Vol. 17 No. 3

Memoirs of the
Zoological Survey of India

A taxonomic review of the genus *APHIS* Linnaeus (Homoptera : Aphididae) in India

L. K. Ghosh

ZOOLOGICAL SURVEY OF INDIA

MEMOIRS
OF THE
ZOOLOGICAL SURVEY OF INDIA

Vol. 17 No. 3

A TAXONOMIC REVIEW OF THE GENUS *APHIS* LINNAEUS (HOMOPTERA : APHIDIDAE) IN INDIA

By

L. K. GHOSH

Zoological Survey of India, Calcutta-700 053

Edited by the Director, Zoological Survey of India

1990

Published : December, 1990

PRICE : Inland : Rs. 110.00

Foreign : £ 9·00 or $ 12·00

PRODUCTION : PUBLICATION UNIT,
ZOOLOGICAL SURVEY OF INDIA, CALCUTTA.

PRINTED AT THE BANI PRESS, 16, HEMENDRA SEN STREET, CALCUTTA-700 006,
PRODUCED BY THE PUBLICATION DIVISION AND PUBLISHED BY THE
DIRECTOR, ZOOLOGICAL SURVEY OF INDIA, CALCUTTA 700 053

FOREWORD

Aphids are one of the most important groups of phytophagous insects because of their being polymorphic, having rather complicated biology and possessing an ability to transmit plant viral diseases.

The Aphid fauna of India and adjacent countries constitutes about 16% of the total world fauna. It includes a large number of rare and endemic (23%) species. The present work is the first consolidated account on 27 Indian species of the genus *Aphis* L. The author, Dr. L. K. Ghosh has given detailed taxonomy, descriptions and identification keys to various species and morphs of *Aphis* and has supported it with essential and good illustrations. The work is supplemented by an up-to-date list of host plants (576 plant species in 385 genera and 118 families) infested by species of *Aphis* in India. This, I am sure, is likely to be of great value to agricultural entomologists of our country. The author has also provided informations on endemism, host plant association, sexual morphs and Zoogeographical analyses of the species. The present contribution "A Taxonomic Review of the Genus *Aphis* Linnaeus (Homoptera : Aphididae) in India" would be very useful for the entomologists, plant pathologists, etc.

I am sure all aphidologists will join me in expressing deep sense of appreciation for this significant contribution by Dr. Ghosh who as a scientist of the Zoological Survey of India has been engaged in these studies for over two decades.

PROF. MOHAMMAD SHAMIM JAIRAJPURI
Director
Zoological Survey of India

Calcutta
December 11, 1990.

MEMOIRS
OF THE
ZOOLOGICAL SURVEY OF INDIA

Vol. 17 (3) **1990** **Pages 1—159**

CONTENTS

Introduction

Aphids are small polyphagous and polymorphic homopteran insects and are ranked as one of the major pests of agricultural crops all over the world. These are interesting insects not only from the view point of biology but also from economic entomology and virology. The aphids are important carriers of many viral diseases of cultivated and wild plants (Bodenheimer and Swirski, 1957). The infestations by aphids result in the appearance of damage symptoms of various degrees (Figs. 1 & 2).

About 793 species of aphids under 213 genera are known from the Indian Region (Ghosh, A. K. 1989), whereas the Oriental fauna is represented by about 1015 species under 253 genera (Agarwala and Ghosh, A. K., 1985) and the world fauna is represented by about 3742 species (Eastop and Hille Ris Lambers, 1976). Thus the Indian aphids constitute at least 20% of the world fauna.

Aphis Linnaeus is a large genus comprising nearly 500 recorded species (Eastop and Hille Ris Lambers (*op. cit.*) which occur on diverse host plants and have the ability to thrive in various climatic conditions. Most of the species are distributed in the northern hemisphere, but a few are native to South America, New Zealand and Australia. These are mostly small to medium-sized aphids, subject to much colour variation depending upon the physiological condition of the host plants which are chiefly shrubs or herbs, while a small number occurs on trees also. They usually live on the young foliage, often causing distortion of the leaves. Some may occur on young twigs or at the bases of stem or may be associated with the roots. Most species of *Aphis* are attended by ants. There are some species-groups specifically associated with particular groups of plants.

At present, there is no comprehensive account of this genus from India even on regional basis. However, Palmer (1952) discussed the North American species, Stroyan (1972) revised the European species Shaposhnikov (1964) dealt with the species of European part of U.S.S.R. while Japanese species were worked out by Takahashi (1966).

Previous to the present study, it was observed that the genus *Aphis* Linn. (tribe Aphidini, subfamily Aphidinae) was represented by 31 valid

species known from the Indian subregion. Besides, there were a few species whose taxonomic positions were not ascertained. Moreover, there was no authentic running key for separating the species and whatever available, was misleading because of overlapping characters.

The paper attempts to present a consolidated account of the Indian species of the genus *Aphis* Linnaeus. A review of the literature reveals that out of 27 species dealt with in the paper, 6 are indigenous, 4 palaearctic and 17 either distributed in tropical belt from South-East Asia to Africa or cosmopolitan. Within India, one species is restricted to North-east, 8 to North-west and 6 are found all over the country. Some of the species in India exhibit characters not usually met with in the genus. Stiletto-shaped (Figs. 116, 147) ultimate rostral segment (u.r.s.), much shorter processus terminalis (Figs. 146, 238) and more number (upto 9) of hairs on u.r.s. (Fig. 162) are some of these peculiarities. The genus is re-defined in this contribution. Also short descriptions of available morph (s) of each species/subspecies are provided with suitable diagrams and measurements (in mm) for easy identification of the taxa. Running key for separating various taxa is provided for both apterous and alate viviparous females and also for the sexuales available for study. Original reference, synonymy (-ies), if any, and distributional records both in India and abroad of each species are provided. For detailed synonym(s), the reference may be made to Eastop & Hille Ris Lambers (1976). Necessary illustrations are provided as an aid to the identification of aphids. The taxonomic nomenclature of the listed species is after Eastop and Hille Ris Lambers (*op. cit.*). In addition, contributions of Behura (1963, 1965), Raychaudhuri, D. N. (*ed.*) (1980, 1983), Agarwala and Ghosh, A. K. (1984, 1985), are taken into consideration regarding the nomenclature of the species. The plant nomenclature is after Willis (1966). The entire work is supplemented by providing a complete up-to-date aphid-host catalogue, which involves about 590 plant species belonging to 385 genera distributed over 118 families. It may be mentioned here that some of these aphid species are highly polyphagous, while a few are restricted to specific plant families only. A brief discussion is made on the host plant-association, endemism, distribution, sexuales and also zoogeographical analysis. Except for certain taxa, not available for

study, all othes are incorporated on the basis of authentically identified materials. The species which are of uncertain status, and could not be examined, are listed with their synonymy and references. The taxonomic keys presented here are essentially for the identification of the Indian speciesof the genus and it may not work for aphids elsewhere. Inevitably, there may be both errors and omissions in this contribution and the author will be grateful, if those are pointed out.

The study is based on the collections in the Zoological Survey of India, Calcutta, and also those in the Entomology Laboratories of Calcutta and Kalyani Universities. It is supplemented by examining specimens from the Commonwealth Institute of Entomology, London, Central Potato Research Institute, Shimla, Madras Christian College, Madras and Aphid Research Unit, Department of Zoology, M. M. (P. G.) College, Modinagar, Uttar Pradesh.

Abbreviations used :

A.N.C.	:	A. N. Chowdhuri
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
F. T. C.	:	First tarsal chaetotaxy
H. P	:	Himachal Pradesh
h.t.2	:	2nd segment of hind tarsus
L. K. G.	:	L. K. Ghosh
M	:	Media of forewing
M. R. G.	:	M. R. Ghosh
p.t.	:	processus terminalis
P. K. M.	:	P. K. Mondal
S. C.	:	S. Chakrabarti
S. P. M.	:	S. P. Maity
u.r.s.	:	ultimate rostral segment
U. P.	:	Uttar Pradesh
Z.S.I.	:	Zoological Survey of India

List of Species/Subspecies

1. *Aphis achyranthi* Theobald
2. *A. affinis* del Guercio
3. *A. citricola* v.d. Goot
4. *A. clematidis simlaensis* Kumar & Burkhardt
5. *A. craccivora* Koch
6. *A. eugeniae* v.d. Goot
7. *A. euphorbiae* Kaltenbach
8. *A. fabae* scopoli complex
9. *A. farinosa* Gmelin
10. *A. glycines* Matsumura
11. *A. gossypii* Glover Complex
12. *A. kurosawai* Takahashi
13. *A. longisetosa* Basu
14. *A. nasturtii* Kaltenbach
15. *A. nerii* B. d. F.
16. *A. paraverbasci* Chakrabarti
17. *A. pollinosa* Walker
18. *A. polygonacea* Matsumura
19. *A. pomi* de Geer
20. *A. punicae* Passerini
21. *A. raji* Kumar and Burkhardt (= *A. leptorhyncha* David *et al.*)
22. *A. rhamniphila* David, Narayanan & Rajasingh
23. *A. rhoicola* Hille Ris Lambers
24. *A. rubifolii* (Thomas)
25. *A. rumicis* Linnaeus
26. *A. verbasci* Schrank
27. *A.* (*Protaphis*) *carthami* (Das)

Systematic Account

Genus **Aphis** Linnaeus

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

Type species. *Aphis sambuci* Linnaeus, 1758.

Body oval to elongate. Head smooth and usually without any lateral frontal tubercle ; frons smooth, straight or slightly concave. Antennae usually 6-segmented (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 & 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 (Fig. 269) ; u.r.s. normal in shape, sometimes heart-shaped, or stiletto-shaped (Figs. 116, 147), shorter to slightly longer than ht_2 and usually bearing 2 to 4 secondary hairs, which may be upto 9 (Figs. 162, 186) and shorter or longer (Figs. 155, 209, 218) 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 (Figs. 48, 101, 277). Spiracle normal. Post-siphuncular sclerite rarely present (Fig. 280) ; dorsal hairs often short with acuminate or blunt spines, sometimes being quite long with acute apices (Fig. 125). Siphunculi subcylindrical or tapering, imbricated, dark, rarely smooth, pale and with only a small flange. Cauda usually elongate, 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 imbrications ; alatae often with darker legs ; F. T. C. 3, 3, 2 or 3, 3, 3. Wing venation normal.

Distribution : Cosmopolitan.

Key to the Indian species of the genus **Aphis** Linnaeus

Apterae viviparae :

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 2× b.d. III ; u.r.s. 1.3-1.5×ht_2 ; 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 VII ; 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 hairs ; 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 ; siphunculi 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 (Fig. 277) ; 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

— Posterior abdominal dorsum not as above ; siphunculi (Fig. 71) shorter (0.6-0.9) than cauda (Fig. 72) ; never shiny in life ... *euphorbiae* Thomas

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_3 ; p.t. about 2.5-3.0×base VI ; cauda with 7-9 hairs ; brown to reddish brown in life ... *longisetosa* 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_3 ; a.s. III subequal to or slightly longer than siphunculi ; cauda (Fig. 158) 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_3 ; a.s. III much shorter (about 0.5×) than siphunculi ; cauda dark (Fig. 249) 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 ih life ... *citricola* v.d. Goot

—	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 abdomlnal tergites about 2×b.d. III ; abdominal dorsum with polygonal reticulations ...	*rhamniphila* 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 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. 279) ; 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) ...	*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_1 ; 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×ht_2 ; 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 yollowish ... *glycines* Mats.

— 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 :

I. 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 terminalis 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×ht_3 ; 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 hairs ... 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. 248) ; 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 ... *citricola* v.d.G.

— 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 ... *longisetosus* 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 $\times ht_2$; 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 rhinaria 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

Male:

1. Siphunculi much longer (about 3.5×cauda); distal half of siphunculi distinctly pigmented; secondary rhinaria distributed: III 12-14, IV 5-8, V 2-8 ... *clematidis simlaensis* Kumar and Burkhardt

— Siphunculi appreciably shorter (at most 2×cauda); siphunculi uniformly brown; secondary rhinaria distributed: III 18-40, IV 15-27, V 7-19 ... 2

2. 8th abdominal tergite always with more than 2 hairs; caudal hairs more than 7; secondary rhinaria distributed: III 25-30, IV 22-26, V 8-16 ... *fabae* Complex

— 8th abdominal tergite never with more than 2 hairs; caudal hairs not more than 7 ; secondary rhinaria distributed : III 18-40, IV 15-26, V 7-19 ... 3

3. Second tarsal segment with only primary hairs ; p.t. at most 2×base VI ; cauda conical, 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. always more than 2.0×base VI ; cauda with blunt apices ... 4

4. p.t. 2.2-2.5×base VI ; secondary rhinaria distributed : III 31-37, IV 21-26, V 12-18 ... *gossypii* Glover

— p.t. about 3.0×base VI ; secondary rhinaria distributed : III 18-24, IV 15-20, V 11-19 ... *craccivora* Koch

Oviparae :

1. 8th abdominal tergite always with more than 2 hairs ... 2

— 8th abdominal tergite usually with 2 hairs ... 4

2. F. T. C. 3, 3, 3 ; cauda with 10-12 hairs ; siphunculi dark uniformly ; longest hair on anterior abdominal tergites 3.5-4.5 times as long as b.d. III ... *paraverbasci* Chakrabarti

— F. T. C. 3, 3, 2 ; cauda with 5-8 hairs ; siphunculi pale brown or pigmented only distally ; longest hair on anterior abdominal tergites as long as to twice as long as b.d. III ... 3

3. Siphunculi imbricated and pigmented only on distal 0.3-0.4 portion ; siphunculi twice as long as bluntish cauda ; hairs on 8th tergite 2.0-3.1 times the longest hair on a.s. III ; pseudosensoria distributed over basal 0.5 portion ... *clematidis simlaensis* Kr. and Burkhardt

— Siphunculi uniformly brown and imbricated throughout ; siphunculi 0.70-0.80 times as long as thumb-shaped cauda ; caudal hairs 6-8 ; hairs on 8th tergite about 4 times as long as longest hair on a s. III ; pseudosensoria distributed over basal 0.80 portion ... *fabae* Complex

4. Hairs on anterior abdominal tergites longer, about 1.5 times as long as b.d. III ; cauda with more than 10 hairs ; u.r.s. usually with more than 2 (2-9) secondary hairs ; antennae usually 5-segmented ... *pollinosa* walker

—	Hairs on anterior abdominal tergites shorter, 0.5-1.0 times as long as b.d. III ; cauda with less than 10 hairs ; u r.s. always with 2 secondary hairs ; antennae 5-or 6-segmented ...	5
5.	Longest hair on hind femora about as long as its maximum width ; cauda with 10 hairs ...	*citricola* v.d. Goot
—	Longest hair on hind femora appreciably shorter than its maximum width ; cauda with 10 hairs ...	6
6.	Abdomen with scattered blackish brown muskel platten and two slightly paler blotches beyond siphunculi ; second segment of hind tarsus with both ventral and dorsal secondary hairs besides primary ones ; hind tibiae about 8-9 times its maximum width ; cauda with narrowed apex and with 5-7 hairs ; siphunculi subequal to cauda ...	*craccivora* Koch
—	Abdomen absolutely pale brown but never with such muskel-platten and blotches ; second segment of hind tarsus with only ventral secondary hairs besides primary ones ...	7
7.	Siphunculi distinctly shorter than cauda ; antennae 6-segmented ; abdominal dorsum light brown ; cauda with 5-6 (usually 5) hairs ...	*gossypii* Glover
—	Siphunculi as long as or longer than cauda ; antennae 5-segmented ; abdominal dorsum absolutely pale ; cauda with 4-5 hairs ...	*nasturtii* Kaltenbach

1. **Aphis achyranthi** Theobald, 1929 (Figs. 7-14, 242)

[*Type locality* : India]

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, 1961)* 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., *Orient. Insects*, 6 : 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.

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.*

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 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 ; ht_2 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.

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, 1911 (Figs. 15-20, 243)

[*Type locality* : Portugal]

1911. *Aphis affinis* del Guercio, *Redia*, 7 : 315 ; 1974. David and Ghorpade, *Orient. Insects*, 8 (2) : 196 ; 1981. Bhagat, *Sci. & Cult.*, 47 : 134-136.

