Sarkar, *J. Aphidology,* **15**(1&2) : 15.

Apterous viviparous female : Body semioval, 2.0-2.3 mm long with 0.9-1.5 mm as its maximum width. Head (Fig. 226) pale brown, samll antennal tubercles not exceeding vertex, dorsum of head somewhat wrinkled, dorsal cephalic hairs (Fig. 226) moderately long, (about 9μ) being about as long as b.d. III. Antennae about half as long as body,



Figs. 226-233. *A. verbasci* Schrank : Aptera. 226, Head; 227, a.s.III; 228, a.s.IV; 229, a.s.V; 230, a.s.VI; 231, u.r.s.; 232, siphunculus; 233, cauda.

p.t. (Fig. 230) darker, 1.7-2.5 times as long as base VI, flagellum more distinctly imbricated from base towards apex, antennal hairs with acute apices and about as long as or just a longer than b.d. III. Rostrum extends beyond hind coxae, u.r.s. (Fig. 231) dark, narrow, elongated about 3.4 times its basal width, with smooth margins, 1.5-2.0 times as long as ht_2 and bearing 2 short hairs on basal half. Abdominal dorsum pale with scattered brown sclerite, dorsal hairs (30-38μ long) about as long as or just a longer than b.d. III. 8th tergite with 2 hairs and 50μ long and 1.5-1.7 times as long as antennal hairs. Siphunculi (Fig. 232) stout, black, imbricated, 0.2-0.4 times as long as body and 2.5-3.0 times as long as cauda. Cauda (Fig. 233) concolourous

with siphunculi, 1.2 times as long as its basal width and bears 10-14 hairs. Legs pale brown with apices of tibiae and whole tarsi blackish, ht_2 with both primary and secondary hairs.

Measurements (in mm) of an aptera : Length of body 2.25; width of body 1.35; antenna 1.20; a.s. III, 0.31, IV 0.24, V 0.22, VI (0.13 + 0.26); u.r.s. 0.22; ht_2 0.10; siphunculus 0.39; cauda 0.15.

Alate viviparous female : Body 2.0-2.5 mm long with 0.9-1.3 mm as maximum width. Head dark, frons smooth. Antennae also dark except the pale base of a.s. III; p.t. 2.0-2.4 times as long as base of a.s. VI; a.s. III with 19-28, IV with 3-9 secondary rhinaria; u.r.s. rather long about twice as long as ht_2 and about 4.5 times as long as its basal width, bearing 2-4 short hairs besides three preapical paris. Abdominal dorsum with scattered brown sclerites; post-siphuncular sclerite present. Siphunculi 0.10-0.14 times as long as body and 1.8-2.0 times as long as cauda which is blackish, rather short and pointed. Legs brown except apical half of femora, apices of tibiae and whole tarsi blackish. Otherwise, as in apterous viviparous female.

Measurements (in mm) of an alata : Length of body 2.12; width of body 1.01; antenna 1.23; a.s. III 0.29, IV 0.22, V 0.18, VI (0.12 + 0.25); u.r.s. 0.22, ht_2 0.12; siphunculus 0.30, cauda 0.14.

Material examined : 3 apterae and 7 nymphs, on *Verbascum thapsus,* Kufri (H.P.), 31.x.78, coll. *MRC & PKM;* 1 aptera, on *Verbascum thapsus,* Bagrata, 22.xii.1968, coll. *ANC*; 1 aptera, on *Polygonum alatum,* ix.1966, coll. *A. N. C;* 1 aptera, on *Cedrum deodara,* Simla (H.P.), viii.1966, coll. *ANC*; 1 alata, on *Cedrus nutaus,* Khadrala, (H.P.), 28.xi.1968, coll. *ANC.*; 2 alatae, host ?, Nainital (U.P.), 22.v.1980, coll. *S. C.*

Colour : Bright yellow to yellowish brown usually with a black band between and in front of the siphunculi.

Remark : The species attacks leaves and other young parts of host plants, often causing considerable damage.

Distribution : India : Himachal Pradesh, Punjab, Uttar Pradesh; Europe; France; Middle East.

27 ***Aphis (Protaphis) carthami*** (Das)
(Figs. 234-241)

1917. *Brachynguis carthami* Das, *Mem. Indian Mus.,* **6** : 237-239;

1917. *Brachyunguis carthami,* van der Goot, *Rec. Indian Mus.,* **13**(4) : 175-183;

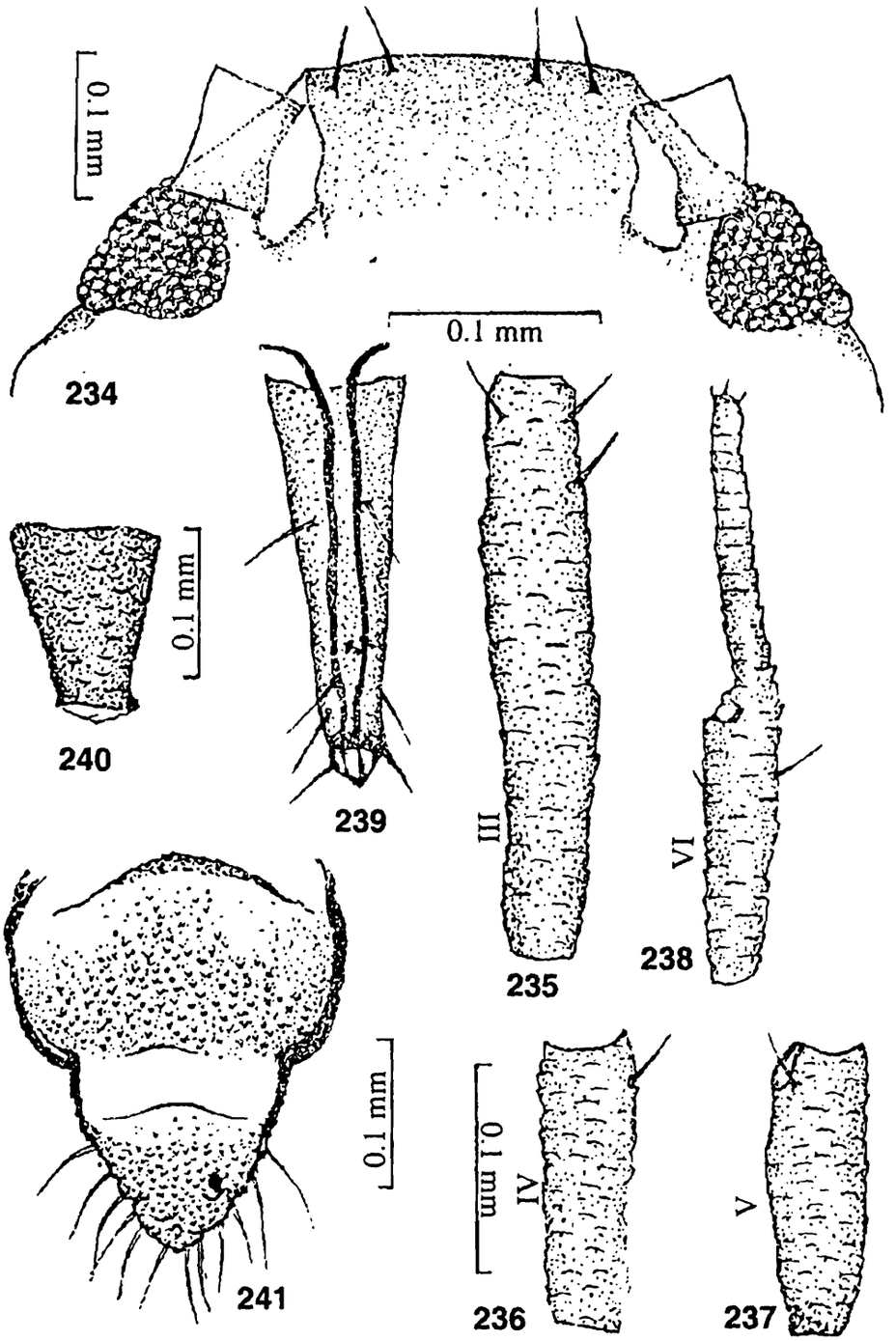
1940. Ghulamullah, *Indian J. Ent.,* **2** : 13-25.

1958. David, *Ibid,* **19** : 171-180.

1958. *Aphis (Protaphis) carthami* (Das) : Agarwala and Ghosh, A. K., *Mem. zool. Surv. India,* **16**(3) : 36.

1990. Ghosh, L. K., *Mem. Zool. Surv. India,* **17**(3) : 66-67.

1997. Remaudiere and Remaudiere, Catalogue of the World's Aphididae : 53.



Figs. 234-241. *A. (Protaphis) carthami* (Das) : Aptera. 234, Head; 235, a.s. III; 236, a.s. IV; 237, a.s. V; 238, a.s. VI; 239, u.r.s.; 240, siphunculus; 241, cauda.

Material examined : 2 apterae, alatiform apterae; host indet. Ranchi (Bihar), 8.iv.1976 (CIEA 8779); 1 aptera (Shrunken), on *Vernonia cinena,* Coimbatore (S. India), 8.x. 1952, Coll. *S. K. David.*

Apterous viviparous female : Body rather oval, 1.68-1.95 mm long with 1.11-1.14 mm as its maximum width near the middle of abdomen. Head (Fig. 234) smooth, brown. Antennae 6-segmented, 0.35-0.39 times as long as body, a.s. I and II concolorous with head, flagellum (Figs. 235-238) progressively more distinctly imbricated, and

with several short to medium-sized hairs; secondary rhinaria absent, antennal hairs upto 12μ long and about 0.8 times as long as b.d. III., p.t. as long as or just a shorter than base of segment VI; Rostrum reaches hind coxae, u.r.s. (Fig. 239) 1.4-1.6 times as long as ht_2 and with 2 secondary hairs besides 3 preapical pairs. Abdominal dorsum rather pale, smooth; with segmental sclerotic patches; dorsal abdominal hairs with acute to acuminate apices, about 22μ long, longest hair on anterior abdominal tergites about 0.7 times as long as b.d. III. 8th abdominal tergite with 2 hairs about 2.4 times as long as b.d. III. Siphunculi (Fig. 240) dark brown, thick, imbricated, 0.05-0.07 times as long as body, subequal to cauda. Cauda (Fig. 241) pale to brown, conical, as long as its basal width, spinose and bears 14-16 hairs. Legs pale brown except coxae, distal half of femora, apices of tibiae and tarsi deep brown; primary and seondary hairs on ht_2 present; F T. C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 1.95; width of body 1.95; antenna 0.75; a.s. III 0.26, IV 0.09, V 0.09, VI (0.11 + 0.10); u.r.s. 0.14; ht_2 0.09; siphunculus 0.13; cauda 0.13.

Distribution : India : Bihar, South India; Pakistan.

Genus 2. ***Brachygunguis*** Das, 1918
(Figs. 242-247)

1918. *Brachynguis* Das, B., *Mem. Indian Mus.*, **6** : 227; Remaudiere, G. and Davatchi, A. 1955, *Revue, Path. Veg. Ent. agric. Fr.* **33** : 241; Eastop, V. F., *Aust. J. Zool.*, **14** : 483. Type-species; *Brachyunguis harmalae* Das.

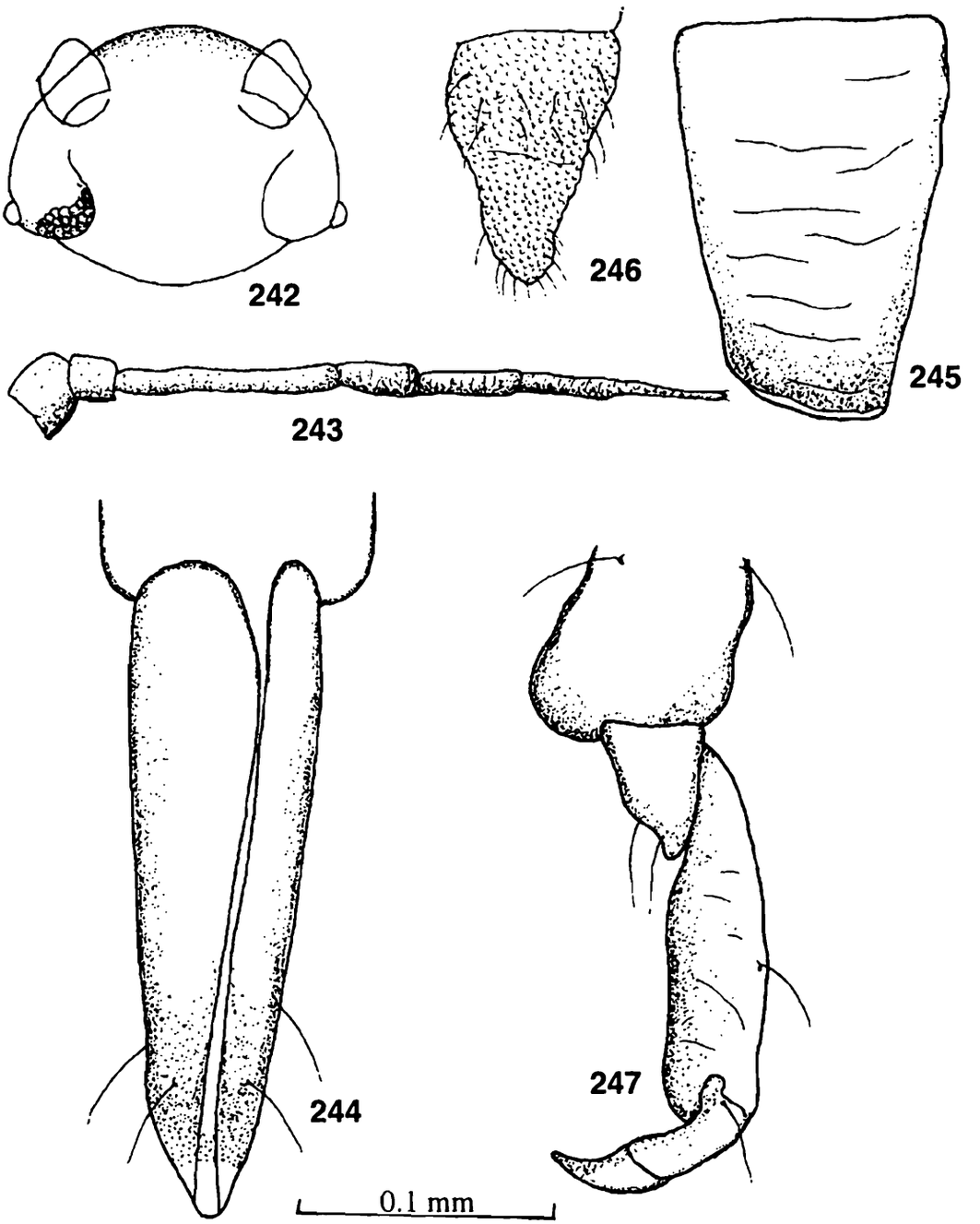
Morphology : Body 1.5-2.5 mm long. Antennal tubercles hardly discernible. Antennae 6-segmented, always much shorter (upto 0.50 x) than the body, apterae with secondary rhinaria on apical part of segment III and sometimes also on segment IV; alatae with similar rhinaria always on III, variably on IV and V; processus terminalis 0.66-2.0x as long as base of antennal segment VI. Ultimate rostral segment 0.6-1.6x as long as second segment of hind tarsus and bears 2 accessory hairs. Mid thoracic furca sessile or with separate arms. Dorsum of apterae often with paired segmental sclerotic areas on 1st-5th tergites and transverse band on posterior tergites; dorsum in alate with less developed pigmented areas. Dorsal hairs fine, 0.010-0.050 mm long. Abdominal tubercles on 1st and 7th tergites large, others variably present but distinctly small. Siphunculi dark, slender, equal or little longer than cauda, 0.05-0.10 times as long as the body. Cauda dark elongate with 7-20 hairs. Legs with first tarsal segments bearing 3, 3, 2 hairs. Wing venation normal.

Oviparae apterous very similar to viviparae but with swollen hind tibia bearing pseudosenosoria. Males may be apterous or alate bearing numerous secondary rhinaria in all segments.

Discussion : The genus *Brachyunguis* Das has been considered to be a close associate of the genus *Aphis* L. The members of this genus (about 25 species) are normally associated with xerophytes and mostly known fro Central Asia and Middle East.

Eastop (1966) stated that the group is probably polyphyletic consisting of degenerate *Aphis* spp., with more dorsal pigmentation in apterae and that several morphologically similar old world compositae—feeding aphids (e.g *Protaphis* Börner 1952, *Ephedraphis* H.R.L. 1959, *Towana* Hottes, 1954 etc.) are known which may not be closely related. Within the genus itself, many of the nominal species appear very similar and only transfer experiment may finally decide their distinctiveness.

Only one coccinellid predator, e.g. *Hoppodamia (Adonia) variegata* (Goeze) which has a wide prey range feeds on the type species in the region. No syrphid predator or aphidiid parasite is known in this region. Ant association is common.



Figs. 242-247. *Brachyunguis* sp. : Aptera. 242, Head; 243, antenna; 244, u.r.s.; 245, siphunculus; 246, cauda; 247, tarsal segments.

Biology : In Central Asia and Middle East the aphids of the *genus* feed on *Lycium, Tamarix* and plants of Chenopodiaceae. *B. harmalae* leads holocyclic life cycle on *Peganum harmala* but in Israel, the same species also feeds on *Citrus*. The members of this genus have also been frequently recorded from base of stems of Composite (Asteracae) in earth shelters built by ants (Eastop, 1966). In the region, *Calotropis gigantea* and *Peganum harmalae* (Zygophylaceae) have been recorded as common host.

Distribution : Widespread including Oriental, Ethiopian, Palaearctic, Nearctic and Australian regions. Regional works include Szelegiewicz (1959) : Europe; Remaudiere and Davatchi (1955) : Middle East; Eastop (1961) : Africa.

Type species : *Brachyungis harmalae* Das 1918. Although a part of Das's aphid collection is present in National Zoological collection (NZC) in Zoological Survey of India, no specimen of *Brachyunguis* could be located. Location of types remain unknown.

28. ***Brachyunguis calotropicus*** Menon and Pawar

1958. *Brachyunguis calotropicus* Menon and Pawar, *Proc. 45th Indian Sci. Congr.,* Calcutta, p.t. **3** : 348.

1959. *Brachyunguis* sp., Raychaudhuri, D.N. and Ghosh, A.K., *Indian Agric.,* Calcutta, **3**(1) : 17-22.

1997. *Brachyunguis calotropicus* (Menon and Pawar) : Catalogue of the Worlds Aphididae : 53.

Remarks : Menon and Pawar (1958) described very briefly the species collected on flower heads of *Calotropis* sp. from Delhi. Later, Raychaudhuri, D.N. and Ghosh A.K. (1959) recorded a few specimens as *Brachyunguis* sp. from *Calotropis gigantea* (N.O. Asclepiadaceae) at Rajasthan. The same may be either *B. harmalae* Das or *Brachyunguis calotropicus* Menon and Pawar. Since the material was not at the disposal of the authors no Comments could be given as to the correct identity of the species.

Genus 3. ***Casimira*** Eastop, 1966

1966. *Casimira* Eastop, V. F., *Aust. J. Zool.,* 14 : 485; Raychaudhuri D. N., Ghosh, M. R., and Basu, R. C. 1980 *In* Aphids of North East India and Bhutan 58 Type-species; *Aphis canberrae* Eastop.

Morphology : Body small, less than 2.0mm. Head pale smooth without any antennal tubercle or median frontal prominence. Dorsal cephalic hairs fine, longer than basal diameter of antennal segment III. Antennae 6–segmented shorter than the body, without secondary rhinaria in apterae; processus terminalis 3.30-3.70 times as long as base of antennal segment VI. Ultimate rostral segment blunt, 1.30-1.80 times as long as second of hind tarsus and bears 4 accessory hairs. Midthoracic furca with separate arms. Tergum pale smooth. Dorsal hairs long and fine; 8th tergite with 4 hairs. Abdominal tergite 7 without lateral tubercle. Suphuncli 0.60-0.10 times as long

as the body, 0.33-0.50 times as long as the processus terminalis. Cauda dusky bearing 6 hairs. Subgental plate with 2 hairs on anterioir half and 6-8 hairs on posterior margin. Legs pale; first tarsal segments with 2, 2, 2, hairs. Wing venation normal; Media of forewing once–branched.

Larvae with hind tibiae smooth. Sexuales not known.

Discussion : The genus with only 2 species so far described seems to have a most discontinuous distribution in Australia (Canberra; New South Wales) and Bhutan. The presence of 2, 2, 2 hairs on first tarsal segments, absence of lateral abdominal tubercle on 7th tergite, once-branched Media but the absence of stridulatory mechanism etc., makes the genus separable from both *Aphis* Linnaeus and *Toxoptera* Koch.

Biology : The host plant in Australia is recorded as *Epilobium junceum* (Onagraceae); In the region more than one species of *Epilobium* is knwon but the single record from Bhutan does not indicate the host-plant. No natural enemy or ant association is known.

Distribution : Bhutan; Australia

Type-species : *Aphis canbernae* Eastop, 1961. Deposited in the collections of British Musuem (Nat. Hist.) London.

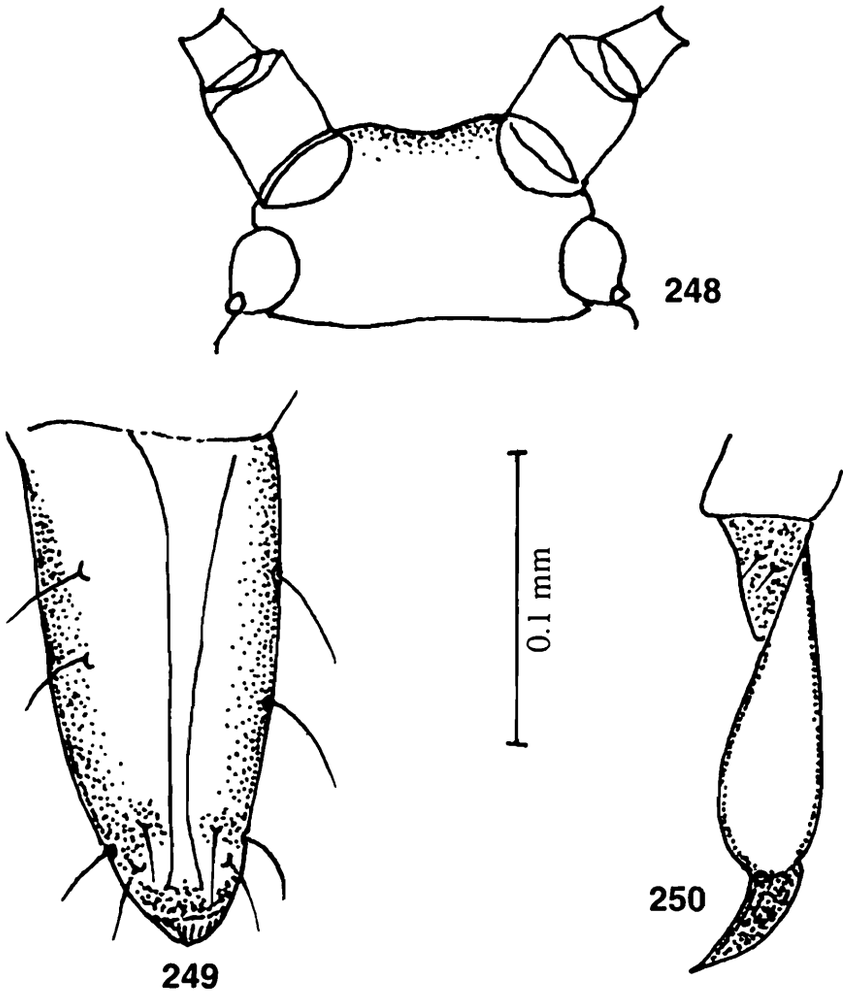
29. ***Casimira bhutanensis*** Ghosh, Basu and Raychaudhuri (Figs. 248-250)

1971. *Casimira bhutanensis* Ghosh, Basu and Raychaudhuri, *Kontyu,* **39**(2) : 124.

1997. *Casimira bhutanensis* : Remaudiere and Remaudiere, catalogue of the World's Aphididae : 56.

Apterous viviparous female : Body 1.4-1.5 mm long with 0.8 mm as maximum width near the middle of abdomen. Head concolourous with pale body, with low diverging lateral prominence on an indistinct median concavity. Antennae 6-segmented, about 0.8 times as long as body, pale except at the apices of segments III, IV, V and base of p.t. which are dusky; a.s. III faintly imbricated; p.t. 3.6–3.7 times as long as base VI; flagellar hairs sparse and short, longest one on a.s. III 0.3–0.5 times as long as b.d. III. Rostrum reaches 3rd coxae, u.r.s. thick, parallel-sided, blunt, 1.5–1.6 times as long as h.t. 2 and bears two pairs of secondary hairs besides 3 pairs of preapical ones. Abdominal dorsum pale, lateral abdominal tubercles present on tergite I but segment VII without any tubercle; hairs on dorsum of abdomen long, fine, about 2–2.5 times as long as b.d. III. Siphunculi pale, cylindrical, almost smooth or faintly imbricated, about 0.18 times as long as body and 2.3 times as long as cauda. Cauda pale, tongue-shaped, concolourous with siphunculi, bears 6 long hairs. Legs rather pale; F.T.C. 2 : 2 : 2.

Measurements (in mm) of one specimen : Length of body 1.55; width of body 0.80; antenna 1.2; a.s. III 0.20, IV 0.16, V 0.19, VI (0.11 + 0.40); u.r.s. 0.12; h.t. 2 0.08; siphunculus 0.27; cauda 0.12.



Figs. 248-250. *Casimira bhutanensis* Ghosh *et al.* : Aptera. 248, Head; 249, u.r.s.; 250, h.t.2.

Material : Apterous viviparous females, host unknown, near Wangdu Phodrant Rd. (*c* 2377 m), Bhutan, 26.2.1968.

Distribution : Australia; Bhutan.

Remarks : The species shows its affinity with *Casimira canberrae* (Eastop) in absence of any tubercle on 7th abdominal tergite and F.T.C. 2 : 2 : 2, but differs in having longer siphunculi.

Genus 4. ***Cryptosiphum*** Buckton 1875

1875. *Cryptosiphum* Buckton, G. B., Monograph of the British Aphids, London, **1** : 47 (nomen nudum); Buckton G.B.,1879. Monograph of the British Aphids, London, **2** : 144; Raychaudhuri, D. N., Ghosh, M.R., and Basu, R.C., 1980. *In :* Aphids of North East India and Bhutan, 127. Type species : *Cryptosiphum artemisiae* Buckton.

Morphology : Body small 1.1–2.0 mm long. Head smooth, without any lateral or median prominence; a ventral longitudinal suture present. Dorsal cephalic hairs long. Antennae 6–segmented distinctly shorter than the body; flagellum imbricated without secondary rhinaria in apterae but with such rhinaria on segment III or sometimes on segment IV in alatae; flagellar hairs short, bluntish; processus terminalis short, may

be shorter (0.3–0.7x) or little longer than base of last antennal segment. Eyes with triommatidia partly covered. Rostrum short with ultimate rostral segment stiletto–shaped, longer than second segment of hind tarsus and bearing 2-4 accessory hairs besides preapicals. Tergum may be pale to dull in apterae often with fine reticulate pattern; 8th tergite with brownish pigmentation; alatae without any mid dorsal sclerotic bars or patch. Dorsal hairs long and thick. Siphunculi very short, wider than long, without apical flange. Cauda short, broad rounded. Subabal plate broadly rounded. Subgenital plate with 14-16 hairs on posterior margin. Legs very short, femoral and tibial hairs fine; first tarsal segments, usually with 3, 3, 2 hairs. Wing venation normal with veins little dusky, redial sector nearly straight.

Sexuales are known for some species e.g. *C. artemisae.* Males are alatae.

Table : List of species of *Cryptosiphum* from the World

artemisiae Buckton, 1899

astrachanicae Ivanovskaya, 1960

brevipilosum Börner, 1932.

caspicae Bozhko, 1957.

eurotiae Mamontova, 1968

innokentyi Ivanovskaya, 1970

mordvilkoi Ivanovskaya, 1960

nevskii Börner, 1952

sieversiaua Ivanovskaya, 1958

(Source : Eastop & Hille Ris Lambers, 1976)

Discussion : A genus of about 9 valid species (Table above) members of which have often been confused with *Aphis* Linnaeus. The most well known species *C. artemisiae* is known to cause conspicuous curling of leaves of *Artemesia* on which plant most of the species of *Cryptosiphum* have evolved. The absence of secondary rhinaria in apterae, acute ultimate rostral segment, flangeless siphunculi and absence of dorsal sclerotic patch in alatae separates out the genus from the related ones. Heie (1986) has treated the genus under Aphidini following Shaposhnikov (1964). But Börner (1952), Miyazaki (1971) and Stroyan (1984) have considered the genus under Macrosiphini with close affinites with *Anuraphis* del Guercio and *Dyasaphis* Börner.

Biology : The members of the genus are associated with *Artemesia* spp. and lead either a monoecious holocyclic life cycle or anholocyclic life cycle on the same host plant. Pseudogalls or leaf curling with change of colouration of leaves are common sympton of its infestation. Ants are not known to visit these aphids.

Distribution : India; China; Japan; Korea; Taiwan and Europe. Most of the species occur in the steppes of Eurasia (Heie, 1986).

Type-species : *Cryptosiphum artemisiae* Buckton, 1879. Lectotypes are deposited in the collections of British Museum (National History), London.

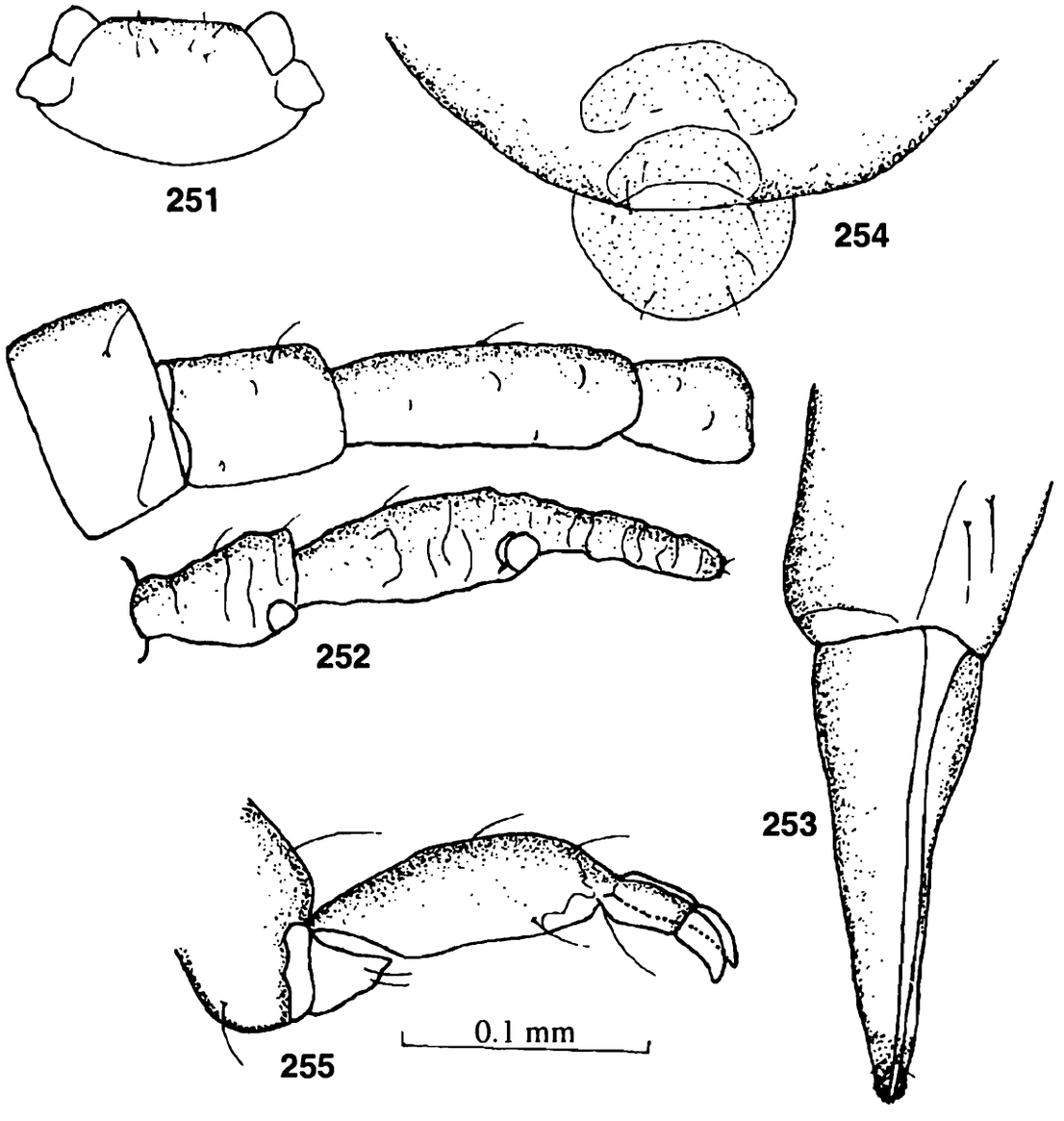
30. ***Cryptosiphum artemisiae*** Buckton
(Figs. 251-258)

1879. *Cryptosiphum artemisiae* Buckton, *Monogr. Brit. Aphides,* **2** : 145.

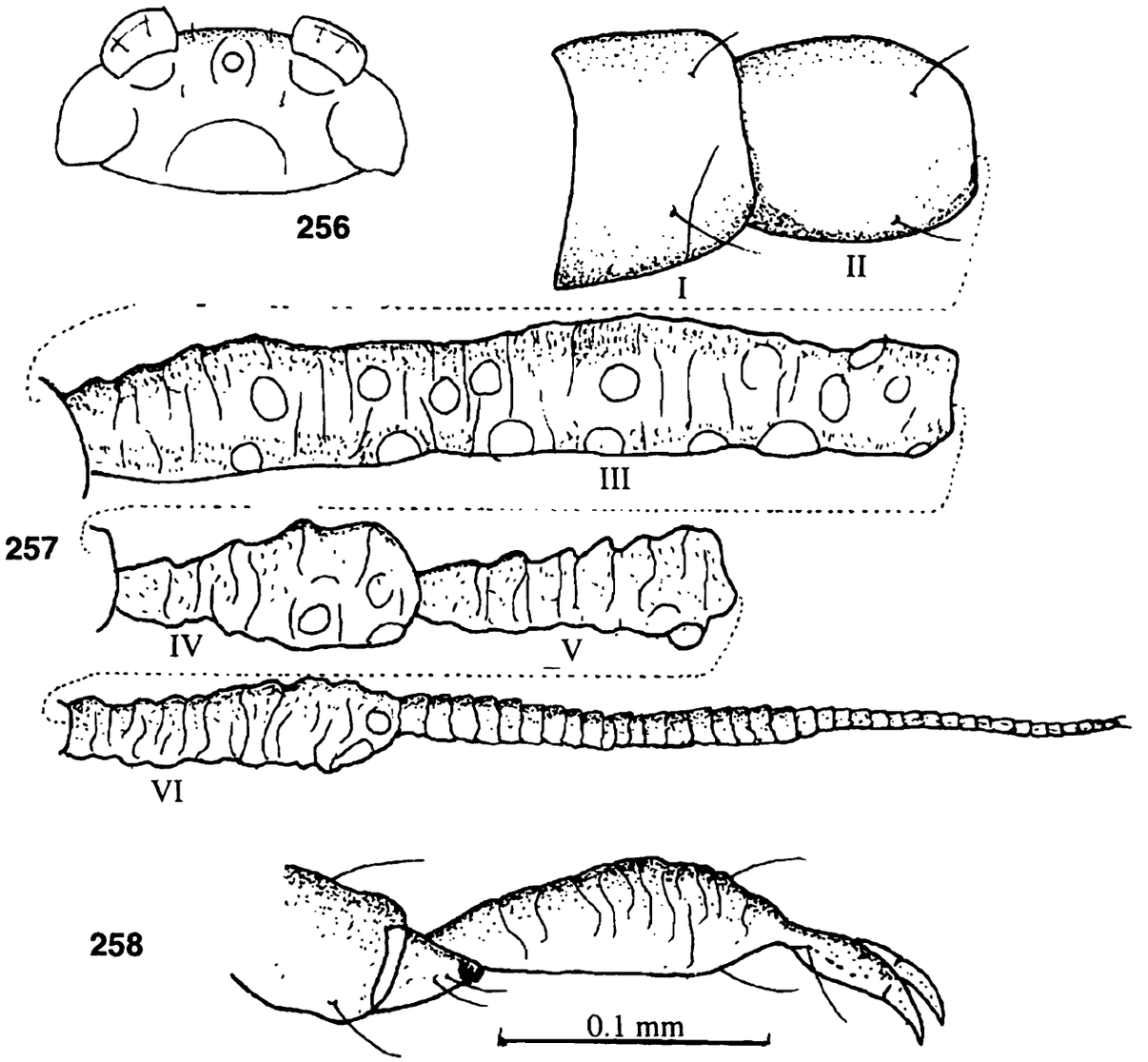
1980. *Cryptosiphum artemisiae* Buckton : Raychaudhuri, D. N. (ed.), Aphids of NE India and Bhutan : 128.

1997. *Cryptosiphum artemisiae* : Remaudiere and Remaudiere, Catalogue of the world's aphididae : 56.

Apterous viviparous female : Body about 1.50 mm long with 0.90 mm. as maximum width near the middle of abdomen. Head smooth, without lateral frontal tubercles and median frontal prominence, dorsal cephalic hairs stiff, long with blunt apices,



Figs. 251-255. *Cryptosiphum artemisiae* Buckton : Aptera. 251, Head; 252, antenna; 253, u.r.s.; 254, portion of abdomen showing cauda. 255 h.t.2.



Figs. 256-258. *Cryptosiphum artemisiae* Buckton : Alata. 256, Head; 257 antenna; 258, tarsal segments.

ventral cephalic hairs a little longer than dorsal ones, the longest hair being about as long as or a little longer than b.d. III. Antennae 6-segmented, about 0.3 times as long as body, a.s. I and II slightly scabrous, flagellum imbricated, flagellar hairs short (shorter than b.d. III), with bluntish to acuminate apices; without secondary rhinaria, primary rhinaria with short cilia; p.t. about as long as base VI. Ultimate rostral segment stiletto-shaped, about 1.4 times as long as ht. 2., bearing 1-2 pairs of secondary hairs besides 3 pairs of primary hairs of which 2 shifted much towards base. Thoracic and abdominal tergites somewhat dusky with a transverse brown band on segment 8, with fine reticulate ornamentation; dorsal hairs long and thick with acuminate apices. Siphunculi very short and wider than long. Cauda broadly oval. Subanal plate slightly rounded on posterior margin, subgenital plate with about 15 hairs on posterior margin and 5–6 hairs anteriorly. Abdomen with finely spinulose striae ventrally and with fine hairs shorter than dorsal hairs. Legs with femora and tibiae smooth, hairs on femora and tibiae fine; 2nd tarsal segment with indistinct scanty spinules; F. T. C. 3 : 3 : 3.

Measurements (in mm) of one specimen : Length of body 1.45; width of body 0.90; antenna 0.42; a.s. III 0.10, IV 0.06, V 0.05, VI (0.03 + 0.03); u.r.s. 0.13; h.t.2 0.09.

Material : Apterous viviparous female, on *Artemisia vulgaris,* India : West Bengal, Kalimpong, 18.11.1991, M. R. Ghosh coll.

Distribution : India : Arunachal Pradesh, Meghalaya, Sikkim, West Bengal;

Elsewhere : China; Europe; Japan; Korea and Taiwan.

Genus 5. ***Toxoptera*** Koch, 1856

1856. *Toxoptera* Koch, C.L. Die Pflanzenlause Aphiden, Nunburg, 255 : Stroyan, H.L.G. 1961. *Pl. Prot. Bull.* F.A.O. 45; Tao, C.C. 1961. *Q. Jl. Taiwan Mus.,* **14** : 257 : Eastop, V. F. 1966. *Aust. J. Zool.* 14 : 485 : Mondal, P. K., Basu, R.C. Raychaudhuri D. N. 1976. *Oriental Ins.* 533. Type species : *Aphis aurantii* Boyer de Fonscolombe.

1891. *Ceylonia* Buckton, G. B. *Indian Mus. Notes,* **2** : 35. Type species : *Ceylonia theaceola* Buckton = *Aphis aurantiaekoch.*

1917. *Arimakia* Matsumura, S. *J. Coll. Agric. Tohoku Imp. Univ.,* **7** : 405. Type-species : *Arimakia araliae* Mats. = *Toxoptera odinae* (van der Goot).

1929. *Somaphis* Shinji, O. *Lansanea* **1** : 110. Type-species : *Aphis somei* Essig & Kuwana = *Toxoptera odinae* (v.d. Goot).

1944. *Paratoxoptera* Blanchard, E.E. *Aeta Zool. lilloane* **2** : 191. Type-species: *Paratoxoptera argenteniinsis* E E Blachard = *Toxoptera citricidus* (Kirkaldy).

Morphology : Body small to medium in size (1.4-2.6 mm long). Head smooth or finely granulated with weakly developed or without lateral frontal tubercles. Antennae 6-segmented, shorter or longer than the body, without secondary rhinaria in apterae but with such rhinaria on segment III or on III and IV in alatae; processus terminalis always more than twice and upto 6.4 times as long as base of segment VI; flagellar hairs short or much longer than the basal diameter of antennal segment III. Rostrum reaches near hind coxae, ultimate rostral segment, subequal to 1.6 times as long as second segment of hind tarsus and bears 2–4 secondary hairs. Mesothoracic furca with a broad base. Abdominal dorsum in apterae pale, with some polygonal reticulation and scattered muscles-plate like structures, in alate with segmental spino-pleural sclerotic patches; post-siphuncular sclerites and transverse sclerotic bands present on 7th and 8th tergites with 2-12 hairs. Siphunculi dark brown, cylindrical, 0.05-0.18 × as long as the body, and 0.66–1.55 × as long as the cauda. Cauda dusky brown, elongate constricted in the middle, bearing 10-53 hairs. Subgenital plate with 15-42 hairs. Lateral abdominal tubercles may be present only on 1st and 7th segments and also on 2nd and 3rd segments, sternum with raised and serrated cuticles on 5th and 6th segments which together with peg-like stout hairs on hind tibiae form a typical stridultatory mechsnism, characteristic for the members of this genus First tarsal segments with 3, 3, 3 or 3, 3, 2 hairs. Forewing with media once or twice–branched, hind wings with both obliques.

Larvae with hind tibiae smooth.

Sexual forms not known.

T aurantii is known to transmit citrus tristeza besides 'little leaf' and lemon rubbing virus of lemon and blister spot virus of arabic coffee and ringspot virus of excelsa coffee; however, *T. citricidus* is considered as the principal vector of citrus tristeza; it is also capable of transmitting 4 other viruses of citrus lemon, and viruses of citrus, lemon and orange and mosaic viruses of abaca, pea, yam etc. (Blackman and Eastop, 1985.)

Two aphidiid parasitoids, *Lipolexix scutellaris* and *Trioxys indicus* are known from all the three species of *Toxoptera* in India, besides two undertermined species of *Trioxys* and one of *Ephedrus,* (Stary and A. K. Ghosh, 1983). At least six species of coccinellid predators have been recorded for members of *Toxoptera* in the region (Agarwala and A.K. Ghosh, 1988) and 11 species of syrphid predators have been reported from elsewhere.

Cytologically, the karyotype study shows 2n = 8 chromosomes.

Biology : Two members of this genus (*aurantii* and *odinae*) appear to be highly polyphagous, specially *T. aurantii,* forming large colonies on undersurface of leaves and tender shoots, while *citricidus* remains restricted to Rutaceae, almost entirely anholocyclic life cycle but occasionally report of abortive holocycle on *citrus* (in *T. citricidus)* in Japan, is available. Ant association is common. The effects of feeding on host plants often include rolling, twisting or bending of leaves, stunting of shoots.

Distribution : India : Widespread; believed to be far eastern in origin but now widespread except in Central and North America.

Discussion : The genus is easily distingushed from *Aphis* Linnaeus and allied genera by the typical stridulatory mechanism, the variability in branching of media of forewings is rather an unstable character in view of result based on large samples. These species viz, *aurantii* (B.d.F), *citricidus* (Kiricaldy) and *odinae* (v.d.G.) are normally known from a wide geographical area and the species *schlingeri* Tao, 1961 described from Taiwan is considered a synonym of *aurantii* (B.d.F) following Mondal *et al.* (1976); *schlingeri* was distinguished from *aurantii* by the presence of secondary rhinaria on antennal segment VI but this again appears to be a variable character, when large number of samples are examined.

Type species : *Aphis aurantii* Boyer de Fonscolombe, 1841. Location of types not known.