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

Apterous viviparous female : Body 1.26 mm long with 0.7 5 mm as its maximum width. Dorsum smooth. Head (Fig. 15) with small antennal tubercles not exceeding beyond vertex width. Antennae 0.4--0.6 times 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 times 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 times the b.d. III. Siphunculi (Fig. 19) dark, imbricated, cylindrical, tapering towards apex, 0.15-0.17 times as long as body and 2.0-2.2 times 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, ht_2 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

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 form India. In the Punjab, the aphid was first observed on Japanese mint in 1974 (Anonymous, 1977). Darkgrey-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 citricola** van der Goot, 1912
(Figs. 21-32, 244-245)

[*Type locality* : South America]

1912. *Aphis citricola* van der Goot, *Rec. Indian Mus.*, 13 : 175-183 ; 1914. *A. spiraecola* Patch, *Bull. Me. agric. exp. stn.*, 233 : 270 ; 1931. Krishnamurthi, *J. Bombay nat. Hist. Soc.*, 34 : 411-419 ; 1948. Krishnsmurthi, *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 Raychaudhuri, D. N., *Sci. Cult.*, 34 : 133-134 ; 1968. Ghosh, A. K. and Raychaudhurl, D. N., *Proc. zool. Soc.*, 21 : 179-195 ; 1969. Basu, A. C., Nath and Chatterjee, *Proc. zool. Soc.*, 22 : 169-178. ; 1962. Banerjee, Ghosh, A. K. and Raychaudhuri, D. N., *Orient. Insects*, 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. 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 ; *Orient. Insects*, 6 : 333-342 ; 1973. Raychaudhuri, D. N., USPL 480 project, *Tech. Report* : 1-107 ; 1975 Ghosh, A. K., Biswas, Chanda, Lahiri and Rhynth, *Sci. Cult.*, 41 : 502-594 ; 1975. Chakrabarti and Raychaudhuri, D. N., *Orient. Insects*, 9 : 195-21 ; 1978. Raychaudhuri, D. N., Dutta, Agarwala, Raychaudhuri, D. and Raha, *Entomon*, 3 : 93-94 ; 1979. Stary and Ghosh, A. K., *Orient. Insects*, 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.

1929. *Aphis bidentis* Theobald, *Entomologist*, 62 : 177-181 ; 1931. Krishnamurthi, *J. Bombay nat. Hist. Soc.*, 34 : 411-419 ; 1956. David, *Indian J. Ent.*, 18 : 141-145 ; 1963. Behura, *Proc. 1st Summer School of Zoology* (Simla, 1961), Govt. of India : 25-78.

1863. *Aphis malvae* Passerini, *Aroh. Zool. Anat. Fisiol., Modena*, 2 : 129-212. ; 1909. Lefroy and Howlett, *Indian Insect life* : 743-748.

1917. *Aphis malvoides* Das, *Mem. Indian Mus.*, 6 : 135-274 ; 1961. Basu, A. N., *Sci. Cult.*, 27 : 456 ; 1958. David, *J. Bombay nat. Hlst. Soc.*, 55 : 110-116 ; 1958. *J. South Indian Hort.*, 6 : 67-74 ; 1963. Behura, *Proc. 1st Summer School of Zoology* (Simla, 1961) : 25-78 ; 1965. Behura, *Prakruti J. Utkal Uuiv. Sci.*, 3 : 40-65. 1965. Ganguli and Ghosh, M. R., *Sci. Cult.*, 31 : 541-542 ; 1969. Rao, *CIBC U.S. PL* 480 *Project, Final Tech. Rep.* : 1-93.

1773. *Aphis pomi* de Geer, *Memoires Pour Servir a Histoire des Insects. Stockholm*, Aphids, 3 : 30 ; 1948. Krishnamurti, *Indian J. Ent.*, 10 : 51-53.

1912. *Acyrthosiphon citricola* van der Goot, *Rec. Indian Mus.*, 13 : 175-183 ; 1961. Basu, A. N., *Curr. Sci.*, 30 : 390-391 ; 1963. Behura, *Proc. 1st Summer School of Zoology* (Simla, 1961) : 25-78.

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.) ; 5 apterae and 1 alata, on *Spiraea* sp., Kasauli (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 *Spiraea chanoidri*, Phagli (H. P.), 14.xii.1973, coll. *L. K. G.* ; 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.*

Apterous viviparous female : Body pale, 1.5-2.4 mm. long with 0.8 t-o 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 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 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 o. 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 1.60mm long with 0.75mm 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 0.84.

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 differences 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 *citricola*. In *A. pomi* u.r.s. is about 3 times as long as as wide at the base, while in *A. citricola* it is only

twice as long as wide. Moreover, in *citricola* there are less hairs on the cauda (apterae 8-15, alatae 7-14) than in *pomi* which bears 14-20 in apterae and 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.

Distribution : India : all over ; Africa ; Australia ; Bhutan ; Bermuda Is, ; China ; Nepal ; New Zealand ; North America ; Pakistan ; Sri Lanka ; Sytia ; Taiwan ; Thailand and Vietnam.

4. **Aphis clematidis simlaensis** Kumar and Burkhardt, 1970.

(Fig. 40)

[*Type locality* : India]

1970. *Aphis clematidis simlaensis* Kumar and Burkhardt, *J. Kansas Ent. Soc.*, **43** (4) : 463 ; 1980. Basu, R. C. and Raychaudhuri, D. N., *Rec. zool. Surv. India*, Occ. Paper, **18** : 7.

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

Apterous viviparous female : Body rather oval, 1.14 mm long with 0.60mm as maximum width near the middle of abdomen. Head brown, without frontal tubercles. Antennae 6-segmented, about half as long as body, longest hair on a.s. III 0.4 times as long as b.d. III, p.t. 2.1 times as long as base VI. Rostrum reaches near 3rd coxae, u.r.s. 1.4 times as long as ht_2 and with 2 secondary hairs. Abdominal dorsum pale, dorsal hairs about 10μ long, sclerites absent, 8th tergite with 4 hairs. Siphunculi light to dark brownish, cylindrical, lightly imbricated, with small but distinct apical flange, 2.1 times as long as bluntish cauda 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, 1.1-1.2 mm long. Head pale brown, without frontal tubercles. Antennae 6-segmented, about half as long as body, without secondary rhinaria, the longest hairs on a.s. III 2.0-2.5 times as long as b.d. III, p.t. about 2.5 times as long as

the base of a.s. VI. Rostrum reaches upto second coxae, u.r.s. 1.4 times as long as ht_2 and with 2 secondary hairs. Abdominal dorsum pale, dorsal hairs about as long as the longest hair on a.s. III. 8th tergite apparently with 4 hairs being 2.0-3.1 times as long as the longest hair on a.s. III. Siphunculi cylindrical, imbricated, distal 0.3-0.4 portion pigmented, about twice as long as cauda. Cauda bluntish, dusky, with 5 hairs. Subgenital plate with many small fine hairs. No eggs found inside the abdomen, Hind tibiae swollen with many pseudosensoria, maximum width of hind tibiae about twice the midwidth of other tibiae.

Measurements (in mm) of an ovipara : Length of body : 1.23 ; width of body 0.84, antenna 0.71 ; antennal segment III 0.19, IV 0.10, V 0.11, VI (0.07+0.19) ; u.r.s. 0.09 ; ht_2 0.06 ; siphunculus 0.19 ; cauda 0.10.

Alatoid male : Body oval to elongated, 0.84-0.98 mm long with 0.50-0.55 mm as maximum width near the middle of abdomen. Head (Fig. 33) brownish, without frontal tubercles, cephalic hairs about 1.5 times as long as the longest hair on a.s. III ; triommatidion distinct. Antennae 0.86-0.88 times as long as body, a.s. III (Fig. 34) with 5-9, IV (Fig. 35) with 2-5 and V (Fig. 36) with 6-9 secondary rhinaria varying in size ; longest hair on a.s. III subequal to b.d. III ; p.t. dark brown, about twice as long as base VI. Rostrum reaches 3rd coxae, gradually tapering to apex ; u.r.s. (Fig. 38) 1.38-1.40 times as long as ht_2. Abdomen apparently without distinct sclerites. Siphunculi (Fig. 39) cylindrical, brownish at base to dark brown at apex, about 2.5 times as long as cauda. Cauda (Fig. 40) concolourous with basal part of siphunculi, bearing 5 hairs. F. T. C. 3, 3, 2.

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.

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 on 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, called apterous male which the author 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.

Distrtbutiou : India : Himachal Pradesh.

5. **Aphis craccivora** Koch, 1854

(Figs. 41-57, 246)

[*Type locality* : Germany]

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 : 1-2 ;

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, *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 Benerjee, *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., *J. Bombay nat. Hist. Soc.*, 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., *Indian Agric.*, 5 : 87-88 ;

1962. Batra and Wadhi, *Indian J. Eni.*, 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., *Orient. Insects*, 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 Teeh. Bull.*, 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 pp. ;

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 Pranesh. 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 Raychaudhurl, 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 : 1-222 1940. Ullah, *Indian J. Ent.*, **2** : 13 : 25 ; 1948. Krishnamurti, *Ibid.*, **10** : 51-53 ; 1954. Krishnamurti and Ushman, *Ibid.*, **16** : 327-344.

1915. *Anuraphis cynariella* Theobald, *Bull. ent. Res.*, **6** : 103-153. : 1948. Krishnamurti, *Indian J. Ent.*, **10** : 51-53.

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. (Maharastra) 6.xii.1974, coll. *P. P. Kulkarni* ; Apterae, on *Hibiscus rosasinensis*, Tocklai, Shillong (Assam), 18.1.1969,

coll. ? Ten 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.1982, 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. ♀ ♀, on *Tinospora cordifolia*, 6.ii.1268, 'C. U.' coll.

Apterous viviparous female : Body somewhat oval, blackish, about 1.6-2.8 mm long with 1.2-1.6 mm as its maximum width. Head (Fig. 41) smooth with small antennal tubercles not extending beyond vertex, Antennae 6-segmented, (Figs. 42-43) about 0.5-0.8 times as long as body, a.s.I somewhat rounded with small wrinklings, particularly on inner side ; a.s. II with some imbrications especially on ventral and inner sides ; rest of the antennae progressively more distinctly imbricated from base towards apex, flagellum with several fairly short to medium hairs, secondary rhinaria absent ; p.t. about 2.1-2.8 times as long as base of segment VI ; Rostrum reaches up to hind coxae, u.r.s. (Fig. 44) about 0.85-1.0 times as long as ht_2. Abdominal dorsum (Fig. 47) rather blackish with a dark continuous medium patch with polygonal reticulations, this area appearing shining black under a pocket lens in life ; hairs on dorsum with acuminate apices, longest hair on anterior tergites about 0.5-0.8 times as long as b.d. III. Siphunculi (Fig. 45) black, strongly imbricated, cylindrical, about 0.14-0.20 times as long as body and 1.5–2.0 times cauda ; Cauda (Fig. 46) elongate, black, spinose, tapering to apex and somewhat constricted at basal 0.3 to 0.5 portion, bearing 5-9 hairs including dorsal subapical one. Subgenital plate with up to about 16 hairs of moderate length. F. T. C. 3, 3, 2.

Measurements (in mm) of an aptera : Length of body 2.11 ; width of body 1.28 ; antenna 1.46 ; III 0.35, IV 0.28, V 0.25, VI (0.13+0.32) ; u.r.s. 0.11 ; ht_2 0.13, siphunculus 0.42 ; cauda 0.25.

Alate viviparous female : Body 1.7-2.5 mm long with 0.6-1.30 mm

as its maximum width. Head (Fig. 51) smooth, brownish ; antennae (Fig. 49) about 0.7-0.8 times as long as body ; p.t. (Fig. 53) 1.5-2.8 times as long as base of a.s. VI ; a.s. III (Figs. 52, 54) with 3-8 circular secondary rhinaria near base. Rostrum extends upto mid coxae ; u.r.s. (Fig. 55) about 0.80-0.85 times as long as ht_2 ; dorsum of abdomen frequently with rather long dark segmental bars across the abdominal tergites besides distinct postsiphuncular sclerites (Fig. 48), longest hair on anterior abdominal tergites about 0.7-1.0 times as long as b.d. III. Siphunculi (Fig. 56) blackish, strongly imbricated, 0.10-0.20 times as long as body, 1.7-1.9 times as long as cauda. Cauda (Fig. 57) blackish, strongly spinose somewhat constricted near at the middle, bearing 5-9 hairs. F. T. C. 3, 3, 2. Wing venation normal (Fig. 50).

Measurements (in mm) of an alata : Length of body 2.22 ; width of body 1.03 ; antenna 1.42 ; a.s. III 0.321 IV 0.28, V 0.26, VI (0.12 +3.2), u.r.s. 0.10 ; ht_2 0.12 ; siphunculus 0.28, cauda 0.19.

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

Apterous oviparous famale : 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 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, 2.

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 known as black aphid, attacks many plants and most often leguminous 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 diseases. Sexuales of the species has so far been reported on leguminous plants in Germany (Falk, 1957/58) and on *Tinospora cordifolia* (Family Leguminosae) in Calcutta (Basu, R. C. *et al.* 1968). Verma and Khurana (1974) reported males and oviparous females on green gram (*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 postiphuncular and marginal sclerites. An excellent morphological account has been given by Cottier (1953).

Distribution : India : all over ; virtually cosmopolitan.

6. **Aphis eugeniae** van der Goot, 1917.

[*Type locality* : Java (?)]

1917. *Aphis eugeniae* van der Goot, *Contr. Faune Ind. neerl.*, 3 : 250 ; 1969. David, Narayanan and Rajasingh, *Bull. Ent.*, 10 (2) : 158.

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.*

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 siphinculi 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 tarsus 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.

7. **Aphis euphorbiae** Kaltenbach, 1843

(Figs. 66-72)

[*Type locality* : Germany]

1843. *Aphis euphorbiae* Kaltenbach, *Mon. Fam. Pflanz.* : 94 ; 1971. Chakrabarti, Ghosh, A. K. and Raychaudhuri, D. N., *Sci. Cult.*, 37 : 248.

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.*

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 0.6-0.7 times as long as body; 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 ht_2. Abdomimal 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 (Eig. 71) darkar, 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.

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

8. **Aphis fabae** Scopoli 1763 Complex

[*Type locality* : Carniola]

(Figs. 73-78, 248)

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, 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., *Orient. Insects*, 3 : 355-57 ;

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

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

1970. Ghosh, A. K., Basu, R. C. and Raychaudhuri, D. N., *Orient. Insects*, 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 Zoolo. gical Society, Calcutta : 521 pp. ;

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 ;

1965. Kareem and Basheer, *Indian J. Ent.*, 27 : 234-235.

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

1969. Basu A. N., *Orient. Insects*, 3 : 335-371 ;

1970. Ghosh, A. K., Basu, R. C. and Raychaudhuri, D. N., *Orient. Insects*, 4 : 65-76 ;

1970. Ghosh, A. K., Ghosh, M. R. and Raychaudhuri, D. N., *Orient. Insects*, 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 Chakrabarty, *Sci. Cult.*, 45 : 160-162 ;

1979. Rsychaudhuri, D. N. Dutta, Agarwala, Raha and Rauchaudhuri, 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, *CIBC U. S. PL 480 Project. Final Tech. Rep.* : 1-93 ;

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

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

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

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.1978 ; 1 aptera, 1 alata and 11 nymphs, Jakhu (H. P.), *C* 2400 m., on *Rhamnus* sp., 28.x.1971 ; 4 apterae, Javii (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.*

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-35μ 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-paatten like structure, the sclerites may sometimes form segmntlly 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 tetgite 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) 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 hairs. Other characters as in apterae.

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 3.12 ; 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 long 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 thumbshaped, concolorous with siphunculi and bears 6-8 hairs. Hind tibiae swollen with numerous pseudosensoria distributed over basal 0.80 portion. Fore and mind 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 selerites ; dorsal hairs on anterior

abdominal tergits 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.

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, compositae and cruciferae). It sometimes causes serious damage to beans and peas. Raychaudhuri, D. N. *et al.* (1980) described oviparous female and alate male from northwest India.

Distribution : India : all over ; virtually cosmopolitan.

9. **Aphis farinosa** Gmelin, 1788
(Figs. 79-86, 249, 250)
[Type-locality : Sweden]

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

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

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

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

Material examined : 1 aptera, on *Salix capra*, Wadoora (J. & K.), 1.vi.1970, A-62, CIEA 6449.

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) about as long as or just a longer than ht_2 ; dorsum of abdomen pale, smooth, abdomen with submarginal integumental sclerites, 8th tergite with 2-4 (usually 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 an 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.

10. **Aphis glycines** Matsumura, 1917

(Figs. 87-94, 251)

[Type locality : Japan]

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.

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 hairs (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. II^1. Otherwise, as in aptera.

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 ; Malayesia ; Manchuria ; Nepal ; Philippines ; Taiwan and Thailand.

11. **Aphis gossypii** Glover, 1877 Complex

(Figs. 95-110, 252-253)

[Type-locality : U. S. A.]

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 ;

1979. Kulkarny and Kacker., *Bull. zool. Surv. India.*, 2 : 1-2 ;

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 ;

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.

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

1963. Ghosh, A. K. and Raychaudhuri, 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. Ramaseshiah 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., *Orient. Insects*, 6 : 387-400. ;

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

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

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

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

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

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

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

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

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

1979. Agarwala and Raychaudhuri, D. N., *Indian Agric.*, 23 : 25-29 ;

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

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

1978. Raychaudhuri, Dutta, Agarwala, Raha and Raychaudhuri, *D. Entomon*, 4 : 163-166.

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

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

1980. Basu, R. C. and Raychaudhuri, D. N., *Rec. zool. Surv. India*, Occ. paper, 18 : 7-54 ;

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.) ; 1980. Chattopadhyay and Raychaudhuri, D. N., *Sci. Cult.,* 46 : 326-328 ;

1980. Ghosh, A. K. and Agarwala, *Indian Agric.,* 24 : 101-107 ;

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

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

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 J. agric. Sci.* 51 : 690-692 ;

1981. Agarwala ann Raychaudhuri, D. N. *Indian Agric.,* 25 : 101-107 ;

1981. Ghosh, M. R. and Raychaudhuri, D. N. *Entomon,* 6 : 61-68 ;

1981. Nayak, Basu, M. and Raychaudhuri, D. N., *Pranikee,* 3 : ?

1981. Raychaudhuri, D. N., Ghosh, D., Raychaudhuri, D. and Agarwala, *Ins. matsum.* (n. s.), 23 : 1-20 ;

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

1917. *Aphis malvoides* Das, *Mem. Indian Mus.,* 6 : 135-375 ; 1948. Krishnamurti, *Indian J. Ent.,* 10 : 51-53.

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

1917(?). van der Goot, *Rec. Indian Mus.,* 14 : 175-183.

1918. *Aphis ficus* Theobald, *Bull. ent. Res.,* 8 : 273-294 : 1927. George, *J. Asiat. Soc. Beng.* (N. S.), 23 : 1-12.

1918. *Aphis tridacis* Theobald, *Bull. ent. Res.,* 8 : 273-294 ;

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

1956. David, *Indian J. Ent.,* 18 : 141-145.

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

1845. *Aphis frangulae* Kaltenbach, in Koch, 1855. *Die Pflanzen. Aphide* : 142 ;

1979. Rishi, *Abs. Symp. Second Oriental Entomology,* Madras : 20-31.

1854. *Aphis malvae* Koch, *Die Pflanzen Aphiden.,* Nunberg : 1-134 ;

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

1977. *Aphis gossypii frangulae* group ; Ghosh, L. K., A study on the aphids (Homoptera ; Aphididae) of Himachal Pradesh in N. W. Himalaya, Ph.D. Thesis, Unversity of Calcutta : 1-360.

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 dalhoussiana* ; 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. G.* & *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 *Polyalthia* 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 *Strobilanthes 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. ; 1 alate ♂, on *Zinnia* sp. Simla, (H. P.), 28.x.1968, coll. *A. N. Chowdhuri* ; 4 apterae ovip. ♀ ♀, on *Citrus decumana*, Rautara, W. B., 23.i.1967, coll. *L. K. G.*

Apterous viviparous female : Body pale, about 1.3-1.7 mm long with

0.7-1.1 mm as its maximum width near the middle of abdomen ; antennae (Fig. 96) 0.5-0.7 times as long as body ; a.s. IV+V shorter than a.s. VI, p.t. 2.0-3.5 times as long as base of a.s. VI. Rostrum reaching beyond midcoxae ; u.r.s. (Fig. 97) 1.0-1.3 times as long as ht_2. Abdominal dorsum (Fig. 100) pale to light brown with scattered brown sclerites, longest hair on anterior tergites about 0.6-0.8 times as long as b.d. III, 8th tergite with 2 hairs with 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, about 0.1-0.19 times as long as body and 1.2-1.8 times as long as cauda ; cauda (Fig. 99) spinose, dusky and usually slightly constricted near at the middle and bearing 5-6 hairs. F. T. C. 3, 3, 2., second tarsal segment with secondary hairs ventrally.

Measurements (in mm) of an aptera (6-segmented) : Length of body 1.53 ; width of body 0.78 ; antenna 1.07 ; a.s. III 0.26, IV 0.18, V 0.17, VI (0.11+0.26) : u.r.s. 0.12 ; ht_2 0.11 ; siphunculus 0.30 ; cauda 0.16.

Measurements (in mm) of an aptera (5-segmented) : Length of body 1.40 ; width of body 0.75 ; antenna 1.05 ; a.s. III 0.42, IV 0.18, V (0.10+0.30) ; u.r.s. 0.12 ; ht_2 0.10 ; siphunculus 0.28 ; cauda 0.15.

Alate viviparous female : Body pale brownish, 0.9 to 1.8 mm long with 0.5-0.9 mm as its maximum width. Head (Fig. 103) brownish. Antennae (Figs. 104-105) about 0.6-0.8 times as long body, p.t. (Fig. 105) subequal to a.s. III and 2.1-3.6 times as long as base of a.s. VI, a.s. III with 5-7 secondary rhinaria distributed over entire length (Figs. 104, 106) ; u.r.s. (Fig. 107) 1.0-1.2 times as long as ht_2, Abdominal dorsum pale smooth with some brown scattered segmental sclerites from tergites 6 to 8 inclusive (Fig. 101), and in larger specimens often with such sclerites on some abdominal tergites as well and with distinct post-siphuncular sclerite (Fig. 101) ; longest hair on anterior abdominal tergites about 0.6-1.0 times as long as b.d. III. Siphunculi (Fig. 108) brownish, about 0.1 to 0.14 times as long as body, 4.3-4.5 times as its width at apex and 1.5-1.9 times as long as cauda (Fig. 109) bearing 4-7 hairs. Wing venation normal (Fig. 110).

Measurements (in mm) of an alata : Length of body 1.50 , width of body 1.00 ; antenna 0.88 ; a.s. III 0.15, IV 0.15, V 0.14, VI (0.10+0.26) ; u.r.s. 0.08 ; ht_2 0.08 ; siphunculus 0.25 ; cauda 0.16.

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.

Alate male : Body elongated. Head and thorax dark brown, abdomen rather pale. Antennae dark brown, imbricated, a little longer than body ; a.s. III with about 30 circular secondary rhinaria distributed irregularly almost over the entire length cxcept the very base ; a.s. IV with 20 and V with 14 similar rhinaria, p.t. 3 times as long as base of VI ; u.r.s. bluntish, reaching mid coxae, 1.2 times as long as ht_2. Abdominal dorsum with two rows of marginal sclerite with irregular rows of spinules ; Siphunculi dark brown, imbricated ; cauda short, with 5 hairs. Claspers with a process at their base. Other characters as in alate viviparous female.

Measurements (in mm) of a male : Length of body 1.58 ; width of body 0.75 ; antenna 1.62 ; a.s. III 0.30, IV 0.28, V 0.25, VI (0.13+0. 39) ; u.r.s. 0.10 ; ht_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.

Basu, A. N. and Banerjee S. N. (1958) found that the species is of little importance in case of pear. Ghosh, M. R. and Raychaudhuri, D. N. (1981) have dealt with seasonal history and incidence of the species infesting rosaceous plants. According to them also, its occur rence on *Pyrus* was always of negligible proportion, apparently without causing 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 cruciferous 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.

12. **Aphis kurosawai** Takahashi

(Figs. 111-118, 254, 255).

(Type locality : Formosa)

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

1969. Basu, A. N. *Orient. Insects,* 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. *Orient. Insects*, 9 : 195-211 ;

1977. Ghosh, L. K. *Orient. Insects*, 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. Raychaudhurl, 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.

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 *Artemesia* sp., Kalimpong, 30.1.1970, coll. ?

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 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).

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 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 ; siphunculus 0.17 ; cauda 0.13 ; secondary rhinaria distributed ; III, 4-6.

Colour : Brown.

Remarks : The species is one of the typical inhabitants 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 aud Thailand.

13. **Aphis longisetosa** Basu, 1969

(Figs. 119-127, 256,257)

[*Type locality* : India]

1969. *Aphis ruborum longisetosus* Basu, A. N. *Orient. Insects*, 3 (4) : 356 ;

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

1969. Basu, A. N., *Orient. Insects* 3 : 355-371 ;

1971. Ghosh, M. R., Ghosh, A. K. and Raychaudhuri, D. N., *Proc. zool. Soc., 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. *Orient. Insects*, 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.*) *The Zoological Society, Calcutta*; 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* Börner, *Mitt. Blattl. Anr. Schad.*, 8 : 33 ;

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

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

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

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.*

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 0.93 ; 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.

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.

14. **Aphis nasturtii** Kaltenbach, 1843

(Figs. 128-135, 259-260)

[*Type locality* : Germany]

1843. *Aphis nasturtii* Kaltenbach, *Mongr. 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. ; *Orient. Insects*, 3 : 327-334 ;

1969. Chowdhuri, A. N., Basu, R. C , Chakrabarti, S. and Raychaudhuri, D. N., *Orient. Insects*, 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., *Orient. Insects*, 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., *Orient. Insects*, 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., Räychaudhuri, D. N., *Rec. zool. Surv. India, Occ. Paper*, 18 : 7-54 ;

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.*

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 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 pennis.

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.

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 74 species belonging to 64 genera under 37 plant families.

Distribntion : 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.

15. **Aphis nerii** Boyer de Fonscombe, 1841

(Figs. 136-141, 261)

[*Type locality* : France]

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

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, Behura and Basant Kumar, *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 ; Raychaudhnri, D. N., *USPL 480 Project Tech. Report* : 1-107 ;

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. *Orient. Insects*, **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. Sarv. India*, **3** : 103-105 ;

1981. Agarwala, Raychaudhuri, D. and Raychaudhuri, D. N., *Akitu*, new series, **39** : 1-16.

1841. *Myzus nerii* Boyer, *Ann. Soc. ent. Fr.*, **10** : 157-198 ;

1909. Lefroy and Howlett, *Indian Insect Life* : 743-748.

1851. *Aphis asclepiadis* Fitch, *Ann. Rep. N. Y. State Cab. Natur Hist.*, **4** : 65-69 ;

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

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 cuspidata*, 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 pale with dorsal 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 thih both dorsal and vantral 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. Anatennae 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 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. citricola* 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 *citricola*.

Although the species is not so polyphagous one like *gossypii*, *citricola* etc., there is no record of occurrence of any sexual form in the Indian plains and hills which suggests that it leads 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.

16. **Aphis paraverbasci** Chakrabarti,1976

(Figs. 142-157, 262)

[*Type locality* : India]

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

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

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.*

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 1.40 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 ht_2 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, longest hair 1.50-3.0 times as long as b.d. III ;

7th and 8th tergite each with 6-8 hairs being 2.0-2.60 times as long as b.d. III. Siphunculi (Fig. 148) brown, subcylindrical, 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+ 0.13) ; 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 concolourous 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 distributed throughout the entire length except the basal 0.25 portion, flagellar hairs long, flagellate, 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 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, subcylindrical, 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 : Lentgh 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 0.09.

Note : As to the shape of u.r.s., nature of dorsal hairs, siphunculi and cauda, *A. paraverbasci* Chakrabarti shows affinity 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. (1981) described and illustrated apterous oviparous female of the species collected from an unknown plant at Manali (H.P.). Subsequently, Ghosh, L. K. and Kurl (1988) described the alate viviparous female collected from *Buddelia* sp. and *Debregeasia* ap. 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 to holocyclic life cycle apart from parthenogenetic reproduction in the area.

17. **Aphis pollinosa** Walker, 1849

(Figs. 158—165)

[*Type locality* : England]

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.

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 long 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, longest 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 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, longest 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 mid-diameter 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 litttle 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.

Distribution : India : Himachal Pradesh ; Anglia ; Polska.

18. **Aphis polygonacea** Matsumura, 1917

(Figs. 166-173, 263)

[Type locality : Japan*]*

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 ;

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. Antenne 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.

19. **Aphis pomi** de Geer, 1773

(Figs. 174-181, 265-267)

[Type locality : Sweden*]*

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.

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

Apterous viviparous female : Body 1.80-1.97 mm long with nearly 1.08 mm as maximum width. Head (Fig. 174) 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, longest hair on a.s. III about twice as long as b.d. III. Rostrum reaches upto mid coxae, u.r.s. (Fig. 179) 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 improtant 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.

20. **Aphis punicae** Passerini, 1863
(Figs. 182-188)

[Type locality : Italy*]*

1863. *Aphis punicae* Passerini, *Arch. Zool. Anuat. 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. *Orent. Insects*, **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 & non insects pest 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.

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

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.

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.

21. **Aphis raji** (Kumar and Burkhardt 1970)
(Figs. 189-194, 268-269)

[*Type locality* : India]

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

1970. *Aphis leptorhyncha* David, Sekhon and Bindra, *Orient. Insects*, **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.

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

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, longest 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 hairs. Abdomen pale without sclerites, lateral abdominal tubercles absent on abdominal segment VII ; hairs on anterior abdominal dorsum $93\mu - 105\mu$ 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.

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 by the author, it reveals that u. r. s. is twice as long as ht_2 in *leptorhyncha* David *et al.* Besides, lateral abdominal tubercle 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.

22. **Aphis rhamniphila** David, Narayanan and Rajasingh, 1971

(Figs. 195-203, 270-271)

[*Type locality* : India]

1971. *Aphis rhamniphila* David, Narayanan and Rajasingh, *Orient. Insects*, **5** : 557-570 ;

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

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 (Fig. 195) 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, p.t. 2.0-2.6 times as long as base VI, longest antennal hair about 0.64 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 : India : Northwestern part.

23. **Aphis rhoicola** Hille Ris Lambers, 1954

(Fig. 272)

[*Type locality* : Eritrea]

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

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

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

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 long with flagellate apices, longest 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. III. 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, longest 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.

24. **Aphis rubifolii** Thomas, 1879

(Figs. 204-212, 273)

[*Type locality* : U. S. A.]

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.

Material examined : Many apterae, on *Rubus* sp., Solan (H.P.), 23.xii.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 7μ-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. Cauda (Fig. 212) 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 (0.06+ 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.

25. **Aphis rumicis** Linnaeus, 1758

(Figs. 213-225, 274-277)

[*Type locality* : Sweden]

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

1909. Lefroy and Hawlett, *Indian insect life*, : 1-786 ;

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

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

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 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 14-16 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 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. 0.130 ; 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.

26. **Aphis verbasci** Schrank, 1801

(Figs. 226-233, 278-280)

[*Type locality* : Germany]

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. Chowdhuri, Basu, R. C., Chakrabarti aud Raychaudhuri, D. N., *Orient. Insects*, 3 : 88-92 ;

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.

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.*

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 small 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, 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, times as long as its basal width and bears 10-14 hairs. Legs pale brown 1.2 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 pairs. 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.

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, 281)

[*Type locality* : Lahore (West Pakistan)]

1917. *Brachyunguis 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.

1985. *Aphis* (*Protaphis*) *carthami* (Das) : Agarwala and Ghosh, A. K., *Mem. zool. surv. India*, 16 (3) : 36.

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 secondary 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.

Species not examined

Aphis asclepiadis Fitch, 1851

1961. Behura, Proc. 1st summer school of Zoology (Simla) Govt. of India publ. : 24-78.

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

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

Aphis astragali Ossiannilsson, 1959.

1973. Wadhi, Misra and Verma, *Indian J. Ent.*, 35 : 273-274 ; 1975. Rishi ; *Abs. Symp. Recent trends in aphidological studies, Bhubaneswar* : 1-52.