Key to the species of the genus *Toxoptera* Koch

Apterous viviparous female :

1. Siphunculi much shorter, maximally about half as long as cauda; F.T.C. 3, 3, 2 ..... *odinae*

– Siphunculi as long as or longer than cauda, F.T.C. 3, 3, 3 2

2. Longest hair on a.s.III as long as to 1.5 times as long as b.d.III; siphunculi heavily imbricated; cauda with 25-36 hairs ..... *citricidus*

– Longest hair on a.s.III shorter than b.d.III; siphunculi sparsely imbricated; cauda with 9-17 hairs ..... *aurantii*

Alate viviparous female :

1. Siphunculi 1.0-1.60 times as long as its width; F.T.C. 3,3,2; cauda always shorter than siphunculi ..... *odinae*

– Siphunculi about 2.0-3.6 times as long as its width; F.T.C. 3,3,3; cauda always longer than siphunculi 2

2. Cauda with 24-36 hairs; a.s.III with more than 16 secondary rhinaria; longest hair on a.s.III as long as to longer than b.d.III ..... *citricidus.*

– Cauda maximally up to 18 hairs; a.s.III with almost 14 secondary rhinaria; longest hairs on a.s.III shorter than to as long as b.d.III ..... *aurantii*

31. ***Toxoptera aurantii*** (Boyer de Fonscolombe)
(Fig. 361)

1841. *Aphis aurantii* Boyer de Fonscolombe, *Annals. Soc. ent. Fr.,* **10** : 178.

1966. *Toxoptera aurantii* (B.d.F.) : Eastop, *Aust. J. Zool.,* **14** : 487.

1976. *Toxoptera aurantii* (B.d.F.) : Mondal, P., Basu R. C., and Raychaudhuri D. N., *Oriental Ins.,* **10** (4) : 535-537.

1992. *Toxoptera aurantii* : Agarwala and Bhattarchaya, *Soc. Nat. Sci.,* **2**(3 & 4) : 2.

1994. *Toxoptera aurantii* : Ghosh, L. K. and Basu, R. C., *State Fauna Series,* **3** : *Fauna of West Bengal,* ZSI : 161.

1998. *Toxoptera aurantii* : Ghosh, L. K. and Basu, R. C., *State Fauna Series,* **4**, *Fauna of Meghalaya,* ZSI : 111.

2000. *Toxoptera aurantii* : Ghosh L. K. and Basu, R. C., *State Fauna Series,* **7**, *Fauna of Tripura,* pt. 2 : 354.

2001. *Toxoptera aurantii* : Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) : 16.

Diagnosis : *Apterous viviparous female* : Body broadly oval, pale to brown in colour, 1.32-2.1 mm long with 0.95–1.05 mm as maximum width near the middle of abdomen. Head smooth, without lateral frontal tubercles. Antennae 6-segmented, longer than body; flagellum gradually more distinctly imbricated from base towards apex; a.s.III without secondary rhinaria, p.t. 3.7–5.8 × as long as base VI, flagellar hairs short with acute or slightly blunt apices. Rostrum extends upto hind coxae; u.r.s. slightly longer than h.t.2, bearing 2–4 secondary hairs. Dorsum of abdomen pale with polygonal reticulations and with large postsiphuncular patch; dorsal hairs like

flagellar hairs. Siphunculi brown to dark brown, imbricated, cylindrical with ill–developed flange at tip, a little longer than cauda. Cauda elongated with many (10-21) hairs. Legs pale except femora, base and apex of tibiae and tarsi which are darker. F.T.C. 3, 3, 2.

Alate viviparous female : Head brown, apices of a.s. III, IV, V concolourous with head. A.s. III with 4 and 4 secondary rhinaria and IV with 0-3 secondary rhinaria. Dorsum of abdomen pale, with brown patches marginally; postsiphuncular sclerite well developed, dorsal hairs long, acuminate, each of 7th and 8th tergites with a narrow small transverse band; cauda shorter than in apterae. Media of forewing once or twice–branched, other veins normal. Other characters as in apterae viviparae.

Host Plants : The aphid infests a wide range of host plants under different Natural Orders. Among the host plants quite a few are of economic importance.

Symptom and Damage : Both adult and nymphs infest the young leaves and stems. As a result, distortion of young leaves is seen, with black sooty moulds on the upper surface of leaves and stems. There remain clusters of black and brown aphids on flush foliage. Some branches and twigs show die black symptoms. These aphids universally infest *Citrus* spp. Occasional several outbreaks occur, especially in dry weather following a rainy season.

The aphid causes "Tea rose yellow mosaic" (Ahlawat & Sardar, 1973). It always infests growing tender shoots therein and produces curling of the young leaves and drying up of young stems of the plant.

Life cycle : The adults are shiny black. Usually they reproduce asexually. They produce living young which are brown in colour. Under favourable weather conditions, a complete generation probably takes only in about seven days. Not much known about the biology of the aphid in India. In Indian condition, the pest species apparently enjoys anholocylic mode of life. So far, no sexual morph is known to the country.

Bionomics : Blackish brown insects infest almost all the aerial parts of a plant body. Normally, emigrant alate initiate colony on the apical tender leaves during late monsoon and good population is formed on the apical twigs, branches and sometimes even on young fruits. Increase in population is accompanied by the production of alatae and a large part of the aphid infestation migrates to other parts. Citrus plants support moderate to severe aphid infestation for 2-3 months. This is preceded and succeeded by poor colonisation for 15-20 days respectively.

Natural enemies-complex :

Predators : *Anisolemnia dilatata* Fabricius, *Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricius, *Coccinella* sp., *Cryptogonus orbiculus* (Gyllential), *Jauravia opaca* Mutschulsky, *Jauravia pubescens* (Fabricius), *Lemnia bisellata* (Mulsant), *Micraspis cardoni* (Weise), *Oenopia sauzeti* (Mulsant), *Psuedospidimerus circumflexa* (Motsch.), *Scymnus* sp., *Stethorus*

gilvitrous Mulsant [Coleoptera : Coccinellidae], *Zygoballus* sp. [Spider], Hemerobidae larvae; Syrphid larvae

Parasitoids : *Ephedrus* sp., *Lipolexis scutellaris, Trioxys indicus, Trioxys* sp. [Hymenoptera]

Vector : Coffee blister mosaic; Citrus tristeza (?) mosaic

Distribution : India : Throughout;

Elsewhere : Cosmopolitan in the warmer parts of the world. It occurs in S. Europe, Africa, Asia and Australasia, Southern U.S.A., Central and S. America.

Remarks : The black to shiny black aphid is highly polyphagous and infests the undersurface of young leaves and grow up shoots of host plants. Nymphs are reddish brown in life. With respect to the number of host plants infested by this aphid, it can be stated that only during April and December as many as 40% plant species become infested by the aphid. The Alate viviparous female of the species can easily be recognised by the once-branched media and very dark stigma and veins of the fore wing. Ants usually attend the aphids. The species is biologically very different from its nearest species *T. citricidus* (Kirk.) attacking a very large number of host plants.

Management : Same as in *T Citricidus.*

32. ***Toxoptera citricidus*** (Kirkaldy)

1907. *Myzus citricidus* Kirkaldy, *Proc. Hawaii ent. Soc.*, **1** : 100.

1980. *Toxoptera citricidus* (Kirkaldy) : Raychaudhuri, D. N. (ed.), *Taxonomy of the Aphids of North-east India and Bhutan* : 76.

1994. *Toxoptera citricidus* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **3** : *Fauna of West Bengal*, ZSI : 161.

1998. *Toxoptera citricidus* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **4** : *Fauna of Meghalaya*, ZSI : 111.

2000. *Toxoptera citricidus* : Ghosh L. K. and Basu, R. C., *State Fauna Series*, 7, *Fauna of Tripura*, ZSI : 354.

2001. *Toxoptera citricidus* : Chakrabarti and Sarkar, *J. Aphidology,* **15**(1 & 2) :

Diagnosis : *Apterous viviparous female* : Head dark brown; antennae about 0.7-0.8 times as long as body, antennal segment III black except at very base and bears 8-20 secondary rhinaria, those on IV antennal segment 0–5, longest hair on antennal segment III always longer than the basal diameter of the segment, p.t. 4.5-5 times as long as the base of the segment VI; rostrum reaches mid coxae, u.r.s. 1.1-1.3 times as long as second joint of hind tarsus. Dorsum of abdomen with large brownish post—siphuncular sclerite besides scattered small sclerites; siphunculi brown, 1.5-1.6 times as long as black cauda bearing 20-35 hairs. Media of forewing twice-branched.

Host plants : The species infests mostly the plants of N.O. Rutaceae and Urticaceae but the insects have also been noticed on other Natural Orders like Fagaceae, Passifloraceae and Ternstroemiseae.

Symptom and Damage : *T citricidus* always infests growing tender shoots where it produces curling of the young leaves and drying up of young stems of the host plants. The aphid causes "Citrus mosaic" (Dakshinamurthi & Subbayya, 1981), "Citrus tristeza" (Vasudeva *et al.,* 1959; Verma *et al.,* 1960 and "Citrus vein enation" (Mali *et al.,* 1976).

Natural enemies-complex :

Predator : *Cheilomenes sexmaculata* (Fabricius), *Cryptogonus bimaculatus* Kapur, *Lemnia bisellata* (Mulsant), *Micraspis cardoni* (Weise) [Coleoptera : Coccinellidae]

Parasitoid : *Lepolexis scutellaris* Mackauner, *Trioxys indicus* Subba Rao, *Trioxys* sp.

Both the predators and parasites are quite common in aphid colonies on the citrus plants.

Vector : Citrus decline; virus Citrus vein; enation Abaca mosaic

Distribution : India : all over;

Elsewhere : Cosmopolitan except Europe, N. Africa or U.S.A. and the W. Indies.

Remarks : The dark brown large aphid is polyphagous and occurs almost throughout the year and infests quite a good number of plants of economic importance like *Citrus* spp. and *Pyrus* spp. Large colonies are recorded particularly in April-May and December-January. It is much gregarious in habit and attended by ants.

Management : Control measures should only be applied in periods of flush growth, when the recommended insecticide is dimethoate as a full-cover spray in water. Dimethoate should not be used on rough lemon trees or on non-budded rough lemon stock (Hill, 1975).

33. ***Toxoptera odinae*** (van der Goot)

1917. *Longiunguis odinae* van der Goot, *Contrib. Fauna Indes Neerl* **1** (3) : 113.

1962. *Toxoptera odinae* (Vander goot) : Ghosh, A. K. and Raychaudhuri, D. N., *J. Bombay nat. Hist. Soc.,* **59** (1) : 249.

1976. *Toxoptera odinae* (van der Goot) : Mondal *el al. Oriental Ins.,* **10**(4) : 537.

1994. *Toxoptera odinae* (van der Goot) : Ghosh, L. K. Basu, R. C. *State Fauna Series*, **3**, *Fauna of West Bengal*, Z.S.I. Pt. **5** : 162.

2003. *Toxoptera odinae* (van der Goot) : Ghosh, L. K. and Basu, R. C., *State Fauna Series,* **9**, *Fauna of Sikkim*, Z.S.I, pt. 2 : 273.

Apterous viviparous female : Body 1.4-2.3 mm long with 0.7-1.4 mm as maximum width near the middle of abdomen. Head brown. Antennae 6 segmented, about 0.5-1.05 times as long as body; a.s. I and II concolourous with head, flagellum pale excepting the apices of a.s. III, IV and V which are dusky and a.s.VI dusky to pale brown; flagellum more distinctly imbricated from base to apex; hairs on a.s. III with acuminate apices, longest hair on a.s. III about 1.0–3.5 times as long as b.d. III; p.t. 2.05-3.9 times as long as base of segment VI. Rostrum reaches hind axae; u.r.s. about 1.1-1.5 times as long as h.t.2 and with 4 secondary hairs. Abdominal dorsum pale with some irregular brownish patches on tergites 7 and 8; dorsal abdominal hairs with acute apices, longest hair about 1.8-3 times as long as b.d. III; tergite 7 with 4-7 hairs, the longest one being 1.8-3.5 times as long as b.d. III, tergite 8 with 4-6 hairs 1.8-3.1 times as long as b.d. III. Siphunculi cylindrical, broader towards the base, pale brown to bornw, imbricated, about half as long as body and 0.4-0.6 times as long as cauda. Post siphuncular sclerite weakly developed. Cauda dark, parallel-sided, with weak constriction near at the middle, bearing 12-20 hairs. Femora and tibia brown except basal portion being pale; basal half of tibiae brown except basal portion being pale; basal half of tibiae with a row of 7-9 peg-like structure. F.T.C. 3 : 3 : 2.

Measurements (in mm) *of one specimen* : Length of body 2.1 ; width of body 1.21; antenna 1.40; a.s. iii 0.35, iv 0.27; v 0.25, vi (0.12 + 0.330); u.r.s. 0.14; h.t. 0.11; siphunculus 0.09; cauda 0.20.

Alate viviparous female : Flagellum more distinctly imbricated from base to apex; antennal segment III with 8-14 round secondary rhinaria distributed along the entire length, a.s. IV with 1-4 secondary rhinaria. Abdominal dorsum with marginal dark patches arranged segmentally on a continuous dark band on segments 6-8 besides some scattered patches spinally and plenrally, postriphuncular sclerite well developed and antisiphunculer sclerite ill-developed; 8h abdominal tergite with 2-4 hairs being 2.2-4.2 tims as long as b.d. III. Siphunculi short, dark brown, 0.04-0.05 times as long as body. Cauda elongated, dark brown with a little constriction near at the middle and bearing 10-20 hairs. Femora brown excepting fore femora being slightly paler; bases and apices of tibiae brownish, rest rather pale; tarsus dark brown. Media once or twice branched in fore wing. Otherwise, similar to apterous viviparous female.

Measurements (in mm) of one specimen : Length of body 2.28; width of body 0.98; antenna 1.35; a.s. III 0.30, IV 0.21, V 0.23, VI (0.11 + 0.35); u.r.s. 0.14; h.t. 2 0.10; siphunculus 0.12; cauda 0.20.

Material examination : Many apterae, alatae and nymphs, India : Arunachal Pradesh, on *Erythrina indica, Momordica charantia, Tagetes patula* 20.11.1971, R. C. Basu coll. West Bengal : Darjeeling distict, on *Mangifera indica,* 29.5.1969, M. R. Ghosh.

Remarks : The species is polyphagons and gregarious colonies could be found on the young leaves on also on moderately old leaves. These are mostly found along the midribs and stout veins. No appreciable damage could be observed in spite of heavy

infestation except curling of the young leaves in a few cases. The aphid species is usually attended by ants.

Distribution : India : all over.

Elsewhere : China; Japan; Java; Korea; Malaya; Nepal; Philippines; Sri Lanka; Sumatra; South America; Taiwan and Thailand.

Genus 6. ***Hyalopterus*** Koch, 1854

1854. *Hyalopterous* Koch, C. L., *Die Pflanz. Aphiden,* **16** : Eastop, V. F. 1966. *Aust J. Zool.,* 14 : 488; Raychaudhuri, D. N., Ghosh, M.R., Basu, R. C. 1980., *In* : Aphids of North East India and Bhutan, 59.

Morphology : Body slender elongate oval, less than 3.0 mm long. Head smooth,lateral projections low, distinct. Antennae 6-segmented upto 0.80x as long as the body, without secondary rhinaria in apterae but alatae with variable number of secondary rhinaria on III (7–38), IV (0–12) and V (0–1); antennal hairs fine longest one on segment III in apterae nearly equal to the basal diameter of the segment but in alate decidedly shorter; processus terminalis usually up to 3.0x as long as base of segment VI but sometimes may be 4.25 x as long as the same. Ultimate rostral segment 0.50–0.60x as long as second segment of hind tarsus and bears 2 accessory hairs. Midthoracic furca sessile or sometimes with separate arms. Lateral abdominal tubercles small, variably present on segment 2–5 besides the regular ones on segment 1 and 7. Dorsum of abdomen pale except for the sclerotic band on 7th and 8th tergite in alatae. Dorsal hairs fine, acute; 8th tergite with 2 hairs upto 0.065 mm long. Siphunculi short, slender, narrowest at base, much shorter than the cauda. Cauda dark, elongate, usually twice as long as the siphunculi and bears 4–6 hairs. Subgenital plate with two groups of 4 hairs each on posterior margin besides a pair of long hairs on anterior margin. Legs with femora and tibiae nearly smooth. First tarsal segments with 3, 3, 3 hairs. Wing venation normal.

Larvae with hind tibiae smooth; sexuales with oviparae apterous smaller in size with numerous pseudosensoria on thickened hind tibiae. Males alatae, with dark marginal and dorsal sclerite (in Europe) and with more secondary rhinaria on antennae, than in the alate viviparae.

Fundatrix have 5-segmented antennae (Heie, 1986).

Discussion : Originally a genus considered to have many species and mostly with small siphunculi, it is now recognised to be a small genus of only two species viz, *amygdali* (Blanchard) and *pruni* (Geoffroy), biology of both species being similar and differences being untenable in a global scale. These have been considered by economic entomologists as under one species only (Blackman and Eastop, 1984). It may, however, be noted that while *pruni* has a global distribution with possibility of geographical races in South East Asia (Eastop, 1966), *amygdali* is confined to Europe, the Medditeranean region, the Middle East and Central Asia to Pakistan (Blackman and Eastop 1984). Some populations as in Africa (on *Phragmites)* appear to be

parthenogenetic. Cytologically it has 2n = 10 chromosomes. *H pruni* can act as a vector of 'Millet red leaf' virus and plum pox virus. Natural enemies specially parasitoids *(Aphidius)* can cause serious stress effects on population of *Hyalopterus.*

Biology : The members of this genus appear with white wax meal on the undersurface of the host plants. In areas of heteroecious holocycle they alternate between *Prunus* spp., and *Phragmites* while primary hosts are always confined to 6–7 species of *Prunus.* The secondary host may sometime include *Arundo donax* (as in S. India) besides *Phragmites communis.* Life histories have been studied in different geographical regions (Europe, Japan and Middle East). In India, at least three species of *Aphidius* have been recorded as parasitoids of *H. pruni.* These aphids are not visited by ants.

Distribution : India; Central Asia; South East Asia; Middle East; Europe and other parts of the world.

Type species : *Aphis pruni* Fabre. 1775 =*Aphis pruni* Geoffroy, 1762. Location of types not known.

34. ***Hyalopterus pruni*** (Geoffroy)
(Mealy plum aphid)
(Figs. 259-275, 362)

1762. *Aphis pruni* Geoffroy, *Histoire Abregea des. Ins. Environs de Paris,* **1** : 497.

1966. *Hyalopterus pruni* (Geoffroy) : Eastop, *Aust. J. Zool.,* **14** : 489.

1969. *Hyalopterus pruni* (Geoffroy) : Biswas, Chakrabarti, Basu and Ghosh, *Sci. Cult.,* **35** : 640.

1976. *Hyalopterus pruni* (Geoffroy) : Singh, Studies on the Aphids of Manipur State (Ph.D. Thesis, Calcutta University) : 85.

1980. *Hyalopterus pruni* (Geoffroy) : Raychaudhuri, D. N. (ed.), Aphids of Northesast India and Bhutan, The Zoological Society, Calcutta : 60.

1986. *Hyalopterus pruni* (Geoffroy) : Medda, Saha and Chakrabarti, *Proc. 2nd Nat. Symp. Recent trends in Aphidological Studies,* Modinagar (ed. S. P. Kurl) : 33.

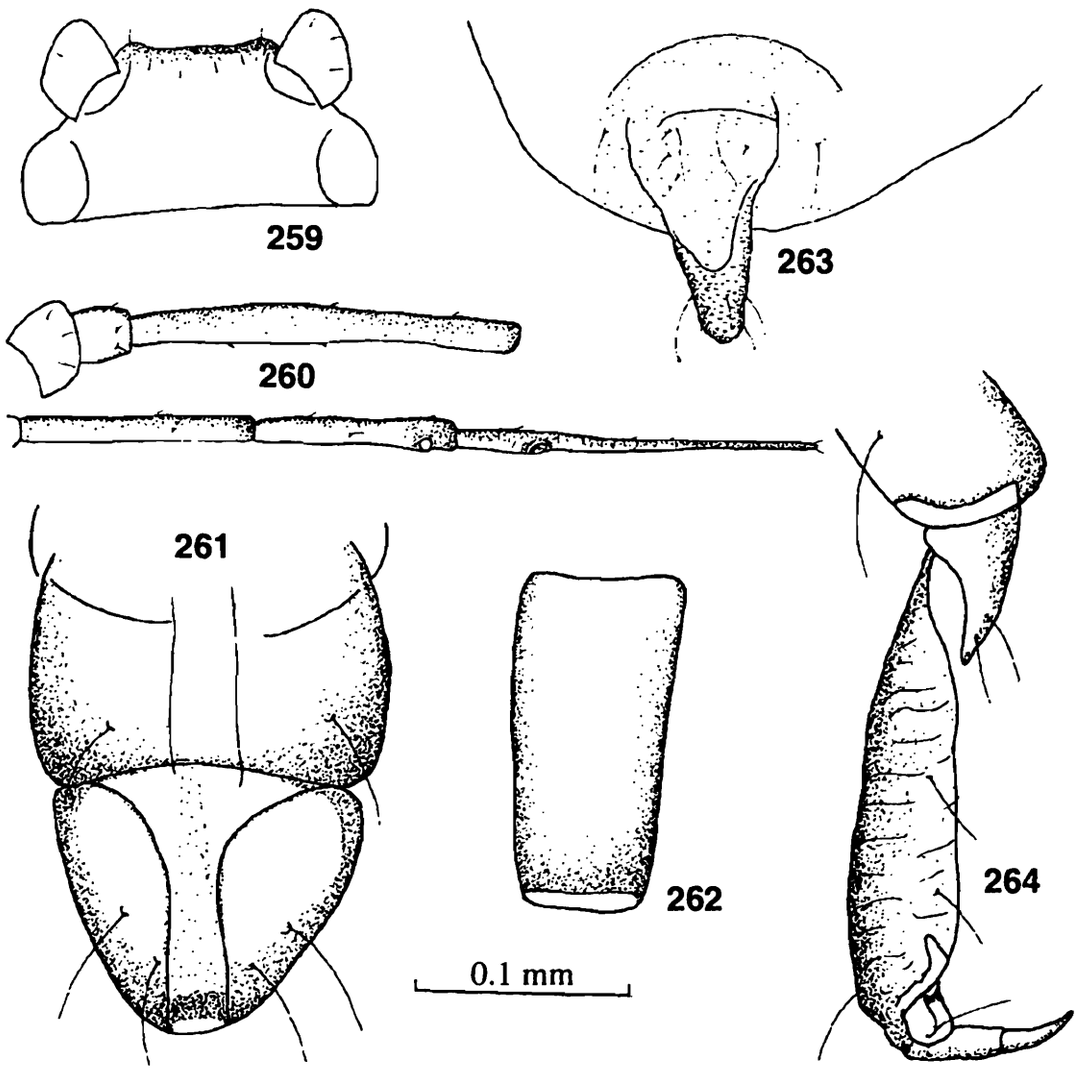
1997. *Hyalopterus pruni* (Geoffroy) : Remaudiere, G. and Remaudiere, *M. Catalogue of the World's Aphididae,* Paris : 60.

Diagnosis : *Apterous viviparous female* : Body small (1.9-2.5 mm), elongated oval. Mealy–covered in life. Head (Fig. 259) smooth, lateral frontal projections distinct. Antennae 6-segmented (Fig. 260), shorter than body; flagellum faintly imbricated, but more distinctly imbricated from apical half of a.s. IV onwards; flagellar hairs 0.5-0.7 times as long as b.d. III; a.s. III without secondary rhinaria; p.t. about 3–4 times base VI; u.r.s. (Fig. 261) short, triangular, about half as long as h.t. 2 (Fig. 264) and bears 2 secondary hairs. Dorsum of abdomen pale, dorsal hairs sparse, much longer than b.d. III; segments 7 and 8 with a pair of short hairs, 1.3–1.5 times as long as b.d. III.

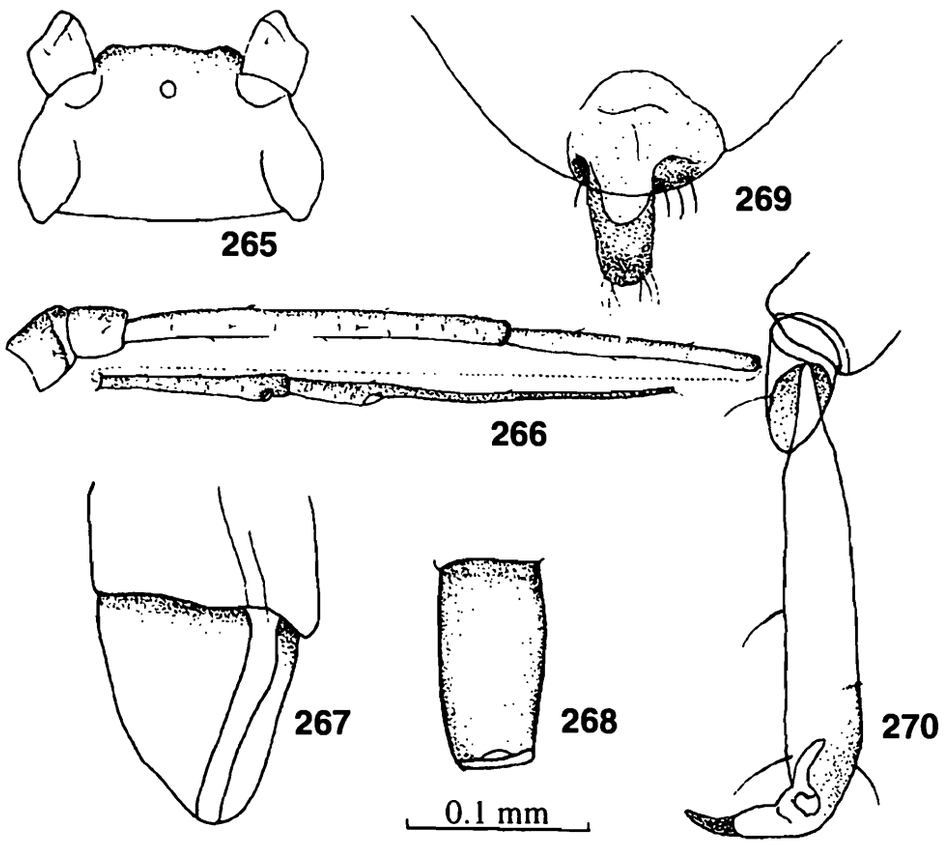
Siphunculi (Fig. 262) subcylindrical, gradually narrowing apically, about 0.04–0.06 times as long as body. Cauda (Fig. 263) dark, elongate, 0.16–0.18 mm long, bearing 5 hairs. F.T.C. 3 : 3 : 2.

Alate viviparous female : Head (Fig. 265) brown, a.s. III (Fig. 266) darker from apical half onwards; alatae with many secondary rhinaria on a.s. III arranged irregularly, a.s. IV with 0–6 similar rhinaria; with pigmented bar on each of segments 7 and 8. Siphunculus narrow both at base and apex, brown but basally a little paler, with spinular imbrications and without flange. Legs light brown, pigmented towards proximal end of femora and tibiae. Wing venation normal, veins bordered brown. Other characters as in apterae.

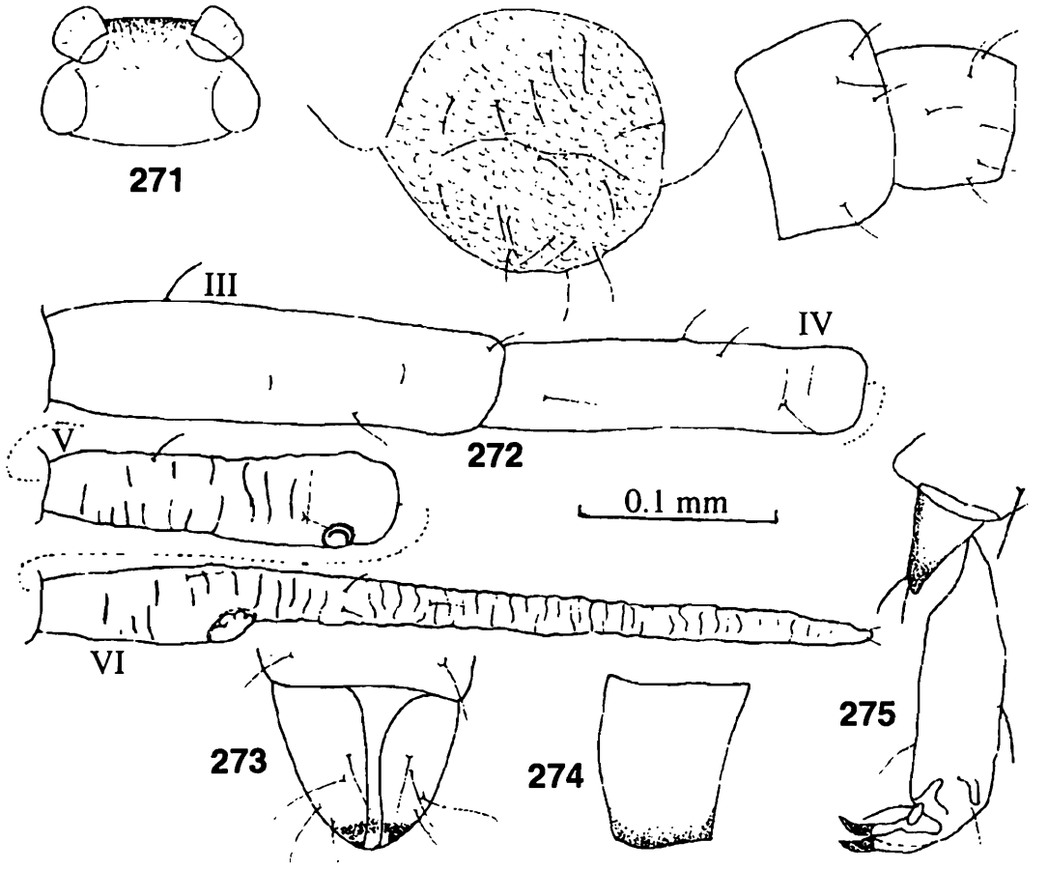
Host plants : *Arundo donax* (Poaceae); *Arundo* sp. (Poaceae); *Brasicca oleracea* (Brassicaceae); *Canna orientalis* (Cannaceae); *Chenopodium album* (Chenopodiaceae); *Coriandrum sativum* (Umbelliferae); *Datura* sp. (Solanaceae); *Oenanthe stolonifera* (Umbelliferae); *Phaseolus vulgaris* (Fabaceae); *Phragmites communis* (Poaceae); *P. karka* (Poaceae); *Phragmites* sp. (Poaceae); *Poa* sp. (Poaceae); *Prunus armeniaca*



Figs. 259-264. *Hyalopterus pruni* (Geoff.) Aptera : 259, Head; 260, antenna; 261, u.r.s.; 262, siphunculus; 263, cauda; 264, h.t. 2.



Figs. 265-270. *Hyalopterus pruni* (Geoff.) Alata : 265, Head; 266, antenna; 267, u.r.s.; 268, siphunculus; 269, cauda; 270, h.t. 2.



Figs. 271-275. *Hyalopterus pruni* (Geoff.) Nymph : 271, Head; 272, antenna; 273, u.r.s.; 274, siphunculus; 275, h.t.2.

(Rosaceae); *P. cerasus* (Rosaceae); *P. domesticus* (Rosaceae); P. *persica* (Rosaceae); *Prunus spp.* (Rosaceae).

Symptom and Damage : Both the nymphs and adults of these greenish aphids infest all the aerial parts showing mealy coating on both surfaces of plant parts. Under heavy attack, infestations cover leaf-petioles and the green parts of stem.

Life cycle : Not much is known about the biology of the aphid in India. However, the species is known to be holocyclic and heteroecious alternating between *Prunus* spp. and grasses, *Phragmites communis* (Palmer, 1952; Eastop, 1966), *Phragmites* sp. and *Poa* sp. (Medda *et al.* 1986; Raychaudhuri, D. N. (ed.) 1980).

Natural enemies-complex :

Predator : *Cheilomenes sexmaculata* (Fabricius), *Cryptogonus bimaculatus* Kapur, *Cryptogonus quadriguttatus* Kapur, *Jauravia binotata* Gorham, *Harmonia cucharis* (Mulsant), *Micraspis vincta* (Gorham), *Oenopia luteopustulata* Mulsant, *O. quadripunctata* Kapur, *Propylea japonica* (Thunbcrg) [Coleoptera : Coccinellidae]

Parasitoid : *Aphidius colemani* Viereck, *A. maricariae* Haliday, *Aphidius* sp. [Hymenoptera : Aphidiidae].

Vector : Celery mosaic; Cucumber mosaic; Millet red leaf; Onion mosaic.

Management : Spray 500 ml. of nicotine sulphate 40 EC or 250 ml of menazon 100 EC or 800 ml of malathion 50 EC in 500 litres of water per ha is suggested. The insecticidal spray should be avoided where the parasites *Aphidius* spp. are present.

Genus 7. ***Hysteroneura*** Davis, 1919

1919. *Hysteroneura* Davis, J. J., *Can. Ent.*, **5**(1) : 263; Raychaudhuri, D. N. Ghosh, M. R., Basu R. C. 1980 *In* : Aphids of North East India and Bhutan, 60. Type Species : *Siphonophora setariae* Thomas.

Morphology : Small brown aphids (1.3–2.1 mm long) with dark siphunculi and parallel–sided elongate pale cauda. Head smooth, lateral frontal prominences low. Antennae 6–segmented longer than the body or little shorter; apterae without secondary rhinaria, alatae with rounded secondary rhinaria usually on segment III; processus terminalis 5.07.0x as long as base of segment VI; flagellar hairs sparse, short, acuminate. Ultimate rostral segment about as long as second segment of hind tarsus and bears a pair of accessory hairs. Midthoracic furca sessile. Dorsum of abdomen pale in apterae; in alatae, with ante and post–siphuncular sclerites coalescing around siphunculi, besides marginal patches and pigmented bar on 8th tergite; lateral tubercles on 2nd and 7th tergites distinctly larger than others. Dorsal hairs sparse, minute; 7th and 8th tergite each with 2 hairs. Siphunculi brown, imbricated, cylindrical, 1.0–1.3x as long as the cauda. Cauda elongate pale with 2 pairs of hairs. Legs normal, first tarsal segments with 3, 3, 3 (2) hairs. Forewings with media twice–branched, hind wings with one oblique.

Sexuales are known in U.S.A. and Australia. In U.S.A. males and oviparae are both apterous. Males are bronze green to rusty with body 0.95–1.40mm long and antennae 1.0–1.14 mm long. Oviparae are dark brown to brownish black, spindle–shaped, 1.6 mm long; antennae (0.94 mm long) with segment III and IV often fused and hind tibiae not so swollen, bearing only 19 pseudosensorea, mostly in the middle portion. Eggs when laid appear solid yellow, later turn into shining black.

Discussion : A monotypic genus, the only species *setariae* (Thomas) was known largely from North America as 'Rusty Plum Aphid' The typical wing venation of hind wing, long processus terminalis, long pale cauda with few (4) hairs help to separate the type-species from related members of *Aphis.* Although the species was described as *Siphonophora setariae* by Thomas in 1878 and was only placed under *Hysteroneura* by Davis in 1919, many of the aphidologists reported it under *Aphis* between 1878 and 1919 (Eastop & Hille Ris Lambers, 1976) and Palmer even listed it under *Aphis* in 1952. It is interesting to note that B. Das while working on Aphids of Lahore, collected a single alate on wheat in 1914 and labelled the slide as *Aphis* sp. It is after 63 years that first official record of *H. setariae* was published from Indian region (David *et al.* 1967) in South India. The concept that it has recently been introduced to South India, South Africa and Australia (Blackman and Eastop, 1984) as such need to be changed.

However, the species *setariae* has positively become widespread during last 25 years all over the Indian subcontinent, coinciding with the introduction of high yielding rice varieties and changing irrigation pattern.

In U.S.A., the species has often been recorded in suction trap in the North Central States during May 1 to October with a peak activity in May and June (Medler and Ghosh, 1969); known to be a vector of sugarcane mosaic virus, it is also capable of transmitting soybean mosaic, onion yellow dwarf, cucumber mosiac and water melon mosaic viruses (Blackman and Eastop, 1984). Karyotypic study indicates 2n = 12. Ant attendance is common. The parasitoid *Trioxys indicus* has been recorded from *H. setariae* in India (Stary and Ghosh 1983); at least five species of coccinellid predators are also knwon to feed on *setariae* in India (Agarwala and Ghosh, 1988).

Biology : The single species leads heteroecious holocyclic life cucle, alternating between *Prunus* (Rosaceae) and Poaceae in North America. In other parts, the species mostly leads anholocyclic life cycle on secondary hosts i.e. Poaceae. Biology and seasonal incidence of *setariae* infesting paddy in Delhi, India (Garg and Sethi, 1976) indicate an activity throughout the year, with grasses acting as reservoir hosts.

Distribution : India : South Africa; Japan; Korea, Australia; North America.

Type species : *Siphonophora setariae* Thomas 1878, Lectotype (7714) and paratypes (7715) deposited in the Illinois Natural History Survey; Urbana, Illinois, U.S.A.

35. ***Hysteroneura setariae*** (Thomas)
(Rusty plum Aphid)
[Syn. *Carolina setariae* Thomas]
(Fig. 363)

1878. *Siphonophora setariae* Thomas, *Bull. Ill. St. Lab. nat. Hist.*,. **2** : 5.

1980. *Hysteroneura setariae* (Thomas) : Raychaudhuri, D. N. *(ed.) In* : Taxonomy of the aphids of Northeast India and Bhutan : 61.

1994. *Hysteroneura setariae* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **3** : *Fauna of West Bengal*, ZSI : 163.

1997. *Hysteroneura setariae* : Remaudiere and Remaudiere, Catalogue of World's Aphididae, Paris : 60.

2001. *Hysteroneura setariae* : Chakrabarti and Sarkar, *J. Aphidology*, **15** (1 & 2).

Type species : *Siphonophora setariae* Thomas, 1878.

Diagnosis : *Apterous viviparous female* : Body 1.3-1.90 mm long. Antennae 0.8–1.00 times as long as body; flagellum progressively more distinctly imbricated, a.s. VI black, rest paler, p.t. 4.3–6.4 × base VI, 1.4–2.05 × a.s. III. U.r.s. 0.77-1.1 × h.t.2. Siphunculi black, 0.17-0.22 × as long as body, 1.6-1.9 × pale yellow cauda bearing only 4 medial hairs; Antennal hairs 9-12μ long and more than half of b.d.III. Posterior dorsal cephalic hairs 9-15μ, about 0.27-0.62 × b.d. III. Hairs on 8th abdominal tergite about 15μ long.

Alate viviparous female : Body 1.37-1.95 mm long. Antennae dusky to brown with an intermittent yellowish portion, 0.81-1.10 × as long as body. Antennal segment III with 10-16, IV with 0-4 secondary rhinaria and V usually without rhinaria. Hind wing with only one oblique vein which is the distinguishing character of the genus. Other characters as in apterous viviparous female.

Material examined : Oviparous female from *Prunus* sp. (Rosaceae), Nongrim Hill, Shillong, Meghalaya 12.12.1968, R. C. B.

Apterous Oviparous Female : Body pale, short 1.2–1.4 mm long with the maximum width 0.6–0.8 mm. Head brown, smooth, without any prominence; antennae concolourous with the head excepting the a.s. III and basal 0.75 portion of IV which are dark; antennae 6-segmented, sometimes segmentation between III and IV obscure, about 0.7-0.8 times as long as body, p.t. 4-5 times as long as base VI; rostrum passing beyond mid coxae, u.r.s. blunt, nearly equal to 1.1 times as long as h.t.2. Siphunculi rather broad and stout, cylindrical with broad base, 0.09–0.1 times as long as body, almost as long as cauda; cauda slightly darker than the viviparous form but with pale tip, with 2 pairs of hairs; hind tibiae greatly swollen, with numerous pseudosensoria.

Measurements (in mm) of an aptera ovipara : Length of body 1.32; width 0.76; antenna 0.99; a.s. III 0.18, IV 0.15, V 0.14, VI (0.80 + 0.35); u.r.s. 0.09; h.t.2 0.08; siphunculus 0.14; cauda 0.13.

Host plants : The aphid species is known to infest about 82 plant species in about 40 genera mostly belonging to plant family Poaceae including Rice, Sugarcane, Corn, Wheat and other plants.

Symptom and Damage : Both nymphs and adults suck the sap from the leaves and unripened grains of rice throughout the crop season. Moderately infested grains show brown necrotic spots. A heavy infestation turns all spikelets brown and chaffy. Apart from the physical damage, honey dew deposited by the aphids also attracts fungal development on the earheads and the leaf sheath, thus interfares the normal physiological activities of the rice plant.

Material examined : Oviparous female from *Prunus* sp. (Rosaceae), Nongrim Hill, Shillong, Meghalaya 12.12.1968, R.C.B.

Bionomics : Basu *et al.* (1970) and Ghosh *et al.* (1971) reported the oviparous females of the species whereas Pal (1975) reported alate male. This hints at the possibility of holocyclic life cycle of the species in the Indian conditions.

In India, adult aphid reproduces asexually throughout the crop season and starts laying nymphs in a day or two after emergence. Nymphs are pink in colour and nymphal development lasts for 9-10 days through four nymphal instars. Aphid population reaches its peak in April when they congregate on the earheads and between the leaf sheaths and leaf blades. In late April, as the host plants begin to dry, the winged aphids migrate in search of other plants and even they maintain themselves on the stubbles.

Natural enemies-complex :

Predator : *Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* Linnaeus [Coleoptera : Coccinellidae].

Parasitoid : *Trioxys (Binodoxys) indicus* Subba Rao and Sharma [Hymenoptera : Aphidiidae]

Vector : Onion yellow dwarf; Sugarcane mosaic

Distribution : India : Widely distributed.

Elsewhere : Africa; America; China; Eastern Islands; Fiji; Japan; Korea; Malayasia; Nepal; New Guinea; Philippines; Solomon Is.; Taiwan; Thailand; Vietnan.

Remarks : The pest species is known from North and South America for a century where it infests the plum tree during the autumn and spends the summer on secondary hosts like cereals and grasses (David *et al.* 1967). *H. setariae* has been reported for the first time from India (David *et al. op. cit.),* occurring on a number of plants including the paddy, in South India. It is now widespread in India. It is attended by ants *Camponotus (Tanaemyrmex) compressus* Latr., *Solenopsis geminata* Fabricius and *Crematogaster* sp.

During May 1984 about 80% of the pots maintained at CRRI Green House at Cuttack were severely damaged by this aphid (Dani 1986).

Management : Infested plants may be sprayed by 0.04% phosphamidon or oxydemetomethyl for effective control of this aphid.

Genus 8. ***Melanaphis*** van der Goot, 1917

1917. *Melanaphis* van der Goot, P., *Contrib Fauna Indes Neerl.*, **1**(3) : 61; Raychaudhuri, D. N. and Banerjee, C., 1974. *Oriental Ins.* **8**(3) : 365. Type species : *Aphis bambusae* Kirkaldy lapsus pro Fullaway.

1917. *Longiunguis* van der Goot, P., *Contrib Faune Indes Neerl.*, **1**(3) : 112. Type species : *Aphis sacchari* Zehntner.

1917. *Yezabura* Matsumura, S., *J. Coll. Agric. Hokkaido Imp. Univ.*, **7** : 392. Type species : *Yezebura sasae* Matsumura : *Aphis bambusae* Fullaway.

1921. *Geoktaphia* Mordvilko, A. K., *Izy. Sev. Oblast. Sta Zasch Rast Vredlt.*, **3** : 53: Type species, *Geoktuplia areshensis* Mordvilko, B= *Myzm pyrarius* Paaserini.

1931. *Pyraphis* Börner, C. *Anz. Schadlingsk*, **7** : 10. Type species : *Pyraphis streili* Borner = *Myzus pyrarius* Passerini.

1932. *Nevskia* Mordvilko, A.K., *Trudy Zashch. Rust. Ent.*, **5** : 236. Type species : *Nevskia pyraria* (Passerini) = *Myzus dyaarius* Passerini.

1938. *Masraphis* Soliman, *Bull. Ministr. Agric Egypt Tech. Scient Serv.*, **208** : 4. Type species : *Masraphis phyllostachia* Soliman.

1939. *Schizaphidiella* Hille Ris Lambers, D., *Zool. Meded.*, Leiden, **22** : 100. Type species : *Schizaphidiella quinguarticulata* Hille Ris Lambers = *Myzus pyrarius* Passerini.