Aphis hederae Kaltenbanch, 1843

1979. Rishi, *Abs. Symp. on recent trends in aphidological studies, Bhubaneswar* : 1-52.

Aphis umbrella (Börner, 1950)

= **A. malvae** Koch, 1854

1976. (1973) Behura, Dash and Pradhan, *Prakruti. J. Utkal Univ. J. Sci.*, 10 : 17-29 ;

1968. Behura and Mahapatra, *Prakruti J. Utkal Univ. J. Sci.* 5 : 63-81 ;

1970. David, Narayanan and Rajasingh, *Orient. Insects*, 4 : 413-425 :

1969. Ghosh, A. K., Basu, R. C. and Raychaudhuri, D. N., *Orient. Insects*, 3 : 245-254 ;

1964. Sidhu and Singh, *Indian Oil Seed J.*, 8 : 348-359.

Aphis verbenae Macchaiti, 1884

Aphis nr. **craccivora** Koch, 1854

1961. Chowdhuri, Basu, R. C., Chakrabarti and Raychaudhuri, D. N., *Sci. Cult.*, 34 : 133-134.

Aphis nr. gossypii Glover, 1877

1975. David and Hameed, *Orient. Insects*, 9 : 213-219.

Aphis gossypii / nasturtii Complex

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

Aphis grossulariae Kaltenbach, 1843

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

Aphis nr. **pollinosa** Walker, 1849

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

Aphis nr. **punicae** Passerini, 1863

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

Aphis ? rhoicola Hille Ris Lambers, 1956

1971. David, Narayanan and Rajasingh, *Madras agric. J.*, 58 : 372-374.

Aphis ? ruborum (Borner 1832)

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

Aphis nr. **rumicis** Linnaeus, 1758

1980. Bhalla and Pawar, *A Survey of insect and non insect pests of economic importance in Himachal Pradesh, Chambaghat*, Solan (H. P.) : 19 ;

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

Aphis nr. **umbrella** (Börner, 1850)

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

Aphis (Protaphis) nr. **carthami** (Das, 1918)

1965. Behura, *Proc. 1st Summer School of Zoology* (Simla, 1961), Govt. of India publ., : 25-78.

APHID HOST PLANT CATALOGUE

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.) Huds	Labiatae
	Mentha viridis L.	Labiatae
Aphis (*Aphis*) *asclepiadis* Fitch	*Asclepias* sp.	Asclepiadaeeae
	Calotropis gigantea Br.	Asclepiadaceae
	Calotropis procera Br.	Asclepiadaceae
	Calotropis grandiflora Br.	Asclepiadaceae
	Cynanchum 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.	Aselepiadaceae
	Leptadenia reticulata Wt. & Arn.	Asclepiadaceae
	Nerium indicum Miil	Apocynaceae
Aphis (*Aphis*) *astragali* Ossiannilson	*Astragalus* sp.	Fabaceae
Aphis (*Aphis*) *citricola* v.d.G.		
= *A. bidentis* Theobald	*Achyranthes* sp.	Amaranthaceae
= *A. malvoides* Das	*Adhatoda vasica* Nees.	Acanthaceae
= *A. pomi* de Geer	*Ageratum conyides* L.	Compositae
= *A. spiraecola* Patch	*Alnus nepalensis* D. Drn.	Betulaceae
= *Acyrthosiphon citricola* van der Goot	*Alstonia scholaria* Br.	Apocynaceae
	Amaranthus vicidis L.	Amaranthaceae
	Ambrosia artemisiaefolia Bess.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Anacardium occidentale L.	Anacardiaceae
	Anaphalis contorta HKf.	Compositae
	Anemone rivularis Buch Ham.	Ranunculaceae
	Ardisia sp.	Myrsinaceae
	Artemisia caruifolia Buch-Ham.	Compositae
	Artemisia nilagirica (Cl) Pamp.	Compositae
	Artemisia sp.	Compositae
	Azudiracta indica	?
	Bauhinia acuminata L.	Fabaceae
	Bauhinia sp.	Fabaceae
	Berberis spp.	Berberidaceae
	Bindens bipinnata (L.) Ber	Compositae
	Bidens pilosa L.	Compositae
	Bidens wallichi DC	Compositae
	Borreria diffusa L.	Nyctaginaceae
	Borreria hispida	Nyctaginaceae
	Bombax malabaricuim DC	Bombacaceae
	Bougainvillea spectabilis	Nyctaginaceae
	Brassica napus L.	Cruciferae
	Brassica oleracea L.	Cruciferae
	Bridelia sp.	Euphorbiaceae
	Bryophyllum sp.	Crassulaceae
	Caianus caian	Fabaceae
	Canna sp.	Cannaceae
	Capsicum annum L.	Solanaceae
	Capsicum frutescens L.	Solanaceae
	Cedrus deodara Loud	Pinaceae
	Cestrum fasiculatum Miev.	Solanaceae
	Cestrum sp.	Solanaceae
	Chenopodium album L.	Chenopodiaceae
	Chenopodium sp.	Chenopodiaceae
	Chrysanthemum coronarium L.	Compositae
	Chrysanthemum spp.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Cinchona sp.	Rubiaceae
	Citrus aurantifolia (Christm) Swingle	Rutaceae
	Citrus reticulata Blanco	Rutaceae
	Citrus spp.	Rutaceae
	Clerodendrum infortunatum Gaertn.	Verbenaceae
	Clerodendrum spp.	Verbenaceae
	Cnicus sp.	Compositae
	Colocasia antiquorum Schott.	Araceae
	Commelina bengalensis L.	Commelinaceae
	Commelina sp.	Commelinaceae
	Conyza anqustifolia Roxb.	Compositae
	Conyza japonica Less	Compositae
	Coriandrum sativum L.	Umbelliferae
	Cosmos bipinnatus Cav.	Compositae
	Cosmos spp.	Compositae
	Cotonis sp.	Compositae
	Cotula hemispherica Wall	Compositae
	Crotalaria brownei Rehb	Fabaceae
	Croton sp.	Euphorbiaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita maxima Duchesne	Cucurbitaceae
	Cynodon dactylon Pers.	Gramineae
	Cyphomandra betacea Miers	Solanaceae
	Dahlia sp.	Compositae
	Datura sp.	Solanaceae
	Dianthus sp.	Caryophyllaceae
	Dichrocephala latifolia L.	Compositae
	Dracocephalum latifolium	Labiatae
	Duabanga sonneratioides Buch-Ham	Sonneratieceae

Name of Aphid	*Host Plant*	*Plant Family*
	Duranta repens Jacq.	Verbenaceae
	Eleusine coracana Gaertn.	Gramineae
	Emilia sonchifolia DC	Compositae
	Erechtites valerianefolia DC	Compositae
	Erechtites spp.	Compositae
	Erigeron sp.	Compositae
	Eupatorium adenophorum Spreng	Compositae
	Eupatorium cannabinum L.	Compositae
	Eupatorium odoratum L.	Compositae
	Eupatorium ripavium Regel	Compositae
	Eupatorium wallichii DC.	Compositae
	Eupatorium spp.	Compositae
	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.	Compositae
	Glycosmis arborea DC	Rutaceae
	Gnaphalium luteoalbum L.	Compositae
	Gynura angulosa DC	Compositae
	Gynura crepidioides Benth	Compositae
	Gynura nepalensis DC	Compositae
	Gynura sp.	Compositae
	Hamiltonia suaveolens Roxb	Rubiaceae
	Hedera nepalensis L.	Araliaceae
	Helianthus annus L.	Compositae
	Helianthus spp.	Compositae
	Helichrysum sp.	Compositae
	Heliotropium indicum L.	Boraginaceae

Name of Aphid	*Host Plant*	*Plant Family*
	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.	Compositae
	Ichnocarpus frutescens Br.	Apocynaceae
	Ilex sp.	Dicinaceae
	Impatiens balsamina L.	Geraniaceae
	Impatiens falcifer Hook-f.	Geraniaceae
	Impatiens sp.	Geraniaceae
	Inulu cuspidata Clarke	Compositae
	Ipomoea hederacea Jacq.	Convolvulaceae
	Jacaranda mimosaefolia D. Don	Bignoniaceae
	Jasminum sp.	Oleaceae
	Jatropha curcas L.	Euphorbiaceae
	Lactuca sativa L,	Compositae
	Lageneria lcucantha	Cucurbitaceae
	Lageneria vulgaris Ser.	Cucurbitaceae
	Lagerstroemia indica L.	Lythraceae
	Lantana camara L.	Verbenaceae
	Leucas aspera Spreng.	Labiateae
	Leucas linifolia Spreng.	Labiateae
	Leucas sp.	Labiateae
	Lindera sp.	Lauraceae
	Litsea polyantha Juss.	Lauraceae
	Litsea sp.	Lauraceae
	Lonicera macrantha DC	Caprifoliaceae
	Luculia spp.	Rubiaceae
	Ludwigia suffruticosa Walt	Onagraceae
	Luffa sp.	Cucurbitaceae

Name of Aphid	*Host Plant*	*Plant Family*
	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
	Azudiracta indica	
	Melia azardirachta L.	Meliacese
	Mikania cordifolia Willd.	Compositae
	Mikania scandens Willd.	Compositae
	Mirabilis jalapa L.	Nyctaginaceae
	Momordica charantia L.	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Compositae
	Morus alba L.	Urticaceae
	Morus sp.	Urticaceae
	Musa sapientum L.	Musaceae
	Mussaenda sp.	Rubiaceae
	Myriactis wallichii Less	Compositae
	Nasturtium indicum DC	Cruciferae
	Nerium sp.	Apocynaceae
	Nicotiana tabacum L.	Solanaceae
	Ocimum sp.	Labiatae
	Oenanthe stolonifera 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
	Pinus sp.	Pinaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Pisum sativum L.	Fabaceae
	Polyalthia longifolia Benth & HKf	Anonaceae
	Polygonum alatum Buch-Ham	Polygonaceae
	Polygonum berbatum L.	Polygonaceae
	Polygonum chincnse 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
	Prnnus persica Benth & HKf	Rosaceae
	Prnnus 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.	Cruciferae
	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
	Rudbeckia tagetes James	Asteraceae
	Rumex acetosella L.	Polygonaceae
	Rumex nepalensis Spreng	Polygonaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Salvia coccinea L.	Labiateae
	Sambucus javanica Bl.	Sambucaceae
	Schima wallichii Chois	Ternstroemiaceae
	Schima edule Forsk.	Ternstroemiaceae
	Senecio sp.	Compositae
	Sida acuta Burm.	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.	Compositae
	Sonchus arvensis L.	Compositae
	Spilanthes acmella L.	Compositae
	Spinacia oleracea L.	Chenopodiaceae
	Spiraea bella Slms	Rosaceae
	Spiraea cantoninsis Lour	Rosaceae
	Spiraea chanoidri	Rosaceae
	Spiraea collosa Wall.	Rosaceae
	Spiraca corymbosa Roxb.	Rosaceae
	Spiraca spp.	Rosaceae
	Symplocos cyatcrataegoides Buch-Hax.	Symplocaceae
	Symplocos sp.	Symplocaceae
	Synedrilla nudiflora Gaertn.	Compositae
	Tagetes patula L.	Compositae
	Tagetes sp.	Compositae
	Terminalia arjuna W & A.	Combretaceae
	Thunbergia coccinca Wall	Acanthaceae
	Tibouchina semidecandra Cogn.	Melastomaceae
	Tridax procumbens L.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Urtica sp.	Urticaceae
	Valeriana wallichii DC	Valerianaceae
	Vernonia sp.	Compostae
	Viburnum foetidum Wall.	Caprifoliaceae
	Vicia faba L.	Papilionaceae
	Vigna catjang Endl.	Papilionaceae
	Caphdsnyhud tovrus	
	Vinca rosea L.	Apocynaceae
	Vitex sp.	Verbenaceae
	Wendlandia glabrata DC	Rubiaceae
	Weldenlandia sp.	Rubiaceae
	Woodfordia fructicosa Kurz	Lythraceae
	Xanthium sp.	Compositae
	Zanthoxylum armatum Roxb.	Rutaceae
	Zanthoxylum sp.	Rutaceae
	Zinnia elegans Jacq.	Compositae
	Zinnia sp.	Compositae
	Indet	Asclepiadaceae
	Indet	Compositae
	Indet	Fern
	Indet	Gramineae
	Indet	Rosaceae
	Indet	Urticaceae
Aphis (Aphis) clematidis simlaensis	*Clematis* sp.	Ranunculaceae
Kumar and Burkhardt	*Veronica agrestris* L.	Scrophulariaceae
Aphis (Aphis) craccivora	*Acalypha* sp.	Euphorbiaceae
	Achyranthes aspera L.	Amaranthaceae
	Aeschynomene sp.	Fabaceae
	Ageratum conyzoides L.	Compositae
	Alhagi pseudoalhagi (Bieb.) Desv.	Fabaceae
	Alysicarpus glumaceus (Vehl.) DC	Fabaceae
	Alstonia scholaris Br.	Apocynaceae
	Amaranthus gangeticus L.	Amaranthaceae
	Amaranthus gangeticus L.	

Name of Aphid	*Host Plant*	*Plant Family*
	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*)	Compositae
	Boerhaavia diffusa L.	Nyctaginaceae
	Bougainvillea spectabilis Willd.	Nyctaginaceae
	Bougainvillea spp.	Nyctaginaceae
	Cajanus cajan	Fabaceae
	Cajanus sp.	Fabaceae
	Calotropis gigantea R. Br.	Asclepiadaceae
	Camellia theifera Griff.	Theaceae
	Canavalia ensiformis DC.	Fabaceae
	Carica papaya L.	Caricaceae
	Carrissa sp.	Apocynaceae
	Carthamus tinctorius L.	Compositae
	Cassia auriculata L.	Caesalpiniaceae
	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.	Compositae
	Chrysanthemum sp.	Compositae
	Cicer arietinum L.	Fabaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Cicer sp.	Papilionaceae
	Citrus limonum Wall.	Rutaceae
	Citrus madurensis Lown	Rutaceae
	Citrus paradisi Macfad	Rutaceae
	Citrus reticulata Blanco	Rutaceae
	Citrus sinensis Pers	Rutaceae
	Cleome chelidonii L.	Capparidaceae
	Cleome pentaphylla L.	Capparidaceae
	Cnicus wallichii Clarke	Compositae
	Coccinea cordifolia (L.) Cogn.	Cucurbitaceae
	Coffea arabica L.	Rubiaceae
	Colocasia antiquorum Schott.	Araceae
	Colocasia sp.	Araceae
	Coriander sativum L.	Umbelliferae
	Coriandrum sativum L.	Umbelliferae
	Cosmos sp.	Compositae
	Crotalaria juncea L.	Fabaceae
	Crotalaria sp.	Fabaceae
	Cucumis sativus L.	Cucurbitaceae
	Cyamopsis tetragonoloba	Fabaceae
	Dalbergia sissoo Raxb.	Fabaceae
	Dalbergia sp.	Fabaceae
	Desmodium sp.	Fabaceae
	Dolichos lablab L.	Fabaceae
	Dolichos sp.	Fabaceae
	Erigeron asteroides Wall	Compositae
	Eupatorium odoratum L.	Compositae
	Eupatorium sp.	Compositae
	Euphorbia sp.	Euphorbiaceae
	Ficus heterophylla L.	Moraceae
	Geranium spp.	Geraniaceae
	Gliricidia maculata H.B.&K.	Fabaceae
	Glycine max	Fabaceae
	Guizotia abyssynica Cass	Compositae
	Helianthus annus L.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	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
	Iudigofera spp.	Fabaceae
	Ipomoea sp.	Convolvulaceae
	Kochia sp.	Chenopodiaceae
	Lagenerla vulgaris Ser.	Cucurbitaceae
	Lagerstroemia flos-reginae Rez.	Lythraceae
	Lantana sp.	Verbenaceae
	Lathyrus aphaca L.	Fabaceae
	Lathyrus sativus L.	Fabaceae
	Lens esculenta Moench	Fabaceae
	Litchi chinensis Sonner	Sapindaceae
	Luffa acgyptiaca Mill.	Cucurbitaceae
	Lycopersicum esculentum Mill.	Solanaceae
	Lycopersicum sp.	Solanaceae
	Lyonia ovalifolia (Wall.) Drude	Ericaceae
	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.	Mimosaceae
	Mimosa sp.	Mimosaceae
	Mirabilis jalapa L.	Nyctaginaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Nicotiana tabacum L.	Solanaceae
	Oenanthe stolonifera Wall	Umbelliferae
	Petunia alba	Solanaceae
	Petunia violacea Lindl.	Solanaceae
	Phaseolus aureus Buch-Ham.	Fabacere
	Phaseolus mungo L.	Fabaceae
	Phaseolus radiatus L.	Fabaceae
	Phaseolus roxburghii W. & A.	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
	Psophocarpus tetragonolobus DC	Papilionaceae
	Raphanus sativus L.	Brassicaceae
	Rumex nepalensis Spring	Polygonaceae
	Sesamum indicum DC	Pedaliaceae
	Sesbania bispinosa Stend	Fabaceae
	Sesbania cannabina Pers.	Fabaceae
	Sesbania grandiflora Pers.	Fabaceae
	Sesbania speciosa	Fabaceae
	Smithia semsitiva Ait	Fabaceae
	Solannm clavatum	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum spp.	Solanaceae
	Tagets sp.	Compositae
	Tephrosia candida DC.	Fabaceae
	Tinospora cordifolia Miers	Menispermiaceae
	Tribulus terrestris L.	Zygophydaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Trifolium alexandrinum L.	Fabaceae
	Trifolium prutetianum Ser.	Fabaceae
	Trifolium repens L.	Fabaceae
	Trigonella foenum-graecum L.	Fabaceae
	Trollius phamaceliodies	Ranunculaceae
	Vernonia cinerea Less.	Compositae
	Vicia faba L.	Fabaceae
	Vigna catjang Endl.	Frbaceae
	Vigna mungo Linn.	Fabaceae
	Vigna sesouipedalis Marechal *et al.*	Fabaceae
	Zea mays L.	Gramineae
	indet plant of compositae, indet plants of Cucurbitaceae	
Aphis (*Aphis*) *nr. craccivora* Koch	*Strobilanthes atropurpureus* Nees.	Acanthaceae
Aphis (*Aphis*) *citricola* van der Goot = *A. bidentis* Theobald = *A. malvoides* Das = *A. pomi* de Geer = *A. spiraecola* Patch = *Acyrthosiphon citricola* van der Goot		
Aphis (*Aphis*) *eugeniae* van der Goot	*Dipsacus inermis* Wall.	Acanthaceae
Aphis (*Aphis*) *euphorbiae* Kaltenbach	*Euphorbia* sp.	Euphorbiaceae
Aphis (*Aphis*) *fabae* Complex = *Aphis evonymi* Fabricius = *Aphis fabae solanella* Theobald		
	Adenostemma viscosum Forst	Compositae
	Alternanthera philoxeroides Griseb.	Amaranthaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Anaphalis sp.	Compositae
	Asclepias curassavica L.	Asclepiadaceae
	Bambusa sp.	Gramineae
	Benincasa hispida Cogn.	Cucurbitaceae
	Beta vulgaris L.	Chenopodiaceae
	Bidens pilosa L.	Compositae
	Caloasia sp.	Araceae
	Capsicum annum L.	Solanaceae
	Centaurea sp.	Compositae
	Cestrum fasiculatum Miets.	Solanaceae
	Cestrum nocturnum L.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium ravely	Chenopodiaceae
	Citrus sp.	Rutaceae
	Clematis sp.	Ranunculaceae
	Cnicus arvensis Hoffm.	Compositae
	Cnicus wallichii HKF.	Compositae
	Crotalaria striata DC.	Papilionaceae
	Cyanotis axillaris R. & S.	Commelinaceae
	Datura fastuosa L.	Solanaceae
	Debregeasia sp.	Urticaceae
	Dicorocephala latifolia	?
	Deutzia crenata Sieb & Zucc.	Philadelphae
	Dolichos lablab L.	Fabaceae
	Duabanga sonneratioides Buch-Ham.	Lythraceae
	Eclipta prostrata (L)	Compositae
	Erigeron sp.	Myrtaceae
	Euonymus sp.	Celastraceae
	Eupatorium adenophorum HBK	Compositae
	Eupatorium odoratum L.	Compositae
	Eupatorium wallichii DC.	Compositae
	Galinsoga parviflora Cav.	Compositae
	Helianthus annus L.	Compositae
	Hibiscus rosa-sinensis L.	Malvaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Lantana camara L.	Verbenaceae
	Lindenbergia indica (L.) Vatke	Scrophulariaceae
	Michelia champaca L.	Magnoliaceae
	Mirabilis jalapa L.	Nyctaginaceae
	Momordica charantia L.	Cucurbitaceae
	Nerium indicum Mill.	Apocynaceae
	Nicotiana tabacum L.	Solanaceae
	Nicotiana sp.	Solanaceae
	Philadelphus coronarius L.	Philadelphaceae
	Punica granatum L.	Punicaceae
	Pyrus communis L.	Rosaceae
	Quercus sp.	Fagaceae
	Rhamnus nepalensis Laws.	Rhamnaceae
	Rhammus sp.	Rhamnaceae
	Rubia cordifolia L.	Rubiaceae
	Rubus ellipticus Sm.	Rosaceae
	Rumex acetosella L.	Polygonaceae
	Rumex dentatus L.	Polygonaceae
	Rumex hastatus D. Don	Polygonacae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex spp.	Polygonaceae
	Sambucus javanica Bl.	Sambucaceae
	Saurauja nepalensis	Actinidiaceae
	Schima wallichii Chos	Ternstroemiaceae
	Sida cordifolia L.	Malvaceae
	Solanum clavatum	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum torvum SW.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum spp.	Solanaceae
	Sonchus sp.	Compositae
	Spiraea bella Sims.	Rosaceae
	Strobilanthes atropurpureus Nees	Acanthaceae
	Tagetes patula L.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Vernonia cineria Less.	Compositae
	Viburnum opulus L.	Caprifoliceae
	Vicia faba L.	Papilionaceae
	Vigna catjang Endl.	Papilionaceae
	Vinca rosea L.	Apocynaceae
	Zinnia elegans Jacq.	Compositae
	indet	Gramineae
	indet	Solanaceae
	plants of indet families	
Aphis (Aphis) farinosa Gmelin	*Salix* sp.	Salicaceae
Aphis (Aphis) glycines Matsumura	*Glycine max* (L.) Mers.	Fabaceae
	Glaxina maxima	
Aphis (Aphis) gossypii Glover	*Abelmoschus esculentus* W. & A.	Malvaceae
	Abroma angusta L.	Sterculiaceae
=*A. Ficus* Theobald	*Abutilon indicum* G. Don	Malvaceae
=*A. frangulae* Kaltenbach	*Acalypha* sp.	Euphorbiaceae
=*A. gossypii frangulae* group	*Acanthospermum hispidum* DC	Compositae
=*A. malvacearum* Das	*Achras sapota* L.	Sapotaceae
=*A. malvae* Koch	*Achyranthes aspora* L.	Amaranthaceae
=*A. malvoides* Das	*Achyranthes* sp.	Amaranthaceae
=*A. tridacis* Theobald	*Acorus calamus* L.	Arceae
	Ageratum conyzoides L.	Compositae
	Ageratum sp.	Compositae
	Ajuga cractionia	Labiatae
	Ajuga sp.	Labiatae
	Allium cepa L.	Alliaceae
	Alocasia indica Schott.	Araceae
	Alstonia sp.	Apocynaceae
	Alternanthera nodiflora Br.	Amaranthaceae
	Althaea rosea L.	Malvaceae
	Amaranthus gangeticum	Amaranthaceae
	Amaranthus spinosus L.	Amaranthaceae
	Amaranthus viridis L.	Amaranthaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Anaphalis contorta H.K.f.	Compositae
	Anaphalis triplinervis Clarke	Compositae
	Anaphalis spp.	Compositae
	Annona sp.	Annonaceae
	Antigonon leptopus Hook & Ann.	Polygonaceae
	Argemone mexicana L.	Papaveraceae
	A. nilagirica (Cl) Pamp	Papaveraceae
	Artemisia vulgaris L.	Compositae
	Asclepias curassavica L.	Asclepiadaceae
	Aster trinervises Roxb.	Compositae
	Aster spp.	Composiae
	Bambusa arundinacea Willd.	Gramineae
	Benincasa cerifera	Cucurbitaceae
	Benincasa hispida Cogn.	Cucurbitaceae
	Beta vulgaris L.	Chenopodiaceae
	Bidens bipinnata L.	Compositae
	Bidens pilosa L.	Compositae
	Blumea lacera DC.	Compositae
	Blumea laciniata DC.	Compositae
	Blumea witiara DC.	Compositae
	Blumea sp.	Compositae
	Boerhaavia hispida	Nyctaginaceae
	Bougainvillea spectabilis Willd.	Nyctaginaceae
	Bougainvillea spp.	Nyctaginaceae
	Brassica juncea HKf.& T.	Cruciferae
	Brassica oleracea L.	Cruciferae
	Brassica sp.	Cruciferae
	Bridelia sp.	Euphorbiaceae
	Bryonia sp.	Cucurbitaceae
	Buddleja asiatica Lour	Buddlejaceae
	Buddleja macrostachya Benth.	Buddlejaceae
	Butea menesperma Taub.	Fabaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Cajanus cajan (L.) Millap	Fabaceae
	Calaminthe umbrosa	Labiatae
	Calceolaria esculenta (?)	Scrophulariaceae
	Calceolaria mexicana Benth.	Scrophulariaceae
	Calendula spp.	Compositae
	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 stylosa DC.	Capparidaceae
	Capsella bursa-pastoris Moench.	Cruciferae
	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
	Caiharanthus roseus G. Drn.	Cynaceae
	Celosia argentea L.	Amaranthaceae
	Cestrum diurnum L.	Solanaceae
	Cestrum nocturnum Lam.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium album L.	Chenopodiaceae
	Chrysanthemnm coronarium L.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Chrysanthemum hortorum sp.	Compositae
	Chrysanthemum sinense Sabine	Compositae
	Chrysanthemum spp.	Compositae
	Citrullus vulgaris Schrad	Cucurbitaceae
	Citrus aurantium L.	Rutaceae
	Citrus decumina	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
	Cleome chelidenii L.	Capparidaceae
	Cleome pentaphylla L.	Capparidaceae
	Clerodendrum incana	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 spp.	Araceae
	Commelina benghalensis L.	Commelinaceae
	Commelina spp.	Commelinaceae
	Commiphora berryi Engl.	Burseraceae
	Conyza japonica Less.	Compositae
	Conyza spp.	Compositae
	Corchorus capsularis L.	Tiliaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Corchorus olitorius L.	Tiliaceae
	Corchorus sp.	Tiliaceae
	Cordia dichotessa Forst.	Boraginaceae
	Coriandrum sativum L.	Umbelliferae
	Cosmos sp.	Compositae
	Crepis sp.	Compositae
	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 melo var	Cucurbitaceae
	Cucumis sativus L.	Cucurbitaceae
	Cucurbita maxima Duchesne	Cucurbitaceae
	Cucurbita moschata Duchesne	Cucurbitaceae
	Cucurbita pepo DC	Cucurbitaceae
	Cucurbita ?	Cucurbitaceae
	Cucurbita spp.	Cucurbitaceae
	Cuphea sp.	Lythraceae
	Cupressus sp.	Cupressceae
	Curcuma longa L.	Scitaminaceae
	Cuscuta reflexa Roxb.	Convolvulaceae
	Cyamopsis tetragonoloba	Fabaceae
	Cyanotis axillaris R. & S.	Commelinaceae
	Dynoglossum lanceolatum Heyne	Boraginaceae
	Cyperus rotundus L.	Cyperaceae
	Cyphomandra betaceae Sendt.	Solanaceae
	Cypripedium sp.	Orchidaceae
	Dahlia variabilis Desf.	Compositae
	Dahlia sp.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Datura fastuosa L.	Solanaceae
	Datura stramonium L.	Solanaceae
	Datura spp.	Solanaceae
	Digitalis sp.	Scrophulariaceae
	Dolichos lablab L.	Fabaceae
	Drymaria cordata Willd.	Caryophyllaceae
	Duabanga grandiflora (Rovb.) Walp.	Sonneratiaceae
	Duranta repens L.	Verbenaceae
	Dysophylla sp.	Labiatae
	Eclipta prosprata (L.)	Compositae
	Elsholtzia polystachya Bentd.	Labiatae
	Eleusine coracana Geertn.	Graminaceae
	Emilia sonchifolia DC	Compositae
	Emila sp.	Compositae
	Epilobium sp.	Onagraceae
	Erechtites valerianaefolia DC	Compositae
	Erechtites spp.	Compositae
	Erigeron sp.	Compositae
	Eucalyptus sp.	Myrtaceae
	Eugenia michelii Lam.	Myrtaceae
	Eupatorium heteroclium Griseb.	Compositae
	Eupatorium odoratum L.	Compositae
	Eupatorium cannabinum L.	Compositae
	Eupatorium sp.	Compositae
	Euphorbia hirta L.	Euphorbiaceae
	Euphorbia pilulifera L.	Euphorbiaceae
	Euphorbia spp.	Euphorbiaceae
	Eurya japonica Thunb.	Ternstroemiaceae
	Fagopyrum cymosum Meissm.	Polygonaceae
	Fagopyrum sp.	Polygonaceae
	Ficus bengalensis L.	Moraceae

Name of Aphid	*Host Plant*	*Plant Family*
	Ficus heterophylla L.	Moraceae
	Ficus tsiela Roxb.	Moraceae
	Ficus spp.	Moraceae
	Flaveria australasica Hook	Compositae
	Forsythia sp.	Oleaceae
	Fragaria sp.	Rosaceae
	Galinsoga parviflora Cav.	Compositae
	Gardenia florida L.	Rubiaceae
	Geranium ocelatum Camb.	Geraniaceae
	Gerbera macrophylla Benth.	Compositae
	Gladiolus sp.	Iridaceae
	Glycine max Merx	Fabaceae
	Gnaphalium luteoalbum L.	Compositae
	Goldfussia dalhousiana Nees	Acanthaceae
	Gossypium arboreum L.	Malvaceae
	Gossypium barbadense L.	Malvaceae
	Gossypium herbaceum L.	Malvaceae
	Gossypium hirsutum L.	Malvaceae
	Gossypium indicum Lank	Malvaceae
	Gossypium spp.	Malvaceae
	Grewia asiatica L.	Tiliaceae
	Gynura angutosa DC	Compositae
	Gynura nepalensis DC	Compositae
	Gynura sp.	Compositae
	Hamiltonia suaveolens	Rubiaceae
	Hedyotis scandens Roxb.	Rubiaceae
	Hedyotis sp.	Rubiaceae
	Helianthus annuus L.	Compositae
	Helicteres isora L.	Sterculiaceae
	Hibiscus cannabinus L.	Malvaceae
	Hibiscus esculentus L.	Malvaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Hibiscus sabdariffa L.	Malvaceae
	Hibiscus spp.	Malvaceae
	Holarrhena antidysentrica Wall.	Apocynaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Holmskioldia sanguinea Retz.	Verbenaceae
	Holoptelea integrifolia Planch	Ulmaceae
	Hydrangea spp.	Saxifragaceae
	Hypericum oblongifolium Choiss	Hypericaceae
	Hypericum patulum Thumb	Hypericaceae
	Hypochaeris radicata L.	Compositae
	Ichinocarpus frutescens Br.	Apocynaceae
	Impatiens balsamina L.	Balsaminaceae
	Impatiens spp.	Balsaminaceae
	Indigofera sp.	Fabaceae
	Inula cappa DC	Compositae
	Ipomoea batatas Lamk.	Convoluvlaceae
	Ipomoea carnea Jacq.	Convolvulaceae
	Ipomoea fistulosa Martex Choisy	Convolvulaceae
	Ipomoea hederaces Jacq.	Convolvulaceae
	Ipomoea spp.	Convolvulaceae
	Ixora chinensis Lam.	Rubiaceae
	Ixora coccinea L.	Rubiaceae
	Jacaranda mimosifolia D. Drn.	Bignoniaceae
	Lagenaria siceraria Standl	Cucurbitaceae
	Lagenaria vulgaris Ser.	Cucurbitaceae
	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
	Leucaena glauca Benth	Fabaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Leucas aspera Spreng	Labiatae
	Leucas cephalotes Spreng	Labiatae
	Leucosceptrum canum Sr.	Labiatae
	Lippia sp.	Verbenaceae
	Lonicera sp.	Caprifoliaceae
	Ludwigia peruviflora Roxb.	Onagraceae
	Luffa aegyptiaca Mill	Cucurbitaceae
	Lycopersicum esculentum Mill	Solanaceae
	Lyonia ovalifolia (Wall.) Drude	Ericaceae
	Maesa chisia D. Don	Myrsinaceae
	Maesa indica Wall.	Myrsinaceae
	Malachra capitata L.	Malvaceae
	Malva parviflora L.	Malvaceae
	Malva sylvestris L,	Malvaceae
	Malvastrum tricuspidatum A. Gray	Malvaceae
	Malvaviscus conzonthie	Malvaceae
	Mangifera indica L.	Anacardiaceae
	Medicago sativa L.	Leguminosae
	Melilotus indica All.	Leguminosae
	Mentha arvensis L.	Labiatae
	Mentha longifolia (L.) Huds	Labiatae
	Mentha viridis L.	Labiatae
	Mentha sp.	Labiatae
	Michelia champaca L.	Magnoliaceae
	Mikania scandens Wild	Compositae
	Mikania sp.	Compositae
	Mimosa pudica L.	Mimosceae
	Momordica charantia L.	Cucurbitaceae
	Momordico cochinensis Spreng	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Morus alba L.	Moraceae
	Morus sp.	Moraceae
	Mussaenda frondosa L.	Rubiaceae
	Myriactis nepalensis Less.	Compositae
	Nerium odorum Soland	Apocynaceae
	Nicotiana tabacum L.	Solanaceae
	Nicotiana spp.	Solanaceae
	Ocimum basilicum L.	Labiatae
	Ocimum canum Sims	Labiatae
	Ocimum sanctum L.	Labiatae
	Ocimum sp.	Labiatae
	Oenothera biennis L.	Onagraceae
	Origanum vulgare L.	Labiatae
	Osbeckia capitata Benth	Melastomaceae
	Osbeckia crinata Benth	Melastomaceae
	Oxalis sp.	Oxalidaceae
	Paederia foetida L.	Rubiaceae
	Paederia sp.	Rubiaceae
	Pedilanthus tithymoloides Poit	Euphorbiaceae
	Pelargonium zonale L. Herit	Geraniaceae
	Peltophorum pterocarpum Baker ex Heyne	Caesalpineae
	Pennisetum purpureum	Gramineae
	Perilla sp.	Labiatae
	Petunia spp.	Solanaceae
	Physalis peruviana L.	Solanaceae
	Pilea microphylla (L) Liebm.	Urticaceae
	Piper betle L.	Piperaceae
	Pimpinella monoica Dalz.	Umbelliferae
	Plantago major L.	Plantaginaceae
	Plectrhnthus coetsa Buch Ham.	Labiatae
	Plectranthus striatus Benth.	Labiatae