Morphology : Body small, 0.8-2.1 mm long, variably coloured from pale green to dark brown. Head usually smooth, lateral frontal tubercles ill–developed, with charateristic projections of Rhopalosiphini. Dorsal cephalic hairs short to more than 4.0x as long as basal diameter of antennal segment III. Antennae 5-6 segmented in apterae but always 6–segmented in alatae, usually shorter than or at most slightly longer than the length of the body, variably imbricated, secondary rhinaria circular, present only on segment III or also on IV and V of alatae; flagellar hairs bluntish and short in apterae, fine and much longer than basal diameter of segment III in alatae; processus terminalis usually much longer (2.7–4.2 x the base of antennal segment VI) in alatae, than in apterae (1.4-4.5x). Rostrum short, hardly reaching midcoxae, ultimate rostral segment usually shorter than second segment of hind tarsus, sometimes upto 1.9x (alate of *bambusae)* as long as ht 2 and bears a pair of accessory hairs. Abdominal dorsum pale to variably pigmented, smooth to scabrous spiracles reniform. Lateral tubercles on segment 2–6 variably developed. Dorsal hairs short or very long and may be 5.0x as long as the basal diameter of antennal segment III; 8th tergite with only 2 or sometimes upto 10 hairs. Siphunculi brown to dark brown, short truncate, weakly or distinctly imbricated, 0.05 to 0.12 x as long as the body, shorter or slightly longer

than the cauda. Cauda dark elongate with a median constriction and bears 4–20 hairs. Subgenital plate with very varibale number (2–11) of hairs on posterior margin. Legs normal with tibiae smooth or faintly imbricated; first tarsal segments with 3, 3, 3 or 3, 3, 2 hairs. Wing venation normal, veins may be bordered brown, radial sector nearly or strongly curved.

Larvae with hind tibiae smooth.

Males alate. Oviparae apterous.

Discussion : A genus of 19 species known from Old world countries, largely from plants of Graminae. Most of the species have been described from Far East and South East Asia. At least one species is known to be a vector (*sacchari* Zehnt.) of persistent virus (millet red leaf), and is most widely distributed through tropical and subtropical region of the world; known as a major pest of sugarcane, the species has often been referred as *Longiungus sacchari* in literature. Ant association has been known for many members of *Melanaphis*. Biologically, the colours of live insects may differ remarkably on its secondary host plants depending on the species of grass (Blackman and Eastop, 1984). Cytologically it has 2n = 8 to 10 Chromosomes. Stary and Ghosh (1983) reported 4 species of aphidiid parasitoids *(Lysiphlebus, Lysiphlebia, Praon, Prioxyx* sp) from *M donacis* and *M. sacchari* complex in Indian region. Similarly 4 species of Coccinellid predators have been reported for *sacchari* and one species of predator for *donacis* in India (Agarwala & A. K. Ghosh, 1988); a number of syrphid predators (10) have also been reported for *sacchari* complex in India. Six species of *Melanaphis* are known from the region.

Biology : The members of this genus infests leaves., buds and stems of Poaceae and leaves of Rosaceae and may lead a monoecious holocycle on Poaceae (e.g. *formosana)* or heteroecious holocycle, alternating between rosaceous primary host and poaceous secondary host (e.g, *bambusae, pyraria* and pherhaps *pahanensis*) or anholocycle on Poaceae. The leaves of the host plant may be rolled up diagonally to midrib, (as in rosacecous host of *pahanensis* and *pyraria),* often the colonies are covered with waxy sectretions. The poaceous hosts include economically important crops like Maize, Sorghum and Sugarcane in Indian region.

Distribution : India : Arunachal Pradesh, Assam, Meghalaya and other N.E. Indian regions, Sikkim, West Bengal, N.W. India, South India : China; Taiwan; Japan; Indonesia; Malayasia; Egypt; Europe; USA and Australia. Regional accounts have been provided by Raychaudhuri and Banerjee (1974) : India; Sorin (1970) : Japan.

Type species : *Aphis bambusae* Fullaway, 1910. Location of types not known.

Key to the species and subspecies of *Melanaphis* v.d. Goot

Apterous viviparous female

1. Longest hair on mid femora longer than its middle width; marginal hair on anterior abdominal segments 1-many 2

– Longest hair on midfemora shorter than its middle width; marginal hair on anterior abdominal segments never more than 2 4

2. Marginal hair on anterior abdominal segments always less than 3; cauda with 4-10 hairs; genital plate with 2-7 hairs on anterior half..... *meghalayensis*

(a) Cauda with 8-10 hairs; genital plate with 2 hairs on anterior half..... ..... *meghalayensis meghalayensis*

(b) Cauda with 4-5 hairs, genital pale with 4-7 hairs on anterior half..... ..... *meghalayensis bengalensis*

– Marginal hair on anterior abdominal segments vary between 3 and 5; genital plate with 4-7 hairs on anterior half 3

3. P.t. about 1.8 × length of base of the segment; longest hair on antennal segment III 2.3-3.8× basal diameter of the segment; abdominal dorsum with segmentally arranged transverse patches; dorsal abdominal hairs fewer, i.e. 8-11 on each of 3 anterior segments; cauda with 7-12 hairs ..... *pahanensis*

– P.t. never less than 2.7× and may be up to 3.2× length of base of segment; longest hair on antennal segment III 3-4.3× basal diameter of the segment; abdominal dorsum never with segmentally arranged patches but sometimes small scattered sclerites present; abdominal dorsum very much hairy, i.e. 15-22 on each of 3 anterior segments; cauda usually with 5-7 hairs ..... *arundinariae*

4. Siphunculi shorter than its basal width; body hairs short, longest hair on anterior abdominal tergites 0.8× basal diameter of antennal segment III; genital plate with 4-6 hairs on anterior half..... *vandergooti*

– Siphunculi usually longer than but seldom as long as its basal with; genital plate usually with 2–11 hairs on anterior half 5

5. Longest hair on anterior abdominal tergites shorter than or at most as long as the basal diameter of antennal segment III; cauda usually with 9-17 hairs .... *sacchari*

– Longest hair on anterior abdominal tergites always longer than the basal diameter of antennal segment III..... 6

6. P.t. about 3.3-4.5× the base of last antennal segment; u.r.s. as long as or slightly longer than h.t.2; cauda with 4-5 hairs ..... *bambusae*

– P.t. about 1.3-1.57× base of last antennal segment; 7

7. U.r.s. about 0.44–0.67× h.t.2; cauda with 15-21 hairs ..... *donacis*

– U.r.s. 1.5–1.6× h.t.2; cauda with 10-11 hairs ..... *strobilanthi*

36. ***Melanaphis arundinariae*** (Takahashi)
(Fig. 276, 364)

1937. *Aphis arundinariae* Takahashi, *Philippine J. Sci.*, **63** : 12.

1974. *Melanaphis arundinariae* (Tak.) : Raychaudhuri and Banerjee, *Oriental Ins.*, **8** (3) : 371.

1997. Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 60.

Apterous viviparous female : Body 1.45-1.6 mm long with about 0.79-1.15mm as maximum width. Head dark brown with ill-developed lateral frontal tubercles and median frontal prominence, very finely stippled dorsally; dorsal cephalic hairs very long and fine, longest hair about 2.8-4× b.d.III. Antennae 6-segmented, about 0.6-0.71× length of body; segment I slightly paler than head, finely stippled on surface, with 4-6 very long fine hairs and 1 short hair with acuminate apex; segment II pale brown, finely stippled on surface, with 4-5 long fine hairs; flagellum pale excepting last segment and apex of penultimate segment nearly smooth up to segment V, rest prominently imbricated; antennal segment III about 0.54-0.72× length of p.t. and 2.8-4.2× base VI antennal hairs long and fine, longest hair on segment III about 3-3.8× b.d.III. U.r.s. just reaching mid-coxae, short, with a pair of secondary hair, about 0.82-1.08× length of 2nd segment of hind tarsus. Thoracic tergites pale, stippled with irregular-shaped brown spinopleural transverse bands. Abdominal segments pale with scattered, irregular–shaped brown patches both spinally and marginally, finely stippled on dorsum; long and fine dorsal abdominal hairs scattered irregularly, longest hair on anterior abdominal tergites about 3.2-4.5× b.d.III; 8th abdominal tergite with 8-10 long fine hairs up to about 4-5.5× mentioned diameter; 3-5 long marginal hairs on anterior abdominal segments. Siphunculi sybcylindrical, concolorous with head, with fine spinulose imbrications, about 1.1-1.73× its basal width and about 0.86-1× elongated dark cauda bearing 5-9 long fine hairs. Genital plate with 7-8 long fine hairs on anterior half. Mid-and hind femora dark brown with very base and apex pale, fore femora pale brown at middle, rest pale; femoral hairs long and fine, longest hair on mid femora longer than its middle width; tibiae smooth, pale with apex pale brown; tarsi brown. F.T.C. 3.3.2.

Measurements of one specimen (in mm) : Length of body 1.514, width 0.644; antenna 1.083; antennal segments III : IV : V : VI 0.22 : 0.152 : 0.18 : (0.97 + 0.305); ultimate rostral segment 0.071; 2nd segment of hind tarsus 0.083; siphunculus 0.100; cauda 0.100.

Alate viviparous female : Body 1.52-1.62 mm long with about 0.65-0.69mm as maximum width near middle of abdomen. Antennae 6-segmented, brown, about 0.76-0.8× body; flagellum imbricated; segment III with 26-38 strongly protuberant circular secondary rhinaria scattered irregularly over its entire length, each of segments IV and V with 14-29 and 7-19 similar rhinaria respectively, scattered irregularly over their entire length, base of last segment with 1-2 similar rhinaria; longest hair on segment III about 2.1-2.5× diameter of the segment at its constricted base. u.r.s. not reaching mid coxae. Dorsum of abdomen pale with segmentally arranged brown

spinopleural transverse bands which are sometimes broken on anterior segments, those on segments 7 and 8 fused with similar marginal patches to form a continuous band over entire segment; scattered muscle plate-like structure also present pleurally; marginal brownish patches separated from spinopleural ones, up to abdominal segment 6; dorsal hairs long and fine, arranged more or less in distinct transverse rows, longest hair on anterior abdominal tergites about 4.2-5.1× b.d.III. Siphunculi subcylindrical, brown with a distinct apical flange, about 0.83-1.34× elongated, somewhat dusky cauda with rounded apex bearing 4-7 hairs. Femora brown to dark brown with bases slightly paler, smooth but with spinulose striae ventrally; tibiae brown with bases and apices darker; tarsi pale brown. Wing venation normal; radial sector elongated, other characters as in apterae viviparae.

Measurements of one specimen (in mm) : Length of body 1.625, width 0.694; antenna 1.25; antennal segments III : IV : V : VI : 0.291 : 0.263 : 0.208 : (0.097 + 0.263); ultimate rostral segment 0.068; 2nd segment of hind tarsus 0.078; siphunculus 0.093; cauda 0.112.

Biological notes : The dark brown (nearly black) insects infest the undersurface of the leaves. The infestation may sometimes be quite heavy.

Remarks : The Indian specimens of apterae viviparae agree fairly well with the description of the same morph of *arundinariae* given by Takahashi (1937) except in the presence of 6-segmented antennae, in the ratio of the length of the siphunculus to its maximum width, the slightly shorter siphunculi and the more number of caudal hairs. In so far as the alate are concerned the Indian specimens possess many more rhinaria on the different antennal segments. This species was previously reported from India by Ghosh, Basu and Raychaudhuri (1970) and Ghosh, Banerjee and Raychaudhuri (1971).

Distribution : India : Assam, Meghalaya.

Material examined : Many apterous and 4 alate viviparous ♀♀ India : MEGHALAYA, 13.vii.1966, 2.i.1967, 16.xii.1968, 4.ii., 13.vii.1969, 24.xii.1970, 8.ii.1971 from unidentified specis of bamboo, colls. S. Biswas, R.C. Basu and H. Banerjee; apterous viviparous ♀♀ and 6 nymphs, ASSAM : Cherrapunji, 21.xii.1968 from unidentified species of bamboo, Coll. R.C. Basu.

37. ***Melanaphis bambusae*** (Fullaway)

1910. *Aphis bambusae* Fullaway, *Rep. Hawaii Agric. Expt. sta.* (1909) : 35.

1974. *Melanaphis bambusae* (Fullaway) : Raychaudhuri and Banerjee, *Oriental Ins.*, **8** (3) : 371.

1997. *Melanaphis bambusae* (Full.) : Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 60.

Apterous viviparous female : Body 0.90-1.40 mm long with about 0.40-0.90mm as maximum width. Head dark brown with posterior half paler, very finely stippled on

both upper and under surfaces, with moderately developed lateral frontal tubercles and median frontal prominence; dorsal cephalic hairs rather short with bluntish apices, longest of these hairs about 0.7-1× b.d. III. Antennae 5 or 6–segmented, about 0.79-1.1× (in 5-segmented antennae) and about 0.83-1.01× (in 6-segmented antennae) length of body; a.s. I with 4-5 rather short hairs; segment II much paler than segment 1 and with 4 hairs; flagellum in both 5- and 6-segmented antennae imbricated in 5-segmented antennae, segment III pale, segment IV pale to pale brown with apex darker and last segment dark brown, in 6-segmented antennae either entire flagellum dark brown or segments III and IV pale and rest dark; about 3.3-4.5× length of base of the last segment; flagellar hairs short with acuminate to slightly incrassate apices, longest hair on antennal segment III about 0.3-0.5× b.d. III U.r.s. reaches hind coxae, about 1-1.2× length of 2nd segment of hind tarsus, bearing 2 secondary hairs. Thoracic and abdominal tergites pale, smooth. Dorsal hairs on anterior tergites of abdomen moderately long and fine, those placed caudad longer than those on anterior tergites, longest hair on anterior tergites about 1–1.7× basal diameter of antennal segment; 8th tergite with only 2 hairs which are up to about 1.1-2.1× b.d. III. Siphunculi somewhat cylindrical, brown to dark brown, imbricated, about 1-1.6× its basal width and 1-1.2× elongated dark cauda, which has a median constriction and globular apex and with 4-6 hairs; 1-2 marginal hairs on anterior abdominal segments. Genital plate with 2 very long fine hairs on anterior half. Fore femora pale brown, others dark brown with very base slightly paler; all femora smooth, venter with spinulose striae; longest hair on mid femora shorter than its middle width; tibiae pale with knees and extreme apices slightly darker, nearly smooth; tarsi brown. F.T.C. 3.3.2.

Measurements of one specimen (with 5-segmental antenna) in mm : Length of body 1.02; width 0.62; antenna 1.08; antennal segments III : IV : V 0.27 : 0.18 : (0.027 + 0.430); ultimate rostral segment 0.08; 2nd segment of hind tarsus 0.07; siphunculus 0.10; cauda 0.09.

Measurements of one specimen (with 6-segmented antenna) in mm : Length of body 1.30, width 0.77; antenna 1.31; antennal segments III : IV : V : VI 0.23 : 0.16 : 0.20 : (0.11 + 0.43); ultimate rostral segment 0.08; 2nd segment of hind tarsus 0.07; siphunculus 0.13; cauda 0.11.

Alate viviparous female : Body 1.30-1.70 mm long. Dorsal cephalic hairs with slightly acuminate apices, longest hair about 1-1.4 × b.d. III. Antennae 6-segmented, pale brown to brown; segment I scaly on anterior inner margin of dorsal surface; segment II finely scabrous; antennal segment III about 0.6-0.7× length of p.t.; segment III with 14-28 somewhat protruding circular secondary rhinaria scattered all over, segment IV with 7-13 and V with 0-4 similar rhinaria; hairs on flagellum short and sparse with acuminate to fine apices; longest hair on antennal segment III about 0.4-0.6 × b.d. III. U.r.s. extends beyond mid coxae, about 1.04-1.9 × length of second segment of hind tarsus. Abdominal dorsum pale; dorsal abdominal hairs long, fine and sparse. Siphunculi brown, nearly cylindrical, imbricated, about 1.4-1.8 × its basal width. Cauda dusky, elongated with round apex. Genital plate with 5-7 hairs on

anterior half. Mid and hind femora brown with extreme base slightly paler, fore femora just pale brown distally; femoral hairs short; tibiae pale with knees dark brown and apices brown, smooth; tarsi brown. Wing venation normal, short radial sector and curved, all veins rather thick and bordered brown. Otherwise as in apterae viviparae.

Measurements (in mm) of one specimen : Length of body 1.33, width 1.22; antenna 1.25; antennal segments III : IV : V : VI 0.25 : 0.15 : 0.19 : (0.097 + 0.40); ultimate rostral segment 0.06; 2nd segment of hind tarsus 0.06; siphunculus 0.01; cauda 0.07.

Biological notes : The insects, nearly black, are sometimes covered with powdery waxy secretion. They infest the buds, young shoots and the lower surface of the young leaves. The plants may be slightly to heavily infested and the insects may or may not be attended by the ants.

Material : Many apterous viviparous ♀♀, alate viviparous ♀♀ and many nymphs, INDIA : WEST BENGAL : Kalimpong, 28.xi.1969; 12.ii, 15.v, 18.vi, 1.ix, 21.x, 19.xi. 1.xii, 4.xii, 15.xii.1970; 4.i. 18.i, 21.i, 12 ii, 4.vi, 9.vii, 4.xi, 9.xii. 1971; 4.i., 14.i. 1972 from *Bambusa* sp., Coll. M.R. Ghosh.

38. ***Melanaphis donacis*** (Passerini)
(Fig. 371)

1860. *Longiunguis donacis* Passerini, *Gli Afidi;* 1–160.

1974. *Melanaphis donacis* (Pass.) : Raychaudhuri and Banerjee, *Oriental Ins.,* **8**(3) : 375.

1980. *Melanaphis donacis* (Pass.) : Raychaudhuri, D. N. (ed.), Aphids of NE India and Bhutan : 65

1997. *M. donacis* (Pass.) : Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 60.

Apterous viviparous female : Body 1.56-1.90 mm long with about 0.9–1.3 mm as maximum width near the middle of abdomen. Head dark brown on anterior half, rest pale to pale brown; lateral frontal tubercles ill–developed and median frontal prominence absent; both upper and under surfaces of head with minute stipples and with a median longitudinal furrow; dorsal cephalic hairs long with acute apices, longest of these hairs about 1.6-1.7× b.d. III. Antennae 6-segmented, about 0.41-0.54× length of body; segment I slightly paler than head and with 4 hairs; segment II dusky with 4 hairs; segment III and basal 0.75 portion of segment IV pale, rest of flagellum pale brown to brown apicad; flagellum nearly smooth near base of segment III, rest gradually more distinctly imbricated towards apex; antennal segment III about 1.6-1.7× length of p.t; about 1.42-1.57× b.d. III; flagellar hairs rather short and fine, longest hair on antennal segment III about 0.62-0.67× u.r.s. hardly reaching midcoxae, wider than long and about 0.64-0.67× length of second segment of hind tarsus and with a pair of secondary hair. Thoracic and abdominal tergites pale, wrinkled, with irregular shaped median patches up to abdominal segment 2. Dorsal abdominal hairs

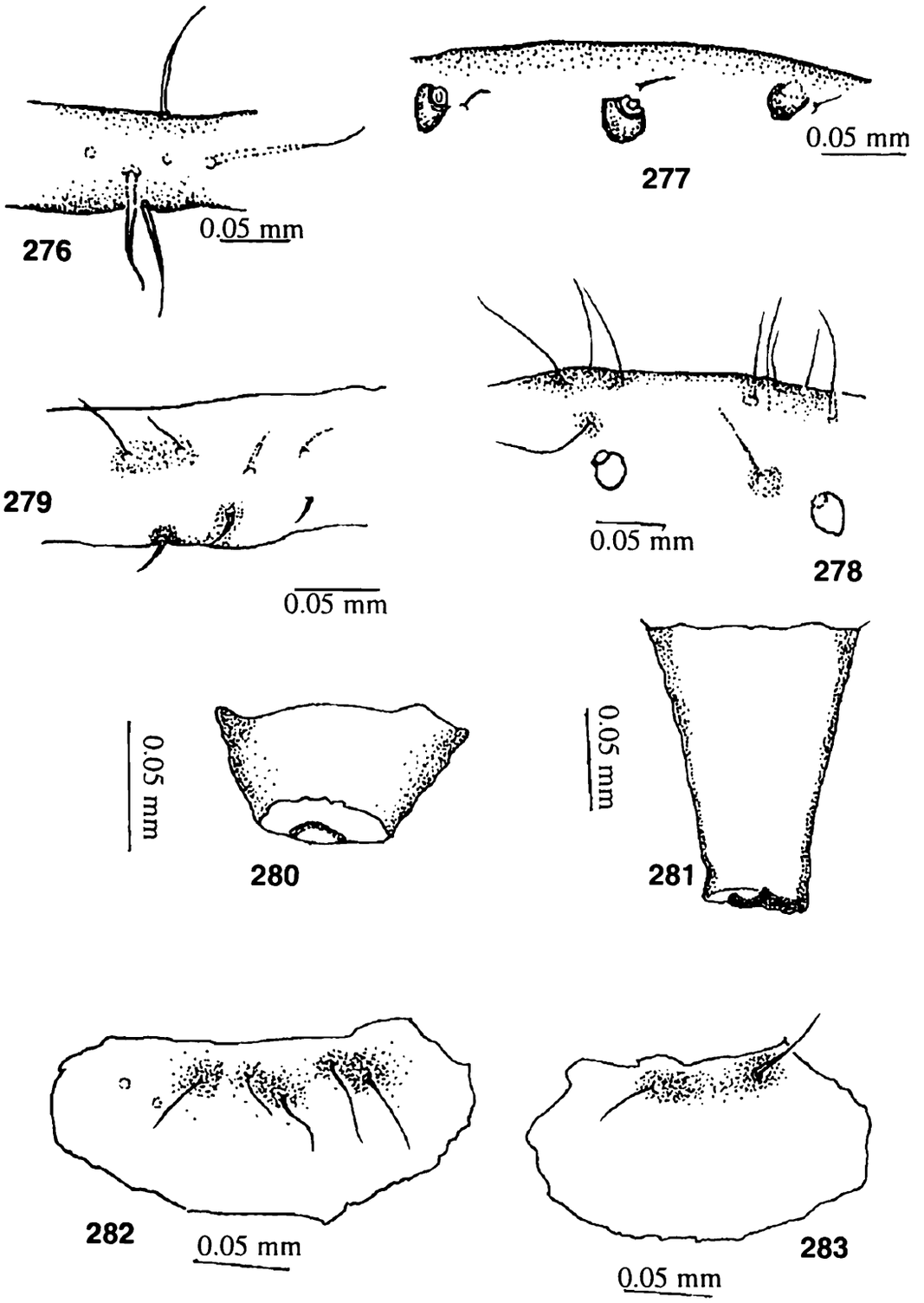


Fig. 276-283. 276. *Melanaphis arundinariae* (Tak.), Aptera : portion of mid femur with a few hairs; 277. *Melanaphis meghalayensis* Raychaudhuri and Banerjee, Aptera : Lateral portion of abdominal segments 2–4 showing marginal hairs; 278. *Melanaphis pahanensis* (Tak.), Aptera : Lateral portion of abdominal segments 2–3 showing marginal hairs; 279. *Melanaphis sacchari* (Zehnt.) Aptera : portion of mid femur with a few hairs; 280. *Melanaphis vandergooti* Raychaudhuri and Banerjee : Aptera : siphunculus; 281. *Melanaphis sacchari* (Zehnt.) : Aptera. siphunculus; 282. *Melanaphis sacchari* (Zehntner) : Aptera : genital plate with 4–9 hairs on anterior half. 283. *Melanaphis donacis* (Pass.) : Aptera. genital plate with 2 hairs on its anterior half.

rather long with acute to slightly bluntish apices, longest hair on anterior abdominal tergites 1.5-1.8× b.d. III; 8th abdominal tergite with 4-5 long and fine hairs which may be up to about 2-2.5× b.d. III. Siphunculi concolourous with head, about 1.07-1.2× its basal width, with spinulose imbrications on both surfaces and about 0.67-0.83× dark cauda which is elongated and bears 10-20 hairs. Genital plate with 2-4 hairs on its anterior half. Fore femora pale brown, mid femora brown and hind femora slightly darker than middle one; femora smooth on margin but with minute granules on both the surfaces and with distinct transverse sipinulose striae ventrally; tibae pale brown with knees and apices darker, smooth with minute granules at least on basal half; tarsi brown. F.T.C. 3,3,2.

Measurements (in mm) of one specimen : Length of body 1.50, width 0.90; antenna 0.85; antennal segments III : IV : V : VI 0.23 : 0.12 : 0.12 : (0.09 + 0.12); ultimate rostral segment 0.06; 2nd segment of hind tarsus 0.01; siphunculus 0.08; cauda 0.11.

Biological notes : The insects are dark brown (nearly black) in life and they infest the undersurfaces of the leaves.

Distribution : India : Meghalaya, Tamil Nadu.

Material : 2 apterous viviparous ♀♀, MEGHALAYA, 8.ii.1971 from *Bambusa* sp., Coll. H. Banerjee; 4 apterous viviparous ♀♀, MEGHALAYA, 17.xii.1969 from a graminaceous plant, Coll. R. C. Basu.

39. ***Melanaphis meghalayensis***
Raychaudhuri and Banerjee
(Fig. 277, 284-289)

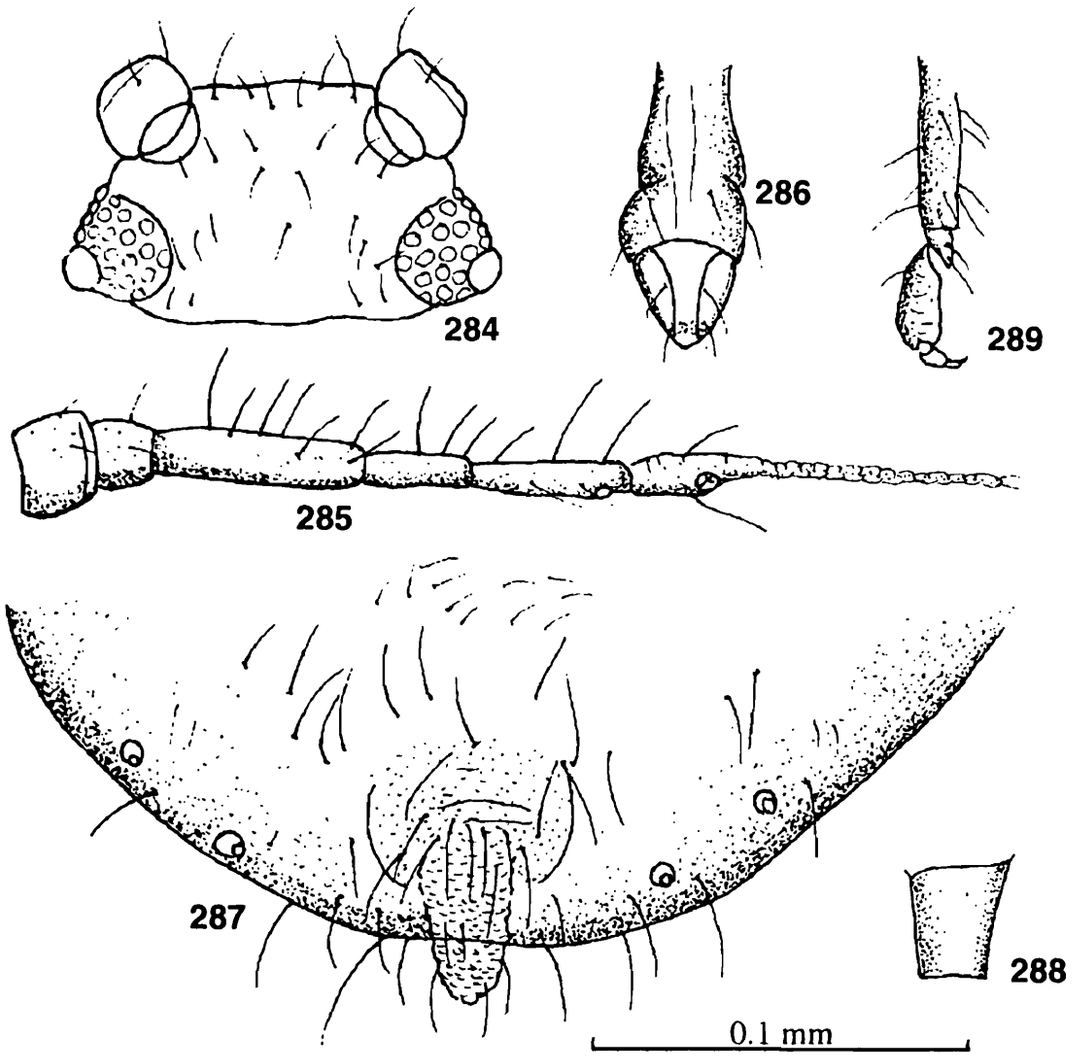
1974. *Melanaphis meghalayensis* Raychaudhuri, D.N. and Banerjee, *Oriental Ins.*, **8**(3) : 376.

1974. *Melanaphis meghalayensis meghalayensis* Raychaudhuri, D. N. and Banerjee, *Oriental Ins.*, **8**(3) : 376.

1980. *Melanaphis meghalayensis meghalayensis* : Raychaudhuri, D.N. (ed.) *In* : Aphids of NE India and Bhutan : 65.

1997. *M. meghalayensis* : Ramaudiere and Remaudiere, Catalogue of the worl's Aphididae : 60.

Apterous viviparous female : Body 1.30-1.40 mm long with about 0.61–0.83 mm as maximum width near the middle of abdomen. Head brown to dark brown with lowly elevated lateral frontal tubercles and median frontal prominence; dorsum of head with minute stipples besides fine corrugations especially near posterior margin; dorsal cephalic hairs long and fine, longest hairs about 3.27-3.4× basal diameter of antennal segment III. Antennae 6-segmented, 0.57–0.75× length of body; segment I brown, smooth, with finely sculptured surface and with 2-4 fine hairs; segment II slightly paler, smooth, but with sculpturings as on segment I, with 3-5 short to long fine hairs; segment III pale, rest of flagellum either uniformly brown or segments IV and V pale and rest brown; segment III nearly smooth at least on basal half, outer margin of rest



Figs. 284-289. *Melanaphis meghalayensis* : Aptera. 284, Head; 285 antenna; 286 portion of rostrum showing u.r.s.; 287, posterior abdominal dorsum; 288, siphunculus; 289, portion of tibia showing tarsal segments.

of the segment faintly imbricatd and with fine spinulose striae present almost over entire surface of segment, rest of flagellum distinctly imbricated; antennal segment III 0.9–1.2× p.t.; p.t. 2.2-2.8× b.d. III; long and short flagellar hairs occur intermingled but majority of hairs long and directed inwards, longest hairs on antennal segment III about 3-3.8× basal diameter of the segment. U.r.s. reaches a little beyond mid coxae, 0.74-0.83× length of second segment of hind tarsus and with a pair of secondary hairs. Both thoracic and abdominal tergites pale, with fine sculpturings all over. Dark muscle plate-like structure on first 5 abdominal segments pleurally, dorsal abdominal hairs long and fine and arranged in distinct transverse rows, longest hair on anterior abdominal tergites 3.09-3.4× b.d. III; 8th abdominal tergite with 5-6 long fine hairs which are up to 3-4.5× b.d. III; marginal hairs on anterior abdominal tergites 1-2. Siphunculi slightly paler than head, smooth but with fine granules on surface, without a distinct apical flange, 0.80-0.90 its basal width and 0.76-0.95× length of cauda being dusky to dark brown and elongated with a median constriction and with 7-10 hairs. Genital plate with 2 hairs on anterior half. Fore leg pale brown with apices of tibiae

and entire tarsi darker; mid and hind femora brown with bases and apices paler; mid and hind tibiae and tarsi concolorous with fore tibiae and tarsi; both femora and tibiae smooth at margin and with spinulose striae on venter of femora and minute stipples on entire tibiae; longest hair on mid femora much longer than its middle width. F.T.C. 3,3,2.

Measurements (in mm) of one specimen : Length of body 1.40, width 0.85; antenna 0.84; antennal segments III : IV : V : VI 0.22; 0.08 : 0.10 : (0.08 + 0.23); ultimate rostral segment 0.07; 2nd segment of hind tarsus 0.09; siphunculus 0.08; cauda 0.103.

Alate viviparous female : Body 1.50–1.58 mm long with about 0.70 mm as maximum width near the middle of abdomen. Head blackish brown, dorsal cephalic hairs about 5–7 times as long as b.d. III. Antennae 0.6–0.7 times as long as body; p.t. 2.5–3.2 times as long as base VI; a.s. III with 18-20, IV with 4–8 round secondary rhinaria distributed over the entire length of the segments, longest hairs on a.s. III about 3.5–5.0 times as long as b.d. III; u.r.s. 0.7–0.8 times as long as h.t. 2. Abdomen pale, abdominal tergites 3–5 with a continuous brown band, dorsal abdominal hairs long with flagellate apices, longest hair on anterior tergites about 5–6 times as on 7th and 8th tergites 6.0–6.5 times and 6–7.5 times as long as b.d. III respectively. Siphunculi and cauda concolourous with head. Other characters as in apterous viviparous females.

Measurements (in mm) of one specimen : Length of body 1.60; width of body 0.68; antenna 1.05; a.s. III; 0.30, IV 0.14, V 0.15, VI (0.08 + 0.25); u.r.s. 0.06; h.t. 2 0.08; siphunculus 0.08; cauda 0.10.

Material : Apterae and alatae, on *Arundinaria* sp., India : Uttar Pradesh, Kedarnath, 3.vi.1978, coll. S. P. Maity; apterae on undet. grass, India : West Bengal : Kalimpong, 16.12.1971, Coll. T.K. Pal.

Biological notes : The insects are brown to dark brown in life and infest the undersurfaces of the leaves and the stem at ground level. The infestation is weak. The insects are not attended by ants.

Following the key to *Longiunguis* of Japan provided by Sorin (1970) this species, in having siphunculus shorter than its basal width and 1-2 marginal hairs on anterior abdominal segments, resembles *tateyamaensis* Sorin, *siphonellus* (Essig and Kuwana) and *montanus* Sorin but can be distinguished by its very long hairs on antennal segment III. From other Indian species it can be differentiated by the hairs on the mid femora being much longer than its middle width and by the fewer marginal hairs (1-2) on the anterior segments of the abdomen.

Distribution : India : Meghalaya, West Bengal.

40. ***Melanaphis meghalayensis bengalensis*** Raychaudhuri and Banerjee

1974. *Melanaphis meghalayensis bengalensis* Raychaudhuri and Banerjee, *Oriental Ins.*, **8**(3) : 377.

1980. *Melanaphis meghalayensis bengalensis* Raychaudhuri and Banerjee : Raychaudhuri, D.N. (ed.), Aphids of NE India and Bhutan.

1990. *Melanaphis meghalayensis* Raychaudhuri and Banerjee : Agarwala and Mahapatra, **24** : 38.

1997. *M. meghalayensis bengalensis* : Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 60.

This subspecies agrees with the nominate subspecies in almost all the characters but differs in having 4-7 hairs on the anterior half of the genital plate and 4-6 hairs on the cauda.

Measurements (in mm) of one specimen : Length of body 1.85, width 1.05; antenna 0.90 : antennal segments III : IV : V : VI 0.208 : 0.152 : 0.152 : (0.125 + 0.194); ultimate rostral segment 0.081; 2nd segment of hind tarsus 0.112; siphunculus 0.078; cauda 0.093.

Biological notes : The green to dark brown insects covered with scanty waxy secretion cause moderate infestation on the lower surfaces of the young to moderately young leaves. They are not attended by ants.

Distribution : India : West Bengal.

Material : Apterous viviparous females, on unidentified species of grass, India : West Bengal, Darjeeling, 9.1.1971, Coll. S.P. Chakrabarti.

41. ***Melanaphis pahanensis*** (Takahashi)
(Fig. 278)

1950. *Aphis pahanensis* Takahashi, *Ann. ent. Soc. America,* **43** : 596.

1992. *Melanaphis pahanensis* Medda and Chakrabarti, *Entomol. Gener.*, **17**(2) : 141.

1997. *Melanaphis pahanensis* (Tak.) : Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 61.

Apterous viviparous female : Body 1.85-2.0 mm with 1.06-1.20 mm as maximum width near the middle of abdomen. Anterior part of head dark brown, rest slightly paler; frons slightly convex at middle, lateral frontal tubercles nearly absent; dorsum of head with minute stipples; dorsal cephalic hairs very long with acute apices, up to about 2.4-3.6 × b.d. III. Antennae 6-segmented, 0.50-0.60 × length of body; segment I brown with 3–4 fine hairs, segment II dusky, longer than wide, with 4-6 long fine hairs; antennal segments III and IV pale, rest of flagellum darker; flagellum gradually more distinctly imbricated from distal part of segment III; antennal segment III 1.10-1.29 × length of p.t. 1.8-2.4 × b.d. III; flagellar hairs long and fine, longest hair of antennal segment III 2.2-2.8 × b.d. III. U.r.s. reaching midcoxae, 0.75-0.85 × length of second segment of hind tarsus with a pair of secondary hair. Each of thoracic and abdominal tergites with a transverse spino-pleural sclerotic patch bearing minute stipples, dark brown marginal patches also present on abdominal segments 1-5. Dorsal

abdominal hairs very long and fine, longest hair on anterior abdominal tergites about 2.5-4 × b.d. III; 8th tergite with 6-8 hairs 2-3.3 × b.d. III. Siphunculus brown, sybcylindrical, without distinct flange, smooth on margin but with fine spinules on surface, about 1.1-1.4 × its basal width and 0.80-0.90 × length of cauda which is brown and somewhat elongated, without any constriction and bears 7-12 fine hairs. Genital plate bears 3-7 hairs on anterior half; 3-5 marginal hairs on anterior abdominal segments. Mid and hind femora brown excepting extreme base and apex which are as pale as entire fore femora, smooth on margin but with numerous spinulose striae on ventral surface; femoral hairs long and fine; longest hair on mid femora much longer than its middle width; tibiae concolorous with fore femora excepting extreme apex which is brown like tarsi. F.T.C. 3, 3, 3, or 3, 3, 2.

Measurements (in mm) of one specimen : Length of body 1.95, width 1.26; antenna 1.18; antennal segments III : IV : V : VI 0.33 : 0.16 : 0.18 : (0.11 + 0.26); ultimate rostral segment 0.10; 2nd segment of hind tarsus 0.12; siphunculus 0.10; cauda 0.12.

Material : 6 apterous viviparous ♀♀ and 4 nymphs, INDIA : UTTAR PRADESH : Ranikhet, 14.iv.1970, from *Pyrus kumaoni,* Coll. S. Chakrabarti.

Biological notes : The dark brown apterous viviparous females covered with mild waxy secretion infest the undersurfaces of the leaves causing curling of the leaves. The apterae infest rosaceous plants like *Pyrus*. A rosaceous host plant for *Melanaphis bambusae* has been reported by Sorin (1962) in Japan.

Previous Indian record of this species is found in the work of David, Narayanan and Rajasing (1969).

Distribution : India : Sikkin (?), Uttar Pradesh.

Alate viviparous female : Body 1.5-1.9 mm long with 0.7–0.8 mm as maximum width near middle of abdomen. Dorsum of head with 12–13 hairs, the longest one 2.7–3.5 times as long as b.d. III. Antennae brown, about 0.6 times as long as body. A.s. I and II with 4 and 4–5 hairs respectively, the longest hair on a.s.III 2.4-3 times as long as b.d. III. A.S. III with 15-28 and a.s. IV with 0–1 protuberant secondary rhinaria. Processus terminalis 2.2–2.7 times as long as base VI. U.r.s. 0.7–0.9 times as long as h.t.2. Abdominal tergum pale with separate spinopleural sclerotic patches on abdominal segments 4–6; anterior abdominal tergites with 2–3 marginal hairs, the longest one 2.8–3.7 times as long as b.d. III; tergite 7 with 7-12 and 8 with 5-6 hairs; the longest hair on 8th tergite 3.4–3.8 times as long as b.d.III. Siphunculi rather cylindrical, 0.05–0.06 times as long as body, 0.8–1.1 times as long as cauda which is elongately subpentagonal and with 7-9 hairs. Genital plate with 2–7 hairs on anterior half and 8–12 on posterior half. Wing venation normal. other characters are as in apterous viviparous female.

Measurements (in mm) of one specimen : Length of body 1.7; width of body 0.80; antenna 1.05; a.s. III 0.30, IV 0.12, V 0.14, VI (0.10 + 0.24); u.r.s. 0.08; h.t.2 0.10; siphunculus 0.08; cauda 0.09.

Apterous oviparous female : Body 1.4–1.5 mm long with 0.7–0.8 mm as maximum width near the middle of abdomen. Dorsal hairs 9–12, the longest one being 2–3 times as long as b.d. III. Antennae 0.3–0.4 times as long as body, longest hair on a.s. III about 2.0–2.9 times as long as b.d. III. U.r.s. 0.8–1.0 times as long as h.t. 2. Abdomen smooth and membranous; anterior abdominal tergite with 2 marginal hairs, the longest hair about twice as long as b.d. III; abdominal segment 7 with 4–6 and segment 8 with 7–10 hairs, the longest hairs on segment 7 about 60–80 mm and those on segment 8 being 64–82 mm long. Siphunculi with fine spinular imbrications, 0.03–0.04 times as long as body and 0.7–0.8 times as long as cauda. Cauda pentagonal with 5–9 hairs and 0.7–1.1 times as long as basal width. Genital plate with 7–11 hairs on anterior half and 15–20 hairs on posterior half. The longest hair on posterior femora about as long as its middle diameter. Hind tibiae swollen with 50–70 pseudosensoria. Other characters as in apterous viviparous female.

Measurements (in mm) of one specimen : Length of body 1.4; width of body 0.7; antenna 0.55; a.s. III 0.11, IV 0.07, V 0.07, VI (0.07 + 0.16); u.r.s. 0.08; h.t. 2 0.08; siphunculus 0.05; cauda 0.06.

Material : 1 apt. ovip.♀, India : Uttar Pradesh, Joshimath, 12.08.1984, coll. P.K. Medda.

Alate male : Body 1.6–1.9 mm long with 0.5–0.7 mm as maximum width near middle of abdomen. Dorsum of head with 12 hairs, the longest hair about 70 mm long. Antennae 0.6–0.7 times as long as body, the longest hair on a.s. III 30–40 mm long and about as long as b.d. III. Antennal segment III with 48–70, IV with 20–35, V with 13–25 and a.s.VI with 2–5 protuberant secondary rhinaria. Anterior abdominal tergites with 3–5 marginal hairs, the longest being 60–90 mm long. Abdominal segment 7 with 4–6 and segment 8 with 4–7 hairs, the longest one being upto 2.8 times as long as b.d. III. Siphunculi 0.04–0.05 times as long as body and about as long as cauda. Cauda 1.2–2.1 times as long as its basal width. Genitalia with aedeagus having two claspers at its base. Other characters as in alate viviparous female.

Measurements (in mm) of one specimen : Length of body 1.95; width of body 0.7; antenna 1.15; a.s. III 0.36, IV 0.19, V 0.19, VI (0.09 + 0.20); u.r.s. 0.08; h.t.2 0.10; siphunculus 0.08; cauda 0.08.

Material : Alate males, India : Uttar Pradesh, Joshimath on *Pyrus communis*, 24.11.1984, Coll. P.K. Medda.

Remarks : The species is holocylic and heteroecious alternating between *Pyrus* spp. (primary host) on grasses (secondary host). Medda and Chakrabarti (1992) studied the biology of the aphid from the western Himalaya.

42. ***Melanaphis sacchari*** (Zehntner)
(Fig. 279, 281-282)

1897. *Aphis sacchari* Zehntner, *Arch. Suikerind Ned. Ind.*, **5** : 551.

1958. *Longiunguis sacchari* : Eastop, Aphididae of East Africa : 81.

1974. *Melanaphis sacchari* (Zehntner) : Raychaudhuri, D. N. and Banerjee, C., *Oriental Ins.*, **8**(3) : 379.

1994. *Melanaphis sacchari* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **3** : *Fauna of West Bengal* : 165.

1997. *Melanaphis sacchari* : Remaudiere and Remaudiere, Catalogue of the World's Aphididae, Paris : 61.

1998. *Melanaphis sacchari* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **4** : *Fauna of Meghalaya*, ZSI : 115.

2000. *Melanaphis sacchari* : Ghosh, L. K. and Basu, R. C., *State Fauna Series*, **7** : *Fauna of Tripura*, pt. 2, ZSI : 355.

2001. *Melanaphis sacchari* : Chakrabarti and Sarkar, *J. Aphidology*, **15**(1 & 2) : 15.