Name of Aphid	*Host Plant*	*Plant Family*
	Polyalthia longifolia Benth & H. K. f.	Anonaceae
	Polyalthia sp.	Anonaceae
	Polygonum nepalenne Missn.	Polygonaceae
	Polygonum barbatum L.	Polygonaceae
	Polygonum capitatum Buch-Ham.	Polygonaceae
	Polygonum flaccidum Meissn.	Polygonaceae
	Polygonum orientale L.	Polygonaceae
	Polygonum runcinatum Buch-Ham,	Polygonaceae
	Polygonum serrulatum Lagasc.	Polygonaceae
	Polygonum vulgare Gueldenst	Polygonaceae
	Polygonum spp.	Polygonaceae
	Portulaca sp.	Portulacaceae
	Pouzolzia hirta Hassk.	Urticaceae
	Pouzolzia sp.	Urticaceae
	Prinsepia utilis Royle	Rosaceae
	Prosopis juliflora DC.	Mimosacae
	Prunus amygdalus Baill	Rosaceae
	Prunus cerasus L.	Rosaceae
	Prunus domestica L.	Rosaceae
	Prunus persica Benth & HKf.	
	Prunus puddum Roxb.	Rosaceae
	Prunus spp.	Rosaceae
	Punica granatum L.	Punicaceae
	Pyrus communis L.	Rosaceae
	Pyrus malus L.	Rosaceae
	Pyrus spp.	Rosaceae
	Raphanus sativus L.	Cruciferae
	Rhamnus nepalensis Laws	Rhamnaceae
	Rhamnus sp.	Rhamnaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Rhododendron arboreum Sm.	Ericaceae
	Rhododendron 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
	Rubus moluccanas L.	Rosaceae
	Rubus sp.	Rosaceae
	Rudbeckia tagetes	Asteraeeae
	Ruellia prostrata Lamk	Acanthaceae
	Rumex nepalensis Spreng	Polygonaceae
	Rumex spp.	Polygonaceae
	Saccharum officinarum L.	Gramineae
	Salvia aspera Mart. & Gal.	Labiatae
	Salvia spp.	Labiatae
	Schima wallichii Chois	Ternstroemiaceae
	Scutellaria repens Buch-Ham.	Labiatae
	Scutellaria scandens D. Don	Labiatae
	Sechium edule SW.	Cucurbitaceae
	Sechium sp.	Cucurbitaceae
	Senecio densiflorus DC	Compositae
	Senecio spp.	Compositae
	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

Name of Aphid	*Host Plant*	*Plant Family*
	Siegesbeckia orientalis Linn.	Compositae
	Sisymbrium sp.	Cruciferae
	Smilax sp.	Liliaceae
	Solanum indicum L.	Solanaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Solanum seaforthianum Andr.	Solanaceae
	Solanum sisymbrifolium Lam.	Solanaceae
	Solanum torvum SW.	Solanaceae
	Solanum tuberosum L.	Solanaceae
	Solanum wendlendi ?	Solanaceae
	Solanum sunattenae Burm. f.	Solanaceae
	Salanum spp.	Solanaceae
	Sonchus sp.	Compositae
	Spermacoce hispida L.	Rubiaceae
	Spilanthes acmella L.	Compositae
	Spinacia oleracea L.	Chenopodiaceae
	Spiraea cantoniensis Low	Rosaceae
	Stellaria media L.	Caryophyllaceae
	Stenolobium stans Seem.	Bignoniaceae
	Stenosiphonium parviflorum T. Anders.	Acanthaceae
	Stenosiphonium russalianum Nees.	Acanthaceae
	Strobilanthes atropurpureus Nees.	Acanthaceae
	Strobilanthes helictus T. Anders.	Acanthaceae
	Strobilanthes penstemonoides T. Anders.	Acanthaceae
	Strobilanthes spp.	Acanthaceae
	Symplocos spicata Roxb.	Styraceae

Name of Aphid	*Host Plant*	*Plant Family*
	Tagetes erecta L.	Compositae
	Tagetes patula L.	Compositae
	Taraxacum officinale Wigg.	Compositae
	Tecoma sp.	Bignoniaceae
	Tectona grandis L. f.	Verbenaceae
	Terminalia arjuna W. & A.	Combretaceae
	Tibouchina rosaeiformis	Melastomaceae
	Tibouchina semidecandra Cogn.	Melastomaceae
	Tinospora sp.	Melastomaceae
	Trichosanthes anguina L.	Cucurbitaceae
	Trichosanthes dioica Roxb.	Cucurbitaceae
	Tridax procumbens L.	Compositae
	Tridax spp.	Compositae
	Trigonella foenum-graecum L.	Papilionaceae
	Tropaeolum majus L.	Tropeolaceae
	Typhonium trilobatum Schott.	Araceae
	Urtica parviflora Roxb.	Urticaceae
	Urtica sp.	Urticaceae
	Verbena officinalis L.	Verbenaceae
	Vernonia cinerea Less.	Compositae
	Vernonia sp.	Compositae
	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.	Ampelideae (Vitaceae)
	Wedelia sp.	Compositae
	Wendlandia glabrata DC	Rubiaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Woodfordia fructicosa Kurg.	Lythraceae
	Melothria heterophylla (Loun) Cogn.	Cucurbitaceae
	Zingiber officinale Rusc.	Zingiberaceae
	Zinnia elegans Jacq.	Compositae
	Zinnia spp.	Compositae
	Indet.	Acanthaceae
	Indet.	Amaranthaceae
	Indet.	Apocynaceae
	Indet.	Araliaceae
	Indet.	Cucurbitaceae
	Indet.	Euphorbiaceae
	Indet.	Labiatae
	Indet.	Leguminosae
	Indet.	Malvaceae
	Indet.	Meliaceae
	Indet.	Myrtaceae
	Indet.	Papaveraceae
	Indet.	Rhamnaceae
	Indet.	Rosaceae
	Indet.	Urticaceae
	Indet.	Verbenaceae
Aphis (Aphis) ? gossypii Glover = *Aphis ficus* Theobald	*Calendula* sp.	Compositae
	Ficus bengalensis L.	Moraceae
Aphis (*Aphis*) *gossypii* / *nasturtii* Complex	*Mentha arvensis* L.	Labiatae
Aphis (*Aphis*) *hederae* Kaltenbach	*Hedera* sp.	Araliaceae
Aphis (Aphis) kurosawai Takahashi	*Artemisia caruifolia* Buch Ham.	Compositae
	Artemisia milagrica (Cl) Pamp.	Compositae
	Artemisia spp.	Compositae
	Chrysanthemum sp.	Compositae

Name of Aphid	*Host Plant*	*Plant Family*
	Daphne sp.	Thymelaeaceae
	Eupatorium sp.	Compositae
	Helianthus annus L.	Compositae
	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.	*Cucurbita moschata* Duchesne	Cucurbitaceae
Aphis (*Aphis*) *nasturtii* Kaltenbach	*Achyranthes aspera* L.	Amaranthaceae
	Arachis hypogaea L.	Papilionaceae
	Brunella vulgaris L.	Labiatae
	Clinopodium sp.	Labiatae
	Calotropis sp.	Asclepiadaceae
	Capsicum annum L.	Solanaceae
	Capsicum frutescens L.	Solanaceae
	Cestrum spp.	Solanaceae
	Chenopodium sp.	Chenopodiaceae
	Chrysanthemum indicum L.	Compositae
	Clematis spp.	Ranunculaceae
	Clerodendrum viscosum Venta	Verbenaceae
	Clerodendrum sp.	Verbenaceae
	Coccinea cordifolia (L.) Cogn.	Cucurbitaceae
	Coccinea indica W. &. A.	Cucurbitaceae
	Colocasia antiquorum Schott	Araceae

Name of Aphid	*Host Plant*	*Plant Family*
	Cotula sp.	Compositae
	Crotolaria sp.	Fabaceae
	Cucurbita pepo DC	Cucurbitaceae
	Cymbidium sp.	Orchidaceae
	Cynoglossum sp.	Boraginaceae
	Dahlia sp.	Compositae
	Daphne involucrata Wall.	Thymelaceae
	Dichrocephala integrifcha (L.) O. Kumbe	Compositae
	Dysophylla sp.	Labiatae
	Eucalyptus globulus Labill.	Myrtaceae
	Eucalyptus spp.	Myrtaceae
	Eupatorium glandulosum H. B. & K.	Compositae
	Eupatorium odoratum L.	Compositae
	Fagopyrum sp.	Polygonaceae
	Ficus sp.	Moraceae
	Gardenia florida L.	Rubiaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Hypericum patulum Thumb	Hyperaceae
	Hypochaeris radicata L.	Compositae
	Impatiens balsamina L.	Geranicceae
	Ipomoea batatas Lamk	Convolvulaceae
	Ipomoea hederacea Jacq.	Convolvulaceae
	Lantana camara L.	Verbenaceae
	Lycopersicon lycopersicum (L.) O. Kerst.	Solanaceae
	Melastoma indica ?	Melastomataceae
	Mentha arvensis L.	Labiatae
	Michelia champaca L.	Magnoliaceae
	Momordica charantia L.	Cucurbitaceae
	Montanoa bipinnatifida C. Koch	Compositae
	Rorippa indica (L.) Hiarn. (= *Nasturtium indicum* DC)	Cruciferae

Name of Aphid	*Host Plant*	*Plant Family*
	Osbeckia capitata Benth	Melastomataceae
	Osbeckia chinensis L.	Melastomataceae
	Oxalis corniculata L.	Oxalidaceae
	Oxalis sp.	Oxalidaceae
	Perilla ocimoides L.	Labiatae
	Plantago major L.	Plantaginaceae
	Polygonum perfoliatum L.	Polygonaceae
	Polygonum runcinatum Buch-Ham.	Polygonaceae
	Polygonum sp.	Polygonaceae
	Pouzolzia hirta Horsk.	Urticaceae
	Prunella vulgaris L.	Labiatae
	Schima wallichii Choiss	Ternstroemiaceae
	Sesamum indicum DC.	Pedaliaceae
	Shorea robusta Gaertn	Dipterocarpaceae
	Sida sp.	Malvaceae
	Solanum melongena L.	Solanaceae
	Solanum nigrum L.	Solanaceae
	Strobilanthes atropurpureus Nees.	Acanthaceae
	Strobilanthes sp.	Acanthaceae
	Tagetes patula L.	Compositae
	Tectona grandis R. f.	Verbenaceae
	Tibouchina semidecandra 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.	Compositae
	Indet	Labiatae
	Indet	Rhamnaceae
	Plants of indet families	

Name of Aphid	*Host Plant*	*Plant Family*
Aphis nerii Boyer	*Asclepias curassavica* L.	Asclepiadaceae
de Fonscolombe	*Asclepias* spp.	Asclepiadaceae
= *A. asclepidis* Fitch	*Bryophyllum pinnatium* Kurz.	Crassulaceae
= *Myzus nerii* Boyer	*Calotropis gigantea* Br.	Asclepiadaceae
nec. Behura	*Calotropis procera* Br.	Asclepiadaceae
	Calotropis sp.	Asclepiadaceae
	Cryptostegia grandiflora Br.	Asclepiadaceae
	Cucurbita moschata (*Duchesnen exlaese*) Dush. ex. Perir	Cucurbitaceae
	Daemia extensa Br.	Asclepiadaceae
	Daemia sp.	Asclepiadaceae
	Duranta repens L.	Verbenaceae
	Nerium odorum Soland	Apocynaceae
	Nerium sp.	Apocynaceae
	Lyonia ovalifolia (Wall.) Drude	Ericaceae
	Tylophora asthmatica W. & A.	Asclepiadaceae
	Indet plant	Asclepiadaceae
	Plants of indet families	
Aphis (*Aphis*) *paraverbasci* Chakrabarti	Indet.	Labiatae
	Plant of indet. family	
Aphis (*Aphis*) nr. *pollinosa* Walker	*Epilobium hirsutum* L.	Onagraceae
Aphis (*Aphis*) *pollinosa* Walker	*Epilobium* sp.	Onagraceae
	Epilobium hirsutum L.	Onagraceae
Aphis (*Aphis*) *polygonacea* Matsumura	*Rumex ascetosella* L.	Polygonaceae
Aphis (*Aphis*) *pomi* de Geer	*Prunus sp.*	Rosaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Pyrus malus L.	Rosaceae
	Pyrus sp.	Rosaceae
Aphis (Aphis) puincae Passerini = *A. duranti* Das	*Colocasia* sp.	Araceae
	Duranta sp.	Verbenaceae
	Prunus sp.	Rosaceae
	Punica granatum L.	Punicaceae
	Vitex negundo L.	Verbenaceae
Aphis (Aphis) ? punicae Passerini	*Duranta repens* L.	Verbenaceae
Aphis (Aphis) raji (Kumar & Burkhardt). = *Longirostris raji* Kumar & Burkhardt = *Longirostrina raji* Kumar & Burkhardt = *Longirostrina (Longirostris) raji* Kumar & Burkhardt	*Salvia* sp.	Labiatae
Aphis (Aphis) rhamniphila David, Narayanan and Rajasingh	*Rhamnus virgata* Roxb.	Rhamnaceae
	Urtica sp.	Urticaceae
Aphis (Aphis) rhoicola Hille Ris Lambers	*Rumex dentatus* L.	Polygonaceae
	Rumex sp.	Polygonaceae
Aphis (Aphis) rubifolli (Thomas)	*Rubus ellipticus* Sm.	Rosaceae
	Rumex dentatus L.	Polygonaceae
Aphis (Aphis) ruborum (Börner)	*Hibiscus esculentus* (L.) Moench	Malvaceae
	Polygonum sp.	Polygonaceae
	Rubus ellipticus Sm.	Rosaceae
	Rubus fruticosus L.	Rosaceae
	Rubus lineatus Reinw.	Rosaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Rubus palmataus Thunb.	Rosaceae
	Rubus rosaefolius Sm.	Rosaceae
	Rubus sp.	Rosaceae
	Saussurea nepalensis Spreng.	Compositae
	Plant of indet family	
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 Cogn.	Cucurbitaceae
	Cineraria sp.	Compositae
	Citrullus vulgaris Schrad	Cucurbitaceae
	Citrus aurantium L.	Rutaceae
	Coccinea indica W. & A.	Cucurbitaceae
	Colocasia sp.	Araceae
	Convallaria 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