Apterous viviparous female : Body 1.4-1.6 mm long with 0.38-0.68 mm as maximum width near the middle of abdomen. Head pale, with ill-developed lateral frontal tubercles and median frontal prominence; dorsal cephalic hairs with bluntish apices, longest of these hairs 0.4-0.8 times as long as b.d. III. Antennae 5- or 6-segmented, 0.50-0.69 × (in 5-segmented antennae) and 0.4-0.88 × length of body (in 6-segmented antennae); in 6-segmented antennae, flagellum from very tip of segment IV brown but other segments pale and 5-segmented concolorous with 6-segmented ones; flagellum distinctly imbricated from extreme base on inner margin but outer margin of segment III nearly smooth upto basal half, rest of inner margin of flagellum distinctly imbricated; antennal segment III 0.4-0.6 × (in 5-segmented antennae) and about 0.5-1.0 × (in 6-segmented antennae) length of p.t.; ;p.t. about 2-3-4 × and 2.8-4.3 × length of base of the segment in 5- and 6- segmented antennae respectively; flagellar hairs rather short and sparse with acuminate apices, longer hair on segment III 0.2-0.5 × basal diameter of segment. U.r.s. reaching mid coxae, about 0.8 times as long as h.t.2 with a pair of secondary hair. Thoracic tergites usually pale, sometimes broken brownish patches present between meso- and metathorax and these patches are with a sort of broken polygonal pattern. Abdominal dorsum pale but often irregular brown to dark brown patches are developed in spinal and pleural areas, often patches in spinal area coalesce to form segmentally arranged transverse bands from segments 1-6, dorsal abdominal hairs on anterior tergites short with bluntish to slightly acuminate apices, those on segments 7 and 8 much longer and fine, longest hair on anterior abdominal tergites 0.5-1 times as long as antennal segment III and 2 hairs on 8th tergite may be up to 1-1.7 times mentioned diameter; Siphunculi brown to dark brown, sybcylindrical, narrowing towards apex and with distinct constriction just above the siphuncular pore, with somewhat spinulose imbrications, 1.1-2 × its basal width, about 0.61-1 × length of cauda being somewhat dark, elongated with a median constriction and bears 9-17 hairs. Hairs on anterior half of genital plate usually vary between 7 and 9. Legs pale with tips of tibiae and whole of tarsi dusky to brown; femoral hairs short with acuminate apices, longest hair on mid femora shorter than its middle width. F.T.C. 3, 3, 3 or 3, 3, 2.

Measurements (in mm) of one specimen (with 5-segmented antennae) : Length of body 1.50; width 0.79; antenna 0.80; a.s. III 0.15, IV 0.10, V (0.06 + 0.25), u.r.s. 0.07; h.t.2. 0.07; siphunculus 0.08; cauda 0.14.

Measurements (in mm) of one specimen (with 6-segmented antennae) : Length of body 1.58; width 0.88; antenna 1.10; a.s. III 0.20, IV 0.16, V 0.18, VI (0.08 + 0.36), u.r.s.0.07; h.t. 2 0.09; siphunculus 0.10; cauda 0.15.

Alate viviparous female : Body 1.3-1.8 mm long with about 0.56-0.9 mm as maximum width. Head dark brown; dorsum of head with minute stipples; dorsal cephalic hairs rather long and with somewhat bluntish apices, longest of these hairs about 0.7-1.6 × basal diameter of antennal segment III at its constricted base. Antennae 6-segmented, about 0.6-0.8 × length of body; segments I and II brown, smooth dorsally, scabrous ventrally, segment 1 with 3-5 hairs and segment II with 3-4 hairs; flagellum brown to dark brown excepting extreme base of segment III which is pale, imbricated; segment III with 6-16 circular, somewhat protuberant secondary rhinaria distributed in a row over entire segment excepting small basal portion; segment IV with 2-6 similar rhinaria arranged in a row; antennal segment III about 0.6-0.8 × length of p.t. U.r.s. 0.6-0.9 × h.t. 2. Mesothoracic lobes well developed. Abdominal dorsum scabrous with segmentally arranged brown transverse spinopleural bars up to segment 8, besides scattered brown spots occasionally present pleurally; dorsal abdominal hairs long, longest hair on anterior abdominal tergites about 0.7-1.2 × b.d. III; 8th tergite with only 2 long hairs which are up to about 1-2.2 × mentioned diameter. Siphunculi strongly imbricated, 1.8-3 × its basal width. Genital plate with 5-9 long fine hairs on anterior half. Mid and hind femora brown to dark brown excepting the very pale base, fore femora pale brown with base and apex still paler; all femora smooth dorsally and with spinulose striae ventrally; wing venation normal, wing veins bordered brown; other characters as in apterous viviparous female.

Measurements (in mm) of one specimen : Length of body 1.8; width of body 0.80; antenna 1.3; a.s. III 0.25, IV 0.22, V 0.22, VI (0.11 + 0.40) : u.r.s. 0.07; h.t. 2 0.09; siphunculus 0.01; cauda 0.12.

Biological notes : The life colour of the insects is variable, may be cream, brown, dark brown, light green or grey. They infest different poaceous plants affecting the various aerial parts including inflorescence where the infestation may be scanty to heavy. Sometimes the affected portions turn yellow. Ant attendants are often noticed in association with the insects.

Remarks : This species has world-wide distribution. The concept of *sacchari* as given by Eastop (1958, 1961) for East and West African specimens more or less holds good for the Indian specimens. Eastop (1966) while dealing with *Longiunguis* species of Australia, states that *Longiunguis sacchari* seems to exist as a complex of races or strains and can broadly be distinguished into 2 groups in the material available. The 2 groups according to him differ not only in life colour but also in the possession of long processus terminalis along with short body hairs and reduced lateral abdominal

tubercles, in one group and shorter processus terminalis with longer body hairs and better developed lateral abdominal tubercles in the other.

David (1956), while describing *Longiunguis indosacchari,* distinguished the species from *sacchari* by the life colour, longer processus terminalis compared with the base of the last segment of the antennae, shorter hairs between the sense pits on the trochanters and darker pigmentation on the head and stigmatid of *sacchari.* Eastop (1966) considers *indosacchari* representing one of the groups as stated above of the *sacchari* complex.

David (1957) made the first report of the species from India. It is now wide spread in the country.

Material : Many apterae and alatae, India : Assam, Meghalaya, Nagaland, Tripura, on different parts of West Bengal from poaceous plants, colls. R. C. Basu, S. Biswas, R. Ganguly, H Banerjee.

43. ***Melanaphis strobilanthi*** Medda and Chakrabarti.

1992. *Melanaphis strobilanthi* Medda and Chakrabarti, *Entomol. Gener.,* **17**(2) : 144.

Apterous viviparous female : Body 1.20–1.55 mm long with 0.74-0.94 mm as maximum width near the middle of abdomen. Lateral and median frontal tubercles poorly developed. Antennae 5-6 segmented, brown, 0.3–0.4 times as long as body; a.s. I on II smooth, with 4-6 on 4 hairs respectively, flagellum more distinctly progresively imbricated, longest hair on a.s. III 12–14 μm long and 0.4–0.5 times as long as a.s. III. Rostrum reaches 2nd coxae, u.r.s. with 2 secondary hairs and 1.5–1.6 times as long as hind tarsus 2. Midthoracic furca with separate arms. Abdomen pale, dorsal hairs shorter, pointed with acute apices, the longest one on anterior tergites 20–30 μm long and 0.7–1.0 times as long as b.d. III, anterior abdominal tergite with 1-2 marginal hairs; 7th abdominal segment with 4-5 and 8th segment with 2–5 hairs, the longest hairs 30–40 μm and 40–50 μm long respectively. Siphunculi brown, almost cylindrical, with fine spinular imbrications, flangeless, 0.06–0.08 times as long as body 0.8–1.0 times as long as cauda and 1.4–2.0 times, 1.6–2.4 times and 1.8–2.4 times as long as basal, median and apical widths respectively. Cauda subpentagonal, 1.1–1.5 times as long as basal width with 10–11 hairs as genital plate with many scattered hairs; legs brown, femora and tibiae almost smooth, tarsi little imbricated, femoral hairs with fine apices; hind tarsus with 11–19 pseudosensoria. F.T.C. 3 : 3 : 2.

Measurements (in mm) of one specimen : Length of body 1.40; width of body 0.82; antenna 0.55; a.s. III 0.10, IV 0.08, V 0.08 VI (0.08 + 0.10); u.r.s. 0.13; h.t.2 0.08; siphunculus 0.09; cauda 0.10.

Material : Apterous viviparous female, on *Strobilanthes* sp., India : Uttar Pradesh, Bottali, 23.6.1984, coll. S. Saha.

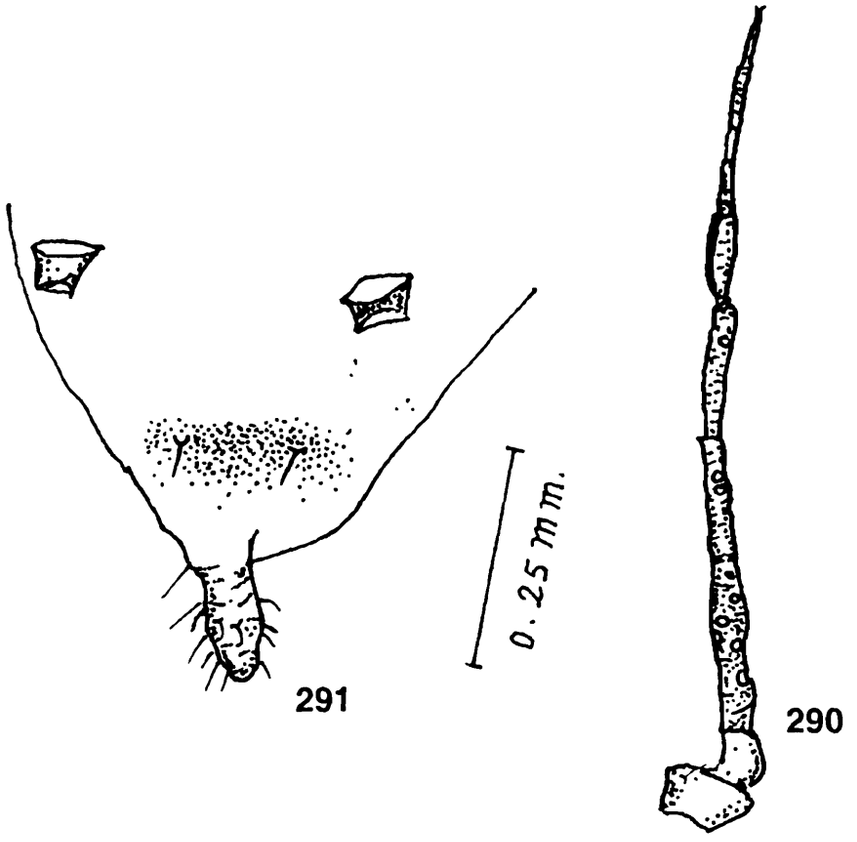
Remarks : The usual host plants for *Melanaphis* are usually plants belonging to Poaceae, Rosaceae Juncacae and ? Rubiaceae (Raychaudhuri and Banerjee 1974). The

host plant *Strobilanthes* belonging to N.O. Acanthaceae appears to be unusual. More collections from the type locality will confirm whether *strobilanthes* is the favoured host plant of the aphid or not. However, the interesting characters for this aphid are presence of pseudosensoria on hind tibiae, flangeless siphunculi being longer than its basal diameter, absence of sclerotic patches on anterior abdominal tergites, ratio of hairs on a.s. III to b.d. III, less number of caudal hairs (10-11).

44. ***Melanaphis vandergooti*** Raychaudhuri and Banerjee (Figs. 280, 290-291)

1974. *Melanaphis vandergooti* Raychaudhuri; and Banerjee, *Oriental Ins.*, 8(3) : 382.

Apterous viviparous female : Body 1.7-1.76 mm long with about 0.91-0.98 mm as maximum width. Head dark brown, finely rugose with ill-developed median frontal prominence and moderately developed lateral frontal tubercles, with a longitudinal median furrow; dorsal cephalic hairs short and fine, 0.5–0.7 times basal diameter of antennal segment III. Antennae 6-segmented and about 0.51-0.6 length of body; segment I brown to deep brown, smooth with 4-5 short fine hairs; segment II much paler and with 3 fine short hairs; flagellum brown excepting segment III and basal 0.5–0.75 portion of segment IV which are pale, gradually more distinctly imbricated from base towards apex; antennal segment III about 0.58-1.2 times length of p.t.; p.t. about 2-2.1 times length of base of segment; flagellar hairs sparse, short with acute to slightly acuminate apices, longest hair on antennal segment III about 0.3-0.4 times



Figs. 290-291. *Melanaphis vanergooti* Roychaudhuri and Banerjee : Alata. 290, Antenna showing secondary rhinaria; Alata : 291, Posterior abdominal dorsum showing siphunculus and cauda.

basal diameter of the segment. U.r.s. just reaching mid coxae. about 0.81-0.83 times h.t. 2, with a pair of secondary hair. Thoracic and abdominal tergites finely rugose, pale with variably developed muscle-plate like structure pleurally up to abdominal segment 5. Dorsal hairs on anterior 5 tergites usually small and fine, longest of these hairs on anterior tergites about 0.5-0.7 times b.d. III, dorsal hairs on other tergites longer; 8th tergite with only 2 fine hairs which are up to about 0.8-0.88 times mentioned diameter; marginal hairs present on anterior abdominal segments 1-2. Siphunculi dark brown, truncated, shorter than its basal width, with spinulose imbrication and about 0.22-0.29 times elongated cauda bearing 14-15 hairs; venter of abdomen with distinct transverse striae. Genital plate with 4-6 hairs on anterior half. Fore femora brownish, mid and hind ones slightly darker; femora smooth on margin but ventrally with transverse spinulose striae; femoral hairs fine but very few, those on mid femora shorter than its median width; tibiae pale excepting very dark apex, smooth; tarsi slightly darker than apices of tibiae. F.T.C. 3,3,2.

Measurements (in mm) of one specimen : Length of body 1.70; width of body 0.9; antenna 0.90; a.s. III 0.16, IV 0.15, V 0.16, VI (0.11 + 0.22); u.r.s. 0.07; h.t.2 0.08; siphunculus 0.62; cauda 0.21.

Material : Apterous viviparous female, INDIA : W. B. Kalimpong, on *Oryza sativa,* 18.11.1991, M. R. Ghosh Coll.

Remarks : The dark brown aphids with waxy powdery secretion usually infest the undersurface of the leaves of the host plant.

Distribution : The species is so far knwon from Eastern Himalaya.

Genus 9. ***Rhopalosiphum*** Koch 1854

1854. *Rhopalosiphum* Koch, C. L. *Die. Pflanzenlause Aphiden Nunnberg,* 23; Richards, W. R. 1960. *Can. Ent.* 92. Supdt. **13** : 5; Takahashi, R. 1965. *Insecta matsum.,* **28** : 50 Eastop, V.F. 1966. *Anst. J. Zool.* **14** : 492; Raychaudhuri, D. N. Ghosh M. R., Basu, R.C 1980. *In* : Aphids of North East India and Bhutan, 67; Stroyan, H.L.G. 1984. *Handok ident. Br. Insects* **2**(6) : 1; Type-species *Aphis nymphaeae* Linnaeus.

1860. *Siphocoryne* Passerini, *Gli. Afidi* Parma, 28, Type-species *Aphis nymphaeae* Linnaeus.

1913. *Stenaphis* del Guercio. G. *Redia* **5** : 185. Type species : *Stenaphis monticelli* del Guercio = *Aphis maidis* Fitch.

1915. *Siphonaphis* van der Goot, P. *Bentr. z. Kennt* d. *Holland Blatt.* Harrlem–Berlin, 238. Type species. *Aphis nymphaeae*

1917. *Yamataphis* Matsumura, S. *J. Coll Agric* Tohonus *Imp. Univ.,* **7** : 412. Type species : *Yamataphis oryzae* Matsumura = *R. rufiabdominnlis* (Sasaki).

1921. *Aresha* Mordvilio, A. K. *Izv. Sev. Oblaststa Zashch Rast Verdit.,* **3** : 53. Type-species. *Aresha shelkovnilovi* Mordvilko = *R. rufiabdominalis* (Sasaki)

1932. *Pseudocerosipha* Shinji, O. *In* Isayoshi Ishii ed. Practical Horticulture, Tokyo, special number, **5** : 238.

Morphology : Body of small to medium size (1–3 mm), variably coloured from olive green to nearly black head smooth; lateral frontal tubercles weakly developed with characteristic rhoplopaloisphine projection at inner apex. Antennae 5–6 segmented, 0.30–0.80 times as long as the body; apterae without secondary rhinaria, alatae with round secondary rhinaria on segment III, often also on segment IV (0–15) and V (0–13); and rarely one on segment VI; processus terminalis always longer and may be upto-6.5 times as long as base of last antennal segment; flagellar hairs 0.010–0.100 mm long. Ultimate rostral segment normal ht_2 0.75–0–1.50 times as, long as and usually with 2 accessory hairs. Midthoracic furca in apterae often sessile. Apterae with dorsum of abdomen pale, with polygonal reticulation, alatae with pleural intersegmental pigmentation and often with dusky transverse band on 7th and 8th tergites; dorsal hairs variable in length from 0.010-0.100 mm, with bluntish or acute apices; 8th tergite usually bears 2 hairs, (except in *rufiabdominalis* which bears 4-8 hairs). Siphunculi often pigmented, variably imbricated, weakly to strongly clavate, 0.04 0.25 times as long as the body, and with well developed apical flange. Cauda usually short, 0.35–0.90 times as long as the siphunculi and bears 4-12 hairs. Legs pigmented, first tarsal segments with 3 3,3 or 3,3,2 hairs. Wing venation normal. Larvae with hind tibiae smooth; nymphs with long fine hairs on hind tibiae.

Oviparae apterous. Alate males have weakly developed pigmentation on abdomen.

Distribution : The genus is now composed of about 13 species, of which 4 including are known from India, Blackman and Eastop (1985) opined that probably all the species are north american in origin except for *Rhopalosiphum padi* (L) which may be palaearctic in origin and *R. maidis* (Fitch) and *R. rufiabdominalis* (Sasaki) of far-eastern origin and informed, without any reasoning, that 'other species are probably only synonyms'; a world revision of the genus can only clarify the status of the presently recognised species. All the members of the genus are characterised by the rhopalosiphine projection in antennal tubercles and dorsally placed lateral abdominal tubercles.

Many of the species are considered to be economically important pests on Rosaceeae and Poaceae; some are well known vectors of persistant barely yellow dwarf viruses (*R. insertum, R. maidis. R. padi) R. rufiandomibalis)* and several non-persistant viruses of grains (*R. padi).*

At least 10 species of parasitoids have been recorded from 3 species of *Rhopalosiphum* in India (Stary & Ghosh, A. K., 1980) and 16 species of coccinellid predators have been recorded for two of the above three species (*R. maidis* and *R. nymphaeae* Agarwala and Ghosh, A. K., 1975, 1978). 5 species of syrphid predators for *R. maidis* are on record in Indian region. 30 hymenopteran parasitoids species for *R. insertum* Wlk., *R. maidis* (Fitch), *R. nymphaeae* (Linn.) and *R padi* (Linn.,) and others are known. Ant Association is not uncommon. Cytologically 2n = 8 to chromosomes, and population of *R. maidis* with structurally different karyotypes are recognised (Blackman, 1980).

Biology : The generalised biology is heteroecious hotocycle, members alternating between Pyroidea (as primary host) and Poaceae and Cyperaceae or sometimes on other, as secondary hosts. In tropical region paracycle involving only viviparae are not uncommon and for *R. maidis,* anholocycly is considered to be a world wide phenomenon (even though males are occasionally recorded but without oviparae and eggs. Often these insects infest roots of poaceous plants and grasses and some species like *R. rufiabdminalis* (Sasaki) leads an anholocyclic life cycle on roots of secondary host plants including rice in south east Asia, and in most parts of the world.

Distribution : Widespread in India : Cosmopolitan. Regional accounts are available for N.E. India: Raychaudhuri *et al.* (1980); Japan : Takahashi (1965); Australia : Eastop (1966); Canda, North America : Richards (1960, 1962); England : Stroyan (1984).

Type-species : *Aphis nymphaeae* Linnaeus; location of types not known.

Key to the species of the genus *Rhopalosiphum* Koch

Apterous viviparous females

1. Antennae 5-segmented; abdominal dorsum densely covered with long and fine hairs ..... *rufiabdominalis*

– Antennae 6-segmented; abdominal dorsum without such hairs as above 2

2. P.t. about 2.5 times as long as base VI; body about 10–15 times as long as siphunculi ..... *maidis*

– P.t. at least 3 times as long as base VI 3

3. P.t. never less than 3.9 times as long as base VI; body at best 8.5 times as long as cylindrical siphunculi; dorsal abdominal hairs with blunt apices ..... *padi*

– P.t. less than 3.5 times as long as base VI; body about 5.6 times as long as swollen siphunculi; dorsal abdominal hairs with acuminate apices ..... *nymphaeae*

Alate viviparus Females

1. Antennae 5-segmented; p.t. never less than 3.0 times as long as and may be upto about 7.0 times as long as base of segment V and 1.03–1.49 times as long as segment III; dorsal abdominal hairs long and fine and longest of these on 7th and 8th tergites about 2.10–2.38 times as long as and 2.25–3.85 times as long as b.d.III respectively; body about 6.90–9.90 times as long siphunculi; segment III with 11-30, IV with 1–8 and V with 3–8 secondary rhinaria. .... *rufiabdominalis*

Antennae 6-segmented 2

2. Processus terminalis 1.70-2.38 times as long as base of segment VI and always shorter than segment III; abdominal dorsum with blunt and fine hairs; body

about 12.0–18.0 times as long as siphunculi; segment III with 11–28, IV with 1–12 and V with 1–5 secondary rhinaria ..... *maidis*

– Processus terminalis never less than 3.0 times as long as and most upto 5.23 times as long as base of segment VI and always longer than segment III 3

3. Siphunculi cylindrical; body about 8.53–8.91 times as long as siphunculi; processus terminalis about 4.62-5.23 times as long as siphunculi; processus terminalis about 4.62-5.23 times as long as base of segment VI; segment III with 14–19, IV with 1–9 and V with 1–6 secondary rhinaria; cauda 0.52–0.63 times as long as siphunculi ..... *padi*

– Siphunculi with a basal cylindrical stem and a distal swollen portion; body about 5.59-7.95 times as long as siphunculi; processus terminalis about 3.45–3.88 times as long as base of segment VI; segment III with 14-27. IV with 0–6 and V with 2–8 secondary rhinaria ..... *nymphaeae*

Key to the species of Sexuales

Apterous oviparous females

1. Antennae 5-segmented; p.t. at least 6 x base of last antennal segment .... *rufiabdominalis*

– Antennae 6-segmented 2

2. P.t. 4.5–5.5 x base VI; subgenital plate with 8 hairs ..... *padi*

– P.t. 1.5–3.2 x base VI; subgenital plate with not less than 10 hairs 3

3. U.r.s. about 0.69 x h.t.2; subgenital plate with 15 hairs; p.t. 1.5 x base VI; siphunculi about twice its maximum width ..... *maidis*

– U.r.s. 1.0–1.2 x h.t.2 : subgenital plate with 30–38 hairs; p.t. 2.6–3.2 x base VI; siphunculi with a basal stem and a distal swollen portion ..... *nymphaeae*

Alate male

– Antennae 5-segmented; p.t. 6.25 x base of last antennal segment; secondary rhinaria distributed as : III 52–54, IV 14–15 and V 2–3; siphunculi cylindrical ..... *rufiabdominalis.*

– Antennae 6-segmented; p.t. 3.4–4.4 x base VI; secondary rhinaria distributed as : III 29–40, IV 11–20 and V 9–16; siphunculi somewhat swollen ..... *nymphaeae*

45. ***Rhopalosiphum maidis*** (Fitch)
(Corn leaf Aphid or wheat Aphid)
(Figs. 292-307, 365)

1855. *Aphis maidis.* Fitch, A. *New York Agric. Soc. Trnas.,* **16** : 551.

1931. *Aphis maidis.* Hottes, F.C., and Frison, T.H., *Bull nat. Hist. Surv.* **29** : 205.

1952. *Rhopalosiphum maidis* : Palmer, M.A., *Thomas Say Foundation,* **5** : 217.

1953. *Rhopalosiphum maidis* : Cottier, W., *Bull. N. Z. Dep. Sci Industr. Res.,* **106** : **162.**

1954. *Rhopalosiphum maidis* : Eastop, V.F., *Proc. R. Ent. Soc. Lond.* (A) **29** : 84.

1957. *Rhopalosiphum maidis* : Borner, C., in Sorauer, *d. pflanz.,* **5** : 98.

1980. *Rhopalosiphum maidis* : Raychaudhuri, D. N. *(ed.)* Aphids of North-east India and Bhutan, The Zoological Society, Calcutta : 69.

1997. *Rhopalosiphum maidis* : Remaudiere, G. and Remaudiere, M. Catalogue of the World's Aphididae, Homoptera : Aphidoidea, Inra, Paris : 62.

2000. *Rhopalosiphum maidis* : Ghosh L. K. and Basu, R. C., *State Fauna Series* **7**, *Fauna of Tripura,* ZSI : 356.

Synonyms : *Aphis adjusta* Zehntner, 1901; *A. maidis* Fitch, 1856 of Indian authors; *Aphis sorghi* Theobald. 1915; *Siphonaphis maidis* Fitch (of Goot, 1917).

Other References : Banerjee & Basu, 1955; Basu & Banerjee, 1958; Basu, R.C. and Raychaudhuri, D. N. 1980; Behura and Dash, 1986; Chona & Rafay, 1951; Chowdhury *et al.* 1969; Das, 1918; David, 1954, 1956, 1958; Deshpande, 1937; Fletcher, 1920; George, 1927; Ghosh, L. K. 1969; Goot, 1917; Kapur, 1942; Krishnamurti & Usman, 1955; Krishnamurty, 1928; Lefroy, 1909; Menon and Ghai, 1969; Pal, 1954; Puttarudriah & Channa Basavanna, 1955; Rahman, 1940; Sengupta & Behura, 1957; Sengupta & Dash, 1960; Ullah, 1940; Ghosh, L. K. *et al.,* 1997; Chakrabarti and Sarkar, 2001.

Diagnosis : *Apterous viviparous Female* : Colour in life : Yellowish green usually with conspicuous dark blotches around bases of siphunculi; head, antennae, legs, siphunculi and cauda dark green, brown or black; slightly pulverulent.

Body spindle-shaped, 1.5-2.5 mm long with 0.7-0.9 mm as maximum width. Frontal tubercles well developed, scabrous, each with a long slender, pointed seta, median tubercle well developed, hairs on disc of head slender, pointed. Antennae shorter than body, five-or six-segmented; antennal hairs normally pointed, those of segments I, II, V, VI, from two to three times as long as the basal diameter on segment III; hairs on segment III-IV from 1½ times to twice the basal diameter of segment III. Rostrum reaching just beyond front coxae, ultimate rostral segment with two secondary hairs. Dorsal prothoracic hairs normally pointed, sometimes blunt or even distinctly minutely capitate. Tibial hairs erect, pointed. First tarsal segments of fore and middle legs each with three hairs; normally only two hairs on first tarsal segment of hind leg. Hairs on abdominal terga normally pointed. Abdomen largely membranous except for pigmented spiracular sclerites. Siphunculi sometimes roughly cylindrical, usually tapering towards attenuation just proximad of flange, often roughly elliptical with the base and attenuated part narrower than swollen middle portion; with strongly spiculose imbrications; cauda elongate, strongly spiculose, slightly constricted at middle, with two or three, slender curved hairs on each side.

Alate viviparous female : Colour in life : Head, antennae, thorax, rostrum, legs abdominal intersegmental and lateral sclerities, cauda and anal plate black; abdomen largely light to dark green.

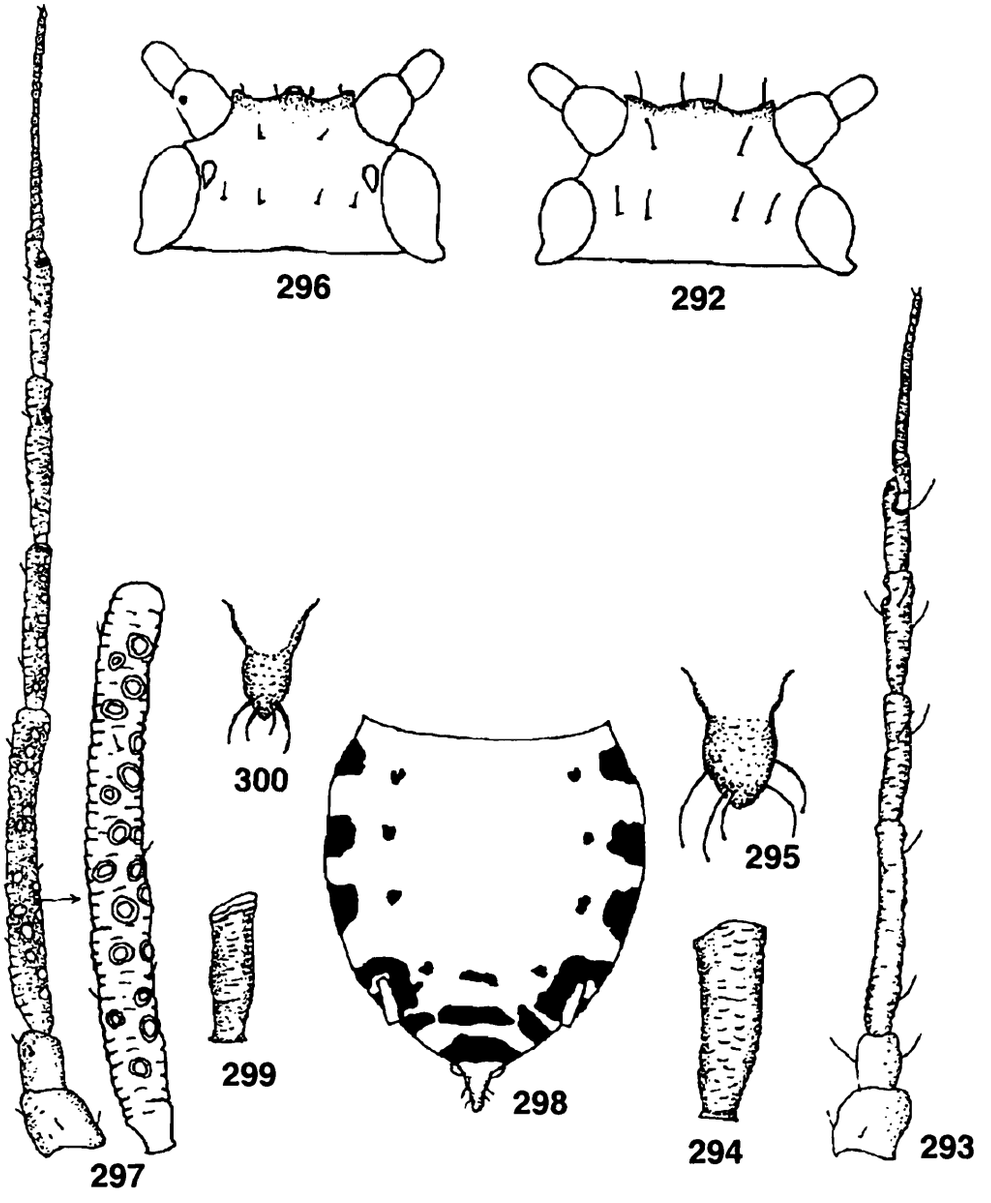
Body 1.5–2.5 mm. Frontal tubercles well developed, scabrous, each with a pointed hair that is equal to or longer than basal diameter of antennal segment III; hairs on disc of head pointed, distinctly longer than basal diameter of antennal segment III. Antennae 6-segmented, segment III with 12-23, IV with 0-10, V and VI with 0-4 rhinaria. Hairs on antennal segment normally pointed, those on segments I and II up to twice as long as the basal diameter of segment III, those on IV-VI usually about equal to basal diameter, those on segment III normally shorter than basal diameter of III. Prothorax with well developed lateral tubercles. Wings hyaline; media of forewings usually two-branched. Hairs on tibia normally pointed and mostly shorter than apical diameter of tibia. First tarsal segments of fore and middle tibia each normally with three hairs, first segment of hind tarsus normally with two hairs; abdomen membranous except for intersegmental sclerities, lateral selerites pigmented sclerotic bars on tergites VI-VIII normally pointed, normally at least $1^1/_2$ times the diameter of siphunculi just proximad of flange. Siphunculi usually elliptical, narrower at base and apically attenuated portion than in middle; normally with strongly spiculose imbrications; cauda elongate, normally constricted at middle, with two or three slender, curved, pointed hairs on each side, strongly spiculose. Dorsum of abdomen weakly reticulate. Anal plate strongly spiculose.

Apterous oviparous female : Colour (in macerated specimens) : Almost hyaline except for the head, the two basal antennal segments, all coxae and trochanters, tibial apices of front and middle legs, apical halves of hind femora, whole of hind tibiae, all tarsi, siphunculi, two large blotches on the subgenital plate, subanal plate, cauda, two subparallel and sublateral dorsal rows of segmental small spots on each side of the thoracic and abdominal segments running up to the bases of the siphunculi and spiracular sclerites, dark brown. The two apical antennal segments, apical half of second and the whole of the third and fourth rostral segments, fore, middle as basal half of hind femora, lighter brown (after Menon & Ghai 1969).

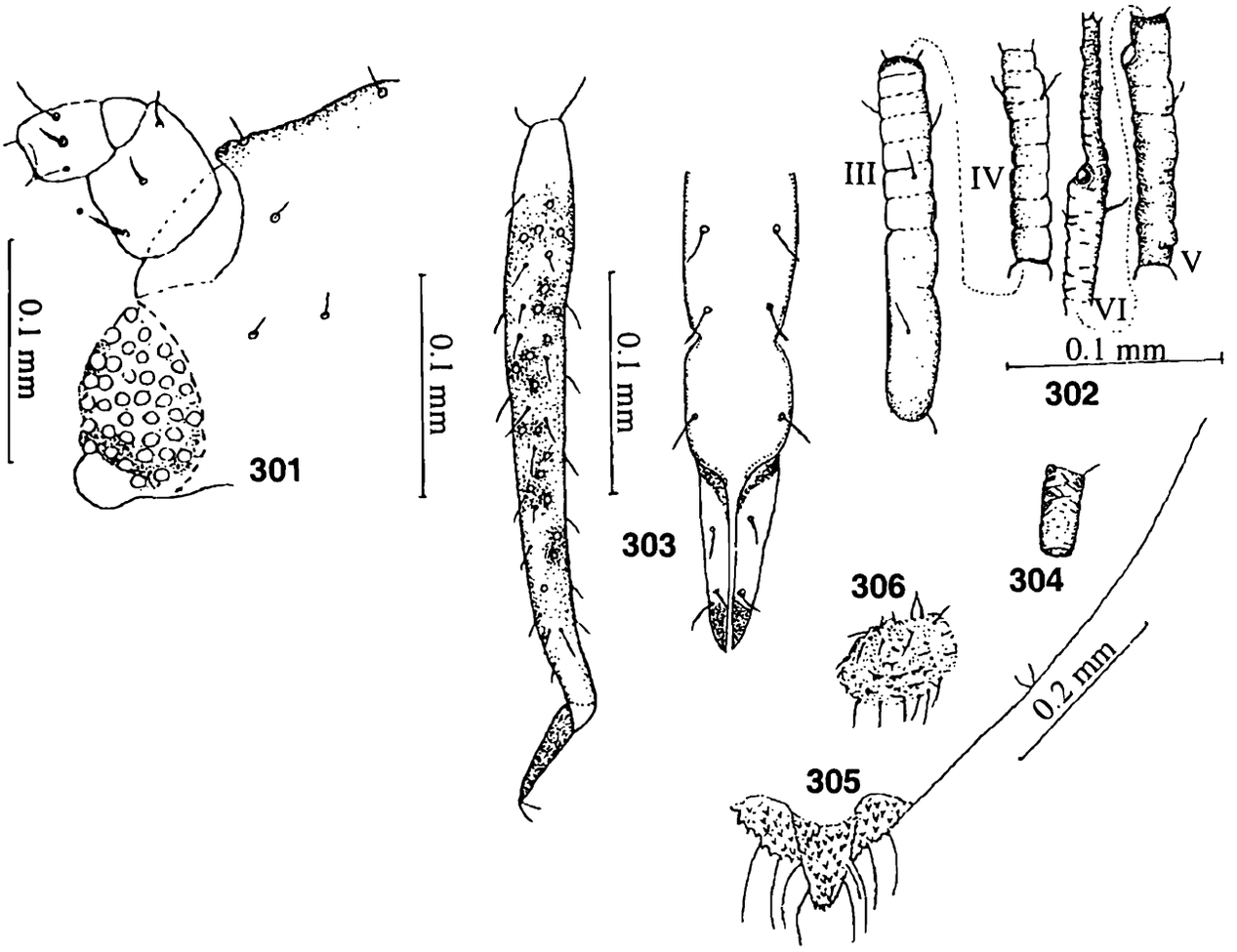
Body oval, short, 1.48-1.54 mm long with maximum width 0.75-0.80 mm near the middle of abdomen; rather hyaline except head, the two basal antennal segments, a.s. V. and VI, whole of 3rd and 4th rostral segments, all coxae and trochanters, tibial apices of front and middle legs, whole of femora and hind tibiae, tarsi, siphunculi, sub-general and subanal plates, cauda, spiracular sclerites dark brown. Median frontal prominence not developed, smooth. Antennae a little longer than half the length of body, six-segmented, p.t. about 4.3 times as long as the base VI and twice as long as segment III. Longest hair on segment III about less than half of b.d. III. Rostrum reaches mid coxae; u.r.s. about twice as long as its width at base and just longer than h.t. 2, with two secondary hairs. Dorsal abdominal hairs sparse, small, about only 6 to 8th tergite with 2 fine hairs. Abdominal tubercles indistinct. Siphunculus sybcylindrical, two and a half times as long as its basal diameter, strongly imbricated,

with poorly developed apical flange. Subgenital plate with about 13 pointed hairs on each pigmented area. Subanal plate rounded, with 5 long slender, slightly curved and pointed hairs on each side. Egg (single *in situ*) ovoid and about 90μ in diameter. Cauda about 1.4 times as long as its basal width, broadened at base and gradually narrowed apically, 0.8 of siphunculi and bears 5 curved long and pointed hairs. Legs relatively shorter than those of apterous viviparous females. Hairs on hind tibiae short (12μ-30μ) stiff, thorny, about half as long as the maximum width of the hind tibiae, with numerous subcircular small pseudosensoria scattered irregularly almost over the entire length except the bsae and apex. F.T.C. 3, 3, 2.

Host plant-aphid association : Association of aphid with host plants play vital role in holocycly of aphid. Consideration of host plant association at plant family level indicates that plants belonging to about 60 species in 36 genera under 10 families are



Figs. 292-300. *Rhopalosiphum maidis* (Fitch) : Aptera : 292, Head; 293, antenna; 294, siphunculus; 295, cauda; Alata : 296, Head; 297, antenna; 298, posterior portion of abdominal dorsum; 299, siphunculus; 300, cauda.



Figs. 301-306. *Rhopalosiphum maidis* (Fitch) : Apterous oviparous Female : 301, portion of head; 302, antennal segments iii-vi; 303, rostrum showing u.r.s.; 304, siphunculus; 305, cauda; 306, genital plate showing hairs.

infested by *R. maidis* (Fitch). Of these, the corn aphid infests maximum number of 36 species belonging to Poaceae and minimum species each of the families Abismataceae, Caryophyllaceae, Combetaceae, Commelinaceae, Cupressceae, Polygonaceae, Portaliaceae, Rosaceae and Solanceae, the most favoured hosts for this aphid are, therefore, poaceous plants. Thus., *R maidis* is impressively host specific on its primary host. Now, whether a plant or plants (other than poaceous) will or will not be successfully colonised by this aphid may depend on ecological or physiological conditions of both aphids and host plants.

Host plants : *Andropogon bicolor* (Poaceae); *Andropogon durr* (Poaceae); *Andropogon halepense* (Poaceae); *Andropogon vulgare* (Poaceae); *Andropogon* spp. (Poaceae); *Avena sativa* (Poaceae); *Bromus uniloides* (Poaceae); *Cajanus cajan* (Fabaceae); *Capsicum frutescence* (Solanaceae); *Cenchrus ciliaris* (Poaceae); *Coix lachyma-jobi* (Poaceae); *Cynodom dactylon* (Poaceae); *Cyperus rotundus* (Cyperaceae); *Dactyloctenium aegypticum* (Poaceae); *Dichanthium* sp. (Poaceae); *Digitaria* sp. (Poaceae); *Echinocholoa colonum* (Poaceae); *Echinochloa cerusqualli* (Poaceae); *Echinocholoa* sp. (Poaceae); *Eleusine coracana* (Poaceae); *Eleusine aegyptiaca* (Poaceae); *Eleusine indica* (Poaceae); *Gizolia abyssinica* (Commelinaceae); *Hordeum vulgare* (Poaceae); *Lycopersicon*

esculentum (Solanaceae); *Nicotiana tabacum* (Solanaceae); *Oryza sativa* (Poaceae); *Panicum atidotae* (Poaceae); *Paspalum scroiculatum* (Poaceae); *Pennisetum glaucum* (Poaceae); *Pennisetum typhoideum* (Poaceae); *Penisetum* sp. (Poaceae); *Poa* spp. (Poaceae); *Polypogum uncinatum* (Polygonaceae); *Potalia* sp. (Portaliaceae); *Pyrus communis* (Rosaceae); *Prunus puddum* (Rosaceae); *Saccharum officinarum* (Poaceae); *Saccharum* sp. (Poaceae); *Sagittaria saggittifolia* (Alismataceae); *Setaria italica* (Poaceae); *Setaria verticillata* (Poaceae); *Setaria* spp. (Poaceae); *Silene conoides* (Caryophyllaceae); *Solanum nigrum* (Solanaceae); *Solanum vulgare* (Solanaceae); *Solanum tuberosum* (Solanaceae); *Sorghum biclor* (Poaceae); *Sorghum vulgare* (Poaceae); *Terminalia arjuna* (Combretaceae); *Triticum aestivum* (Poaceae); *Triticum vulgare* (Poaceae); Triticum spp. (Poaceae); *Zea mays* (Poaceae);

Symptom and Damage : The nymphs and adults of the species suck the sap from leaves as a result of which they turn yellow and ultimately get dried. The infested plants remain stunted in growth. In case of severe injury yellowish patches on leaves appear and the main shoot dries up resulting in the production of late tillars bearing earheads devoid of grains. The losses in grain yeild vary from 3-63% in some promising and commercial varieties. The pest also causes much decrease in fodder yield varying from 7-43% (Bhatia and Singh, 1977). This aphid species in fact is a pest of maize and wheat but also occasionally infests paddy crop in certain areas, where rice crop is grown after maize or wheat in northern India. It's nature of damage is similar to *Hysteroneura setariae* (Thomas) in rice and considerable loss in yield takes place if infestation is in large population.

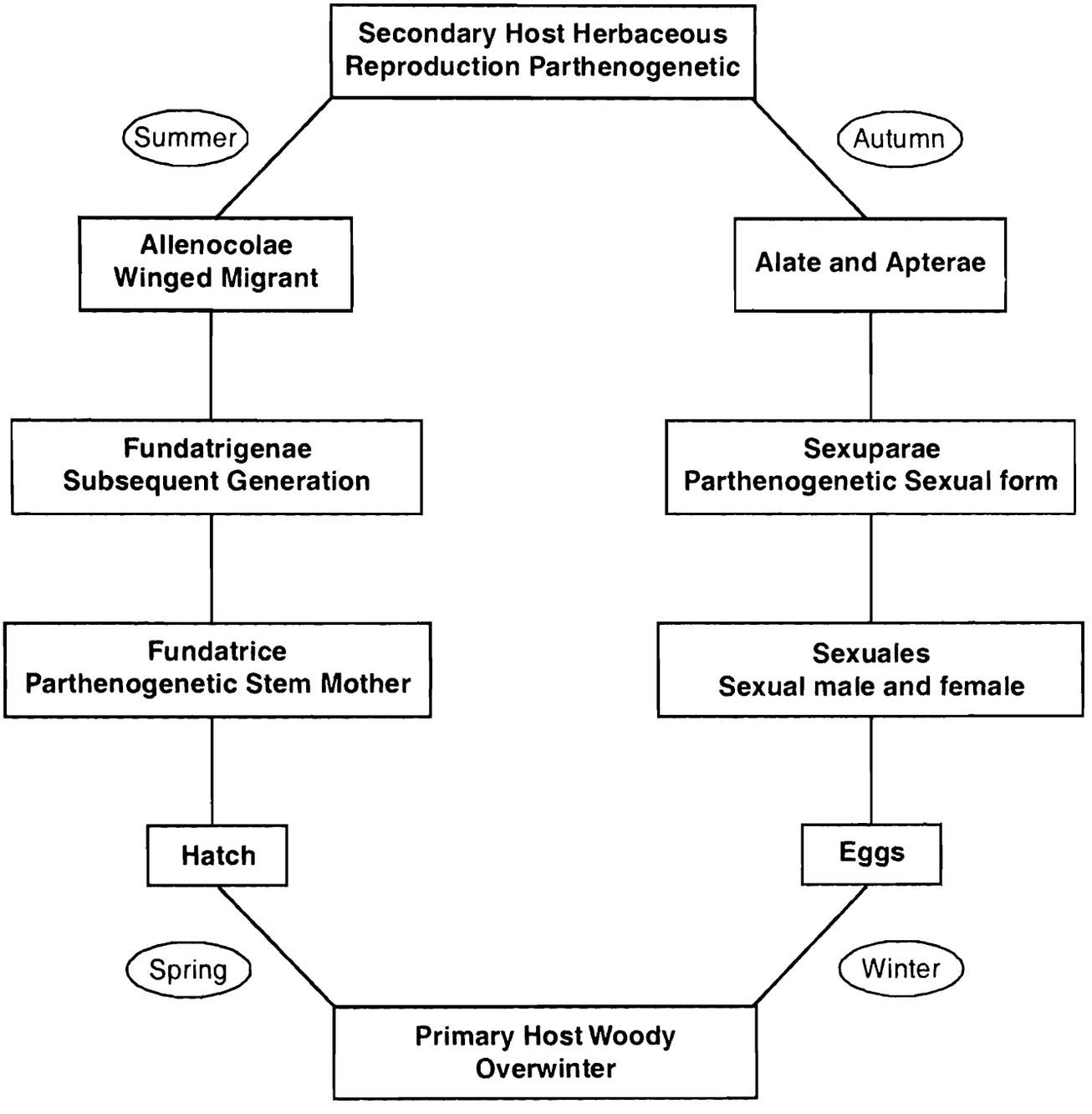
Biology : The aphid is green to dark yellowish in colour. Both apterous and alate viviparous females together with nymphs constitute a colony where winged adults relatively few in number in a population. The adult larviposits 1-5 per day and 24-47 in its life span. The nymphal period is 9-10 days. The adult gives birth to nymphs for 10-25 days and lives for another 3 days. It usually takes 19-35 days to complete a life cycle.

Life cycle : The corn leaf aphid like most other aphids is remarkable for its polymorphism and complicated life cycle. In temperate regions, aphids commonly lead holocyclic mode of life cycle but in tropical areas these insects usually enjoy anholocyclic life cycle throughout the year. It has both anholocyclic i.e., parthenogenetic reproduction and holocyclic i.e., sexual life cycle. It produces five or six morphs *viz.* male, female, fundatrix, apterous and alate parthenogenetic forms, apterous and alate gynoparae giving rise to sexual females or oviparae and males.

In Indian conditions, aphid is predominantly anholocyclic, producing apterous and alate parthenogenetic viviparous females. The immature nymphs laid by them moult four times to attain adult state. Regarding sexuales alate males were recorded from Lahore (now in Pakistan) by Das (1918). Alate males of the species were also recorded from Kenya (Africa) by Eastop (1954). Apterous oviparous females of the species are knwon from Delhi and Netarhat (Bihar) during the colder part of the year (Menon and Ghai 1969, Ghosh, L. K. 1971.)

The cornleaf aphid thus apparently enjoys anholocyclic as well as holocyclic life both in the plains and hills of India. The species presumably overwinters and spends the summer on grasses, sedges and some semiaquatic plants. The picture about complete life cycle of this aphid would be clear only when if it is ascertained the capability of the oviparae to produce viable eggs although available information in respect of at least of a few species suggests that viable eggs are laid in tropical ecosystem of India and fundatrices are produced on primary host.

Although production of sexual forms is treated as an indicator of possible holocyclic reproduction, true sexual reproduction in this species can only be speculated. In that case, complex holocyclic life cycle is yet to be established in India. However, a possible life cycle of *R. maidis* in the country has been given herein under.



Figs. 307. Possible Life cycle of *Rhopalosiphum maidis* (Fitch)

Natural enemy complex : A number of parasites and predators are associated with *R. maidis* (Fitch). Among the parasites *Aphidencyrtus* spp; *Aphidius colemani, Aphidius uzbekistanicus, A. transcaspicus, Ephedrus* sp., *Lipolexis scutellaris [Toxares deltiger], Toxares macrosiphophagum [Toxares shigai], Lysiphlebia delhiensis, Aphidenervtus* sp. are important.

Predator : *Cheilomenes sexmaculata* (Fabr.), *Coccinella septempunclata* Linnaeus, *C. transversalis* Fabr., *Nephus regularis* (Sicard), *Oenopid aexareata* Mulsant, *Scymnus castaneus* (Sicard), *Scymnus quadrillum* Motsch [Coleoptera : Coccinellidae], *Ischiodon scutellaris* (Fabr.), *Syrphus balteatus* (Dee Geer) [Diptera : Syrphidae].

Parasitoid : *Aphidius transcaspicus* Telenga, *Aphidenervatus* sp., *Sysiphlebia mirzai* Shuja Uddin, *Lysiphlebus delhiensis* Subba Rao and Sharma [Hymenoptera]

Vector : The corn aphid acts as a potential vector of the virus causing the following mosaic diseases :

Bajra mosaic; Barley mosaic; Barley yellow dwarf; Broadbean mosaic; Canna mottle; Cucumber mosaic; Cynodon mosaic; Eleusine mosaic; Large cardamom streak mosaic; Maize mosaic; Millet red leaf; Mulberry mosaic; Onion yellow dwarf; Panicum crusagalli mosaic; Pea mosaic; Pumpkin mosaic; Ragi mosaic; Sorghum red stripe; Sugarcane mosaic.

The aphid also transmits *Chirke* virus of large cardamom and certain wheat varieties.

Remarks : *Rhopalosiphum maidis* (Fitch), commonly known as corn-leaf-aphid or wheat aphid, attacks cultivated and wild graminaceous plants from all over tropical and temperate parts of the world. It is a well known pest of several cereal crops in India and the commonest aphid species on Maize. It causes appreciable injury by attacking the inflorescence. This aphid has been known to cause economic losses in maize, sorghum, barely, oats, wheat and crop upto 80% have been reported due to aphids. Barley which is grown for fodder and grain, suffers losses upto 25% by this aphid (Bhatia *et al.* 1971). It appears on cereal crops early in spring and remains in large numbers long after fall migrations of other species are well advanced. The species is also a serious pest of barley crop.

Material : Many apterae and oviparae, Bihar, Netarhat, March, 1971, from *Pyrus communis,* Coll. L.K. G.

Measurements (in mm) of an ovipara : Length of body 1.53 mm; width 0.78; antenna 0.94; segment III 0.16, IV 0.13, V 0.11. VI (0.07 + 0.33); u.r.s. 0.09; second joint of hind tarsus 0.07; siphunculus 0.13; cauda 0.10.

Alate male : (Adopted from Das, 1918) Slender attenuated, shining, dark-reddish, almost black; the usual type of genital armature is conspicuous at the anal end.

Head rather broad, quite black, with dark red eyes. Antennae about the same size as those of the alate viviparous female, but the joints appear thicker, more rounded, and separated from each other by hyaline arthrodial membranes.

Length of proportions :

	III	IV	V	VI
	22	12	10	6+9
Lengths	0.37	0.20	0.16	0.11 + 0.31 mm

Antennal segments are studded over on all sides by secondary rhinaria of various sizes; 3rd bears about 45, 4th about 18 and 5th about 13. None present on 6th, except the primary sensorium with its group of smaller ones.

Wings normal. The membrane appears more smoky; stigma and veins brown.

Abdomen long-oval. Four large circular spots in front of the siphunculi at the carinae, with two or three black stripes on the segments in front of the cauda. Siphunculi cylindrical, with vasiform tip, somewhat incrassate near middle; the size smaller than those of the alate female. Cauda thick, rounded, very much elevated towards the dorsal side, small and stumpy looking; its length slightly less than siphunculi.

Anal plate narrow, directed backwards. The genital armature with a central conical penis; two spiny lateral somewhat triangular lobes on the sides, meeting in a deep black cresentic line in front postero-laterally run two blackish hooks; hind ends curve to touch the sides of the penis.

Remarks : Menon and Ghai (1969) for the first time recorded apterous oviparous females on what at Delhi. Das, B. (1918) recorded alate from Lahore (now in Pakistan) and made some valuable comments on the possible life-history including sexual generation. Ghosh, L.K. (1977) described the sexual female from Bihar.

Management : Spray with 40% nicotine (1 : 800) or 0.02% phosphamidon or 0.03% dimethoate or diazinon is effective for controlling this aphid. It is not recommended to spray the insecticides if the flowers are in bloom. To prevent the occurrence of aphids it is recommended to mix throughly with the soil around the plants aldicarb 5%, earbofuran 3% or phorate 10% granules @ 2 to 3g. per plant. This will also control the other sap sucking pests, if any.

For its biocontrol, two parasitoid species *Lysiphlebia mirzai* Shuja-uddin and *Lysiphlebus delhinesis* Subba Rao & Sharma (Hymenoptera : Braconidae) were evaluated by Tripathi & Singh (1995) and Mishra & Singh (1990) respectively.

46. ***Rhopalosiphum nymphaeae*** (Linnaeus)
(Fig. 366)

1874. *Aphis nymphaeae* Linnaeus, *Fauna suecica,* **2** : 260.

1958. *Rhopalosiphum nymphaeae* (Linnaeus) : Ghosh, A. K. and Raychaudhuri, D.N. *J. Bombay nat. Hist. Soc.,* **56** (8) : 660-664

1986. *Rhopalosiphum nymphaeae* (Linnaeus) : Ghosh, L.K., Tech. Monogr. No. **16,** Zoological Survey of India : 37.

1971. *Rhopalosiphum yoksumi* Ghosh, A.K., Banerjee and Raychaudhuri, D.N., *Proc. zool. Soc., Calcutta,* **24** : 102.

1980. *Rhopalosiphum nymphaeae* (Linn.) : Raychaudhuri, D.N. *(ed.)*. Aphids of NE India and Bhutan : 69.

1997. *Rhopalosiphum nymphaeae* (Linn.) : Remaudiere and Remandiere, Catalogue of the world's Aphididae : 62.

2003. *Rhopalosiphum nymphaeae* (Linn.) : Ghosh, L. K. and Basu, R. C., State Fauna Ser. **9,** Fauna of Sikkim, Zoological Survey of India : 275.

Apterous viviparous female : Colour in life dusky brown. Body 2.15-1.31 mm long with 1.36-1.38 mm as maximum width at middle of abdomen. Head dark brown, with low scabrous frontal tubercles and a scabrous median prominence; antennae 0.57-0.60 times as long as the body, darker than the head, but pale at basal 0.33 portion of segment III and very apices of flagellar segments III-V; segment III almost smooth on pale region, rest of the flagellum gradually more distincly imbricated; processus terminalis 3-3.1 times as long as base of segment VI and 1.1-1.3 times as long as III antennal segment; hairs on flagellum 9-10μ long, sparse with acuminate apices, longest ones 0.37 times as long as the basal diameter of III antennal segment. Eyes large with distinct ocular tubercles. Rostrum reaches hind coxae; ultimate rostral segment 0.14-0.15 mm long, parallel-sided, 1-1.1 times as long as second segment of hind tarsus and bears a pair of secondary hairs. Mid-thoracic furca with a broad but distinct base. Dorsum of abdomen pale with distinct polygonal reticulation and also with small dark, paired, segmental muscleplate-like areas on pleural region; 7th tergite with transverse, spinulose striations and some scattered spinal sclerites, and 8th tergite with similar striations and a broad band-like brown median sclerite; hairs on dorsum of abdomen with apices similar to those on antennal flagellum, sparse, hardly 15 μ long and 0.60 times as long as the basal diameter of III antennal segment; 8th tergite with two hairs 25-28μ long and equal in length to the mentioned diameter. Marginal tubercles distinct, always present on abdominal tergites 1 and 7; often small ones present on 4th and 5th tergites, sometimes on 3rd and 6th tergites. Siphunculi (Pl. 2, fig. 3) dark brown, 0.34-0.41 mm long, almost parallel—sided but often gently tapering near apical 0.20-0.25 portion, distinctly attenuated before the thick apical flange, 0.160-0.18 times as long as body and 2-2.14 as long as the cauda; surface of siphunculi distinctly but sparsely and coarsely imbricated. Cauda elongate, blackish brown, sclerotic, 0.18-0.19 mm long, bearing 6-9 hairs. Legs yellowish brown, darker on apical 0.66-0.75 portion of femora and apical 0.15-0.20 portion of tibiae; femora with apical spinulose imbrications, and mostly with short hairs, (15-18μ long) and some long fine hairs (31-37μ long); first tarsal segments bear 3, 3, 2 hairs.

Measurements of one specimen in mm : Length of body 2.3; width of body 1.4; antenna 1.45; antennal segment III : IV : V : VI 0.36: 0.25 : 0.22: (0.12 + 0.37); ultimate rostral segment 0.15; second segment of hind tarsus 0.14; siphunculus 0.41; cauda 0.19.

Alate viviparous female : Body 1.75-1.87 mm long with 0.83-0.86 mm as maximum width at the middle of abdomen. Head and thorax blackish brown; antennae light

brown, 0.72-0.75 times as long as body; flagellum gradually more distinctly imbricated from base of III antennal segment; segment III with 15-18 secondary rhinaria distributed irregularly over entire length; processus terminalis about 3 times as long as base VI. Abdominal dorsum pale with distinct sclerotic bases of spiracles; polygonal reticulation less conspicuous than in apterae. Siphunculi pale yellowish (much lighter than in apterae), 0.30 mm long, with rows of spinulose imbrications except on the swollen, apical 0.33 portion which is nearly smooth. Cauda dusky, with 6 hairs. Wing venation normal; Other characters as in apterous viviparous female.

Measurements of one in mm : Length of body 1.8; width of body 0.83; antenna 1.36; antennal segments III : IV : V : VI 0.31 : 0.20 : 0.19 : (0.12 + 0.40); ultimate rostral segment 0.14; second segment of hind tarsus 0.13; siphunculus 0.30; cauda 0.15.

Material : Apterous viviparous females, from leaves of *Poa* sp.; Yoksum (c 1981 m), Sikkim; 13 April 1970; coll. H. Banerjee apterous oviparous females and alate males, on *Prunus* sp., Shillong 12.12.1968, Coll. R.C. B.

Apterous oviparous female : Body broadly oval, pale, rather short, 1.2-1.4 mm long with 0.8–0.9 mm as maximum width. Antennae 6-segmented, often segmentation between III & IV inconspicuous, 0.6-0.8 times as long as body, p.t. 2.6-3.2 times as long as base of a.s. VI; rostrum reaching beyond hind coxae, u.r.s. 1.1 to 1.2 times as long as h.t. 2. Dorsum of abdomen pale; siphunculi weakly clavate, almost smooth, 0.15-0.2 times as long as body and 1.8-2.4 times as long as cauda bearing 5 hairs. Hind tibiae swollen and with numerous pseudosensoria.

Measurements (in mm) of an ovipara : Length of body 1.25 mm; width 0.80; antenna 0.80; a.s. III 0.17, IV 0.10, V 0.11, VI (0.08 + 0.24); u.r.s. 0.11; h.t. 2 0.09; siphunculus 0.21; cauda 0.11.

Alate male : Body rather elongate, dark, 1.5–1.9 mm long with 0.6–0.8 mm as maximum width. Antennae 6-segmented, 0.7–0.9 times as long as body, p.t. 3.4-4.4 times as long as base of the segment, secondary rhinaria distributed on a.s. III 30-40, IV 11-20 and V 9-16; rostrum long, reaching 2nd coxae, u.r.s. 1.2 to 1.4 times as long as h.t. 2. Dorsum of abdomen well pigmented, with marginal dark patch on 8th tergite; siphunculi clavate, dark, smooth, about 0.13-0.16 times as long as the body and 2.1-2.6 times as long as cauda bearing 4 hairs.

Measurements (in mm) of an alate male : Length of body 1.56 mm; width of body 0.60; antenna 1.39; a.s. III 0.30, IV 0.20, V 0.20, VI (0.10 + 0.42); u.r.s. 0.13; h.t. 2. 0.10; siphunculus 0.23; cauda 0.09.

Remarks : Alate males of this species had been reported earlier from India (David 1958, Basu *el al.* 1970, David *el al.* 1971), but oviparae were reported by Basu and Raychaudhuri (1980). Theobald (1927) has provided descriptions of male and oviparae from Europe and Richards (1960) also described the oviparae in detail from Canada.

Management : As in *R. maidis* (Fitch)

47. ***Rhopalosiphum padi*** (Linnaeus)
(Figs. 308-324)

1758. *Aphis padi* Linnaeus, *Syst. Nat.* (10 ed.), **1** : 451.

1953. *Rhopalosiphum padi* (Linn) : Cottier. Aphids of New Zealand : 155.

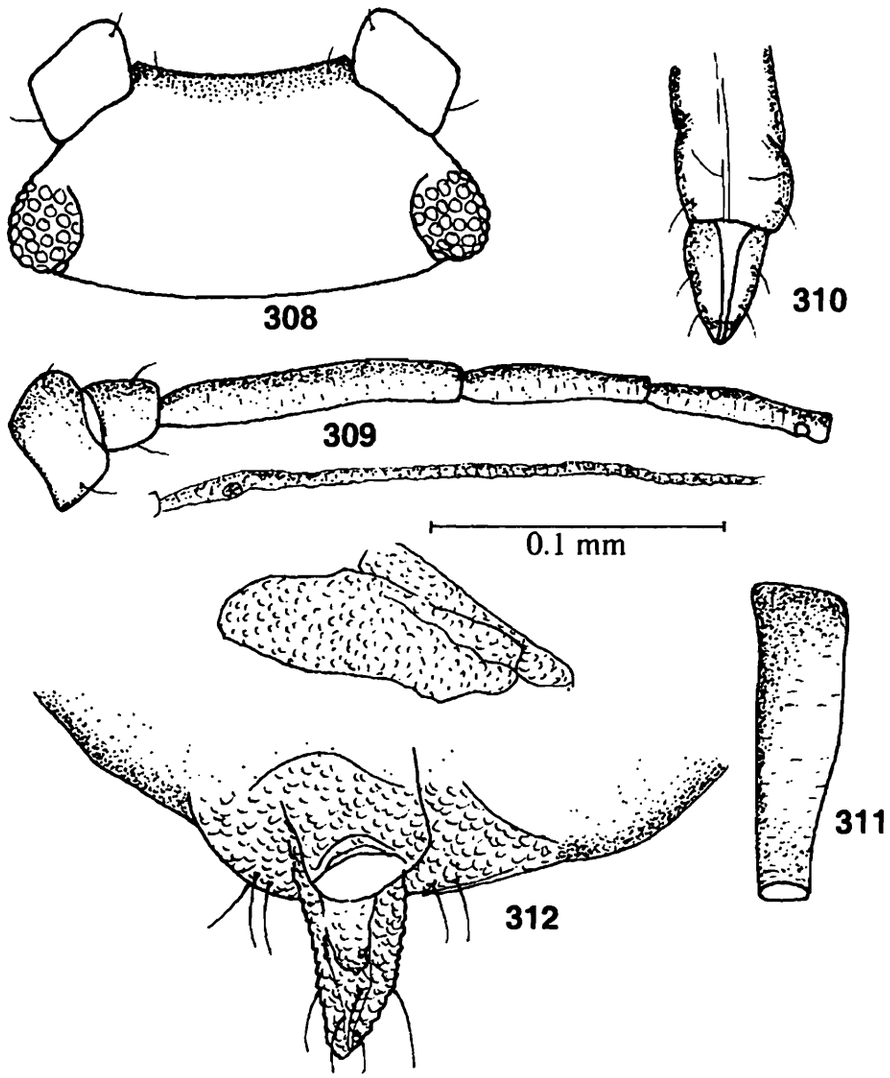
1980. *Rhopalosiphum padi* (Linn) : Raychaudhuri, D. N. *(ed.)*, Aphids of North-East India and Bhutan : 70

1960. *Rhopalosiphum padi* (Linn.) : Remaudiere, G. and Remaudiere, M. Catalogue of the World's Aphididae : 62.

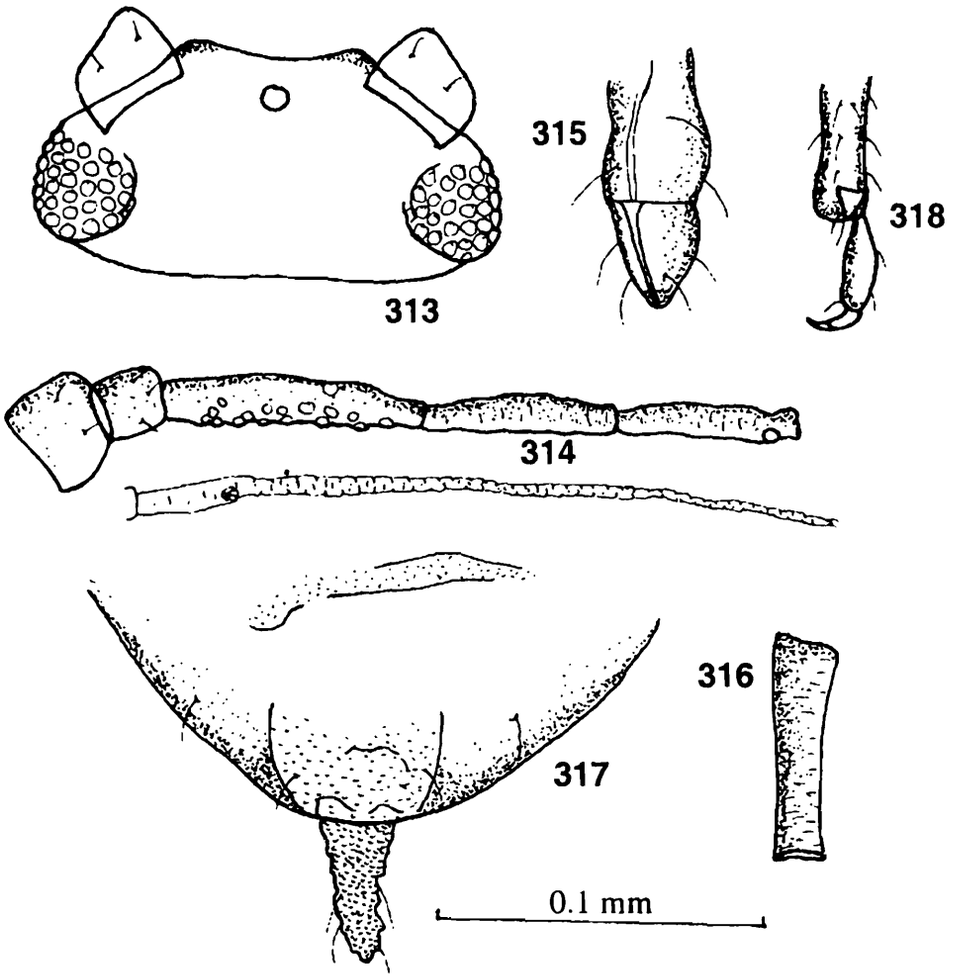
1998. *Rhopalosiphum padi* (Linn.) : Ghosh, L. K. and Basu, R. C., *State Fauna Series* **4** : *Fauna of Meghalaya*, ZSI, pt. 4 : 117.

2000. *Rhopalosiphum padi* (Linn.) : Ghosh, L. K. and Basu, R. C., *State Fauna Series* **7** : *Fauna of Tripura*, ZSI : 356.

2001. *Rhopalosiphum padi* (Linn.) : Chakrabarti and Sarkar, *J. Aphidology,* **15**(2) : 16.



Figs. 308-312. *Rhopalosiphum padi* Linn. Aptera : 308, head; 309, antenna; 310, portion of rostrum showing u.r.s.; 311, siphunculus; 312, posterior abdominal dorsum showing cauda.

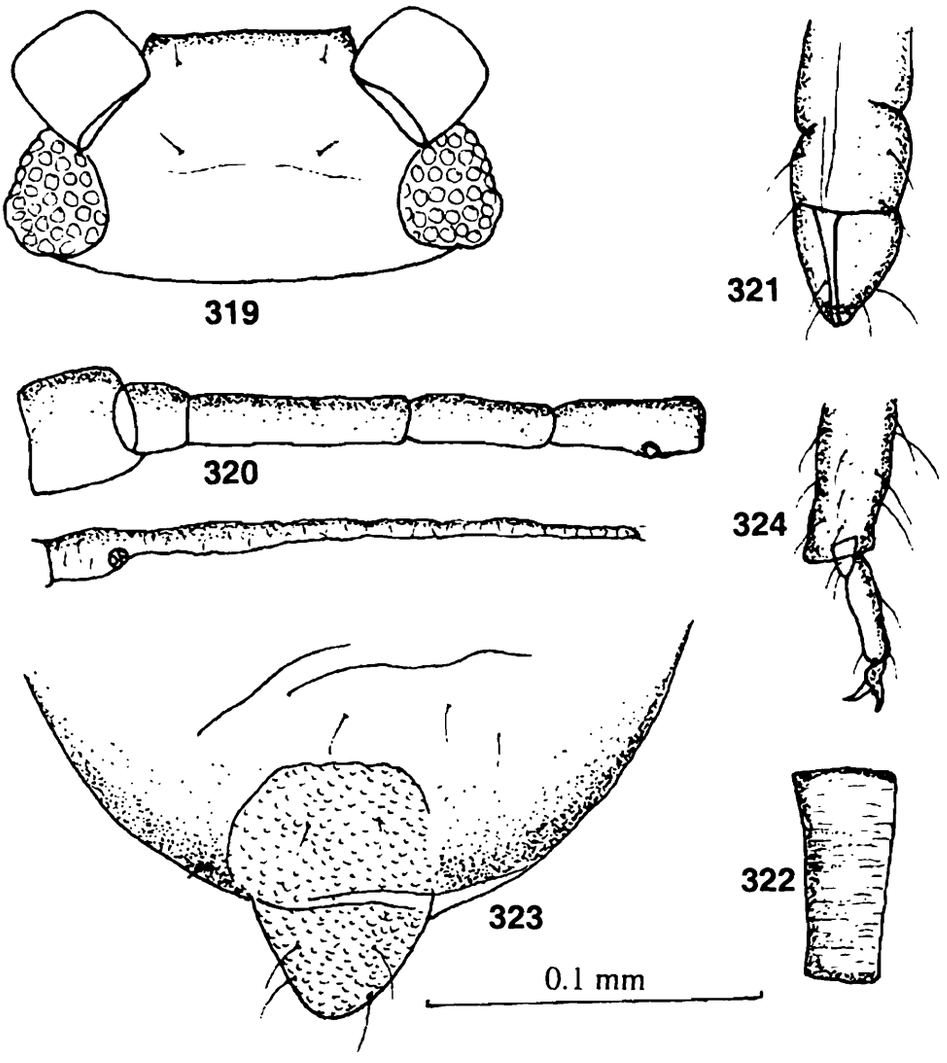


Figs. 313-318. *Rhopalosiphum padi* (Linn.) : Alata. 313, head; 314, antenna; 315, portion of rostrum showing u.r.s.; 316, siphunculus; 317, posterior abdominal dorsum showing cauda and hairs on 8th tergite.; 318, portion of hind tibia showing tarsal segments.

Apterous viviparous female : Body 1.5-1.8 mm long. Head with distinct but small tubercles. Dorsal surface roughened in patches, vertex slightly produced anteriorly. Dorsum of head with medium-sized hairs. Antennae 0.8-0.9 times the body. Rostrum extends upto 2nd coxae; u.r.s. about as long as h.t. 2. Antennae without secondary rhinaria; p.t. about 4-6 times as long as base VI. Abdominal dorsum with reticulated pattern; dorsal abdominal hairs with blunt apices. Siphunculi cylindrical, about 0.15–0.20 times as long as body with well developed apical flange, with a few imbrications, a little more than 1.5 times as long as cauda and 0.15–0.20 times as long as body. Cauda spinose, tapering towards apex with 4-6 hairs yellowish green to blackish green.

Measurements (in mm) of an aptera : Length of body 1.80; width 1.00; antenna 1.20; a.s. III 0.68, IV 0.14, V 0.10, VI (0.07+0.16); u.r.s. 0.08; h.t.2 0.10; siphunculus 0.04; canda 0.03.

Alate viviparous female : Body about 1.80 mm long. Head with distinct but small antennal tubercles not extending beyond vertex. Dorsum smooth; hair medium-sized.



Figs. 319-324. *Rhopalosiphum padi* (Linn.) : Nymph. 319, head; 320, antenna; 321, portion of rostrum showing u.r.s.; 322, siphunculus; 323, portion of posterior abdominal dorsum showing cauda and tergal hairs; 324, portion of hind tibia showing tarsal segments.

Antennae 6-segmented, secondary rhinaria distributed : III 10-20, IV 2-8, V 0-2; a.s. I and II rather smooth with some imbrications on ventral and inner sides, rest of antennae imbricated. Siphunculi cylindrical with distinct apical flange, often slightly swollen appearence before apex, about 1.6 times as long as cauda. Cauda spinose, rather thin on apical half with 4-5 hairs. Wing venation normal.

Measurements (in mm) of an alata : Length of body 1.82; width 0.81; antenna 0.99; a.s.III 0.30, IV 0.14, V 0.13, VI (0.10+0.20); u.r.s. 0.08; h.t.2 0.10; siphunculus 0.04; cauda 0.03.

Material : Apterae, alatae and oviparae, Meghalaya; Shillong, 12.xii.1968, from *Prunus* sp., Coll. R.C.B.

Apterous Oviparous Female : Body pale brown, about 1.24–1.50 mm long with 1.02 mm as the maximum width. Head brown. Antennae usually 6-segmented, but sometimes segmentation between segments III and IV indistinct and then appearing

as 5-segmented, about 0.78-0.90 times as long as body; p.t. 4.50-5.50 times the base of last a.s. U.r.s. slightly shorter than to nearly as long as h.t.2. Dorsum of abdomen rather pale. Siphunculi brown, cylindrical, imbricated, about 0.08-0.09 times as long as body, nearly as long as short cauda with spinular imbrications and bearing 4 hairs. Hind tibiae swollen with 5-6 round pseudosensoria.

Measurements (in mm) of an ovipara : Length of body 1.50 mm; width 1.02; antenna 1.35; a.s. III 0.25, IV 0.20, V 0.19. VI (0.09 + 0.49); u.r.s. 0.10; h.t.2 0.10; siphunculus 0.13; cauda 0.13.

Host plants : In India the species is known to infest about 30 species of plants belonging to N.O. Acanthaceae, Canaceae, Cyperaceae, Poaceae, Oxalidaceae and Polygonaceae.

Symptom and Damage : In the field the species may be very injurious. Severe infestation is observed in the poaceous plants (November-March). From centres of infestation, it spreads in ever-widening circles. As a result, plants turn yellow and become stunted. Severe infestation causes yellowish patches on leaves and ultimate drying of the leaves. It is commonly found on maize, but does not appear to cause noticeable injury. The aphid is responsible for Barley yellow dwarf (Nagaich and Vashisth, 1963) and Wheat streak mosaic (Raychaudhuri and Ganguli, 1968).

Bionomics : The life cycle of these greenish blue aphids does not differ materally from those of other species. The species apparently reproduces parthenogenetically throughout the year in India. However, oviparae of this species are recorded from India (Raychaudhuri, D. N. (ed.), 1980). This hints at the possibility that it may have sexual life cycle in the altitudinal areas where day length is short and temperature is low which may initiate the production of the sexuales. According to Richards (1960) the number of generations of alienicolae produced is unknown, but certainly several are produced. Fall migrants alate viviparous females resemble spring migrants but are produced by Alienicolae and sexuales occur on the winter host from the middle of September to the end of October.

Natural enemy-complex :

Predator : *Syrphus* sp. (Diptera)

Parasitoid : *Aphidius colemani; Ephedrus* sp. [Hymenoptera]

Vector : Barley yellow dwarf, Maize leaf fleck, Oat yellow leaf, Onion yellow dwarf (Kennedy *et al.* 1962).

Distribution : Inida : Throughout.

Elsewhere : Cosmopolitan.

Management : As in *Rhopalosiphum maidis* (Fitch).

48. ***Rhopalosiphum rufiabdominalis*** (Sasaki)
(Figs. 325-328)

1899. *Toxoptera rufiabdominalis* Sasaki, *Rept. Hokkaido Agr. Expt. Sta..* **17** : 202.

1986. *Rhopalosiphum rufiabdominalis* (Sasaki) : Ghosh, L. K. *Tech. Mongr.* **16** : Zoological Survey of India : 38.

1988. *Rhopalosiphum rufiabodominalis* : Verma, *J. Indian Potato Assoc. Shimla,* 15 : 192.

1990. *Rhopalosiphum rufiabdominalis* : Bhattacharya, *J. Aphidology,* **4**(1 & 2) : 11.

1994. *Rhopalosiphum rufiabdominalis* (Sasaki) : Ghosh, L. K. and Basu, R. C., State Fauna Series 3 : Fauna of West Bengal, ZSI : 167.

1997. *Rhopalosiphum rufiabdominalis* : Verma and Ghosh, L. K., *J. Aphidology,* **11**(2) : 189.

1997. *Rhopalosiphum rufiabdoninalii* (Sasaki) : Remaudiere and Remaudiere, Catalogue of the world's Aphididae : 62.

2000. *Rhopalosiphum rufiabdominalis* : Ghosh, L. K. and Basu, R. C., *State Fauna Series* **7** : *Fauna of Tripura*, ZSI : 356.

2001. *Rhopalosiphum rufiabdominalis* : Chakrabarti and Sarkar, *J. Aphidology.* **15**(1 & 2) : 16.

Apterous viviparous female : Body oval, 1.42-1.89 mm long with 0.85-0.90 mm as maximum width; head with well developed lateral frontal tubercles and bears rhopalosiphine projection; antennae normally 5-segmented, about half as long as body, p.t. at least 5 times as long as base VI; longest hair on a.s. III 3-4 × b.d. III; u.r.s. 0.8-0.9 × h.t.2; 8th tergite with 4-8 hairs; siphunculi dark, cylindrical, only slightly attenuated just proximad to flange heavily imbricated, 0.10-0.13 × body and about twice s long as elongate cauda which is slightly constricted and bears 4 hairs, abdominal dorsum densely covered with long and fine hairs. Apterae often subterranean. Head and part of abdomen green in life, posterior half brown.

Alate viviparous female : Body semioval, about 1.60-2.20 mm long. Head with weakly developed lateral frontal tubercles having rhopalosiphine projections. Antennae 5-segmented; p.t. never less then 3 times and may be upto 7 times base V and 1.03-1.50 times as long as a.s. III; a.s. III with 11-54, IV with 0-15 and V with 0-13 secondary rhinaria, flagellar hairs with fine to bluntish apices. U.r.s. 0.7-1.5 times as long as h.t. 2 and with 2-4 secondary hairs. Abdominal dorsum with pleural intersegmental pigmentation and with a dusky band on each of tergites 7 and 8. Dorsal abdominal hairs long and fine and longest of these on 7th and 8th tergites about 2.1-2.3 times and 2.2-3.8 times as long as b.d. III respectively; body about 7-9 times as long as siphunculi being slightly swollen apically and with a well developed flange at the tip. Cauda short, about 0.6 times as long as siphunculi and with 4-9 hairs. Legs brown to dark brown; coxae and femora partly imbricated. F.T.C. 3 : 3 : 2. Wing venation normal.

Symptom and Damage : Both adults and nymphs attack both the aerial parts and roots of Potato. However, a large population has been found on the roots. The species also attacks roots of paddy, maize, jowar, weeds etc. Due to infestation, the plant suffers stunted growth resulting yield loss.

Host plants : The aphid species is known to infest about 55 plant species belonging to N.O. Apocynaceae, Aroidae, Canaceae, Eficaceae, Fagaceae, Poaceae, Liliaceae, Malaceae, Papilionaceae, Rosaceae, Solanaceae etc.

Life cycle : The adults reproduce parthenogenetically and produce nymphs throughout the year. The alate forms that are produced after 2-3 generations of the apterous forms are responsible for dispersal of this aphid. They are carried to the potato fields by wind and subsequently nymphs are produced on the leaves, which move towards the roots at soil level. The adults are minute dark green with reddish blotches around bases of siphunculi. In India, alate male was reported and described for the first time from snow at Nainipeak *(ca.* 8, 563') in Uttar Pradesh by L. K. Ghosh (1969). Later, Verma (1988) reported apterous oviparous females collected on Peach in Uttar Pradesh. Thus, the finding of both sexual male and female from the same geographical range hints at the possibility that the species breeds holocyclically at least in the northern part of India. (A possible life cycle of the species is provided hereinunder.)

Natural enemy-complex :

Predator : *Scymnus* sp. [Coleoptera : Coccinellidae)

Vector : The aphid transmits barley yellow dwarf virus; Ragi mosaic (Sybbayya & Raychaudhuri, 1970).

Distribution : India : Delhi, all over.

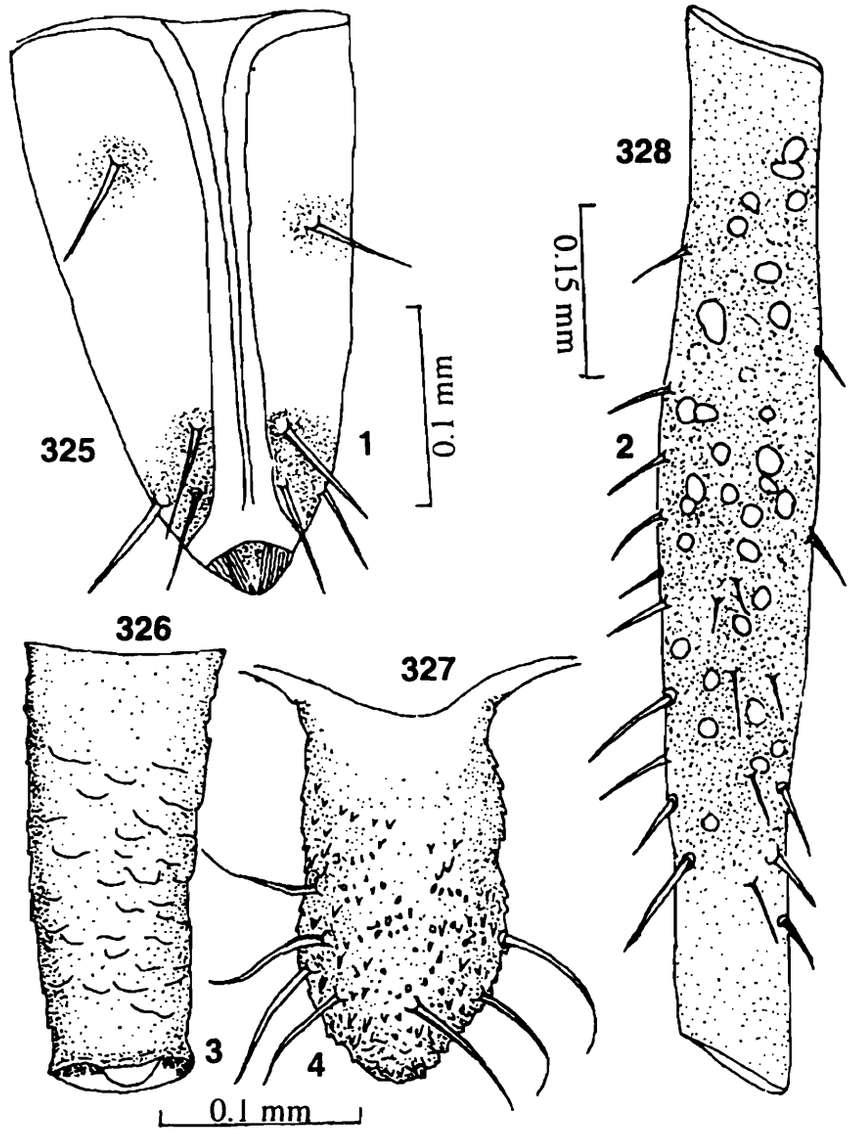
Elsewhere : Africa; Japan; Malayasia; Middle East; Nepal, Netherlands and Taiwan.

Remarks : The species is readily recognised by the relatively long antennal and body hairs and also the presence of usually 4 hairs on abdominal tergite VIII.

Young *et al.* (1971) reported the species from roots and underground stems in Barley at Delhi for the first time in India. According to them, the aphid colonies were present on the crop from the 1st week of January to the end of February.

Material : Apterae and alatae, Shillong on Undet Gramineae, 12.12.1968, Coll. R.C. B. Alate male, Uttar Pradesh, Nainital, Nainipeak, altitude 8, 563' a.sl. 'on snow', 7.3.1968. Coll. L.K.G.; apterous oviparous female on peach, Uttar Pradesh, Daurala, Meerut, 25.11.1988, Coll. K. D. V.

Apterous Oviparous Female : Body oblong, 1.71-1.83 mm in length with 0.96–1.05 mm maximum width near at the middle. Antennae 5-segmented, 0.59-0.61 mm long, 0.33-0.36 times as long as body; a.s.III with hairs about 3 times as long as b.d. III. A.s. V 0.70-1.0 times as long as head width across eyes; p.t. 3.0-3.7 times as long as base V. Rostrum just attaining hind coxae; u.r.s. nearly parallel-sided, 1.8-2.0 times as long as h.t.2, with 2 secondary hairs. Legs comparatively short; hind tibiae 0.30-0.33 times as long as body, swollen, about twice as thick as mid tibiae 0.30-0.33 times



Figs. 325-328. *Rhopalosiphum rufiabdominalis* (Sasaki). Apterous oviparous female. 325(1), u.r.s. showing secondary hairs; 326(3), siphunculus; 327(4), cauda; 328(2), hind tibia showing pseudosensoria.

as long as body, swollen, about twice as thick as mid tibia, maximum diameter at middle 1.21-1.25 times as thick as minimum diameter at apex, with 29-40 roundish pseudosensoria distributed along its whole length, longest hair on hind tibiae about 0.8 times as maximum diameter of hind tibiae. Siphunculus nearly cylindrical, not markedly swollen towards base, imbricated, about 1.1 times as long as cauda. Cauda shortly tongue-shaped, imbricated, about 0.9 times as long as siphunculus, with 6-7 hairs. Abdomen with terga membranous and smooth; 8th abdominal tergite with 6 hairs being about 78μ long and about twice as long as b.d.III; anterior abdominal hairs about 1.5 times as long as b.d III, F.T.C., 3, 3, 2.

Measurements (in mm) of an ovipara : Length of body 1.80 mm; width 0.96; antenna 0.59; a.s. III 0.16, IV 0.09, V (0.05+0.19); u.r.s. 0.12; h.t.2 0.06; siphunculus 0.13; cauda 0.11.

Alate male : Body spindle-shaped, rather slender than alate viviparous female, measuring 1.25 mm, and having the maximum width 0.55 mm near the mid-abdomen.

Head sclerotic dark brown, 0.37 mm broad across the eyes, front smooth, rather concave, bearing 4 hairs which are about as long as the antennal hairs. Eyes with distinct triommatidia visible from above. Thorax dark brown, sclerotic. Abdomen pale membranous with small marginal sclerites on tergites II-IV, each bearing a few hairs and spinular striae; post-siphuncular sclerite well developed; tergites VII and VIII with transverse bars. Dorsal hairs smaller than those in alate viviparous female, rather fine with more or less acute apices, upto about 33μ, longest hair about 1.6 times as long as measuring about 43μ and 1.8 times as long as the longest hair on a.s.III. Antennae 6-jointed, uniformly brownish, imbricated, 0.88 times as long as body, the longest hair on segment III about as long as b.d. of the segment. Segment III with 28-30 partly tuberculate circular rhinaria scattered irregularly along its entire length except the very base; segment IV with 15-18 and segment V with 15 to 16 rhinaria, arranged irregualarly along their entire lengths, while the base of a.s. VI with 1 to 2 moderately large circular rhinaria near the middle; p.t. 6.2 to 6.6 times as long as the base of the segment VI, 1.8 times as long as a.s.III. Rostrum extends upto the second pair of coxae; siphunculi sclerotic, about 0.14 times as long as the body, broadest at the base, maximum basal width being about 1.7 to 2.0 times as long as width of hind tibia near the middle, imbricated with a few transverse striae, more or less cylindrical with a little expansion near the distal half followed by a faint constriction before small but distinct flange at the tip. Cauda dark, imbricated, broadly oval, rather tongue-shaped, about 0.37 times as long as siphunculus, about as long as width at the base and with 5 hairs. Anal and sub-genital plates dark sclerotic. Legs moderately long, pale, except the femora and the apices of the hind tibiae which are dark. First tarsal chaetotaxy 3, 3, 2.

Measurements (in mm) of an alate male : Length of body 1.25 mm; width 0.55; antenna 1 12; a.s. III 0.24, IV 0.13, V 0.13, VI (0.06+0.43); u.r.s. 0.12; h.t. 2 0.07; siphunculus 0.17; cauda 0.06.

Secondary rhinaria on III : 28 & 30; IV : 15 & 18; V : 16 & 15; VI : 2 & 1.

Remarks : The sexual female was collected along with alate viviparous females of *R. rufiabdominalis* the alate male of which was apparently carried out by wind from elsewhere in Nainital area. It is, therefore, presumed that there is possibility of the species having a sexual cycle in the region.