Name of Aphid	*Host Plant*	*Plant Family*
	Cucurbita spp.	Cucurbitaceae
	Dianthus caryophyllus L.	Caryophyllaceae
	Eriobotrya japonica Lindl.	Rosaceae
	Gossypium sp.	Malvaceae
	Hibiscus cannabinus L.	Malvaceae
	Hibiscus esculentus L.	Malvaceae
	Hibiscus rosa-sinensis L.	Malvaceae
	Jasminum sp.	Oleaceae
	Lageneria vulgaris Ser.	Cucurbitaceae
	Leucas sp.	Labiatae
	Luffa acutangula Roxb.	Cucurbitaceae
	Malva sylvestris L.	Malvaceae
	Malvestrum tricuspidatum A. Gray	Malvaceae
	Momordica charantia L.	Cucurbitaceae
	Momordica cochinensis Spreng	Cucurbitaceae
	Nepeta sp.	Labiatae
	Peganum harmala L.	Zygophylaceae
	Pyrus communis L.	Rosaceae
	Rosa damascens Mill.	Rosaceae
	Rubus ellipticus Sm.	Rosaceae
	Rudbeckia spp.	Asteraceae
	Salvia sp.	Labiatae
	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* (Börner) = *Aphis* ? *malvae* Koch	Plant of indet. family	
Aphis (*Aphis*) *verbasci* Schrank	*Buddleja paniculata* Wall.	Buddlejaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Carduus nutans L.	Compositae
	Cedrus deodara Loud.	Pinaceae
	Nicotiana sp.	Solanaceae
	Polygonum alatum Buch Ham	Polygonaceae
	Senecio chrysanthemoides	Compositae
	Verbascum thapsus L.	Scrophulariaceae
	Indet.	Labiatae
Aphis (*Aphis*) *verbenae* Macchaiti	Plants of indet families	
Aphis (*Protaphis*) *carthami* (Das) = *Brachyunguis* ? *carthami* Das		
	Carthamus oxycarpi	Compositae
	Vernonia cineria Less	Compositae
	Plant of indet family	
Aphis spp.	*Ageratum conyzoides* L.	Compositae
	Artemisia vestita Wall	Compositae
	Artemisia vulgaris L.	Compositae
	Benincasa hispida Cogn.	Cucurbitaceae
	Brassica oleracea L. var *cauliflora*	Cruciferae
	Camellia sp.	Thecaceae
	Carthamus tinctorius L.	Compositae
	Carthamus sp.	Compositae
	Centaurea moschata L.	Compositae
	Cestrum fasiculatum Miers	Solanaceae
	Cestrum nocturnum Lam.	Solanaceae
	Citrus maxima ?	Rutaceae
	Convolvulus sp.	Convolvulaceae
	Eupatorium sp.	Compositae
	Glycine max (L.) Merr.	Leguminosae
	Mangifera indica L.	Anacardiaceae
	Nicotiana tabacum L.	Solanaceae
	Perilla fruticosa D. Don	Labiatae
	Phaseolus sp.	Papilionaceae

Name of Aphid	*Host Plant*	*Plant Family*
	Psidium sp.	Myrtaceae
	Pyrus communis L.	Rosaceae
	Pyrus malus L.	Rosaceae
	Rubus moluccanus L.	Rosaceae
	Rubus niveus Wall.	Rosaceae
	Rubus sp.	Rosaceae
	Indet.	Compositae
	Indet.	Verbenaceae

TABLE—1

INVENTORY OF HOST PLANTS OF INDIAN SPECIES OF *APHIS* LINN.

No.	Name of Aphid	Plant Species	Plant Genus	Plant Family
1.	*Aphis achyranthi* Theobald	2	2	2
2.	*A. affiinis* del Guercio	2	1	1
3.	*A. citricola* v. d. Goot	255	175	68
4.	*A. clematidis simlaensis* Kr. & Burk.	2	2	2
5.	*A. craccivora* Koch	163	100	39
6.	*A. eugeniae* v. d. Goot	1	1	1
7.	*A. euphorbiae* Thomas	1	1	1
8.	*A. fabae* Scopoli complex	77	62	30
9.	*A. farinosa* Gmelin	1	1	1
10.	*A. glycines* Mats.	1	1	1
11.	*A. gossypii* Glover	459	275	76
12.	*A. kurosawai* Takahashi	9	7	3
13.	*A. longisetosa* Basu	10	5	5
14.	*A. nasturtii* Kalt.	74	64	37
15.	*A. nerii* B. d. F.	15	11	6
16.	*A. paraverbasci* Chakrabarti	1	1	1
17.	*A. pollinosa* Walker	1	1	1
18.	*A. polygonacea* Mats.	1	1	1
19.	*A. pomi* de Geer	3	2	1
20.	*A. punicae* Pass.	5	5	4
21.	*A. raji* Kr. & Burk.	1	1	1
22.	*A. rhamniphila* David *et al.*	2	2	2
23.	*A. rhoicola* H. R. L.	2	1	1
24.	*A. rubifolii* (Thomas)	2	2	1
25.	*A. rumicis* Linn.	4	4	4
26.	*A. verbasci* Schrank	7	6	6
27.	*A. (Protaphis) carthami* (Das)	27	20	13

HOST PLANT ASSOCIATION

The study on the interrelationship between host plants and various Indian species of *Aphis* L. reveals that the majority of the species are polyphytophagous while a few are monophagous (Table 1). Consideration of host plant association at plant family level depicts that the members of *Aphis* L. are associated with about 118 families distributed over 385 plant genera and 590 plant species. It has been observed that most of the species live on higher dicotyledonous plants while a few are on monocotyledonous ones. It has also been found that among the plant families, Compositae harbours the maximum number of *Aphis* species followed by Solanaceae, Rosaceae and Leguminosae, obviously acting as the predominant plant families for the hosts of *Aphis* spp.

A few species *viz.*, *A. gossypii* Glover, *A citricola* v. d. G., *A. craccivora* Koch, *A. nasturtii* Kalt., *A. fabae* group are highly polyphytophagous and infest 459, 255, 163, 74 and 77 plant species respectively (*vide* Table). They show host alteration, where primary hosts are somewhat definite but with a wide range of secondary hosts. Host plant association is the essential factor in establishment of sexual mode of reproduction in the group.

SEXUALES

Sexuales of only 3 species of aphids were known from India till 1960. Now the sexual morphs are known to a little over 100 species i. e. about 14% of the total Indian species. These represent either by only males or only oviparae or by both. Sexuales of the genus *Aphis* L. on the otherhand, so far known from India, represent 7% of total sexuales of the Indian Aphididae and 26% of the total species of *Aphis* Linn. in India. Incidentally, both sexual males and females of 5 species/subspecies *viz.*, *Aphis clematidis simlaensis* Kumar and Burkhardt, *A. craccivora* Koch, *A.* fabae Scopoli Complex, *A. gossypii* Glover and *A. nasturtii* Kaltenbach and only sexual females of 3 species *viz.*, *A. citricola* v. d. G., *A. paraverbasci* Chakrabarti and *A. pollinosa* Walker are so far known to occur in India. Males of the species/subspecies belonging to the genus *Aphis* L. are usually alates except in *A. clematidis simlaensis* which are alatiform apterae. Males are easily recognised by their opercula, penis and claspers (Fig. 4.) The secondary rhinaria on

antennal segments are more in numbers than alate viviparous females. The sexual females are chiefly characterised by swollen hind tibiae with numerous pseudosensoria (Fig. 6.) besides other characters (Fig. 5). The sensoria-like glands on the tibiae of most sexual females, which apparently do not serve as organs of smell, emit an odour to attract males towards them. Collection data depict that the sexuales in the Indian conditions are more prevalent at altitudes varying between *ca* 750 m. and *ca* 4500 m. during winter when the temperature is low (0°c – 13°c) and the day length is short (8—10 hours). In spite of the above fact, sexual forms of only a few species are known from places at lower altitudes and even from plains in India. Incidentally, both males and females of two species *viz.*, *A. craccivora* Koch and *A. gossypii* Glover are reported from Calcutta and its environ. But it is not certain whether these oviparous females lay viable eggs or not. In this respect, the author agrees with the contention of Agarwala (1984) according to which complete holocyclic life cycle is yet to be established in any Indian aphid and whatever information is available in respect of a few, suggests that viable eggs are laid in tropical ecosystem of India and fundatrices are produced on the primary host.

Zoogeographical Analysis :

Critical analysis of the collection data reveals that great diversity and abundance of the species of *Aphis* Linn. occur at higher elevations of India. The biogeographical diversity of the country is well reflected in the distribution, abundance and also in aphid-hostplant relationship. Endemism in Indian species of *Aphis L.* comprises 22.2% as against 55.6% of endemism shown by total Indian Aphididae. However, endemism dominates in northern regions whereas Indogangetic plains are practically without any indigenous species of *Aphis* L. Out of 27 definitely known species/subspecies of *Aphis* in India, six are indigenous *viz.*, *A. achyranthi* Theobald, *A. clematidis simlaensis* Kr. & Burkhdt., *A. longisetosa* Basu, *A. paraverbasci* Chakrabarti, *A. raji* kr. & Burkhdt. and *A. rhamniphila* David *et al.*; four are palaearctic *viz.*, *A. eugeniae* v.d.G., *A. glycines* Mats., *A. kurosawai* Takahashi and *A. polygonacea* Mats. which are either distributed in tropical belt from Southeast Asia to Africa or are cosmopolitan. Diversity and concentration of aphids are more pronounced in N.W. and N.E. India whereas Indogangetic and

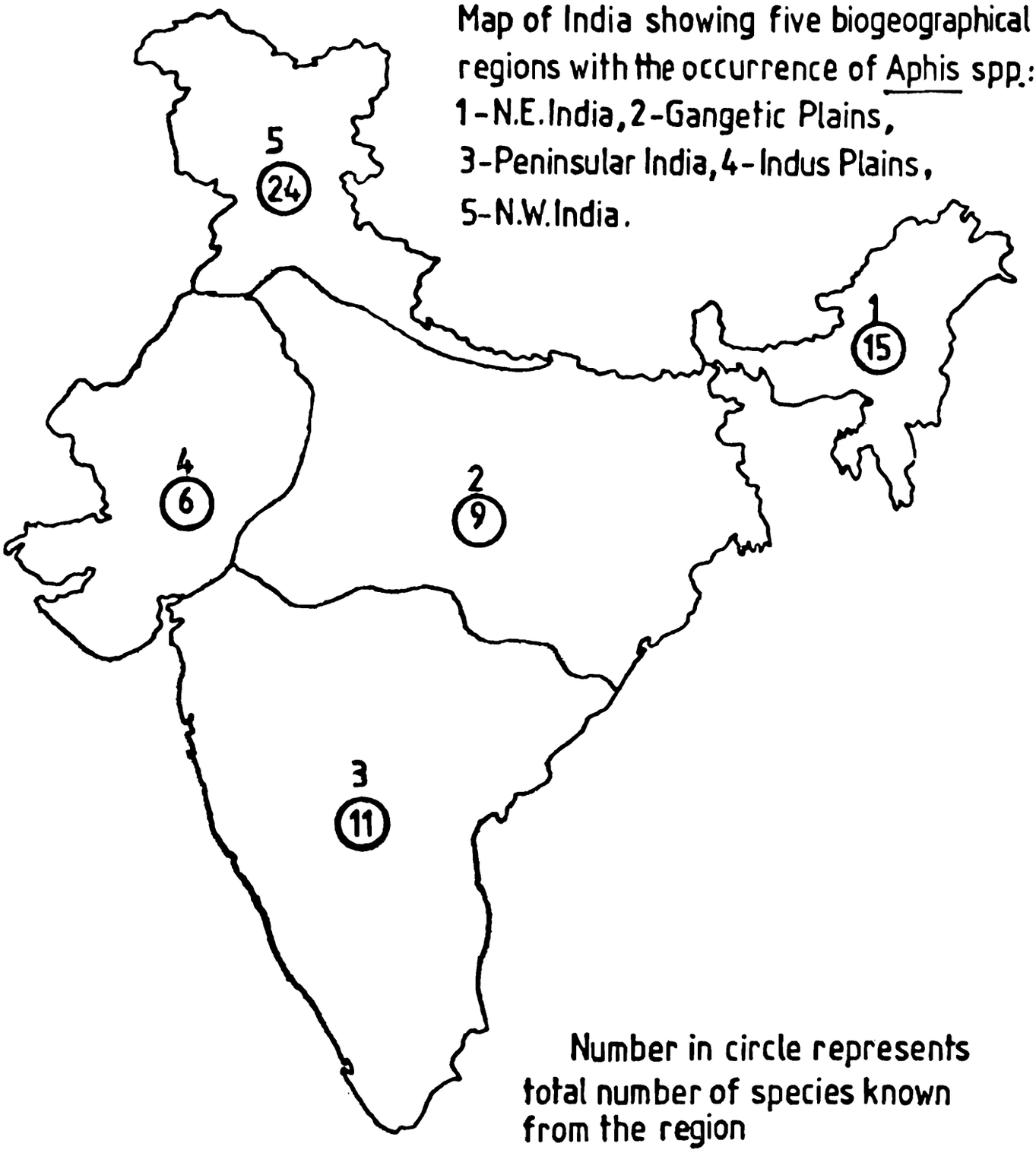
Peninsular India have less species diversity and poor prevalence. Further analysis also reveals that out of 5 biogeographical areas (*vide* Map), N. E. India represents 15 spp., Gangetic plains 9 spp., Peninsular India 11 spp., Indus plains 6 spp. and N.W. India 24 spp. Furthermore, 6 spp. *viz.*, *A. citricola* v.d.G., *A. craccivora* Koch, *A. fabae* Gr., *A. gossypii* Glover, *A. nerii* B.d.F. and *A. pomi* de Geer are found all over India while 8 spp. namely, *A. kurosawai* Tak., *A. longisetosa* Basu, *A. nasturtii* Kalt., *A. polygonacea* Mats., *A punricae* Pass., *A. rubifolii* (Thomas), *A. rumicis* Linn. and *A. verbasci* Schrank are distributed both in N. E. and N. W. India while the only species, *A. glycines* Mats. is restricted to N. E. India, 8 species/subspecies *viz.*, *A. clematidis simlaensis* Kr. & Burkdt., *A. eugeniae* v. d. G., *A. euphorbiae* Kalt., *A. farinosa* Gmelin, *A. paraverbasci* Chakrabarti, *A. pollinosa* walker, *A. raji* Kr. & Burkhdt. and *A. rhamniphila* David, Narayanan & Rajasingh are restricted to N. W. India only. Of these, *A. farinosa* Gmelin is known only from J. & K. State. *A.* (*Protaphis*) *carthami* (*Das*) is so far known from Peninsular India and Gangetic plains. Thus, the distributional pattern of *Aphis* spp./subsp. shows considerable regional variation. Maximum number (24) of *Aphis* spp. has so far been recorded from N.W. India although N.E. India is endowed with more lush and diverse vegetation. Minimum number (6) has been known from the Indus plains. Nonetheless, N.W. and N.E. Indian parts particularly hilly terrains having subtropical and warm temperate climate may be representing ideal climatological conditions with favourable vegetational pattern and these may be responsible for the preponderance of high percentage of *Aphis* spp. in the above areas. The Gangetic and Indus plains on the other hand having predominantly plain lands of typical tropical nature with hot and dry areas and poor floral assemblage appear to be not favourable for the preponderance of diverse fauna of the group. Peninsular India is chiefly of tropical nature although the upper ranges of Annamalai hills are subtropical or warm temperate. Here also preponderance of this group of aphids is more or less similar to that of Gangetic and Indus plains. Thus, in different biogeographical regions of India, *Aphis* shows remarkable species diversity and faunal peculiarities to suit with the diverse ecological conditions of India.

Summary and Conclusion

This work concerns with the comprehensive account of the Indian species of the genus *Aphis* Linnaeus which includes 27 species/subspecies (out of 31 valid species/subspecies known from India) based on various collections from India and abroad. Diagnosis of the genus *Aphis* L. has been redefined. Running keys for determination of the above species have been provided on the basis of apterous viviparous females. Besides, keys for available alate viviparous females and sexuales have also been given. All the species have been dealt with regard to their synonymy, general morphology, distribution, taxonomic remarks etc. The work will be of an ideal aid to the identity of all species of *Aphis* from India and is with sufficient illustrations. The doubtful species and the subspecies which are known from India but could not be examined in spite of efforts, are provided with full references and synonymy, if any.

The taxonomic nomenclature has mostly been adopted from an extremely useful list of aphids with synonymy of genera and species by Eastop and Hille Ris Lambers (1976). The references cited in the text have been given. The work is supplemented by an up-to-date host plant catalogue involving 576 plant species belonging to 385 genera in 118 plant families. Also, a list of aphids associated with different host plants has been furnished. Besides, endemism, hostplant association, occurrence of sexuales and zoogeographical analysis of the aphids have been discussed briefly. Analysis of the collection data as well as the field observations depicts that Anholocylic (Asexual) life cycle is the predominant pattern for most of *Aphis* spp. in Indian conditions. Mostly they are incapable of reproducing sexually or producing viable eggs. Evidently, parthenogenetic viviparous forms become the most common form of life cycle.

In fact, information on the biology of the species of *Aphis* Linn. in the Indian subregion remains far from complete. To fill up the lacunae, extensive longterm biosystematic research on these aphids is important. This may yield much of the needed data for better understanding of this complicated group of aphids in India.