Genus 10. ***Schizaphis*** Borner, 1931

1931. *Schizaphis* Borner, 1931, C., *Anz. Schadlingsk,* **7** : 10; Eastop V.F. 1961. *Entomologist,* 94 : 24 Raychaudhuri, D. N., Ghosh, M.R., Basu, R.C. 1980 : *In* Aphids of North East India and Bhutan : 72; Heie, O. 1986 *Fauna ent. Scand,* **17** : 58. Type species : *Aphis graminum* Rondani, 1847.

Morphology : Body small 1.2-2.0 mm long, oval to elongate oval. Head smooth, with low lateral frontal tubercles and median frontal prominence. Antennae 6-segmented (rarely 5, distinctly shorter than body, apterae without secondary rhinaria, alatae with rounded secondary rhinaria on segment III, IV and sometimes on segment VI. Processus terminalis upto 6.0x as long as base of segment VI. Ultimate rostral

segment shorter than to 1.20x as long as second segment of hind tarsus and bears 2–3 accessory hairs. Dorsum may be evenly membraneous or ronghened by transparent sclerotic nodules; dorsum of abdomen in alatae with marginal sclerites and transverse sclerotic band specially on 7th and 8th tergites. Dorsal hairs may be all short and blunt or longer and flagellate specially on posterior tergites; 8th tergite with 2–10 hairs. Siphunculi cylindrical, tapering, pale or dusky or black, 0.13–0.25x as long as body, less than twice or upto 3.0x as long as the cauda, usually without a distinct apical flange. Cauda pale or black finger- or tongue-like distinctly shorter than siphunculi being with a few hairs. Legs with many short and few long hairs on hind femora; first tarsal segments with 3,3,3 hairs. Forewings with media once-branched. Larvae with hind tibaie smooth.

Biology : It is estimated that about 20 out of 40 known species live hotocyclic life cycle on Poaceae while 17 others live on Cyperaceae; three species viz. *S. piricola* (Matsumura) from Japan, *S. pyri* Shaposhnikov from USSR and *S. punjabipyri* Das from Pakistan where they overwinter as eggs and use primary host and migrate to Poaceae or Cyperaceae; these species defer in colour of body and all form pseudogalls; data on the detailed biology of these species are needed to establish their identity and the secondary forms which have presumably been described under different names as distinct species and they are visited by ants.

Distribution : India; Pakistan; Sri Lanka; Worldwide. Regional accounts are available from West Africa : Eastop (1961); Australia : Eastop (1966); Eastern India : Raychaudhuri *et al.* (1980); Scandinovia : Heie (1980).

Type species : *Aphis graminum* Rondani 1847.

Location of types not known.

Oviparae apterous with darker body than viviparae and hind tibiae swollen bearing many pseudosensoria. Males alate often with secondary rhinaria on antennal segments III, IV and V; sometimes males may be apterous (Mordvilko, 1921.)

A large genus with about 40 species, mostly palaearctic in distribution, is believed to be most closely related to *Rhopalosiphum* Koch, 1854 but differing in the absence of polygonal reticulation on dorsum of apterae, absence of well developed siphuncular flange and in having once-branced media in the forewing of alatae. In other characters it resembles *Hysteroneura* Davis, 1919 but the latter genus has one oblique vein in the hind wing. The biology of three host alternating species (*Pyrus* to Poaceae/ Cyperaceae) is not fully known and as a result the identity of three *Pyrus* infesting species can only be well established through transfer experiments (Raychaudhuri ed., 1980; Blackman and Eastop 1986).

Of the known species, *Schizaphis graminum* (Rondani) is considered a major pest of cereals and grasses as a vector of barely yellow dwarf, mellet red leaf, maize dwarf mosaic, wheat mosaic, rice yellow mottle and sugarcane mosaic viruses. Likewise, *S. hypersiphonata* Basu is a known vector of abaca mosaic virus.

At least 9 species of hymenopteran parasitoids are known from two species *viz.* S. *graminum* (Rondani) and *S. rotundiventris* (Signoret) in Indian region (out of 5 species of *Schizaphis* recorded in the region). No record of coccinellied or syrphid predator is available in India.

Two subgenera *Euschizaphis* H.R.L. 1947 and *Paraschizaphis* H.R.L. 1947 are recognised under *Schizaphis*

Key to the subgenera

1. 8th tergite with 6–10 hairs. Hairs on III antennal segment longer than basal diameter of the segment ..... *Paraschizaphis* H.R.L.

   8th tergite with 2 hairs. Hairs shorter or as long as basal diameter of III antennal segment. 2

2. Marginal tubercles absent. Cutical sclerotic with rugose sculpture .... *Euschizaphis* H.R.L.

   Marginal tubercle present or absent in abdomen. Cuticle not sclerotic or rugose ..... *Schizaphis* Borner

Key to the species of *Schizaphis* Borner

Apterous viviparous females :

1. Siphunculi never less than twice as long as cauda; cauda dark .. *rotundiventris*

– Siphunculi usually not more than twice as long as cauda; cauda somewhat pale 2

2. Cauda usually half as long as siphunculi; siphunculi 0.20–0.25 times as long as body ..... *hypersiphonata*

– Cauda more than half as long as siphunculi; siphunculi 0.13-0.16 times as long as body ..... *graminum*

Alate viviparous female :

1. Cauda dark, less than twice as long as siphunculi; a.s. III with 11-13 and IV with 3-4 secondary rhinaria body hairs long; u.r.s. about as long as h.t.2 .... *rotundiventris* (Signoret)

– Cauda pale, more than half as long as siphunculi; a.s. III with less than 11 secondary rhinaria and IV without rhinaria; body hairs short 2

2. A.S. III with 7-10 secondary rhinaria; ..... *graminum* (Rondani)

– A.S. III with only 4-6 secondary rhinaria ..... *hypersiphonata* Basu

49. ***Schizaphis graminum*** (Rondani)
(Wheat aphid)
(Figs. 329-334)

1852. *Aphis graminum* Rondani, *Nouv. Ann. Sci. Nat. Bologna,* **6**(3) : 10.

1976. *Schizaphis graminum* (Rondani) : Nayer *et al., General and applied Entomology* : 202.

1980. *Schizaphis graminum* (Rondani) : Raycahaudhuri *et al., In* : Aphids of N.E. India and Bhutan : 72.

1992. *Schizaphis graminum* (Rondani) : Agarwala and Bhattacharya, *Soc. Nat. Sci.,* **2**(3 & 4) : 2.

1994. *Schizaphis graminum* (Rondani) : Ghosh, L. K. and Basu, R. C., *In* : *State Fauna Series,* **3** : *Fauna of West Bengal,* ZSI : 168.

1997. *Schizaphis graminum* (Rondam) : Remaudeire and Remaudiere, Catalogue of the World's Aphididae : 63.

1998. *Schizaphis graminum* (Rondani) : Ghosh, L. K. and Basu, R. C., *In* : *State Fauna Series,* **4** : *Fauna of Meghalaya,* ZSI : 118.

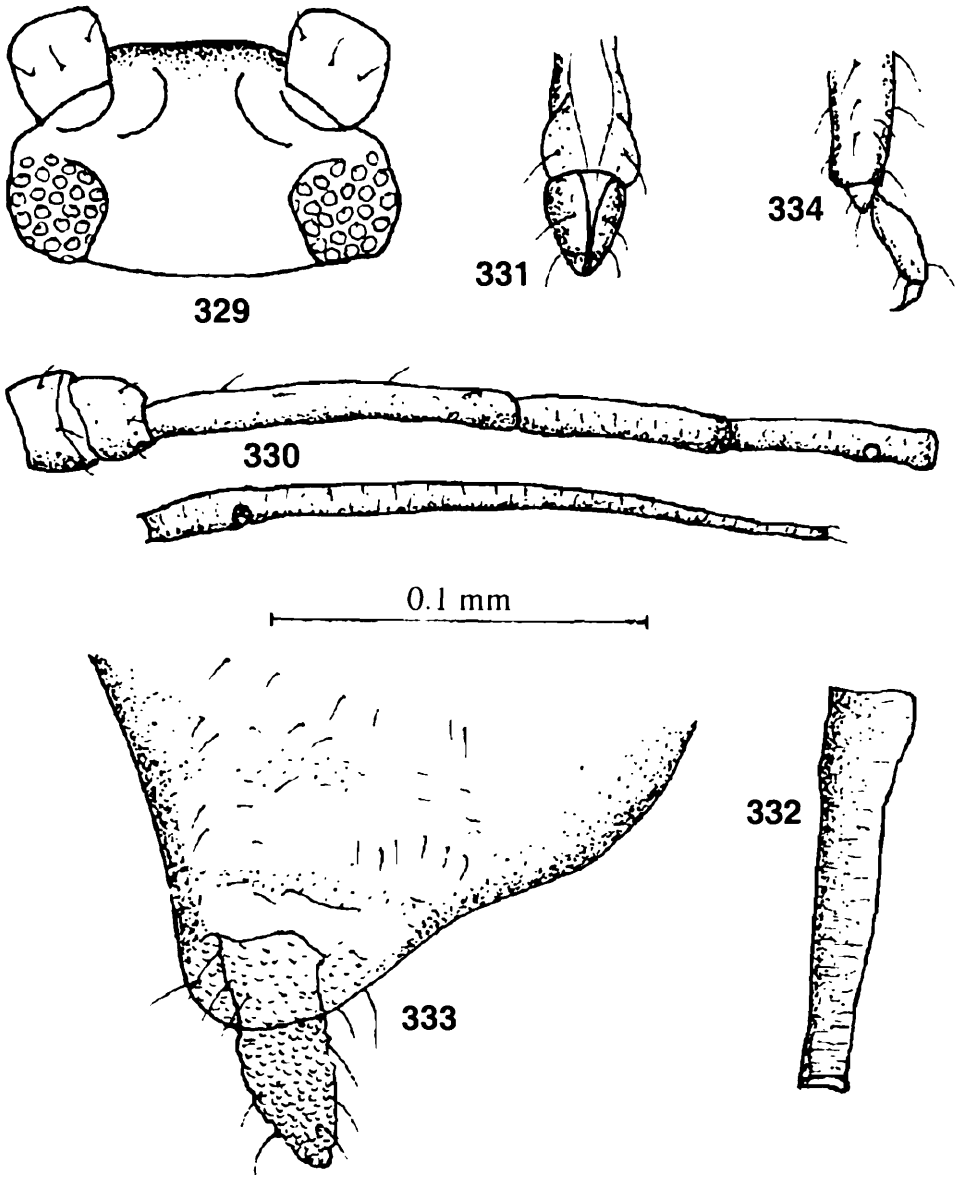
2000. *Schizaphis graminum* (Rondani) : Ghosh, L. K. and Basu, R. C., *State Fauna Series,* **7** : *Fauna of Tripura,* pt. 2 : 357.

2001. *Schizaphis graminum* (Rondani) : Chakrabarti and Sarkar, *J. Aphidology.* **15**(1 & 2) : 16.

Apterous viviparous female : Body elongate, 1.45-2.0 mm long with about 0.80 mm as maximum width. Antennae 6-segmented about 0.9 times as long as body, flagellum imbricated, a.s. III without secondary rhinaria; flagellar hairs short; p.t. long, nearly 5 times as long as base VI. U.r.s. either a little shorter or to about as long as h.t.2, bearing 2-3 secondary hairs. Dorsum of abdomen pale, with usual "aphidine" reticulation, 8th abdominal tergite with a narrow sclerotic band; dorsal hairs on anterior tergites moderately long, hairs on 7th and 8th abdominal tergite fine. Siphunculi pale or dusky, 0.13-0.16 times as long as body, without well developed flange and nearly smooth on distal half. Cauda somewhat pale, about 0.6 times as long as siphunculi, bearing 5-7 hairs. F.T.C. 3 : 3 : 3.

Alate viviparous female : Body elongate, about 1.9 mm long with 1.10 mm as maximum width near the middle of abdomen. Antennae 6-segmented, a little shorter than body, flagellum imbricated; a.s. III with 7–10 roundish secondary rhinaria, a.s. IV and V without such rhinaria, flagellar hairs short, p.t. about 5 times as long as base VI. U.r.s. shorter (about 0.75 times) than h.t. 2., bearing 2 secondary hairs. Abdominal dorsum pale. Abdominal dorsum with marginal pigmented areas and transverse pigmented bands on tergites 7 and 8. Dorsal hairs on anterior tergites short, 7th and 8th abdominal tergites with fine hairs. Siphunculi pale, flangeless, smooth, about 0.10 times as long as body and about 1.5 times as long as cauda. Cauda pale, with 5–7 hairs. F.T.C. 3 : 3 : 3. Media of fore wings once-branched, hind wings with two oblique veins.

Host plants : The species is known to infest 19 species of plants belonging to N.O. Poaceae (Gramineae).



Figs. 329-334. *Schizaphis graminum* (Rondani). Aptera. 329, head; 330, antenna; 331, portion of rostrum showing u.r.s.; 332, siphunculus; 333, portion of posterior abdominal dorsum showing cauda; 334, portion of hind tibia showing tarsal segments.

Symptom and Damage : This aphid is often present in very large and dense colonies on stems, leaves and the inflorescence of the host plant. Its feeding causes yellow patches and in cases of severe attack leaf becomes yellowish brown. Honeydew excretion favours sooty mould development. There can be much grain deformation.

Biology : The species usually reproduces parthenogenetically in the Indian conditions and it is very rapid in its effect. Breeding is continuous almost throughout the country. Both apterous and alate viviparous females are present. The nymphs are deposited on the leaf blade in a single row which afterwards migrate to another leaf. Nymphal period involves 7-13 days. It's life span is 26-39 days. During this period, an alate viviparous female gives birth to 55-79 nymphs at one to eight per day. Both winged and nonwinged adults multiply at fast rate during cold weather and reach the height of their population in February-March. At the advent of summer the species migrates to other plants. These aphids have many generations in a year.

Natural enemies-complex :

Predator : *Cheilomenes sexmaculata* (Fabricius), *Coccinella* Sp. [Coleoptera : Coccinellidae].

Parasitoid : *Aphelinus gossypii* Timberlake, *Aphidius colemani* Viereck, *Aphidius* sp., *Diaeretiella rapae* (M' Intosh), *Ephedrus* sp., *Lysiphlebus delhiensis* Subba Rao and Sharma, *Lysiphlebis mirzai* Shuja-Uddin, *Lysiphlebus* sp., *Parapraon pakistanum* (Kirkland), *Praon* sp.

Fungus : *Entomophthora aphidis* Hoffman

Vector : Barley yellow dwarf; Millet red leaf; Sugarcane mosaic; Wheat mosaic; Radish mosaic.

Distribution : India : all over.

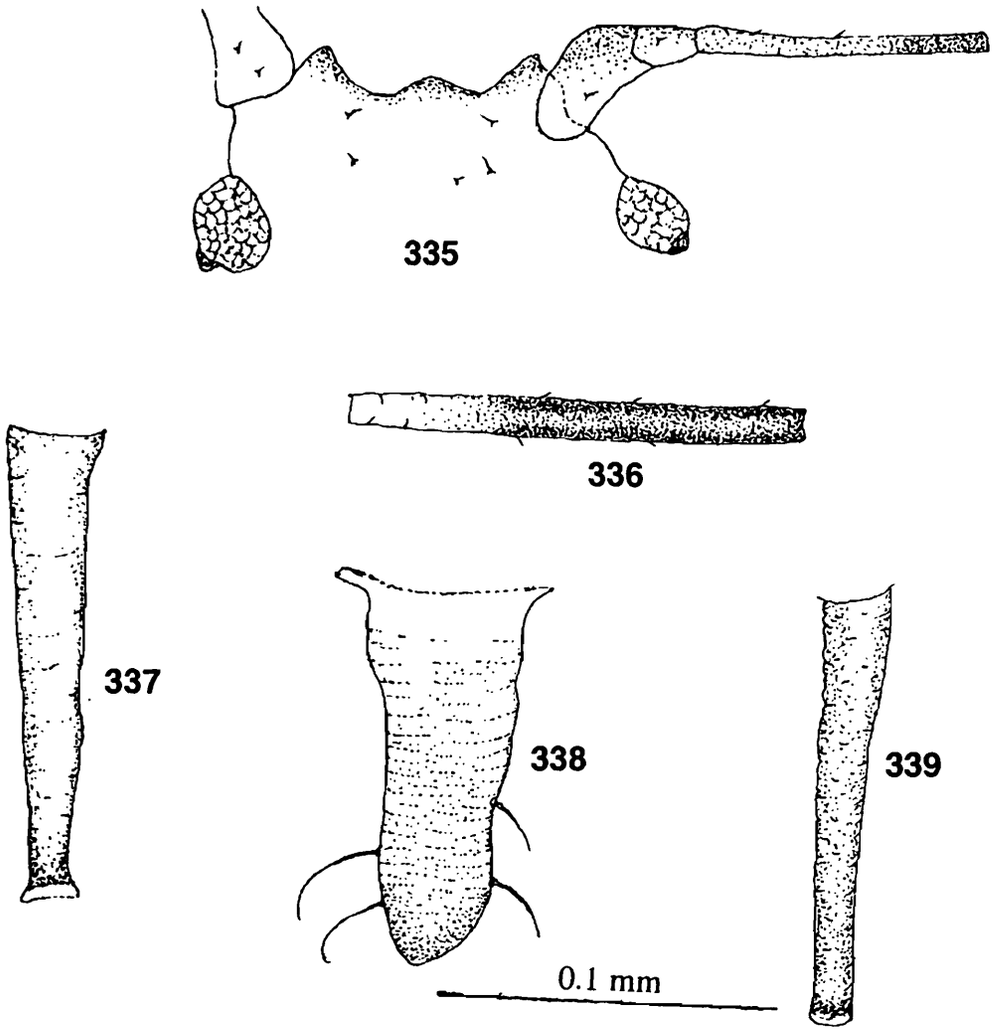
Elsewhere : Very widely distributed in Europe, Asia, eastern and southern Africa, Middle East, S. China, Japan, Philippines and Australia.

Management : Spraying of minocrotophos (0.036%), Oxydemetonmethyl or phosphamidon (0.025%) is most effective.

50. ***Schizaphis hypersiphonata*** Basu
(Figs. 335-339)

1969. *Schizaphis hypersiphonata* A.N. Basu, *Oriental Ins.* **3**(4) : 364.

Apterous viviparous female : Body rather oval, about 1.5-1.6 mm long with 0.85 mm as maximum width near mid abdomen. Frontal tubercles low but higher than median prominence; their margin scabrously corrugated, with a minute hair on the inner side below the apices. Tergum faintly wrinkled, produced marginally into small warts. Antennae 6-segmented, about 0.8-0.9 times as long as body, the two basal segments and very base of antennal segment III concolourous with the head, the rest rather dark; antennal segment I scabrous on inner side; flagellum strongly imbricated except the very base of a.s. III; processus terminalis 4–4.5 times as long as base of segment VI and about 1.5–2.0 times as long as segment III; about 0.5 times as long as b.d. III. Rostrum reaches mid coxae; u.r.s. rather heart-shaped, 0.65–0.80 times as long as 2nd joint of hind tarsi, with 2 secondary hairs besides 3 preapical pairs. Dorsum of abdomen rather pale, dorsal hairs minute, on anterior abdominal tergites up to about 0.5 times as long as b.d. III; 8th tergite with 2 hairs being about as long as b.d. III. Siphunculi imbricated, pale, dark brown apically, about 0.20 times as long as body, usually with a little constriction basally, 5–6 times as long as maximum width and about 10–13 times its minimum width and having weakly developed flange apically. Cauda elongate, bluntly digitiform, 0.4–0.5 times as long as siphunculi, constricted basally and bearing 4–5 hairs. Subgenital plate with several hairs; subanal plate darker and having much longer hairs. Legs brown, apices of tibiae and tarsi rather darker; tibiae with shorter hairs, more hairy than femora; longest hair on hind tibiae equal to or just longer than its mid diameter. F.T.C. 3,3,2.



Figs. 335-339. *Schizaphis hypersiphonata* Basu : Aptera : 335, head and part of antenna; 336, antennal segment III; 337, siphunculus; 338, cauda; Alata : 339, siphunculus.

Measurements (in mm) of one specimen : Length of body 1.58; width of body 0.82; antenna 1.52; antennal segments III 0.30, IV 0.21, V 0.21, VI (0.11+0.52); u.r.s. 0.08; h.t.2 0.09; siphunculus 0.33; cauda 0.17.

Alate viviparous female : Body rather oval, 1.5 mm long. Head and thorax pale brown. Antennae a little shorter than body; a.s. III with 4 and 6 secondary rhinaria arranged in a row; p.t. 5 times as long as base VI. Eyes pale, triommatidia small. Rostrum reaches base of 1st pair of coxae, shorter than apterae. Abdomen pale yellowish, membranous with marginal sclerites on 2nd–4th tergites a little dark and scabrous. Siphunculi pigmented as in apterae, 0.14 times as long as body. Cauda 0.6 times as long as siphunculi and bears 5 hairs. Media of forewings once-branched. Other characters as in apterous viviparous female.

Measurements (in mm) of the specimen examined : Length of body 1.50; width of body 0.78; antenna 1.48; a.s. III 0.27, IV 0.20, V 0.21, VI (0.10+0.52); u.r.s. 0.07; h.t. 2. 0.09; siphunculus 0.24; cauda 0.14.

Material : Apterous viviparous females and alate viviparous female, on under weed (Gramineae), INDIA : Mungpoo, N. Bengal, 3.IV.1966, Coll. D.K. Nath.

Distribution : India : North Bengal.

Remarks : The species infests the leaf blades of the host plant. It shows affinity with *S. graminum* (Rondani) but can be easily separated from *graminum* by longer siphunculi and processus terminalis and 8th tergal hairs.

51. ***Schizaphis rotundiventris*** (Signoret)

1860. *Schizoneura rotundiventris* Signoret (Complete reference could not be traced).

1917. *Toxoptera cyperi* van der Goot. *Contrib. Fauna India Neerl,* **1**(3) : 81.

1966. *Schizaphis cyperi* (van der Goot) : Eastop *Aust. J. zool.,* **14** : 498.

1968. *Schizaphis cyperi* (van der Goot) : David, Rajasingh and Narayanan, *J. Bombay nat. Hist. Soc.,* **65** : 508–512.

1968. *Schizaphis pyricola* : David, Rajasingh and Narayanan, *Ibid.,* **65** : 508–512.

1980. *Schizaphis rotundiventris* (Signoret) : Raychaudhuri, D.N., Ghosh, M. R. and Basu, R.C. *In* : Aphids of North East India and Bhutan : 74.

1997. *Schizaphis rotundiventris* (Signoret) : Remaudiere, G. and Ramaudiere, M. Catalogue of the World's Aphididae : 63.

Apterous viviparous female : Body light brown, with distinct frontal tubercles and a slightly scabrous low median frontal prominence. Antennae 6-segmented, about 0.7 times as long as body, flagellum imbricated, secondary rhinaria on a.s. III absent, flagellar hairs short; p.t. about 4.5 times as long as base VI. Rostrum reaches beyond midcoxae, u.r.s. short, subequal to h.t.2, bearing usually 2 secondary hairs besides 3 preapical pairs. Mid thoracic furca sessile. Dorsum of abdomen with usual "aphidine" reticulation, pale; 8th tergite with a narrow sclerotic band. Dorsal hairs on anterior tergites minute, hairs on 7th and 8th tergites usually fine and longer than anterior tergal hairs. Siphunculi usually pale, imbricated, without any apical flange, 2.8–3.0 times as long as cauda. Cauda rather dark, about 0.35 times as long as siphunculi. F.T.C. 3 : 3: 3.

Alate male : Body 1.6–1.7 mm long with the maximum width 0.6–0.7 mm. Head dark brownish; antennae 6-segmented, about 0.9 times as long as body, a.s. III with 30-35, IV with 20–25 and V with 18–20 secondary rhinaria distributed over entire length; p.t. about 5-6 times as long as the base of the segment; rostrum reaching mid coxae, u.r.s. 1.0-1.2 times as long as h.t.2. Dorsum of abdomen pale but with marginal abdominal sclerites arranged segmentally on tergites 2-6; siphunculi dark, cylindrical and without flange, 0.13-0.15 times as long as body and 2.5 times as long as cauda being black and bearing 4-5 hairs. Genitalia with distinct penis and opercula.

Material : Apterae and Alate males in "Y.P.T.", Shillong, Coll. R.C. B.

Measurements (in mm) of one specimen : Length of body 1.60; width of body 0.85; antenna 1.50; a.s.III 0.30, IV 0.20, V 0.17, VI (0.08 + 0.40); u.r.s. 0.07; h.t.2 0.07; siphunculus 0.24; cauda 0.09.

Remarks : According Eastop (1966) there is a complex of races of *cyperi* and the oldest name for this complex is probably *Schizaphis rotundiventris* (Signoret).

APHID-HOST PLANT CATALOGUE
(Based on Indian records)

Name of Aphid	Host plant	Plant Family
Aphis (Aphis) achyranthi Theobald	*Achyrathes* sp.	Amaranthaceae
	Punica granatum L.	Lythraceae
Aphis (Aphis) affinis del Guercio	*Mentha longifolia* (L.)	Lamiaceae
		Rosaceae
	Rubus ulmifolius	Liamiaceae
	Mentha viridis L.	Lamiaceae
Aphis (Aphis) asclepiadis Fitch	*Asclepias* sp.	Asclepiadaeeae
	Calotropis procera Br.	Asclepiadaceae
	Calotropis grandiflora Br.	Asclepiadaceae
	Cymanchum dalhousiae Wt.	Asclepiadaceae
	*Pengularia daemia (*Forek) Chiov	Asclepiadaceae
	Dregea volubilis (L. f.) Bth ex Hk. f	Asclepiadaceae
	Hoya longifolia Wall. ex. Wt.	Asclepiadaceae
	Hoya sp.	Asclepiadaceae
	Leptadenia reticulata Wt. & Arn.	Asclepiadaceae
	Nerium indicum Mill	Apocynaceae
Aphis (Aphis) astragali Ossiannilson	*Astragalus* sp.	Fabaceae
Aphis spiraecola Patch	*Abelmoschus esculentus*	Malvaceae
= *Aphis (Aphis) citricola* v.d.G.	*Achyranthes* sp.	Amaranthaceae
= *A. bidentis* Theobald	*Adhatoda vasica* Nees.	Acanthaceae
= *A. malvoides* Das	*Ageratum conyides* L.	Asteraceae
= *A. pomi* de Geer	*Alnus nepalensis* D. Drn.	Betulaceae
= *Acyrthosiphon citricola* van der Goot	*Alstonia scholaria* Br.	Apocynaceae
	Amaranthus vicidis L.	Amaranthaceae
	Ambrosia artemisiaefolia	Asteraceae
	Anacardium occidentale L.	Anacardiaceae
	Anaphalis contorta HKf.	Asteraceae
	Anemone rivularis Buch.	Ranunculaceae
	Apicum sp.	Apiaceae
	Ardisia sp.	Myrsinaceae

Name of Aphid	Host plant	Plant Family
	Artemisia caruifolia Buch-Ham.	Asteraceae
	Artemisia nilagirica (Cl)	Asteraceae
	Pamp. *Artemesia vulgaris*	Asteraceae
	Artemisia sp.	Asteraceae
	Azzdirachta indica	Meliaceae
	Bauhinia acuminata L.	Fabaceae
	Bauhinia sp.	Fabaceae
	Berberis sp.	Berberidaceae
	Bindens bipinmata (L). Ber	Asteraceae
	Bidens pilosa L.	Asteraceae
	var. *pinnata,*	Asteraceae
	Bidens spiricola	Asteraceae
	Bidens wallichi DC	Asteraceae
	Bochmeria sp.	Urticaceae
	Boerhavia diffusa L.	Nyctaginaceae
	Boerhavia hispida	Nyctaginaceae
	Bombax malabaricuim DC	Bombacaceae
	Bougainvillea spectabilis	Nyctaginaceae
	Brassiea napus L.	Brassicaceae
	Brassica oleracea L.	Brassicaceae
	Bridelia sp.	Euphorbiaceae
	Browallina sp.	Solanaceae
	Bryophyllum sp.	Crassulaceae
	Cajanus cajan	Fabaceae
	Canna sp.	Cannaceae
	Capsicum annuum L.	Solanaceae
	Capsicum frutescens L.	Solanaceae
	Cedrus deodara Loud	Pinaceae
	Cestrum fasiculatum Miev.	Solanaceae
	Cestrum noctarnum	Solanaceae
	Cestrum sp.	Solanaceae
	Chenopodium album L.	Chenopodiaceae
	Chenopodium sp.	Chenopodiaceae

Name of Aphid	Host plant	Plant Family
	Chrysanthemum coronarium L.	Asteraceae
	Chrysanthemum spp.	Asteraceae
	Cinchona sp.	Rubiaceae
	Citrus aurantifolia	Rutaceae
	(Christm) Swingle	Rutaceae
	Citrus reticulata Blanco	Rutaceae
	Citrus spp.	Rutaceae
	Clerodendrum infortunatum Gaertn.	Verbenaceae
	Clerodendrum spp.	Verbenaceae
	Cnicus sp.	Asteraceae
	Colocasia antiquorum Schott.	Araceae
	Colocasia esculenta	Araceae
	Commelina bengalensis L.	Commelinaceae
	Commelina sp.	Commelineaceae
	Conyza anqustifolia Roxb.	Asteraceae
	Conyza japonica Less	Asteraceae
	Coriandrum sativum L.	Umbelliferae
	Cosmos bipinnatus Cav.	Asteraceae
	Cosmos spp.	Asteraceae
	Cotonis sp.	Asteraceae
	Cotula hemispherica Wall	Asteraceae
	Crotalaria brownei Rehb	Fabaceae
	Croton sp.	Euphorbiaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita maxima Duchesne	Cucurbitaceae
	Cynodon dactylon Pers.	Poaceae
	Cyphomandra betacea Miers	Solanaceae
	Dahlia sp.	Asteraceae
	Datura sp.	Solanaceae
	Dianthus sp.	Caryophyllaceae
	Dichrocephala latifolia L.	Asteraceae
	Dracocephalum latifolium	Lamiaceae

Name of Aphid	Host plant	Plant Family
	Duabanga sonneratioides Buch-Ham.	Sonneratieceae
	Duranta repens Jacq.	Verbenaceae
	Eleusine coracana Gaertn.	Poaceae
	Emilia sonchifolia DC	Asteraceae
	Erectites valerianefolia DC	Asteraceae
	Erechites spp.	Asteraceae
	Erigeron sp.	Asteraceae
	Eupatorium adenophorum Spreng	Asteraceae
	Eupatorium cannabinum L.	Asteraceae
	Eupatorium odoratum L.	Asteraceae
	Eupatorium ripavium Regal	Asteraceae
	Eupatorium wallichii DC.	Asteraceae
	Euphorbia hirta L.	Euphorbiaceae
	Euphorbia nerifolia L.	Euphorbiaceae
	Eurva japonica Thunb.	Ternstroemiceae
	Fagopyrum sp.	Polygonaceae
	Ficus spp.	Urticaceae
	Galium sp.	Rubiaceae
	Gardenia sp.	Rubiaceae
	Gerbera sp.	Asteraceae
	Glycosmis arborea DC	Rutaceae
	Gnaphalium luteoalbum L.	Asteraceae
	Gynura angulosa DC	Asteraceae
	Gynura crepidioides Benth	Asteraceae
	Gynura nepalensis DC	Asteraceae
	Gynura sp.	Asteraceae
	Hamiltonia suaveolens Roxb.	Rubiaceae
	Hedera helix	Araliaceae
	Hedera nepalensis L.	Araliaceae
	Helianthus annuus L.	Asteraceae
	Helianthus spp.	Asteraceae

Name of Aphid	Host plant	Plant Family
	Helichrysum sp.	Asteraceae
	Heliotropium indicum L.	Boraginaceae
	Hibiscus esculentus (L.) Moench.	Malvaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Hibiscus sabdariffa L.	Malvaceae
	Hibiscus spp.	Malvaceae
	Holarrhena antidysenterica Wall	Apocynaceae
	Holmskioldia sanguinea Retz	Verbenaceae
	Hydrangea sp.	Hydrangeaceae
	Hypericum sp.	Hypericaceae
	Hypochaeris radicata L.	Asteraceae
	Ichnocarpus frutescens Br.	Apocynaceae
	Ilex sp.	Dicinaceae
	Impatiens balsamina L.	Geraniaceae
	*Impatiens falcifer*Hook-f.	Geraniaceae
	Impatiens sp.	Geraniaceae
	Inulu cuspidata Clarke	Asteraceae
	Ipomoea hederacea Jacq.	Convolvulaceae
	Jacaranda mimosaefolia D. Don	Bignoniaceae
	Jasminum sp.	Oleaceae
	Jatropha curcas L.	Euphorbiaceae
	Lactuca sativa L.	Asteraceae
	Lageneria leucantha	Cucurbitaceae
	Lageneria vulgaris Ser.	Cucurbitaceae
	Lagerstroemia indica L.	Lythraceae
	Lantana camara L.	Verbenaceae
	Leucas aspera Spreng.	Lamiaceae
	Leucas limifolia Spreng.	Lamiaceae
	Leucas sp.	Lamiaceae
	Lindera sp.	Lauraceae
	Litsea polyantha Juss.	Lauraceae
	Litsea sp.	Lauraceae
	Lonicera macrantha DC	Caprifoliaceae

Name of Aphid	Host plant	Plant Family
	Luculia spp.	Rubiaceae
	Ludwigia suffruticosa Walt	Onagraceae
	Luffa sp.	Cucurbitaceae
	Lycopersicum esculentum Miller	Solanaceae
	Lyonia ovalifolia Wall	Ericaceae
	Maesa indica Wall	Myrsinaceae
	Maesa sp.	Myrsinaceae
	Malus sylvestris Mill	Rosaceae
	Melanthesa patens	Euphorbiaceae
	Melastoma indica	Melastomaceae
	Melia azardirachta L.	Meliaceae
	Mikania cordifolia Willd.	Asteraeae
	Mirabilis jalapa L.	Nyctaginaceae
	Momordica charantia L.	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Asteraceae
	Morus alba L.	Urticaceae
	Morus sp.	Urticaceae
	Musa sapientum L.	Musaceae
	Mussaenda sp.	Rubiaceae
	Myriactis wallichii Less	Asteraceae
	Nasturtium indicum DC	Brassicaceae
	Nerium sp.	Apocynaceae
	Nicotiana tabacum L.	Solanaceae
	Ocimum sp.	Lamiaceae
	Oenamthe stolomifera Wall.	Umbelliferae
	Ophiorrhiza sp.	Rubiaceae
	Passiflora sp.	Passifloraceae
	Paedenia foetida L.	Rubiaceae
	Photinia integrifolia Lindl.	Rosaceae
	Photinia sp.	Rosaceae
	Phyllanthus reticulatus Poir	Euphorbiaceae
	Phyllanthus sp.	Euphorbiaceae
	Pieris ovalifolia D. Don	Ericaceae

Name of Aphid	Host plant	Plant Family
	Pinus sp.	Pinaceae
	Pisum sativum L.	Fabaceae
	Polyalthia longifolia Benth & HKf	Anonaceae
	Polygonum alatum Buch-Ham.	Polygonaceae
	Polygonum berbatum L.	Polygonaceae
	Polygonum chinense L.	Polygonaceae
	Polygonum hydropiper L.	Polygonaceae
	Polygonum serrulatum Lagasc	Polygonaceae
	Polygonum spp.	Polygonaceae
	Pouzolzia hirta Hasrk.	Urticaceae
	Prunus anygdalus Baill	Rosaceae
	Prunus cerasus L.	Rosaceae
	Prunus domestica	Rosaceae
	Prunus nepalensis Koch	Rosaceae
	Prunus persica Benth & HKf	Rosaceae
	Prunus sylvestris	Rosaceae
	Prunus spp.	Rosaceae
	Psidium guajava L.	Myrtaceae
	Punica granatum L.	Punicaceae
	Pyrus communis L.	Rosaceae
	Pyrus kumaoni Dene	Rosaceae
	Pyrus malus L.	Rosaceae
	Pyrus pashia Buch-Ham	Rosaceae
	Raphanus sativus L.	Brassicaceae
	Rhamnus nepalensis Laws	Rhamnaceae
	Rhododendron sp.	Ericaceae
	Richardia pilosa Ruiz-Pov	Rubiaceae
	Ricinus communis L.	Euphorbiaceae
	Rosa canina S.	Rosaceae
	Rosa sp.	Rosaceae
	Rubia cordifolia L.	Rubiaceae
	Rubus ellipticus Sm.	Rosaceae

Name of Aphid	Host plant	Plant Family
	Rudbeckia tagetes James	Asteraceae
	Rumex acetosella L.	Polygonaceae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex sp.	Polygonaceae
	Salvia coccinea L.	Lamiaceae
	Sambucus javanica Bl.	Sambucaceae
	Schima wallichii Chois	Ternstroemiaceae
	Schima edule Forsk.	Ternstroemiaceae
	Senecio sp.	Asteraceae
	Sida acuta Burn.	Malvaceae
	Sida rhombifolia L.	Malvaceae
	Sida sp,	Malvaceae
	Smilax sp.	Smilacaceae
	Solanum clavatum	Solanaceae
	Solannm melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum sisyrbifolium Lam.	Solanaceae
	Solanum torvum SW.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum spp.	Solanaceae
	Solidago canadensis L.	Asteraceae
	Sonchus arvensis L.	Asteraceae
	Spilanthes acmella L.	Asteraceae
	Spinacia oleracea L.	Chenopodiaceae
	Spiraea bella Slms	Rosaceae
	Spiraea cantonensis Lour	Rosaceae
	Spiraea chamoidri	Rosaceae
	Spriaea collosa Wall.	Rosaceae
	Spiraca corymbosa Roxb.	Rosaceae
	Spiraea spp.	Rosaceae
	Symplocos cyatcrataegoides Buch-Hax.	Sympolocaceae

Name of Aphid	Host plant	Plant Family
	Symplocos sp.	Sympolocaceae
	Synedrilla nudiflora Gaertn.	Asteraceae
	Tagetes patula L.	Asteraceae
	Tagetes sp.	Asteraceae
	Terminalia arjuna W & A.	Combretaceae
	Thumbergia coccinea Wall	Acanthaceae
	Tibouchina semidecandra Cogn.	Melastomaceae
	Tridax procumbens L.	Asteraceae
	Urtica sp.	Urticaceae
	Valeriana wallichii DC	Valerianaceae
	Vernonia sp.	Asteraceae
	Viburnum foetidum Wall.	Caprifoliaceae
	Vicia faba L.	Papilionaceae
	Vigna catjang Endl.	Papilionaceae
	Vinca rosea L.	Apocynaceae
	Vitex sp.	Verbenaceae
	Wendlandia glabrata DC	Rubiaceae
	Weldenlandia sp.	Rubiaceae
	Woodfordia fructicosa Kurz	Lythraceae
	Xanthium sp.	Asteraceae
	Zanthoxylum armatum Roxb.	Rutaceae
	Zanthoxylum sp.	Rutaceae
	Zinnia elegans Jacq.	Asteraceae
	Zinnia sp.	Asteraceae
	Indet	Asclepiadaceae
	Indet	Asteraceae
	Indet	Fern
	Indet	Poaceae
	Indet	Rosaceae
	Indet	Urticaceae
Aphis (Aphis) clematidis	*Clematis* sp.	Ranunculaceae
simlaensis	*Clematis buchananiana*	Ranunculaceae

Name of Aphid	Host plant	Plant Family
Kumar and Burkhardt	*Abelmoschus esculentus*	Malvaceae
	Veronica agrestris L.	*Scrophulariaceae*
Aphis (Aphis) craccivora	*Acalypha* sp.	Euphorbiaceae
	Achyranthes aspera L.	Amaranthaceae
	Aeschynomene sp.	Fabaceae
	Ageratum conyzoides L.	Asteraceae
	Alhagi pseudoalhagi (Bieb.) Desv.	Fabaceae
	Alysicarpus glumaceus (Vehl.) DC	Fabaceae
	Alstonia scholaris Br.	Apocynaceae
	Amaranthus gangeticus L.	Amaranthaceae
	Amaranthus gangeticus L. var. *oleracea*	Amaranthaceae
	Amaranthus gangeticus L. var. *tristis*	Amaranthaceae
	Amaranthus gracilis Desj.	Amaranthaceae
	Amaranthus spinosus L.	Amaranthaceae
	Antigonon leptopus HK & An	Polygonaceae
	Arachis hypogaea L.	Fabaceae
	Benincasa hispida Cogn.	Cucurbitaceae
	Beta vulgaris L.	Chenopodiaceae
	Bidens biternata (Lour.) Mem. & Sherff. (=*Bidens pilosa)*	Asteraceae
	Boerhavia diffusa L.	Nyctaginaceae
	Bougainvillea spectabilis Willd.	Nyctaginaceae
	Bougainvillea spp.	Nyctaginaceae
	Cajanus cajan	Fabaceae
	Cajanus sp.	Fabaceae
	Calotropis gigantea R. Br.	Apocynaceae
	Calotropis procera	Apocynaceae
	Camellia theifera Griff.	Theaceae
	Canavalia ensiformis DC.	Fabaceae
	Carica papaya L.	Caricaceae

Name of Aphid	Host plant	Plant Family
	Carrissa sp.	Apocynaceae
	Carthamus tinctorius L.	Asteraceae
	Casearia sp.	Flacourtiaceae
	Cassia auriculata L.	Caesalpiniaceae
	Cassia fistula L.	Caesalpinaceae
	Cassia hirsuta L.	Caesalpiniaceae
	Cassia javanica L.	Caesalpiniaceae
	Cassia sophera L.	Caesalpiniaceae
	Cassia tora L.	Caesalpiniaceae
	Cassia spp.	Caesalpiniaceae
	Cestrum nocturnum Lam.	Solanaceae
	Cestrum sp.	Solanaceae
	Chenopodium album L.	Chenopodiaceae
	Chenopodium ravely	Chenopodiaceae
	Chrysanthemum indicum L.	Asteraceae
	Chrysanthemum sp.	Asteraceae
	Cicer arietinum L.	Fabaceae
	Cicer sp.	Fabaceae
	Citrus limonum Wall.	Rutaceae
	Citrus madurensis Lown	Rutaceae
	Cirtus paradisi Macfad	Rutaceae
	Citrus reticulata Blanco	Rutaceae
	Citrus sinensis Pers	Rutaceae
	Cleome chelidonii L.	Capparidaceae
	Cleome pentaphylla L.	Capparidaceae
	Cnicus wallichii Clarke	Asteraceae
	Coccinea cordifolia (L.) Cogn.	Cucurbitaceae
	Coffea arabica L.	Rubiaceae
	Colocasia antiquorum Schott.	Araceae
	Colocasia sp.	Araceae
	Coriandrum sativum L.	Umbelliferae
	Cosmos sp.	Asteraceae
	Crotalaria juncea L.	Fabaceae

Name of Aphid	Host plant	Plant Family
	Crotalaria sp.	Fabaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita mascima	Cucurbitaceae
	Cuscuta reflexa	Cucurbitaceae
	Cyamopsis tetragonoloba	Fabaceae
	Daphne cannabina	Thymelaeaceae
	Dalbergia sissoo Raxb.	Fabaceae
	Dallbergia sp.	Fabaceae
	Desmodium sp.	Fabaceae
	Dolichos biflorus L.	Fabaceae
	Dolichos lablab L.	Fabaceae
	Dolichos sp.	Fabaceae
	Erigeron asteroides Wall	Asteraceae
	Eupatorium odoratum L.	Asteraceae
	Eupatorium sp.	Asteraceae
	Euphorbia sp.	Euphorbiaceae
	Ficus heterophylla L.	Moraceae
	Geranium spp.	Geraniaceae
	Gliricidia maculata H.B. &K.	Fabaceae
	Glycine max	Fabaceae
	Guizotia abyssynica Cass	Asteraceae
	Helianthus annus L.	Asteraceae
	Helianthus sp.	Asteraceae
	Heliotropium indicum L.	Boraginaceae
	Hibiscus esculentus L.	Malvaceae
	Hibiscus rosa sinensis L.	Malvaceae
	Holoptelea integrifolia Planch	Urticaceae
	Indigofera enneaphylla L.	Papilionaceae
	Indigofera nigra	Papilionaceae
	Indigofera oblongifolia Forsk.	Fabaceae
	Indigofera purpurea Pers	Fabaceae
	Indigofera tinctoria L.	Fabaceae
	Indigofera trita L. f.	Fabaceae

Name of Aphid	Host plant	Plant Family
	Indigofera spp.	Fabaceae
	Kochia sp.	Chenopodiaceae
	Lablab speciosa	Fabaceae
	Lageneria vulgaris Ser.	Cucurbitaceae
	Lagerstroemia flos-reginae Rez.	Lythraceae
	Lantana sp.	Verbenaceae
	Lathyrus aphaca L.	Fabaceae
	Lathyrus sativus L.	Fabaceae
	Lens culinalis	Fabaceae
	Lens culindrica	Fabaceae
	Lens esculenta Moench	Fabaceae
	Litchi chinensis Sonner	Sapindaceae
	Luffa aegyptiaca Mill.	Cucurbitaceae
	Luffa cylindrica	Cucurbitaceae
	Lycopersicum esculentum Mill.	Solanaceae
	Lycopersicum sp.	Solanaceae
	Lyonia ovalifolia (Wall.) Drude	
	Mallotus indica	Euphorbiaceae
	Malus sieverssi	Rosaceae
	Mangifera indica L.	Anacardiaceae
	Medicago denticulata Willd.	Fabaceae
	Medicago lupulina L.	Fabaceae
	Medicago sativa L.	Fabaceae
	Melilotus indica All.	Fabaceae
	Melilotus parviflora Desf.	Fabaceae
	Mimosa pudica L.	Mimoceae
	Mimosa sp.	Mimoceae
	Mirabillis jalapa L.	Nyctaginaceae
	Mussanda sp.	Rubiaceae
	Nicotiana tabacum L.	Solanaceae
	Oenanthe stolonifera Wall	Umbelliferae
	Petunia alba	Solanaceae
	Petunia violacea Lundl.	Solanaceae

Name of Aphid	Host plant	Plant Family
	Phaseolus aureus Buch-Han	Fabaceae
	Phaseolus mungo L.	Fabaceae
	Phaseolus roxburghii W. & A.	Fabaceae
	Phaseolus sinensis	Fabaceae
	Phaseolus trilobus Ait	Fabaceae
	Phaseolus vulgaris L.	Fabaceae
	Phaseolus sp.	Fabaceae
	Phyllanthus niruri L.	Euphorbiaceae
	Pisum sativum L.	Fabaceae
	Plantago zeylanica L.	Plantaginaceae
	Polygonum sp.	Polygonaceae
	Portulaca oleracea L.	Portulaceae
	Prunus amygdalus	Rosaceae
	Psidium guajava	Myrtaceae
	Psophocarpus tetragonolobus DC	Papilionaceae
	Raphanus sativus L.	Brassicaceae
	Rumex nepalensis Spring	Polygonaceae
	Sesamum indicum DC	Pedaliaceae
	Sesbamia bispinosa Stend	Fabaceae
	Sesbania cannabina Pers.	Fabaceae
	Sesbania grandiflora Pers.	Fabaceae
	Sesbania speciosa	Fabaceae
	Smithia semsitiva Ait	Fabaceae
	Solamm clavatum	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum spp.	Solanaceae
	Sonchus sp.	Asteraceae
	Sonchus sp.	Asteraceae
	Syzygium guajava	Myrtaceae
	Tagetes erecta	Asteraceae
	Tephrosia candida DC.	Fabaceae

Name of Aphid	Host plant	Plant Family
	Tinospora cordifolia Miers	Menispermiaceae
	Tribulus terrestris L.	Zygophylaceae
	Trifolium alexandrinum L.	Fabaceae
	Trifolium prutetianum Ser.	Fabaceae
	Trifolium repens L.	Fabaceae
	Trigonella foenum-graceum	Fabaceae
	Tridax procumbens L.	Asteraceae
	Trollius phamaceliodies	Ranunculaceae
	Vernonia cinerea Less.	Asteraceae
	Vicia faba L.	Fabaceae
	Vigna catjang Endl.	Fabaceae
	Vigna mungo Linn.	Fabaceae
	Vigna sesouipedalis Marechal *et al.*	Fabaceae
	Vigna sinensis	Fabaceae
	Zea mays L.	Poaceae
	indet plant of Asteraceae	
	indet plants of Cucurbitaceae	
Aphis (Aphis) nr. *craccivora* Koch	*Strobilanthes atropurpureus* Nees.	Acanthaceae
Aphis (Aphis) eugeniae van der Goot	*Dipsacus inermis* Wall	Acanthaceae
Aphis (Aphis) euphorbiae Kaltenbach	*Euphorbia* sp.	Euphorbiaceae
	Euphorbia hercta	Euphorbiaceae
Aphis (Aphis) fabae Complex		
= *Aphis evonymi* Fabricius		
= *Aphis fabae solanella* Theobald		
	Adenostemma viscosum Forst	Asteraceae
	Alternanthera philoxeroides Griseb.	Amaranthaceae
	Agetratum conyzoides	Asteraceae
	Amaranthus paniculatus	Amaranthaceae

Name of Aphid	Host plant	Plant Family
	A. viridis	Amaranthaceae
	Anaphalis contorta	Asteraceae
	Anaphalis sp.	Asteraceae
	Asclepias curassavica L.	Asclepiadaceae
	Bambusa sp.	Poaceae
	Benincasa hispida Cogn.	Cucurbitaceae
	Beta vulgaris L.	Chenopodiaceae
	Bidens pilosa L.	Asteraceae
	Bidens wallichi	Asteraceae
	Bougainvillia spectabilis	Asteraceae
	Calocasia sp.	Araceae
	Cajanus cajan	Fabaceae
	Cassia fistula	Fabaceae
	Capsicum annum L.	Solanaceae
	Centaurea sp.	Asteraceae
	Cestrum diurnum L.	Solanaceae
	Cestrum nocturnum L.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium ravely	Chenopodiaceae
	Citrus sp.	Rutaceae
	Clematis sp.	Ranunculaceae
	Clerodendrum viscosum	Verbenaceae
	Cnicus arvensis Hoffm.	Asteraceae
	Cnicus wallichii HKF.	Asteraceae
	Cosmos sp.	Asteraceae
	Crotalaria striata DC.	Papilionaceae
	Cuscuta reflexa	Convolvulaceae
	Cyanotis axillaris R. & S.	Commelinaceae
	Dahlia variabilis	Asteraceae
	Datura fastuosa L.	Solanaceae
	Datura stramonium	Solanaceae
	Debregeasia sp.	Urticaceae
	Dicorocephala latifolia	?

Name of Aphid	Host plant	Plant Family
	Deutzia crenata Sieb & Zucc.	Philadelphae
	Dolichos lablab L.	Fabaceae
	Duabanga sonneratioides Buch-Ham.	Lythraceae
	Eclipta prostrata (L)	Asteraceae
	Erigeron sp.	Myrtaceae
	Euonymus sp.	Celastraceae
	Eupatorium adenophorum HBK	Asteraceae
	Eupatorium odoratum L.	Asteraceae
	Eupatorium wallichii DC.	Asteraceae
	Fern (indet)	
	Galinsoga parviflora Cav.	Asteraceae
	Geranium nepalense	Geranaceae
	Glochidion velutinum	Euphorbiaceae
	Helianthus annus L.	Asteraceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Impatiens exabrida	Balsaminaceae
	Ipomoea fistulosa	Convolvulaceae
	Lantana camara L.	Verbenaceae
	Lawsonia alba	Lythraceae
	Lindenbergia indica (L.) Vatke	Scrophulariaceae
	Malus sieverssi	Rosaceae
	Marsdenia sp.	Apocynaceae
	Michelia champaca L.	Magnoliaceae
	Milabilis jalapa L.	Nyctaginaceae
	Momordica charantia L.	Cucurbitaceae
	Nerium indicum Mill.	Apocynaceae
	Nicotiana sp.	Solanaceae
	Philadelphus coronarius L.	Philadelphaceae
	Punica granatum L.	Punicaceae
	Pyrus communis L.	Rosaceae
	Quercus sp.	Fagaceae
	Rhamnus nepalensis Laws.	Rhamnaceae

Name of Aphid	Host plant	Plant Family
	Rhammus sp.	Rhamnaceae
	Rosa indica	Rosaceae
	Rubia cordifolia L.	Rubiaceae
	Rubus ellipticus Sm.	Rosaceae
	Rumex acetosella L.	Polygonaceae
	Rumex dentatus L.	Polygonaceae
	Rumex hastatus D. Don	Polygonaceae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex spp.	Polygonaceae
	Sambucus javanica Bl.	Sambucaceae
	Saurauja nepalensis	Actinidiaceae
	Schima wallichii Chos	Ternstroemiaceae
	Senecio rufinervis	Asteraceae
	Sida cordifolia L.	Malvaceae
	Solanum clavatum L	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum torvum SW.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum spp.	Solanaceae
	Sonchus sp.	Asteraceae
	Spiraea bella Sims.	Rosaceae
	Spiraea chanoldri	Rosaceae
	Spiraea vaccinifolia	Rosaceae
	Strobilanthes atropurpureus Nees	Acanthaceae
	Styrax serrulatum	Styraceae
	Tagetes erecta	Asteracea
	Tagetes patula L.	Asteraceae
	Tecoma stans	Bignoniaceae
	Veronico anagalis	Scrophulariaceae
	Vernonia cineria Less	Asteraceae
	Viburnum opulus L.	Caprifoliceae
	Vicia faba L.	Papilionaceae

Name of Aphid	Host plant	Plant Family
	Vigna catjang Endl.	Papilionaceae
	Vinca rosea L.	Apocynaceae
	Zinnia elegans Jacq.	Asteraceae
	indet	Poaceae
	indet	Solanaceae
	Plants of indet families	
Aphis (Aphis) farinosa Gmelin	*Salix* sp.	Salicaceae
Aphis (Aphis) glycines Matsumura	Mers.*Glaxina maxima* *Glycine max* (L.)	Fabaceae
Aphis (Aphis) gossypii Glover	*Abelmoschus esculentus* W. & A.	Malvaceae
	Abroma angusta L.	Sterculiaceae
=*A. ficus* Theobald	*Abutilon indicum* G. Don	Malvaceae
	Acacia sp.	Fabaceae
=*A. frangulae* Kaltenbach	*Acalypha* sp.	Euphorbiaceae
=*A. gossypii frangulae* group	*Acanthospermum hispidum* DC	Asteraceae
=*A. malvacearum* B. Das	*Achras sapota* L.	Sapotaceae
=*A.malvae* Koch	*Achyranthes aspara* L.	Amaranthaeceae
	Achyranthes bidentata	Amarantheceae
=*A. malvoides* B. Das	*Achyranthes* sp.	Amaranthaceae
=*A. tridacis* Theobald	*Acorus calamus* L.	Araceae
	Ageratum conyzoides L.	Asteraceae
	Ageratum sp.	Asteraceae
	Ajuga brachystemon	Lamiaceae
	Ajuga cractionia	Lamiaceae
	Ajuga sp.	Lamiaceae
	Allium cepa L.	Alliaceae
	Alocasia indica Schott.	Araceae
	Alstonia sp.	Apocynaceae
	Alternanthera nodiflora Br.	Amaranthaceae
	Althaea rosea L.	Malvaceae

Name of Aphid	Host plant	Plant Family
	Amaranthus gangeticum	Amaranthaceae
	Amaranthus spinosus L.	Amaranthaceae
	Amaranthus viridis L.	Amaranthaceae
	Anaphalis contorta H.K.f.	Asteraceae
	Anaphalis triplinervis Clarke	Asteraceae
	Anaphalis spp.	Asteraceae
	Annona sp.	Annonaceae
	Antigonon leptopus Hook & Ann.	Polygonaceae
	Anthraxon sp.	Poaceae
	Apluda mutica	Poaceae
	Argemone mexicana L.	Papaveraceae
	A. nilagirica (CI) Pamp	Papaveraceae
	Artemisia vulgaris L.	Asteraceae
	Asclepias curassavica L.	Asclepiadaceae
	Aster trinervises Roxb.	Asteraceae
	Aster spp.	Asteraceae
	Bambusa arundinacea Wild.	Poaceae
	Basella rubra	Poaceae
	Benincasa cerifera	Cucurbitaceae
	Benincasa hispida Cogn.	Cucurbitaceae
	Beta vulgaris L.	Chenopodiaceae
	Bidens biternata L.	Asteraceae
	Blumea lacera DC.	Asteraceae
	Blumea laciniata DC.	Asteraceae
	Blumea witiara DC.	Asteraceae
	Blumea sp.	Asteraceae
	Boerhavia hispida	Nyctaginaceae
	Bougainvillea spectabilis Wild.	Nyctaginaceae
	Bougainvillea spp.	Nyctaginaceae
	Brassica juncea HKf. & T.	Brassicaceae
	Brassica oleracea L.	Brassicaceae
	Brassica sp.	Brassicaceae
	Bridelia sp.	Euphorbiaceae

Name of Aphid	Host plant	Plant Family
	Bryomia sp.	Cucurbitaceae
	Buddleja asiatica Lour	Buddlejaceae
	Buddleja macrostachya Benth.	Buddlejaceae
	Butea menesperma Taub.	Fabaceae
	Caesalpina sepiaria	Fabaceae
	Cajanus cajan (L.) Millap	Fabaceae
	Calaminthe umbrosa	Lamiaceae
	Calceolaria esculenta (?)	Scrophulariaceae
	Calceolaria mexicana Bench.	Scrophulariaceae
	Calendula sp.	Asteraceae
	Calliandra haematocephala Hassk.	Mimoceae
	Callicarpa macrophylla Vahl	Verbenaceae
	Callicarpa sp.	Verbenaceae
	Calotropis gigantea Br.	Asclepiadaceae
	Calotropis procera Br.	Asclepiadaceae
	Calotropis sp.	Asclepiadaceae
	Camellia sinensis (L) Kun	Theaceae
	Canna spp.	Cannaceae
	Cannabis sativa L.	Urticaceae
	Capparis leucophylla	Capparidaceae
	Capparis stylosa DC.	Capparidaceae
	Capsella bursa-pastoris Moench.	Brassicaceae
	Capsicum annum L.	Solanaceae
	Capsicum frutescens L.	Solanaceae
	Capsicum spp.	Solanaceae
	Carica papaya L.	Caricaceae
	Cassia hirsuta L.	Caesalpiniaceae
	Cassia sophera L.	Caesalpiniaceae
	Cassia spp.	Caesalpiniaceae
	Caitharanthus roseus G. Drn.	Cynaceae
	Celosia argentea L.	Amaranthaceae
	Cestrum diurnum L.	Solanaceae

Name of Aphid	Host plant	Plant Family
	Cestrum nocturnum Lam.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium album L.	Chenopodiaceae
	Chrysanthemnm cororarium L.	Asteraceae
	Chrysanthemum hortorum sp.	Asteraceae
	Chrysanthemum sinense Sabine	Asteraceae
	Chrysanthemum spp.	Asteraceae
	Cissampelos pareira	Menispermaceae
	Cissampelos sp.	Menispermaceae
	Citrulus vulgaris Schrad	Cucurbitaceae
	Citrus aurantium L.	Rutaceae
	Citrus decumina L.	Rutaceae
	Citrus limonum Wall	Rutaceae
	Citrus maxima (Burm.) Merr.	Rutaceae
	Citrus paradisi Macfad	Rutaceae
	Citrus reticulata Blanco	Rutaceae
	Citrus sinensis Pers.	Rutaceae
	Citrus spp.	Rutaceae
	Clematis buchananiana	Ranunculaceae
	Clematis sp.	Ranunculaceae
	Cleome chelidenii L.	Capparidaceae
	Cleome pentaphyla L.	Capparidaceae
	Clerodendrum incana	Verbenaceae
	Clerodendrum intermis	Verbenaceae
	Clerodendrum viscosum Vent.	Verbenaceae
	Clerodendrum serratum Spreng	Verbenaceae
	Clerodendrum spp.	Verbenaceae
	Clitoria ternatea L.	Papilionaceae
	Coccinea cordifolia (L.) Cogn.	Cucurbitaceae
	Coccinea spp.	Cucurbitaceae
	Cocos sp.	Palmae
	Colocasia antiquorum Schott	Araceae
	Colocasia esoculenta	Araceae

Name of Aphid	Host plant	Plant Family
	Commelina benghalensis L.	Commelinaceae
	Commelina spp.	Commelinaceae
	Commiphora berryi Engl.	Burseraceae
	Conyza japonica Less.	Asteraceae
	Conyza spp.	Asteraceae
	Corchorus capsularis L.	Tiliaceae
	Corchorus olitorius L.	Tiliaceae
	Corchorus sp.	Tiliaceae
	Cordia dichotessa Forst.	Boraginaceae
	Coriandrum sativum L.	Umbelliferae
	Cosmos sp.	Asteraceae
	Craniotome versicolor	Lamiaceae
	Crepis sp.	Asteraceae
	Crinum sp.	Amaryllidaceae
	Crotalaria alata Buch-Ham.	Fabaceae
	Crotalaria brown Rehb.	Fabaceae
	Crotalaria juncea L.	Fabaceae
	Crotalaria sp.	Fabaceae
	Cryptostegia grandiflora Br.	Asclepiadaceae
	Cucumis melo L.	Cucurbitaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita maxima L	Cucurbitaceae
	Cynanchum sp.	Apocynaceae
	Cynoglossum furcatum	Boraginaceae
	Cynoglossum wallichi	Boraginaceae
	Cucurbita moschata Duchesne	Cucurbitaceae
	Cucurbita pepo DC	Cucurbitaceae
	Cucurbita ?	Cucurbitaceae
	Cucurbita spp.	Cucurbitaceae
	Cuphea sp.	Lythraceae
	Cupressus sp.	Cupressaceae
	Curcuma longa L.	Scitaminaceae
	Cuscuta reflexa Roxb.	Convolvulaceae

Name of Aphid	Host plant	Plant Family
	Cyamopsis tetragonoloba	Fabaceae
	Cyamotis axillaris R. & S.	Commelinaceae
	Cynoglossum lanceolatum Heyne	Boraginaceae
	Cyperus rotundus L.	Cyperaceae
	Cyphomandra betaceae Sendt.	Solanaceae
	Cypripedium sp.	Orchidaceae
	Dahila variabilis Desf.	Asteraceae
	Dahlia sp.	Asteraceae
	Datura fastuosa L.	Solanaceae
	Datura stramonium L.	Solanaceae
	Datura spp.	Solanaceae
	Desmodium laburmifolium	Fabaceae
	Dicanthium anmulatum	Poaceae
	Dicrocephala integrifolia	Asteraceae
	Digitalis sp.	Scrophulariaceae
	Dolichos lablab L.	Fabaceae
	Drymaria cordata Wild.	Caryophyllaceae
	Duabanga grandiflora (Rovb.) Walp.	Sonneratiaceae
	Duranta repens L.	Verbenaceae
	Dysophylla sp.	Lamiaceae
	Eclipta prosprata (L.)	Asteraceae
	Elsholtzia incisa	Lamiaceae
	Elsholtzia sp.	Lamiaceae
	Elsholtzia polystachya Bend.	Lamiaceae
	Eleusine coracana Geertn.	Poaceae
	Emilia sonchifolia DC	Asteraceae
	Emilia sp.	Asteraceae
	Epilobium sp.	Onagraceae
	Erechites valerianaefolia DC	Asteraceae
	Erechtites spp.	Asteraceae
	Erigeron sp.	Asteraceae
	Eriobotrys japonica	Rosaceae

Name of Aphid	Host plant	Plant Family
	Eucalyptus sp.	Myrtaceae
	Eugenia michelli Lam.	Myrtaceae
	Eupatorium heteroclium Griseb.	Asteraceae
	Eupatorium odoratum L.	Asteraceae
	Eupatorium cannabinum L.	Asteraceae
	Eupatorium sp.	Asteraceae
	Euphorbia hirta L.	Euphorbiaceae
	Euphorbia pilulifera L.	Euphorbiaceae
	Euphorbia spp.	Euphorbiaceae
	Eurya japonica Thumb.	Ternstroemiaceae
	Fagopyrum cymosum Meissm.	Polygonaceae
	Fagopyrum esculentum	Polygonaceae
	Fagopyrum sp.	Polygonaceae
	Ficus bengalensis L.	Moraceae
	Ficus heterophylla L.	Moraceae
	Ficus tsiela Roxb.	Moraceae
	Ficus spp.	Moraceae
	Flaveria australasica Hook	Asteraceae
	Forsythia sp.	Oleaceae
	Fragaria sp.	Rosaceae
	Galinsoga parviflora Cav.	Asteraceae
	Gardenia florida L.	Rubiaceae
	Gentiana kurroo	Gentianaceae
	Geranium ocelatum Camb.	Geraniaceae
	Gerbera macrophylla Benth.	Asterraceae
	Girandinia heterophylea	Lirticaceae
	Gladiolus sp.	Iridaceae
	Glochidion uelutrium	Euphorbiaceae
	Glycine max Merx	Fabaceae
	Gnaphalium luteoalbum L.	Asteraceae
	Goldfussia dalhousiana Nees	Acanthaceae
	Gossypium arboreum L.	Malvaceae
	Gossypium barbadense L.	Malvaceae

Name of Aphid	Host plant	Plant Family
	Gossypium herbaceum L.	Malvaceae
	Gossypium hirsutum L.	Malvaceae
	Gossypium spp.	Malvaceae
	Grewia asiatica L.	Tiliaceae
	Gynura angutosa DC	Asteraceae
	Gynura nepalensis DC	Asteraceae
	Gynura sp.	Asteraceae
	Hamiltonia velutinum	Rubiaceae
	Hedyotis scandens Roxb.	Rubiaceae
	Hedyotis sp.	Rubiaceae
	Helianthus annuus L.	Asteraceae
	Helicteres isora L.	Sterculiaceae
	Hibiscus canabis	Malvaceae
	Hibiscus esculentus L,	Malvaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Hibiscus sabdariffa L.	Malvaceae
	Hibiscus spp.	Malvaceae
	Holarrhena antidysentrica Wall.	Apocynaceae
	Holmskioldia sanguinea Retz.	Verbenaceae
	Holoptelea integrifolia Planch	Ulmaceae
	Hydrangea spp.	Saxifragaceae
	Hypericum oblongifolium Choiss	Hypericaceae
	Hypericum patulum Thumb	Hypericaceae
	Hypericum perforatum	Hypericaceae
	Hypericum uralum	Hypericaceae
	Hypochaeris radicata L.	Asteraceae
	Iccinocarpus frutescens Br.	Apocynaceae
	Iberis amara	Barassicaceae
	Impatiens balsamina L.	Balsaminaceae
	Impatiens spp.	Balsaminaceae
	Indigofera sp.	Fabaceae
	Inula cappa DC	Asteraceae
	Ipomea batatas Lamk.	Convolvulaceae

Name of Aphid	Host plant	Plant Family
	Ipomea carnea Lamk.	Convoluvlaceae
	Ipomea fistulosa Martex Choisy	Convoluvlaceae
	Ipomoea hederaces Jacq.	Convolvulaceae
	Ipomoea spp.	Convolvulaceae
	Ixora chinensis Lam.	Rubiaceae
	Ixora coccinea L.	Rubiaceae
	Jacaranda mimosifolia D. Don.	Bignoniaceae
	Lagerstroemia siceraria Standl	Cucurbitaceae
	Lagenaria vulgaris Ser.	Cucurbitaceae
	Lagerstroemia flomibunda	Lythraceae
	Lagerstroemia flos-reginae Rets.	Lythraceae
	Lagerstroemia sp.	Lythraceae
	Lantana camara L.	Verbenaceae
	Lantana sp.	Verbenaceae
	Lawsonia inermis Roxb.	Lythraceae
	Lens esculenta Moench	Fabaceae
	Leptodermis griffithi HKf.	Rubiaceae
	Leptodermis lanceolata	Rubiaceae
	Leucaena glauca Bench	Fabaceae
	Leucas aspera Spreng	Lamiaceae
	Leucas cephalotes Spreng	Lamiaceae
	Leucosceptrum camum Sr.	Lamiaceae
	Lippia sp.	Verbenaceae
	Lonicera sp.	Caprifoliaceae
	Ludwigia pervuiflora Roxb.	Onagraceae
	Luffa aegyptiaca Mill	Cucurbitaceae
	Luffa cylindrica	Cucurbitaceae
	Lycopersicum esculentum Mill	Solanaceae
	Lyonia ovalifolia (Wall.) Drude	Ericaceae
	Maesa chisia D. Don	Myrsinaceae
	Maesa indica Wall.	Myrsinaceae
	Malachra capitata L.	Malvaceae
	Mallotus philippinensis	Euphorbiaceae

Name of Aphid	Host plant	Plant Family
	Malva parviflora L.	Malvaceae
	Malva sylvestris L.	Malvaceae
	Malvastrum tricuspidatum A. Gray	Malvaceae
	Malvaviscus conzonthie	Malvaceae
	Mangifera indica L.	Anacardiaceae
	Martynia diandra	Pedaliaceae
	Medicago sativa L.	Fabaceae
	Melilotus indica All.	Fabaceae
	Mentha arvensis L.	Lamiaceae
	Mentha longifolia (L.) Huds	Lamiaceae
	Mentha viridis L.	Lamiaceae
	Mentha sp.	Lamiaceae
	Michelia champaca L.	Magnoliaceae
	Mikania scandens wild.	Asteraceae
	Mikania sp.	Asteraceae
	Mimosa pudida L.	Fabaceae
	Mahania microphylla	
	Momordica charantia L.	Cucurbitaceae
	Momordica cochinensis Spreng	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Asteraceae
	Morus alba L.	Moraceae
	Morus sp.	Moraceae
	Mussaenda frondosa L.	Rubiaceae
	Myriactis nepalensis Less.	Asteraceae
	Nerium odorum Soland	Apocynaceae
	Nicotiana tabacum L.	Solanaceae
	Nicotiana spp.	Solanaceae
	Ocimum basillicum L.	Lamiaceae
	Ocimum camum Sims	Lamiaceae
	Ocimum sanctum L.	Lamiaceae
	Ocimum sp.	Lamiaceae
	Oenothera biennis L.	Onagraceae
	Origanum vulgare L.	Lamiaceae

Name of Aphid	Host plant	Plant Family
	Osbeckia capitata Bench	Melastomaceae
	Osbeckia crinata Bench	Melastomaceae
	Oxalis sp.	Oxalidaceae
	Paederia foetida L.	Rubiaceae
	Pedilanthus tithymoloides Poit	Euphorbiaceae
	Pelargonium zonale L. Herit	Geraniaceae
	Peltophorum pterocarpum Baker ex Heyne	Caesalpineae
	Pennisetum purpureum	Poaceae
	Perilla sp.	Lamiąceae
	Petunia spp.	Solanaceae
	Philadelphus caronarius	Saxifragaceae
	Physalis peruviana L.	Solanaceae
	Pilea microphylla (L) Liebm.	Urticaceae
	Piper betle L.	Piperaceae
	Pimpinella monoica Dalz.	Umbelliferae
	Palntago major L.	Plantaginaceae
	Plectranthus coetsa Buch Ham.	Lamiaceae
	Plectranthus striatus Benth.	Lamiaceae
	Plectranthus sp.	Lamiaceae
	Pogostemon bengalensis	Lamiaceae
	Polyalthia longifolia Benth. & H. K. f.	Anonaceae
	Polyalthia sp.	Anonaceae
	Polygonum nepalense Missn.	Polygonaceae
	Polygonum barbatum L.	Polygonaceae
	Polygonum capitatum Buch-Ham.	Polygonaceae
	Polygonum fiaccidum Meissn.	Polygonaceae
	Polygonum orientale L.	Polygonaceae
	Polygonum runcinatum Buch-Ham.	Polygonaceae
	Polygonum fiaccidum Meissn.	Polygonaceae
	Polygonum orientale L.	Polygonaceae
	Polygonum runcinatum Buch-Ham.	Polygonaceae

Name of Aphid	Host plant	Plant Family
	Polygonum serrulatum Lagasc.	Polygonaceae
	Polygonum vulgare Gueldenst	Polygonaceae
	Polygonum spp.	Polygonaceae
	Populus sp.	Salicaceae
	Portulaca sp.	Portulacaceae
	Potentilla sp.	Rosaceae
	Pouzolzia hirta Hassk.	Urticaceae
	Pouzolzia sp.	Urticaceae
	Prinsepia utilis Royle	Rosaceae
	Prosopis juliflora DC.	Mimoseae
	Prunus amygdalus Baill	Rosaceae
	Prunus cerasus L.	Rosaceae
	Prunus domestica L.	Rosaceae
	Prunus perisica Benth & HKf.	Rosaceae
	Prunus puddum Roxb.	Rosaceae
	Prunus spp.	Rosaceae
	Punica granatum L.	Punicaceae
	Pyrus communis L.	Rosaceae
	Pyrus pashia	Rosaceae
	Pyrus spp.	Rosaceae
	Raphanus sativus L.	Brassicaceae
	Rhammus nepalensis Laws	Rhamnaceae
	Rhamnus sp.	Rhamnaceae
	Rhamnus triqueter	Rhamnaceae
	Rhododendron arboreum Sm.	Ericaceae
	Rbododendron sp.	Ericaceae
	Ricinus commenis L.	Euphorbiaceae
	Rosa alba L.	Rosaceae
	Rosa cania L.	Rosaceae
	Rosa spp.	Rosaceae
	Rotala sp.	Lythraceae
	Rubia cordifolia L.	Rubiaceae
	Rubus ellipticus Sm.	Rosaceae

Name of Aphid	Host plant	Plant Family
	Rubus moluccanas L.	Rosaceae
	Rubus sp.	Rosaceae
	Rudbeckia tagetes	Asteraceae
	Ruellia prostrata Lamk	Acanthaceae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex spp.	Polygonaceae
	Saccharum officinarum L.	Poaceae
	Salvia aspera Mart. & Gal.	Lamiaceae
	Salvia spp.	Lamiaceae
	Schima wallichii Chois	Ternstroemiaceae
	Scutellaria repens Buch-Ham.	Lamiaceae
	Scutellaria scandens D. Don	Lamiaceae
	Sechium edule SW.	Cucurbitaceae
	Sechium sp.	Cucurbitaceae
	Senecio densiflorus DC	Asteraceae
	Senecio spp.	Asteraceae
	Sesamum orientale L.	Pedaliaceae
	Sesbania grandiflora Pers.	Papilionaceae
	Shorea robusta Gartn.	Dipterocarpaceae
	Shorea talura Roxb.	Dipterocarpaceae
	Sida acuta Burm.	Malvaceae
	Sida palmata Cav.	Malvaceae
	Sida rhombifolia Linn.	Malvaceae
	Sida sp.	Malvaceae
	Siegesbeckia orientalis Linn.	Asteraceae
	Sisymbrium sp.	Brassicaceae
	Smilax aspera	Liliaceae
	Smilax sp.	Liliaceae
	Solanum indicum L.	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum seaforthianum Andr.	Solanaceae
	Solanum sisymbrifolium Lam.	Solanaceae

Name of Aphid	Host plant	Plant Family
	Solanum torvum SW.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum wendlendi?	Solanaceae
	Solanum sunattenae Burm. f.	Solanaceae
	Salanum spp.	Solanaceae
	Sonchus sp.	Asteraceae
	Spermacoce hispida L.	Rubiaceae
	Spilanthes acmella L.	Asteraceae
	Spinacia oleracea L.	Chenopodiaceae
	Spiraea cantoniensis Low	Rosaceae
	Stepharia sp.	Menispermaceae
	Stellaria media L.	Caryophyllaceae
	Stenolobium stans Seem.	Bignoniaceae
	Stenosiphonium parviflorum T. Anders.	Acanthaceae
	Stenosiphonium ussalianum Nees.	Acanthaceae
	Strobilanthes angustifrons	Acanthaceae
	Strobilanthes atropurpureus Nees.	Acanthaceae
	Strobilanthes ghutinosus	Acanthaceae
	Strobilanthes helictus T. Anders.	Acanthaceae
	Strobilanthes penstemonoides T. Anders.	Acanthaceae
	Strobilanthes spp.	Acanthaceae
	Symplocos spicata Roxb.	Styraceae
	Swertia sp.	Gentianaceae
	Syzygium guajava	Myrtaceae
	Tagetes erecta L.	Asteraceae
	Tagetes patula L.	Asteraceae
	Tagetes sp.	Asteraceae
	Taraxacum officinale Wigg.	Asteraceae
	Tecoma sp.	Bignoniaceae
	Tectona grandis L. f.	Verbenaceae

Name of Aphid	Host plant	Plant Family
	Terminalia arjuna W. & A.	Combretaceae
	Tibouchina rosaeiformis	Melastomaceae
	Tibouchina semidecandra Cogn.	Melastomaceae
	Tinospora sp.	Melastomaceae
	Trema aureantalia	Ulmaceae
	Trichosanthes anguina L.	Cucurbitaceae
	Trichosanthes dioica Roxb.	Cucurbitaceae
	Tridax procumbens L.	Asteraceae
	Tridax spp.	Asteraceae
	Trigonella foenum-graecum L	Papilionaceae
	Tropaeolum majus L.	Tropeolaceae
	Tryphonium trilobatum Schott.	Araceae
	Urtica dioica	Urticaceae
	Urtica parviflora Roxb.	Urticaceae
	Urtica sp.	Urticaceae
	Verbena officinalis L.	Verbenaceae
	Vernonia cinerea Less.	Asteraceae
	Viburnum foetidum Wall.	Caprifoliaceae
	Vicia faba L.	Papilionaceae
	Vigna catjang Endl.	Papilionaceae
	Viola tricolar L.	Violaceae
	Vitex zeylanica Moldenke	Verbenaceae
	Vitex negundo L.	Verbenaceae
	Vitex trifolia L.f.	Verbenaceae
	Vitis vinifera L.	Vitaceae
	Wedelia sp.	Asteraceae
	Woodfordia fructicosa Kurg.	Lythraceae
	Wendlandia glabrata DC	Rubiaceae
	Melothria heterophylla (Loun) Cogn.	Cucurbitaceae
	Zingiber officinale Rusc.	Zingiberaceae
	Zinnia elegans Jacq.	Asteraceae
	Zinnia spp.	Asteraceae

Name of Aphid	Host plant	Plant Family
	Indet.	Acanthaceae
	Indet.	Amaranthaceae
	Indet.	Apoctbaceae
	Indet.	Araliaceae
	Indet.	Cucurbitaceae
	Indet.	Euphorbiaceae
	Indet.	Lamiaceae
	Indet.	Fabaceae
	Indet.	Malvaceae
	Indet.	Meliaceae
	Indet.	Myrtaceae
	Indet.	Papaveraceae
	Indet.	Rhamnaceae
	Indet.	Rosaceae
	Indet.	Urticaceae
	Indet.	Verbenaceae
Aphis (Aphis) ? gossypii Glover= *Aphis fixus* Theobald	*Calendula* sp.	Asteraceae
	Ficus bengalensis L.	Moraceae
Aphis (Aphis) gossypii / nasturtii complex	*Mentha arvensis* L.	Lamiaceae
Aphis (Aphis) hederae Kaltenbach	*Hedera* sp.	Araliaceae
Aphis (Aphis) kurosawai Takahashi	*Artemisia caruifolia* Buch Ham.	Asteraceae
	Artemisia nilagirica (Cl) Pamp.	Asteraceae
	Artemisia roxbunghiana	Asteraceae
	Artemisia spp.	Asteraceae
	Buddleja sp.	Loganiaceae
	Chrysanthemum sp.	Asteraceae
	Daphne sp.	Thymelaeaceae
	Eupatorium sp.	Asteraceae

Name of Aphid	Host plant	Plant Family
	Helianthus annus L.	Asteraceae
	Rhododendron sp.	Ericaceae
	Rudbeckia tagetes	Asteraceae
Aphis (Aphis) leptorhyncha David, Sekhon and Bindra	*Cyathula tomentosa* Moq.	Amaranthaceae
	Plants of indet families	
Aphis (Aphis) longisetosa Basu, A. N. = *Aphis ruborum* (Börner) = *Aphis ruborum longisetosus* Basu, A. N.	*Rubus ellipticus*	Rosaceae
	Cucurbita moschata Duchesne	Cucurbitaceae
Aphis (Aphis) nasturtii Kaltenbach		
	Adenanthera tomentosa	Anacardiaceae
	Arachis hypogaea L.	Papilionaceae
	Brunella vulgaris L.	Lamiaceae
	Clerodendrum inermis	Verbenaceae
	Clerodendrum viscosum Ventra	Verbenaceae
	Clinopodium sp.	Lamiaceae
	Calotropis sp.	Asclepiadaceae
	Capsicum annum L.	Solanaceae
	Capsicum frutescens L.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium sp.	Chenopodiaceae
	Chrysanthemum indicum L.	Asteraceae
	Clematis spp.	Ranunculaceae
	Clerodendrum viscosum Ventra	Verbenaceae
	Clerodendrum sp.	Verbenaceae
	Coccinea cordifolia (L.) Cogn.	Cucurbitaceae
	Coccinea indica W.&.A.	Cucurbitaceae
	Colocasia antiquorum Schott	Araceae
	Cotula sp.	Asteraceae
	Crotolaria sp.	Fabaceae

Name of Aphid	Host plant	Plant Family
	Cucurbita pepo DC	Cucurbitaceae
	Cymbidium sp.	Orchidaceae
	Cynoglossum sp.	Boraginaceae
	Dahlia sp.	Asteraceae
	Daphne involucrata Wall.	Thymelaceae
	Dichrocephala integrifolia (L.) O. Kumbe	Asteraceae
	Dysophylla sp.	Lamiaceae
	Elsholtzia sp.	Lamiaceae
	Eucalyptus globulus Labill.	Myrtaceae
	Euchalyptus spp.	Myrtaceae
	Eupatorium glandulosum H. B. & K.	Asteraceae
	Eupatorium odoratum L.	Asteraceae
	Euphorbia clarkeana	Euphorbiaceae
	Fagopyrum sp.	Polygonaceae
	Fagopyrum cymosum	Polygonaceae
	Fagopyrum esculatum	Polygonaceae
	Ficus sp.	Moraceae
	Gardenia florida L.	Rubiaceae
	Gnaphalium sp.	Asteraceae
	Hamiltonia sauveolens	Rubiaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Hypericum patulum Thumb	Hyperaceae
	Hypericum uralum	Hyperaceae
	Hypochaeris radicata L.	Asteraceae
	Impatiens balsamina L.	Geraniaceae
	Ipomoea batata Lamk	Convolvulaceae
	Ipomoea hederacea Jacq.	Convolvulaceae
	Justicia procumbens	Acanthaceae
	Lantana camara L.	Verbenaceae
	Luffa cylindrica	Cucurbitaceae

Name of Aphid	Host plant	Plant Family
	Lycopersicon lycopersicum (L.) O. Kerst.	Solanaceae
	Melastoma indica?	Melastomataceae
	Mentha arvensis L.	Lamiaceae
	Michelia champaca L.	Magnoliaceae
	Momordica charantia L.	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Asteraceae
	Rorippa indica (L.) Hiarn. (=*Nasturtium indicum* DC)	Brassicaceae
	Osbeckia capitata Benth	Melastomataceae
	Osbeckia chinensis L.	Menastomataceae
	Oxalis corniculata L.	Oxalidaceae
	Oxalis sp.	Oxalidaceae
	Perilla ocimoides L.	Lamiaceae
	Plantago major L.	Plantaginaceae
	Polygonum nepalense	Polygonaceae
	Polygonum perfoliatum L.	Polygonaceae
	Polygonum runcinatum Buch-Ham.	Polygonaceae
	Polygonum sp.	Polygonaceae
	Pouzolzia hirta Horsk.	Urticaceae
	Prunella vulgaris L.	Lamiaceae
	Schima wallichii Choiss	Ternstromiaceae
	Senecio rufinervis	Asteraceae
	Sesamum indicum DC.	Pedaliaceae
	Shorea robusta Gaertn	Dipterocarpaceae
	Sida sp.	Malvaceae
	Solamum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Strobilanthes atropurpureus Nees.	Acanthaceae
	Strobilanthes sp.	Acanthaceae
	Syzygium guajava	Myrtaceae

Name of Aphid	Host plant	Plant Family
	Tagetes patula L.	Asteraceae
	Tectona grandis R. f.	Verbenaceae
	Tibouchina semidecanadra Cogn.	Melastomaceae
	Toddalia venosa D. Don.	Rutaceae
	Torenia sp.	Scrophulariaceae
	Vaccinum griffithianum Wight	Ericaceae
	Woodfordia fructicosa (L) Kurg.	Lythraceae
	Xanthochymus ovalifolius Roxb.	Guthferae
	Zinnia elegans Jacq.	Asteraceae
	Indet	Lamiaceae
	Indet	Rhamnaceae
	Plants of indet families	
	Rubus palmatatus Thumb.	Rosaceae
	Rubus rosaefolius sm.	Rosaceae
	Rubus sp.	Rosaceae
	Saussurea nepalensis Spreng.	Asteraceae
Aphis ruborum Börner	*Rubus lineatus* Reinw	Rosaceae
Aphis (Aphis)? ruborum (Börner)	*Rubus ellipticus* sm.	Rosaceae
Aphis (Aphis) rumicis Linnaeus	*Benincasa hispida* Cogn.	Cucurbitaceae
	Dolichos lablab L.	Fabaceae
	Solanum nigrum L.	Solanaceae
	Vigna catjang Endl.	Fabaceae
Aphis (Aphis) nr. rumicis Linnaeus	*Rumex acetosella* L.	Polygonaceae
Aphis (Aphis) umbrella (Börner)		
= *Aphis malvae* Koch	*Abetisosbus egcerlentus*	?
	Abutilon indicum D. Don	Malvaceae
	Althaea rosea L.	Malvaceae
	Benincasa hispida Cong.	Cucurbitaceae
	Cineraria sp.	Asteraceae

Name of Aphid	Host plant	Plant Family
	Citrullus vulgaris Schrad	Cucurbitaceae
	Citrus aurantium L.	Rutaceae
	Coccinea indica W. & A.	Cucurbitaceae
	Colocasia sp.	Araceae
	Canvallaria majalis L.	Liliaceae
	Crotalaria juncea L.	Fabaceae
	Cucumis melo var. *momordica*	Cucurbitaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita maxima Duchesne	Cucurbitaceae
	Cucurbita moschata Duchesne	Cucurbitaceae
	Cucurbita pepo DC	Cucurbitaceae
	Cucurbita spp.	Cucurbitaceae
	Dianthus caryophyllus L.	Caryophyllaceae
	Eriobotrya japonica Lindl.	Rosaceae
	Gossypium sp.	Malvaceae
	Hibiscus cannabinus L.	Malvaceae
	Hibicus rosa-sinensis L.	Malvaceae
	Jasminum sp.	Oleaceae
	Lageneria vulgaris ser.	Cucurbitaceae
	Leucas sp.	Lamiaceae
	Luffa acutangula Roxb.	Cucurbitaceae
	Malya sylvestris L.	Malvaceae
	Malvestrum tricuspidatum A. Gray	Malvaceae
	Momordica charantia L.	Cucurbitaceae
	Momordica cochinensis Spreng	Cucurbitaceae
	Nepeta sp.	Lamiaceae
	Peganum harmala L.	Zygophyllaceae
	Pyrus communis L.	Rosaceae
	Rosa damascens Mill.	Rosaceae
	Rubus ellipticus Sm.	Rosaceae
	Rudbeckia spp.	Asteraceae
	Salvia sp.	Lamiaceae

Name of Aphid	Host plant	Plant Family
	Solanum nigrum L.	Solanaceae
	Trichosanthes anguina L.	Cucurbitaceae
	Trichosanthes dioica Roxb.	Cucurbitaceae
	Viola tricolor L.	Violaceae
	Withania semnifera Dun	Solanaceae
	Woodfordia fructicosa koz	Lythraceae
Aphis (Aphis) ? umbrella (Borner) = *Aphis? malvae* Koch	Plant of indet. family	
Aphis (Aphis) verbasci Schrank	*Buddleja paniculata* Wall.	Buddlejaceae
	Carduus nutans L.	Asteraceae
	Cedrus deodara Loud.	Pinaceae
	Eriobotrya japonica	Rosaceae
	Lantana camara	Verbenacae
	Nicotiana Sp.	Solanaceae
	Polygonum alatum Buch Ham	Polygonaceae
	Senecio Chrysanthemoides	Asteraceae
	Verbascum chinensis	Scrophulariaceae
	Verbascum thapsus L.	Scrophulariaceae
	Indet.	Lamiaceae
Aphis (Aphis) verbenae Macchaiti	Plants of indet families	
Aphis (Protaphis) carthami (Das)=*Brachyunguis? carthami* Das		
	Carthamus oxycarpi	Asteraceae
	Vernonia cineria Less	Asteraceae
	Indet	Asteraceae
Aphis spp.	*Ageratum conyzoides* L.	Asteraceae
	Artemisia vestita Wall	Asteraceae
	Artemisia vulgaris L.	Asteraceae
	Benincasa hispida Cogn.	Cucurbitaceae

Name of Aphid	Host plant	Plant Family
	Brassica oleracea L. var *cauliflora*	Brassicaceae
	Camellia sp.	Theaceae
	Carthamus tinctorius L.	Asteraceae
	Carthamus sp.	Asteraceae
	Centaurea moschata L.	Asteraceae
	Cestrum fasiculatum Miers	Solanaceae
	Cestrum nocturnum Lam.	Solanaceae
	Citrus maxima?	Rutaceae
	Convolvulus sp.	Convolvulaceae
	Eupatorium sp.	Asteraceae
	Glycine max (L.) Merr.	Fabaceae
	Mangifera indica L.	Anacardiaceae
	Nicotiana tabacum L.	Solanaceae
	Perilla fruticosa D. Don	Lamiaceae
	Phaseolus sp.	Papilionaceae
	Psidium sp.	Myrtaceae
	Pyrus communis L.	Rosaceae
	Pyrus malus L.	Rosaceae
	Rubus moluccamus L.	Rosaceae
	Rubus niveus Wall.	Rosaceae
	Rubus sp.	Rosaceae
	Indet.	Asteraceae
	Indet.	Verbenaceae
Toxoptera aurantii (Boyer de Fonscolombe) = *Ceylonia theaecola* Buckton : Lefroy. and Howlett, 1909 = *Toxoptera schilingeri* Tao : Basu, R. C. *et al.* 1974		
	Acalypha sp.	Euphorbiaceae
	Acorus calamus	Araceae
	Adhathoda vasica	Acanthaceae

Name of Aphid	Host plant	Plant Family
	Aegln marmelos	
	Ailanthus spp.	Simaroubaceae
	Albizzia odoratissima	Fabaceae
	Alnus spp.	Betulaceae
	Amaranthus spp.	Amaranthaceae
	Anacardium occidentale	Anacardiaceae
	Annona squamosa	Annonaceae
	Ardisia spp.	Myrsinaceae
	Artabortrys odoratissima	Annonaceae
	Artenusua vulgaris	Asteraceae
	Artemisia sp.	Asteraceae
	Artocarpus communis	Moraceae
	Artocarpus heterophylla	Moraceae
	Artocarpus integrifolia	Moraceae
	Artocarpus vulgaris	Moraceae
	Artocarpus spp.	Moraceae
	Aster sp.	Asteraceae
	Berberis spp.	Barberidaceae
	Bidens pilosa	Asteraceae
	Bidens wallichi	Asteraceae
	Bougainvillea glabra	Nyctaginaceae
	Bougainvillea spectabilis	Nyctaginaceae
	Bougainvillea sp.	Nyctaginaceae
	Caesalpinia coriaria	Fagaceae
	Caeistemon linearis	Myrtaceae
	Camellia japonicum	Theaceae
	Camellia sikkimensis	Theaceae
	Camellia sinensis	Theaceae
	Camellia theifera	Theaceae
	Camellia spp.	Theaceae
	Carissa carandas	Apocynaceae
	Cestrum fasciculatum	Solanaceae

Name of Aphid	Host plant	Plant Family
	Cestrum nocturnum	Solanaceae
	Cestrum spp.	Solanaceae
	Citrus aurantifolia	Rutaceae
	Citrus aurantium	Rutaceae
	Citrus limettioides	Rutaceae
	Citrus limon	Rutaceae
	Citrus maxima	Rutaceae
	Citrus paradisi	Rutaceae
	Citrus reticulata	Rutaceae
	Citrus sinensis	Rutaceae
	Citrus spp	Rutaceae
	Coffea arabica	Rutaceae
	Combretum sp.	Combretaceae
	Daemia extensa	Asclepiadaceae
	Dalbergia sisoo	Fabaceae
	Dalbergia sp.	Fabaceae
	Dendrodium chrygotoxum	Orchidaceae
	Engelhardtia spicata	Juglandaceae
	Eucalyptus globulus	Myrtaceae
	Eucalyptus sp.	Myrtaceae
	Eugenia sp.	Myrtaceae
	Euodia fraxinifolia	
	Eupatorium odoratum	Asteraceae
	Euphorbia pulcherima	Euphorbiaceae
	Eurya japonica	Ternstroemiaceae
	Eurya spp.	Ternstroemiaceae
	Fagopyrum spp.	Polygonaceae
	Ficus heterophylla	Moraceae
	Ficus tomentosa	Moraceae
	Ficus spp.	Moraceae
	Gardenia florida	Rubiaceae
	Glochidion spp.	Euphorbiaceae

Name of Aphid	Host plant	Plant Family
	Gnaphaleum leuteo-album	Asteraceae
	Gordonia obtusa	Theaceae
	Grewia sp.	Tiliaceae
	Gynura nepalensis	Asteraceae
	Hedyotis scandens	Rubiaceae
	Hedyotis sp.	Rubiaceae
	Heticteres isora	Sterculiaceae
	Hibiscus rosa-sinensis	Malvaceae
	Iles sp.	Aguifoliaceae
	Indigofera sp.	Fabaceae
	Inula cappa	Asteraceae
	Ixora macrothrysa	Rubiaceae
	Jacranda mimosifolia	Bignoniaceae
	Jasminum spp.	Oleaceae
	Lagerstroemia flos-reginae	Lythraceae
	Lagerstroemia indica	Lythreaceae
	Lantana camara	Verbenaceae
	Leea sp.	Leeaceae
	Lindera sp.	Lauraceae
	Litchi chinensis	Sapindaceae
	Litsea citrata	Lauraceae
	Litsea polyantha	Lauraceae
	Litsea salicifolia	Lauraceae
	Litsea sp.	Lauraceae
	Loranthus sp.	Loranthaceae
	Lycopersicon esculentum	Solanaceae
	Lyonia ovalifolia	Ericaceae
	Macleania punctata	Ericaceae
	Maesa angustifolia	Myrcinaceae
	Maesa chisea	Myrcinaceae
	Maesa indica	Myrcinaceae
	Maesa macrophylla	Myrcinaceae

Name of Aphid	Host plant	Plant Family
	Maesa spp.	Myrcinaceae
	Magnolia spp.	Magnoliaceae
	Mangifera indica	Anacardiaceae
	Manihot utilissima	Euphorbiaceae
	Michelia spp.	Magnoliaceae
	Momordica charantia	Cucurpilaceae
	Momordica cochinensis	Cucurbitaceae
	Momordica fernea	Cucurbitaceae
	Olea europaea	Oleaceae
	Olea sp.	Oleaceae
	Osbeckia crinata	Melastomaceae
	Panicum sp.	Poaceae
	Phlogacanthus thyrsiflorus	Acanthaceae
	Photonia japonica	Rosaceae
	Pieris ovalifolia	Ericaceae
	Piper nigrum	Piperaceae
	Piper spp.	Piperaceae
	Poa spp.	Poaceae
	Polyanthia sp.	Anonaceae
	Prunus cerasus	Rosaceae
	Prunus persica	Rosaceae
	Prunus puddum	Rosaceae
	Prunus spp.	Rosaceae
	Psidium guajava	Myrtaceae
	Pyrus communis	Rosaceae
	Pyrus malus	Rosaceae
	Pyrus sp.	Rosaceae
	Quercus dealbata	Fagaceae
	Quercus spp.	Fagaceae
	Rhamnus nepalensis	Rhamnaceae
	Rauwolfia densiflora	Apocynoceae
	Rauwolfia spp.	Apocynaceae

Name of Aphid	Host plant	Plant Family
	Rhus sp.	Anacardiaceae
	Rosa cania	Rosaceae
	Rosa sp.	Rosaceae
	Rubus ellipticus	Rosaceae
	Saccharum officinarum	Poaceae
	Santalum album	Santalaceae
	Sarcococca sp.	Buxaceae
	Schima wallichii	Ternstroemiaceae
	Schima spp.	Ternstroemiaceae
	Senebiera sp.	Brassicaceae
	Sida sp.	Malvaceae
	Sonchus spp.	Asteraceae
	Spiraea sp.	Rosaceae
	Sterculia foetida	Sterculiaceae
	Sterculia spp.	Sterculiaceae
	Symplocos cratigoides	Symplocaceae
	Symplocos paniculata	Symplocaceae
	Symplocos spicata	Symplocaceae
	Symplocos thisifolia	Symplocaceae
	Symplocos sp.	Symplocaceae
	Tamarindus indicus	Fabaceae
	Tamarindus sp.	Fabaceae
	Toddalia aculeata	Rutaceae
	Uncaria sessilifructus	Rutaceae
	Uvaria narum	Anacardiaceae
	Viburnum sp.	Caprifoliaceae
	Xylosma longifolia	Flacourticaceae
	Zanthoxyllum allotium	Rutaceae
	Zanthoxyllum ornatum	Rutaceae
	Zanthoxyllum sp.	Rutaceae
	Indet plant of Euphorbiaceae	
	Indet plant of Moraceae	
	Indet plant of Rutaceae	
	Plants of indet families	

Name of Aphid	Host plant	Plant Family
Toxoptera citricidus (Kirkaldy)		
= *Aphis traversi* del Guercio : George, 1927; Krishnamurti, 1929; Behura, 1963		
	Artocarpus communis	Moraceae
	Berberis spp.	Berberidaceae
	Boehmeria spp.	Urticaceae
	Cassia absus	Fabaceae
	Cassia sp.	Fabaceae
	Citrus aurantifolia	Rutaceae
	Citrus aurantium	Rutaceae
	Citrus acida	Rutaceae
	Citrus karka	Rutaceae
	Citrus limon	Rutaceae
	Citrus maxima	Rutaceae
	Citrus medica	Rutaceae
	Citrus ornatum	Rutaceae
	Citrus paradisi	Rutaceae
	Citrus reticulata	Rutaceae
	Citrus sinensis	Rutaceae
	Citrus spp.	Rutaceae
	Dianthus spp.	Caryophyllaceae
	Engelhardtia spicata	Juglandaceae
	Eurya japonica	Ternstroemiaceae
	Ipomoea staphylina	Convolvulaceae
	Litsea polyantha	Lauraceae
	Loranthus sp	Lauraceae
	Maesa chisea	Myricaceae
	Magnolia sp.	Magnoliaceae
	Mangifera indica	Anacardiaceae
	Michelia sp.	Magnoliaceae
	Nasturtium indicum	Brassicaceae
	Nicotiana tabacum	Solanaceae

Name of Aphid	Host plant	Plant Family
	Passiflora foetida	Passifloraceae
	Pithecellobium saman	Fabaceae
	Pouzolzia hirta	Urticaceae
	Pyrus communis	Rosaceae
	Pyrus malus	Rosaceae
	Quercus spp.	Fagaceae
	Rhus khasiana	Anacardiaceae
	Rhus spp.	Anacardiaceae
	Rubia cordifolia	Rosaceae
	Schima wallichii	Ternstroemiaceae
	Solanum clavatum	Solanaceae
	Viburnum foetidium	Caprifoliaceae
	Zanthoxylum alatum	Rutaceae
	Zanthoxylum spp.	Rutaceae
	Plants of indet families	Rutaceae
Toxoptera odinae (van der Goot)		
= *Aphis odinae* (Van der Goot) : George, 1927 ; Krishnamurti, 1931		
= *Longicaudus hameliae* Theobald 1929; Krishnamurti, 1931 ; David, 1956b;		
	Achras zapota	Zapotaceae
	Anacardium occidentale	Anacardiaceae
	Asclepias sp.	Asclepiadaceae
	Berberis spp.	Berberidaceae
	Betula sp.	Betulaceae
	Camellia sinensis	Theaceae
	Cassia fistula	Fabaceae
	Cassia siamea	Fabaceae
	Cassia spp.	Fabaceae
	Citrus aurantium	Rutaceae
	Citrus spp.	Rutaceae
	Coffea arabica	Rubiaceae

Name of Aphid	Host plant	Plant Family
	Coffea spp.	Rubiaceae
	Cuscutaceae cuscuta	Convolvulaceae
	Datara fastuosa	Solanaceae
	Dubarga sonneratioides	Sonneratiaceae
	Duranta plumieri	Verbenaceae
	Duranta repens	Verbenaceae
	Engelhardtia spicata	Jnglandiaceae
	Eruthrina indica	Fabaceae
	Fagopyrum spp.	Polygonaceae
	Gardenia florida	Rubiaceae
	Hamelia patens	Rubiaceae
	Hamiltonia suaveolens	Malvaceae
	Hibiscus esculentus	Malvaceae
	Hibiscus rosa-sinensis	Malvaceae
	Lagerstroemia indica	Lythraceae
	Leep sp.	Leeaceae
	Lannea woodier	Anacardiaceae
	Lyonia ovalifolia	Ericaceae
	Maesa chisea	Myrsinaceae
	Magnolia sp.	Magnoliaceae
	Mangifera indica	Anacardiaceae
	Momordica charantia	Cucurbitaceae
	Mussaenda frondosa	Rubiaceae
	Nicotina tabacum	Solanaceae
	Panax spp.	Araliaceae
	Parkia roxberghii	Leguminaceae
	Polygonum amplexicula	Polygonaceae
	Potalia sp.	Portaliaceae
	Pyrus communis	Rosaceae
	Quercus serrata	Fagaceae
	Quercus sp.	Fagaceae
	Rhus semialata	Anacardiaceae

Name of Aphid	Host plant	Plant Family
	Rhus succedanea	Anacardiaceae
	Rhus spp.	Anacardiaceae
	Schima wallichii	Ternstroemiaceae
	Siegesbeckia sp.	Asteraceae
	Solanum clavatum	Solanaceae
	Spiraea cantoniensis	Rosaceae
	Spondias euthera	Anacardiaceae
	Sterculia sp.	Sterculiaceae
	Symplocos spicata	Symplocaceae
	Tagetes patula	Asteraceae
	Toddalia aculeata	Rutaceae
	Toddalia sp.	Rutaceae
	Viburnum foetidium	Caprifoliaceae
	Zanthoxylum ornatum	Rutaceae
	Zanthoxylum sp.	Rutaceae
	Indet plant of Anacardiaceae	
	Indet grass	
	Plants of indet families	
Rhopalosiphum maidis (Fitch)		
= *Aphis adusta* Zehntner ; Lefroy and Howlett, 1909		
= *Spihonaphis maidis* (Fitch) ; van der Goot, 1917		
= *Aphis maidis* Fitch : George, 1927; Krishnamurti, 1929; Deshpande, 1938 Ullah, 1940; Dharmadhikari and Ramasehiah, 1970		
	Andropogon bicolor	Poaceae
	Andropogon durra	Poaceae
	Andropogon halepense	Poaceae
	Andropogon vulgare	Poaceae
	Andropogon spp.	Poaceae

Name of Aphid	Host plant	Plant Family
	Avena sativa	Poaceae
	Bromus uniloides	Poaceae
	Cajanus cajan	Fabaceae
	Capsicum frutescence	Solanaceae
	Cyperus rotundus	Cyperaceae
	Cenchrus cillaris	Poaceae
	Coix lachyma-jobi	Poaceae
	Cynodon dactylon	Poaceae
	Cyperus rotundus	Cyperaceae
	Dactyloctenium aegypticum	Poaceae
	Dicanthium sp.	Poaceae
	Digitaria sp.	Poaceae
	Echinochola colonum	Poaceae
	Echinochola cerus galli	Poaceae
	Echinochloa sp.	Poaceae
	Eleusine coracana	Poaceae
	Eleusine indica	Poaceae
	Guizotia abyssinica	Asteraceae
	Hordeum vulgare	Poaceae
	Lycopersicon esculentum	Solanaceae
	Nicotiana tabacum	Solanaceae
	Oryza sativa	Poaceae
	Panicum antdote	Poaceae
	Panicum sp.	Poaceae
	Paspalum scrobiculatum	Poaceae
	Pennisetum purpureum	Poaceae
	Pennisetum typhoideum	Poaceae
	Pennisetum sp.	Poaceae
	Poa spp.	Poaceae
	Polypogum runcinatum	Polygonaceae
	Potalia sp.	Portaliaceae
	Prunus communis	Rosaceae

Name of Aphid	Host plant	Plant Family
	Prunus puddum	Rosaceae
	Saccharum officinarum	Poaceae
	Saccharum sp.	Poaceae
	Sagittaria saggittifolia	Alismataceae
	Setaria italica	Poaceae
	Setaria verticillata	Poaceae
	Setaria spp.	Poaceae
	Silene conoides	Caryophyllaceae
	Solanum nigrum	Solanaceae
	Solanum tuberosum	Solanaceae
	Sorghum bicolor	Poaceae
	Sorghum vulgare	Poaceae
	Terminalia arjuna	Combretaceae
	Triticum aestivum	Poaceae
	Triticum sativum	Poaceae
	Triticum vulgare	Poaceae
	Triticum spp.	Poaceae
	Zea mays	Poaceae
	indet plants of Poaceae	
	indet grasses	
	plants of indet families	
Rhopalosiphum nymphaeae (Linnaeus)		
= *Siphonaphis nymphaeae* (Linnaeus) : van der Goot, 1917 ; Behura 1963		
	Aponogeton monocharia	Aponogetonaccae
	Canna indica	Cannaceae
	Cucurbita sp.	Cucurbitaceae
	Curcuma longa	Zingiberaceae
	Eichhornia crassipes	Pontederiaceae
	Eichhornia spp.	Pontederiaceae
	Euryale ferox	Nymphaeaceae
	Hydrilla sp.	Hydrocharitaceae

Name of Aphid	Host plant	Plant Family
	Fleurya sp.	Oriticareae
	Ipomoea sp.	Nymphaeaceae
	Lemna sp.	Lemnaceae
	Monochoria hastaefolia	Pontederiaceae
	Nelumbo speciosum	Nelambonaceae
	Nymphaea lotus	Nymphaeaceae
	Nymphaea sp.	Nymphaeaceae
	Nymphoides cristatum	Menyanthaceae
	Ottelia alismoides	Hydrocharitaceae
	Pistia sp.	Araceae
	Prunus armeniaca	Rosaceae
	Prunus domestica	Rosaceae
	Prunus persica	Rosaceae
	Prunus spp.	Rosaceae
	Rosa spp.	Rosaceae
	Sagittaria guayanensis	Alismataceae
	Sagittaria sagittifolia	Alismataceae
	Scirpus lacustris	Cyperaceae
	Senecio sp.	Asteraceae
	Trapa bispinosa	Trapaceae
	Vallisneria spiralis	Hydrocharitaceae
	Vallisneria spp.	Hydrocharitaceae
	indet plants of Cactaceae	
	indet plant of Fabaceae	
	plants of indet families	
Rhopalosiphum padi (Linnaeus)		
= *Siphonaphis padi* van der		
	Avena sativa	Poaceae
	Bidens pilosa	Asteraceae
	Bothriochloa sp.	Poaceae
	Canna indica	Cannaceae
	Canna spp.	Cannaceae

Name of Aphid	Host plant	Plant Family
	Symbopogon sp.	Poaceae
	Cyperus australlis	Cyperaceae
	Cyperus sp.	Cyperaceae
	Echinocholoa colonum	Poaceae
	Edgeworthia grandis	Thymelacaceae
	Eleusine coracana	Poaceae
	Hordeum vulgare	Poaceae
	Oryza sativa	Poaceae
	Panicum crusgalli	Poaceae
	Panicum millaceum	Poaceae
	Pennisetum pedicellarae	Poaceae
	Pennisetum sp.	Poaceae
	Phalaris tuberosa	Poaceae
	Photonia notoniana	Rosaceae
	Poa annua	Poaceae
	Poa spp.	Poaceae
	Polygonum sp.	Polygonaceae
	Prunus sp.	Rosaceae
	Scirpus sp.	Cyperaceae
	Triticum aestivum	Poaceae
	Triticum vulgare	Poaceae
	Triticum spp.	Poaceae
	Vernonia cinaria	Asteraceae
	Zea mays	Poaceae
	indet plants of Cannaceae	
	indet plants of Poaceae	
	indet grasses	
Rhopalosiphum rufiabdominalis (Sasaki)		
	Abies sp.	Alliaceae
	Allium cepa	Poaceae
	Allium sativum	Poaceae
	Avena sativa	Poaceae

Name of Aphid	Host plant	Plant Family
	Berberis spp.	Berberidaceae
	Bidens pilosa	Asteraceae
	Carex lachryma	Cyperaceae
	Carex sp.	Cyperaceae
	Cynodon dactylon	Poaceae
	Cyperus rotundus	Cyperaceae
	Datura fastuosa	Solanaceae
	Datura stramonium	Solanaceae
	Dianthus sp.	Caryophyllaceae
	Dolichos lablab	Fabaceae
	Drymaris sp.	Caryophyllaceae
	Echinochola colonum	Poaceae
	Eleusine coracana	Poaceae
	Eragrostis sp.	Poaceae
	Hibiscus rosa-sinensis	Malvaceae
	Hibiscus sabdariffa	Malvaceae
	Hordeum vulgare	Poaceae
	Lycopersicon esculentum	Solanaceae
	Malva rotundifolia	Malvaceae
	Nerium odorum	Apocynaceae
	Nicotiana tabacum	Solanaceae
	Oryza sativa	Poaceae
	Osbeckia chinensis	Melastomaceae
	Paspalum sp.	Poaceae
	Petunia alba	Solanaceae
	Petunia hybrida	Solanaceae
	Petunia sp.	Solanaceae
	Poa annua	Poaceae
	Poa sp.	Poaceae
	Prunus persica	Rosaceae
	Prunus puddum	Rosaceae
	Prunus sp.	Rosaceae

Name of Aphid	Host plant	Plant Family
	Psidium guayajava	Myrtaceae
	Pyrus communis	Rosaceae
	Pryus sp.	Rosaceae
	Rhododendron sp.	Ericaceae
	Rubus ellipticus	Rosaceae
	Saccharum officinarum	Poaceae
	Solanum khasianum	Solanaceae
	Solanum tuberosum	Solanaceae
	Sporobolus mysorensis	Poaceae
	Stellaria media	Caryophyllaceae
	Stellaria sp.	Caryophyllaceae
	Sterculia sp.	Sterculiaceae
	Symplocos cratigoides	Symplocaceae
	Triticum aestivum	Poaceae
	Triticum sativum	Poaceae
	Triticum vulgare	Poaceae
	Triticum spp.	Poaceae
	Viburnum sp.	Caprifoliaceae
	Zea mays	Poaceae
	Zizania latifolia	Poaceae
	indet plants of Araceae	
	indet plants of Chenopodiaceae	
	indet plants of Poaceae	
	plants of indet families	
Schizaphis graminum (Rondani)		
= *Toxoptera gramium* Rondani ; George 1927 ; Ullah, 1940		
	Andropogon vulgare	Poaceae
	Arundo donax	Poaceae
	Avena sativa	Poaceae
	Bambusa spp.	Poaceae
	Cyperus nivens	Cyperaceae

Name of Aphid	Host plant	Plant Family
	Cyperus rotundus	Cyperaceae
	Cynodon dactylon	Poaceae
	Dendrocalamus sp.	Poaceae
	Eleusine coracana	Poaceae
	Hordeum vulgare	Poaceae
	Oryza sativa	Poaceae
	Poa sp.	Poaceae
	Pennisetum glaucum	Poaceae
	Sorghum halipense	Poaceae
	Triticum aestivum	Poaceae
	Triticum sativum	Poaceae
	Triticum vulgare	Poaceae
	Triticum spp.	Poaceae
	Zea mays	Poaceae
	indet plants of Poaceae	
	indet plants of Solanaceae	
	indet grasses	
Schizaphis hypersiphonata Basu		
	indet plant of Poaceae	
Schizaphis minuta (van der Goot)		
	plant of indet family	
Schizaphis punjabipyri (Das)		
= *Toxoptera punjabipyri* Das : Behura, 1963		
= *Schizaphispiricola punjabipyri* (Das) : Rao, 1969		
	Prunus domestica	Rosaceae
	Pyrus communis	Rosaceae
	Pyrus sp.	Rosaceae
Schizaphis ? punjabipyri (Das)		Poaceae
	Cynodon dactylon	Poaceae
	Pyrus communis	Rosaceae
	plant of indet family	

Name of Aphid	Host plant	Plant Family
Schizaphis rotundiventris (Signoret)		
= *Schizaphis cyperi* van der Goot David, 1958a ; Basu, A. N. 1961 b ; Behura, 1963, 1995		
= *Schizaphis? rotundriventris* (Signoret) : Ghosh, A. K. *et al.* 1970		
= *Schizaphis hypersiphonata* Basu : Ghosh M. R. *et al.* 1971b; Basu R.C. *et al.*		
	Crotolaria striata	Fabaceae
	Cynodon dactylon	Poaceae
	Cyperus exhaltatus	Cyperaceae
	Cyperus rotundus	Cyperaceae
	Cyperus umbellatus	Cyperaceae
	Cyperus spp.	Cyperaceae
	Peiris ovalifolia	Ericaceae
	Poa sp.	Poaceae
	Pyrus communis	Rosaceae
	Pyrus pashia	Rosaceae
	Pyrus pistia	Rosaceae
	Pyrus sp.	Rosaceae
	indet grass	
	plants of indet families	

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ADDENDUM

One new taxon, *Aphis spinulosa* B. Das and L.K. Ghosh was described after the completion of the present work. Since it is not included in the text, its original reference, short description, biological notes on the species, taxonomic affinity with its nearest member etc. are included hereinunder.

Ref. : Das, B.C. and Ghosh, L.K. 2003. A new species and a subspecies of aphid from Maharashtra, India (Homoptera : Aphididae). *J. Aphidol.*, **17** : 59–62.

Aphis spinulosa Das and Ghosh

" *Apterous viviparous female :* Body pale, oral, 1.32–1.38 mm. long with 0.80–0.84 mm as maximum width. Head with spinular polygonal reticulation. Antennae 6–segmented, imbricated, flagellar hairs short, bluntish, about 0.40 times of antennal segment III, processus terminalis about 2.5 times as long as base of segment VI. Rostrum reaches beyond hind coxae, ultimate rostral segment elongated, with 2 secondary hairs, being longer than primary hairs, about 1.3 times as long as second joint of hind tarsus. Thorax with polygonal reticulations, more prominent laterally. Abdomen pale, with spinular polygonal reticulations. Dorsal hairs fine, about 1.6 times as long as antennal segment III, hairs on eighth segment also fine and about 2.00 times as long as antennal segment III. Siphunculi brownish, imbricated, cylindrical, wider at base, narrowed towards apex, flanged, about 1.56 times as long as pale, elongated cauda being slightly constricted towards base, pointed towards apex, with 4–6 hairs; legs pale; First tarsal chactotaxy 3, 3, 2."

Holotype : Apterous viviparous female, under creeper, Dhakambe, Wasik, 11.12.03, coll. B.C. Das.

Paratypes : 6 apterous viviparous females, collection data same as holotype.

Measurement of Holotype (in mm.) : Length of body 1.32; width of body 0.80; Antenna 0.80, segments III 0.20, IV 0.20, V 0.90, VI (0.08+0.20); u.r.s. 0.09; h.t.2 0.07; siphunculus 0.21; cauda 0.13.

Biological notes : Pitch black aphids were collected from midrib of under surface of leaves. No ant was noticed to attend the aphids.

Taxonomic affinity : The species is closely related to *Aphis gossypii* Glover in major morphological features but can be differentiated in the spinular reticulations on head, thorax and abdomen; u.r.s. much elongated, reaching beyond hind coxae; secondary hairs on u.r.s. longer than primary hairs; siphunculi imbricated throughout and flanged; and cauda being rather pale.

INDEX TO GENERA AND SPECIES

Valid names of species and genera are printed in Roman type, names given in synonymy, preoccupied or changed generic assignments etc. are given in italic type. Numbers in bold, indicate page containing detailed description.

Fig. 340. *Aphis achyranthi* Theobald, Apterous viviparous female.

Fig. 341. *Aphis affinis* del Guercio, Apterous viviparous female.

Fig. 342. *Aphis craccivora* Koch, Apterous viviparous female.

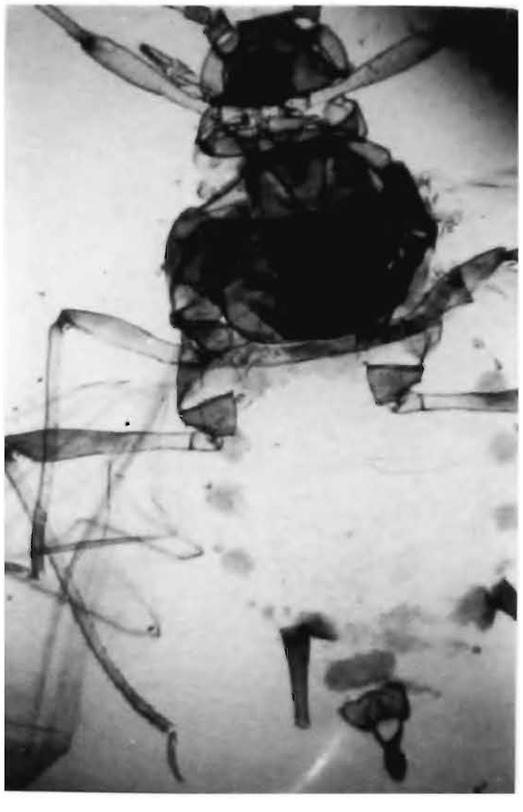

Fig. 343. *Aphis craccivora* Koch, Alate viviparous female.

Fig. 344. *Aphis fabae* complex. Apterous viviparous female.

Fig. 345. *Aphis gossypii* Glover, Apterous viviparous female.

Fig. 346. *Aphis gossypii* Glover, Alate viviparous female.

Fig. 347. *Aphis nasturtii* Kaltenbach, Apterous viviparous female.

Fig. 348. *Aphis nasturtii* Kaltenbach, Alate viviparous female.

Fig. 349. *Aphis nasturtii* Kaltenbach, Apterous oviparous female.

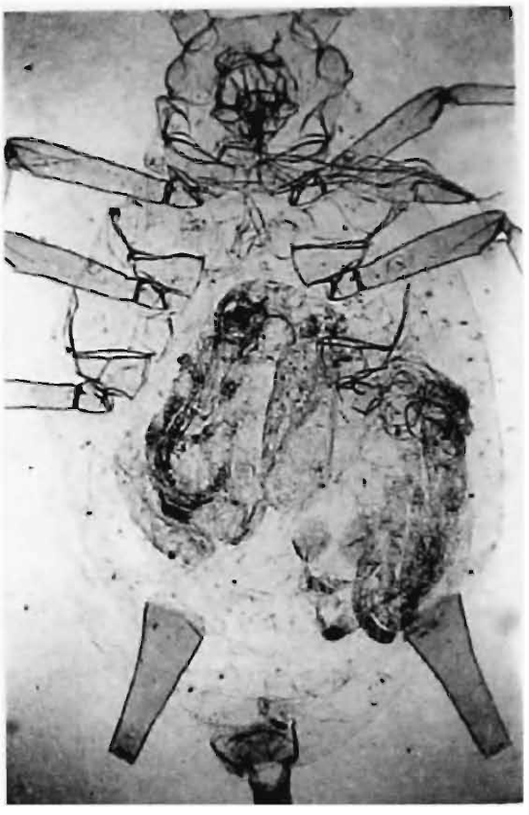

Fig. 350. *Aphis nerii* B.d.F., Apterous viviparous female.

Fig. 351. *Aphis nerii* B.d.F., Alate viviparous female.

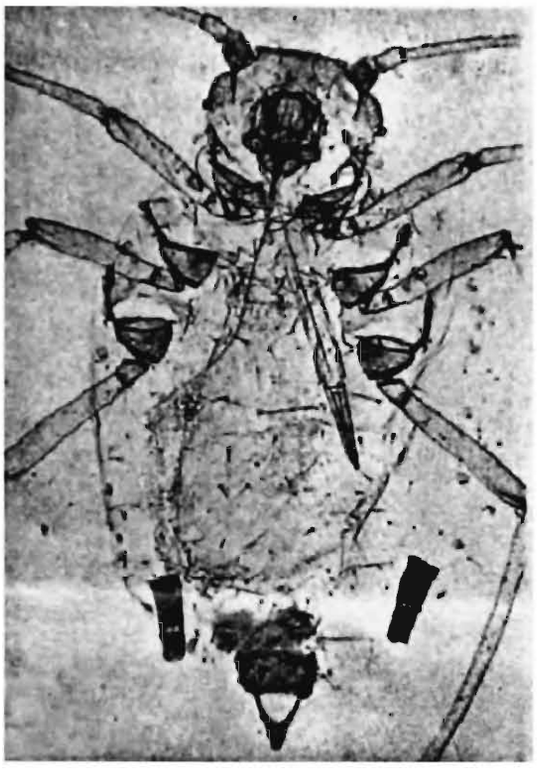

Fig. 352. *Aphis raji* Kumar and Burkhardt, Apterous viviparous female.

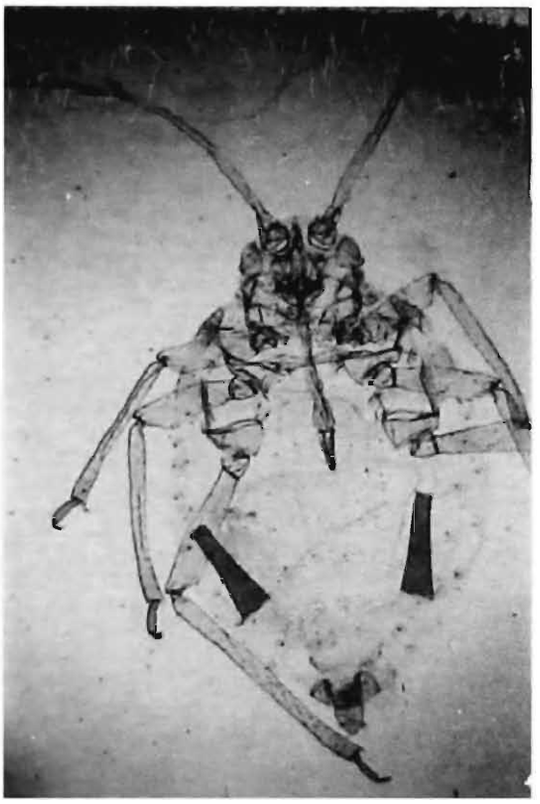

Fig. 353. *Aphis rhamnifila* David *et al.*, Apterous viviparous female.

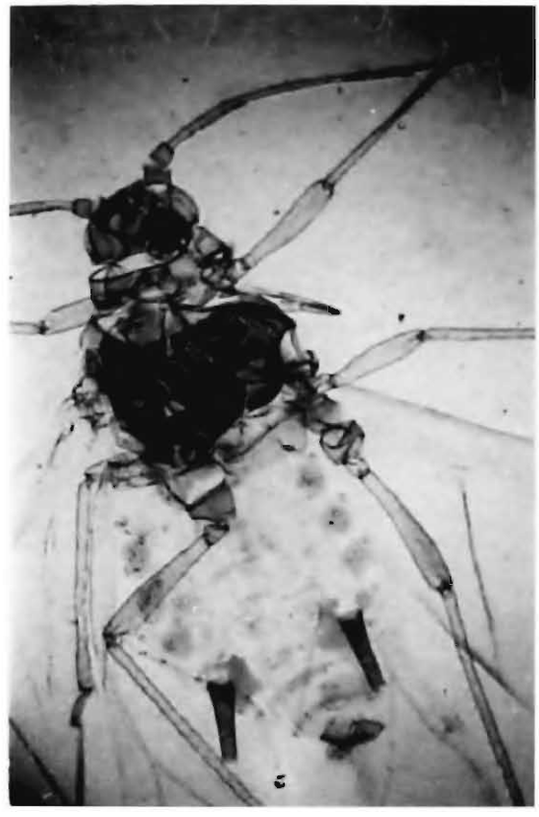

Fig. 354. *Aphis rhamnifila* David *et al.*, Alate viviparous female.

Fig. 355. *Aphis rhoicola* H.R.L., Apterous viviparous female.

Fig. 356. *Aphis rubifolii* (Thomas), Apterous viviparous female.

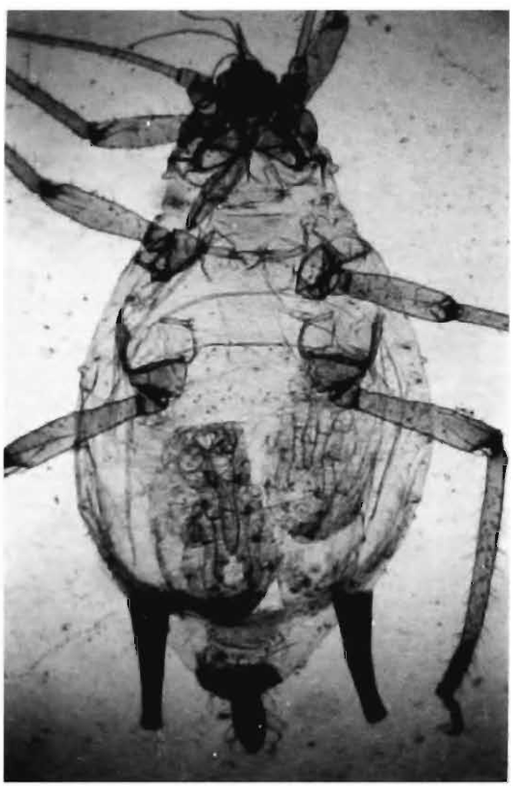

Fig. 357. *Aphis spiraecola* Patch, Apterous viviparous female.

Fig. 358. *Aphis spiraecola* Patch, Alate viviparous female.

Fig. 359. *Aphis verbasci* Schrank, Apterous viviparous female.

Fig. 360. *Aphis verbasci* Schrank, Alate viviparous female.

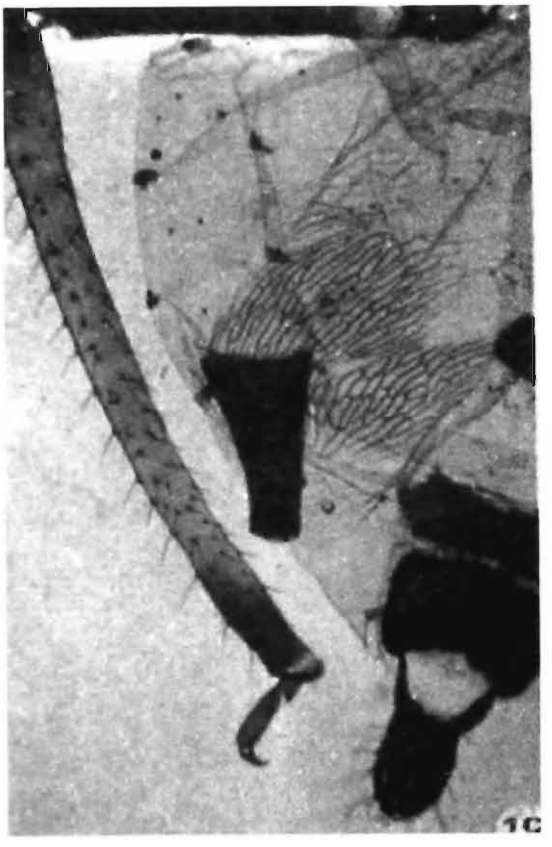

Fig. 361. *Toxoptera aurantii* B.d.F., Apterous viviparous female showing stridulatory apparatus.

Fig. 362. *Hyalopterus pruni* (Geoffroy), Alate viviparous female.

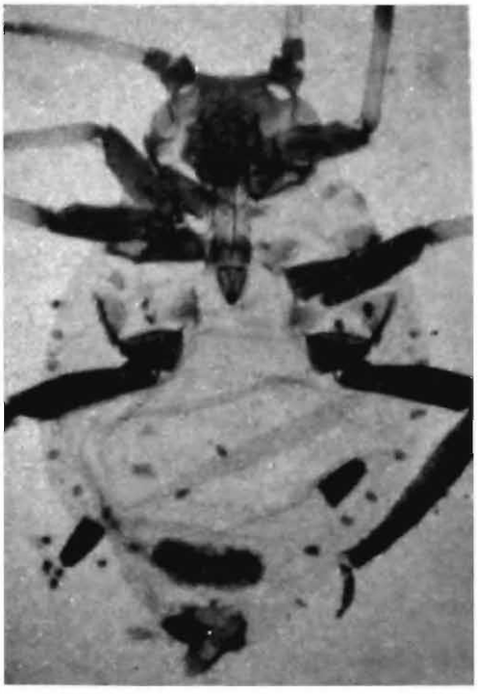

Fig. 363. *Hysteronura setariae* (Thomas), Apterous oviparous female.

Fig. 364. *Melanaphis arundinariae* (Takahashi), Apterous viviparous female.

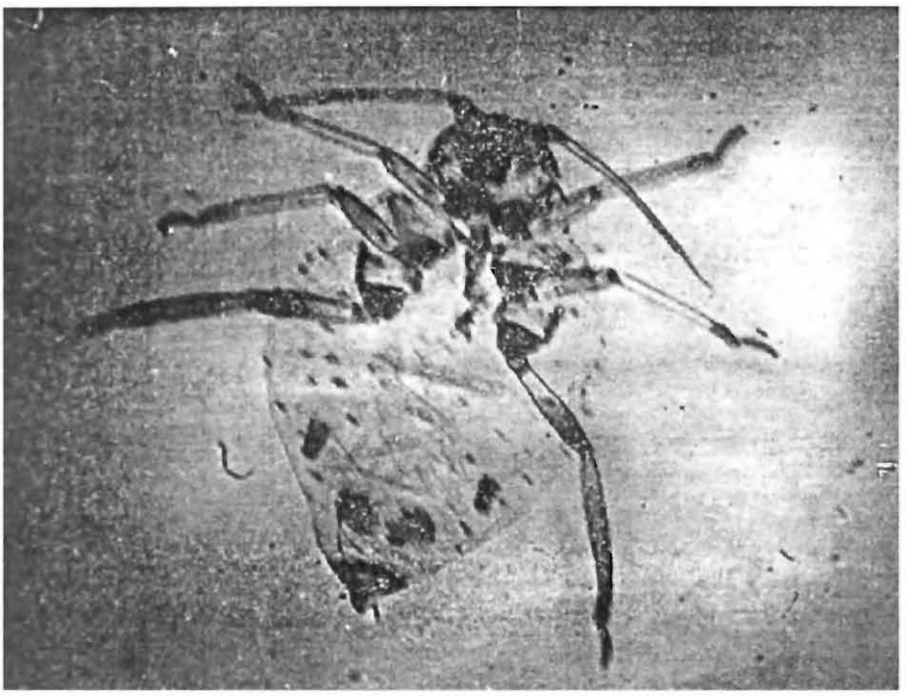

Fig. 365. *Rhopalosiphum maidis* (Fitch), Apterous oviparous female.

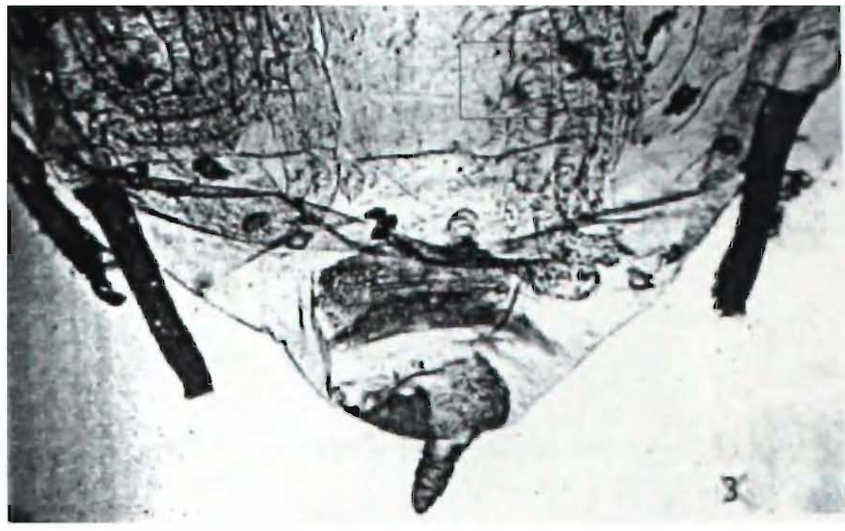

Fig. 366. *Rhopalosiphum nymphaeae* (Linn.), Alate viviparous female.

Fig. 367. *Aphis craccivora* Koch, colony infesting *Cestrum nocturnum*

Fig. 368. *Aphis craccivora* Koch, heavily infesting a fabaceous plant.

Fig. 369. *Aphis gossypii* Glover, infesting cajanus cajan (Fabaceae).

Fig. 370. *Aphis nerii* B.d. Fonscolombe, infesting a plant of ***Asclepias*** sp (Asclepiadaceae).

Fig. 371. *Melanaphis donacis* (Passerini), mummified on *Arundo donax* (Poaceae)

Dr. Lakshmi Kanta Ghosh (Dr. L. K. Ghosh) (Born 31.12.1937) had his education at the University of Calcutta. He started his research in Sericulture at the Central Sericultural Res. Stn., Berhampore, W.B. and subsequently as Research Scholar (1965) at Zoological Survey of India, Calcutta where he actively carried out research for 30 years on hemipteran insects w.s.r. to Indian aphids. He retired as Deputy Director from Z.S.I. in 1995 and later worked as Emeritus Scientist there for 3½ years. He has so far more than 140 research publications to his credit including Monographic, Revisionary works on aphids and multiauthored contributions on Indian Hemiptera under State Fauna Series, Z.S.I. He has been awarded D.Sc. degree for significant contributions on Indian aphids. His current interest includes Biodiversity of Indian Insects under Academy of Biodiversity conservation (Regd.) where he is acting as founder president. He is also acting as the vice-president of the Aphidological Society, India for the last 7 years. A member of several scientific societies, Dr. Ghosh is also engaged in teaching (P.G.) in Entomology. He is recipient of Congress of Zoology Gold Medal, Zoological Society of India.