Map of India showing five biogeographical regions with the occurrence of Aphis spp.:
1-N.E.India, 2-Gangetic Plains,
3-Peninsular India, 4-Indus Plains,
5-N.W.India.

Number in circle represents total number of species known from the region

ACKNOWLEDGEMENTS

The author expresses his deep sense of gratitude to Professor Mohammad Shamim Jairajpuri, Director, Zoological Survey of India, for encouragement and providing laboratory facilities.

He is indebted to Late Dr. D. N. Raychaudhuri, formerly Professor of Zoology, University of Calcutta, for suggesting the problem.

Sincere thanks are due to Dr. A. K. Ghosh, Scientist SF, Z.S.I. and Dr. V. F. Eastop, British Museum (Natural History), London, for kindly going through the keys and suggesting improvements.

He is also thankful to Drs. S. K. Bhattacharyya, O. B. Chhotani, R. K. Varshney, Scientists SF, S. K. Tandon, S. K. Gupta and P. K. Maiti, Scientists SE, and Dr. R. C. Basu, Scientist SD of the department for numerous courtesies. Help rendered by Sri B. Biswas, Mrs. M. Ghosh, Hemiptera Section and Sri S. Biswas, Artist Z.S.I., is thankfully acknowledged. Also, gratitude is expressed to Dr. P. P. Kulkarny, Assistant Zoologist, Z. S. I., for taking the microphotographs.

He is indebted to Dr. M. Miyazaki, National Institute of Agro-Environmental Sciences, Kannondai, Tsukuba, Japan ; Dr. Roger L. Blackman, Keeper and the authorities of British Museum (N. H.), London, for kindly keeping some material at his disposal.

Heartfelt thanks are expressed to Dr. S. Kanakaraj David, Madras, Dr. K. D. Verma, CPRS, Simla and Dr. S. P. Kurl, Dept. of Zoology, M. M. (P. G.) College, Modinagar (U. P.), India, for their active cooperation.

Sincere thanks are also due to Dr. D. Raychaudhuri, Reader, Dept. of Zoology, University of Calcutta and Dr. S. Chakrabarti, Reader, Zoology Department, Kalyani University, India, for offering the opportunity to study some material in their collections.

Dr. B.K. Agarwala, Department of Life Science, Calcutta University, P. G. Centre, Agartala, kindly sent negatives of infestation by *Aphis citricola* v.d. Goot for which the author is thankful to him.

The nomenclature of host-plants included in the Aphid host-plant catalogue was kindly checked up by Dr. U. C. Bhattacharyya, Scientist-D. and Dr. D. C. Pal, Botanist, Botanical Survey of India, Shibpore, Howrah, to whom the author is extremely grateful.

References

AGARWALA, BASANT K. 1984. Holocycly in Indian Aphididae. ***Proc. III Oriental Ent. Symp.***, Trivandrum : 9-17.

AGARWALA, BASANT K. AND GHOSH, A. K. 1984. A checklist of Aphidoidea of India. *Rec. zool. Surv. India*, Occ. paper No. **50** : 1–17.

AGARWALA, BASANT K. AND GHOSH, A. K. 1985. Oriental Aphidoidea, Key to the genera and Synoptic list. *Mem. Zool. Surv. India*, **16** (3) : 1-118.

AGARWALA, BASANT K. AND RAYCHAUDHURI, D. N. 1979. Biotic potential of weeds in respect of *Aphis gossypii* Glover infesting some economic plants in Kalimpong, West Bengal. *Indian Agric.*, **23** : 25-29.

ANONYMOUS 1977. Insect pests of minor crops. *Ann. Rep. Deptt. of Entomology, Punjab Agril. Univ.*, Ludhiana.

BAKHETIA, D. R. C. AND SIDHU, A. C. 1977. Biology and Seasonal activity of the groundnut aphid *Aphid craccivora* Koch. *J. Res. Punjab Agril. Univ.*, **14** (3) : 299-303.

BANERJEE, T. K. AND RAYCHAUDHURI, D. 1986. Analysis of niche selection of *Aphis gossypii* Glover on Okra, brinjal and Chilli. Aphidology in India : *Proc. Nat. Symp., Agartala* : 5-12 (1985).

BASU, A. N. 1969. Further records of new and little known aphids (Homoptera) from West Bengal, India. *Orient. Insects*, **3** (4) : 355-371.

BASU, A. N. AND BANERJEE, S. N. 1958. Aphids of economic plants of West Bengal. *Indian Agric.*, **2** (2) : 89-112.

BASU, R. C., CHAKRABARTI, S. AND RAYCHAUDHURI, D. N. 1968. Records of the sexuales of *Aphis craccivora* Koch (Homoptera : Aphididae) from India. *Orient. Insects*, **2** (3-4) : 349-351.

BASU, R. C., GHOSH, A. K. AND RAYCHAUDHURI, D. N. 1970. Studies on the aphids (Homoptera : Aphididae) from eastern India. 4. A new genus and records of some sexual froms from Assam. *Proc. zool. Soc., Calcutta*, **23** : 83-91.

BATCHELDER, C. H. 1927. The variability of *Aphis gossypii*. *Ann. ent. Soc. Amer.*, **20** : 263-278.

BEHURA, B. K. 1963. Aphids of India : a survey of published information. *Proc. first summer school of Zoology* (Simla, 1961), Govt. of India Publ. : 25-78.

BEHURA, B. K. 1965. Supplement to "aphids of India—a survey of published information". 1. *Prakruti Utkal Univ. J. Sci.*, **3** : 40-65.

BEHURA, B. K. AND DASH, M. M. 1973. Studies on the Aphididae of India VI. Notes on the external morphology of *Aphis nerii* Fonsc. collected on *Bryophyllum pinatum* from Bihar. *Prakruti Utkal Univ. J. Sci.*, **8** : 53-64 (1971).

BEHURA, B. K., DASH, M. M. AND MISHRA, P. K. 1973. Biometrical studies on the common phytophagous aphid, *Aphis gossypii* Glov. (Aphididae : Homoptera.). *Proc. Orissa Assocn. Adv. Science* : 74.

BERNARD, E. N. 1969. Effect of six host plants on the biology of black bean aphid, *Aphis craccivora* Koch. *Philipp. Ent.*, **1** : 287-292.

BHAGAT, K. C., MASOODI, M. A. AND KOUL, V. K. 1988. Some observations on the incidence of Arthropod natural enemies of *Aphis pomi* de Geer (Homoptera : Aphididae) occurring in apple orchard Ecosystem. *J. Aphidology*, **2** (1 & 2) : 80-89.

BLACKMAN, R. L. AND EASTOP, V. F. 1984. Aphids on the World's crops : An identification and information guide. John Wiley & Sons : 1-413.

BODENHEIMER, F. S. AND SWIRSKI, E. 1957. *The Aphidoidea of the Middle East.* The Weizmann Science Press of Israel. Jerusalem : 1-378.

CARROLL, D.P. AND HOYT, S.C. 1984. Natural enemies and their effects on apple aphid *Aphis pomi* de Geer (Homoptera : Aphididae), colonies on young apple trees in Central Washington. *Environ. Entomol.*, **13** (2) : 469-481.

CHAKRABARTI, S. 1976. New Aphids (Homoptera : Aphididae) from Northwest India, *Entomon.*, **1** (2) : 171-173.

CHHABRA, K. S., KAPOOR, B. S. AND CHEEMA, H. S. 1986. Incidence of *Aphis craccivora* Koch on grain legumes in the Punjab. Aphidology in India : *Proc. Nat. Symp., Agartala* : 23-28 (1965).

COTTIER, W. 1953. Aphids of New Zealand. *Bull. N. Z. Dep. scient. ind. Res.*, **106** : 1-368.

DAS, B. 1918. The Aphididae of Lahore. *Mem. Indian Mus.*, **5** (4) : 135-274.

DAS, S. K., RAYCHAUDHURI, D. AND RAYCHAUDHURI, D. N. 1981. Some new species and hitherto unknown morphs of aphids (Homoptera : Aphididae) from Himachal Pradesh, northwest India. *Entomon*, **6** (1) : 47-56.

DAVID, S. K. AND GHORPADE, K. D. 1974. Two species of aphids (Homoptera : Aphididae) new to India and four others new to southern India. *Orient. Insects*, **8** : 195-198.

DEVI PADMAJA, T. AND PRABHOO, N. R. 1988. *Tridax procumbens* L., an additional food plant of *Aphis craccivora* Koch in Kerala. *Newsl. Aph. Soc. India*, **6** (2) : 6-7.

DHIMAN, S.C. 1987. New report of *Aphis gossypii* Glover (Homoptera : Aphidinae) causing pseudoleaf galls on *Bougainvillea* sp. (variegated variety) from Saharanpur, U.P., *Newsl. Aph. Soc. India*, **6** (2) : 6-7.

EASTOP, V. F. 1958. *A Study of Aphididae (Homoptera) of East Africa*, H. M. S. O., London : 1-126.

EASTOP, V. F. AND HILLE RIS LAMBERS, D. 1976. *Survey of the World's Aphids*, Dr. W. Junk b. v. Publishers, The Hague : 1-573.

FALK, U. 1957/58. Biologie and Taxonomie der Schwarzen Blattlause der Leguminosen. *Wiss. Z. Univ. Rostock*, **7** (4) : 616-634.

GHOSH, A. K. 1985. Biosystematic studies on Aphidinae of Indian Region. *Abs. 2nd Nat. Symp. Recent. Trends in Aphidological Studies*, Modinagar : 3.

GHOSH, A. K., BASU, R. C. AND RAYCHAUDHURI, D. N. 1970. Studies on the aphids (Homoptera ; Aphididae) from eastern India. New species and new records from Assam. *Orient. Insects*, **4** : 64-76.

GHOSH, A. K., GHOSH, M.R. AND RAYCHAUDHURI, D. N. 1972. Studies on the aphids (Homoptera : Aphididae) from eastern India XI. Descriptions of hitherto unknown or newly recorded sexual morphs of some species from West Bengal. *Orient. Insects*, **6** (3) : 334.

GHOSH, A.K., CHAKRABARTI, S., CHOWDHURI, A.N. AND RAYCHAUDHURI, D. N. 1970. Aphids (Homoptera) of Himachal Pradesh, India, 2. *Orient. Insects*, **3** : 327-334 (1969).

GHOSH, L.K. AND KURL, S.P. 1988. Hitherto unknown morph of *Aphis paraverbasci* Chakrabarti (Homoptera: Aphididae) from India, *J. Aphidology*, **2** (1&2) : 59-61.

GHOSH, M.R. AND RAYCHAUDHURI, D.N. 1981. Aphids (Homoptera : Aphididae) infesting rosaceous fruit plants in Darjeeling district of West Bengal and Sikkim. *Entomon*, **6** : 61-68.

GLEISS, G.W. 1966. Die Biologie der Rreuzdorn-Rartoffel-Blattlaus *Aphidula nasturtii* (Kalt.) (Homopt., Aphidina) in-mono graphischer Darstellung. *Schr. Arbkr. naturw. Heimatforsch.* Wedel, **2** : 8-69.

HEINZE, K. 1959. New Gelegenheitubertrager fur des Gusbenmosaik virus (Marmor cucumensis) des Y-virus der Kartoffel (Marmorupsilon) Undeinmever ubertager fur dei vergilbungekrankhet der Rube (*Gonium betae*). *Z. Naturf.*, **14**(B), 414-415.

HOLDSWORTH, R.P. 1970. Aphids and aphid natural enemies : effect of integrated control in an Ohio apple orchard. *J. Econ. Entomol.*, **63** (2) : 530-535.

HILLE RIS LAMBERS, D. 1974. On American Aphids, with descriptions of a new genus and some new species. *Tidschr. Ent.*, **117** : 103-155.

HILLE RIS LAMBERS, D. 1975. *Aphis citricola* v. d. G. 1912, replaces *Aphis spiraecola* Patch, 1914 (Hom. : Aphididae). *Ent. Ber.*, **35**:59.

KANDORIA, J. L. AND JAMWAL, R. 1988. Comparative biology of *Aphis gossypii* Glover on Okra, brinjal and Chilli in the Punjab, India, *J. Aphidology*, **2**(1&2) : 35-39.

KHUDA BUKHSH, A. R. AND PAL, N. B. 1985. Cytological studies on Aphids (Homoptera : Aphididae) from India : I Karyomorphology of eight species of *Aphis* L. *Entomon*, **10**(2) : 171-177.

KUMAR, R. AND BURKHARDT, C. C. 1970. A new genus *Longirostris*, a new species and a new subspecies of aphids from India (Homoptera : Aphididae). *J. Kansas Ent. Soc.*, **43** : 458-464.

MALIK, R. A., PUNJAI, A. A. AND BHAT, A. A. 1972. Survey study of insect and noninsect pests in Kashmir, **3**(1-3) : 29-44.

OATMAN, E. R. AND LENGER, E. F. 1961. Bionomics of the apple aphid, *Aphis pomi*. *J. Econ. Entomol.*, **54** (5) : 1034-1037.

PADDOCK, F. B. 1919. The cotton or Melon Louse. Life history studies. *Texas Agr. Exp. Sta. Bull.*, **257** : 1-54.

PALMER, M. A. 1952. *Aphids of the Rocky Mountain Region.* Thomas Say Foundation, Denver, **5** : 1-452.

PATCH, E. M. 1925. The Melon Aphid. *Maine Agr. Exp. Sta. Bull.*, **326** : 185-196.

PODDAR, S. C. 1982. Studies on *Aphis craccivora* Koch and its natural enemies in some parts of India. Ph. D. Thesis, University of Calcutta : 1-245.

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

RAYCHAUDHURI, D. N. (*ed.*) 1983. *Food plant catalogue of Indian Aphididae*, Grafic Printall, Calcutta : 1-181.

REDDY DARMA, K., GARGAV, V. P. AND MISRA, D. S. 1983. Studies on host preference of *Aphis craccivora* Koch, *Entomon*, **8** (6) : 75-78.

RICHARDS, W. R. 1965. The Callaphidini of Canada (Homoptera : Aphididae). *Mem. ent. Soc. Canad.*, **44** : 1-149.

ROY, D. K. 1986. Seasonal growth in *Aphis gossypii* Glover occurring on egg plants (*Solanum melongena* Linn.). Aphidology in India : *Proc. Nat. Symp., Agartala* (1985) : 19-21.

ROY, D. K. AND BEHURA, B. K. 1983. Seasonal variation in the morphology of *Aphis gossypii* Glov. *The Aphids* : 52-59.

SAGAR, PREM AND SINGH, DHARAM PAUL, 1981. Chemical control of the aphid *Aphis affinis* Del Guercio (Homoptera : Aphididae) a pest of Japanese mint, *Mentha arvensis* Linn. in the Punjab. *Entomon*, **6** (1) : 73-79.

SAHA, J. L. AND AGARWALA, BASANT K. 1986. Population trend of *Aphis gossypii* (Homoptera : Aphididae) and its natural enemies on egg plant, *Solanum melongena* Linn. Aphidology in India : *Proc. Nat. Symp., Agartala* : 13-18.

SEN, A. K., BHATTACHARYA, A. AND SRIVASTAVA S. C. 1987. Record of *Aphis craccivora* Koch and *Aphis gossypii* Glover (Fam. Aphididae) on *Mogahania microphylla*, a host plant of Lac Insect. *Entomon*, **12** (3) : 229.

SHAPOSHNIKOV, G. 1964. In Bey-Bienko, "Keys to the Insects of European part of the U. S. S. R." : 489-616.

STROYAN, H. L. G. 1972. Additions and Ammendations to the checklist of British Aphids. *Trans. R. ent. Soc. Lond.*, **124** : 37-79.

SWIRSKI, E. 1954. Fruit tree aphids in Israel. *Bull. ent. Res.*, **45** : 623-638.

TAKAHASHI, R. 1966. Descriptions of some new and little known species of *Aphis* of Japan, with a key to species. *Trans. Am. ent. Soc. Lond.*, **92** : 519-556.

TUATAY, N. AND REMAUDIERE, G. 1964. Sur la presence de cornicules surnumeraires chezun *Aphis* (Hom. Aphididae). *Rev. Pathol. Veg. Entomol. Agr. France*, **43** : 31-35.

VERMA, A.N. AND KHURANA, A. D. 1974. Sexuals of *Aphis craccivora* Koch on green gram in India, *Entomologists Newsletter*, **4** : 53.

WALL, R. E. 1933. A study of colour and colour variation in *Aphis gossypii* Glover. *Ann. ent. Soc. Amer.*, **26** : 425-464.

WILLIS, J. C. 1966. *A Dictionary of the flowering plants and ferns.* Cambridge University Press, London. : 1-1214.

FIGURES

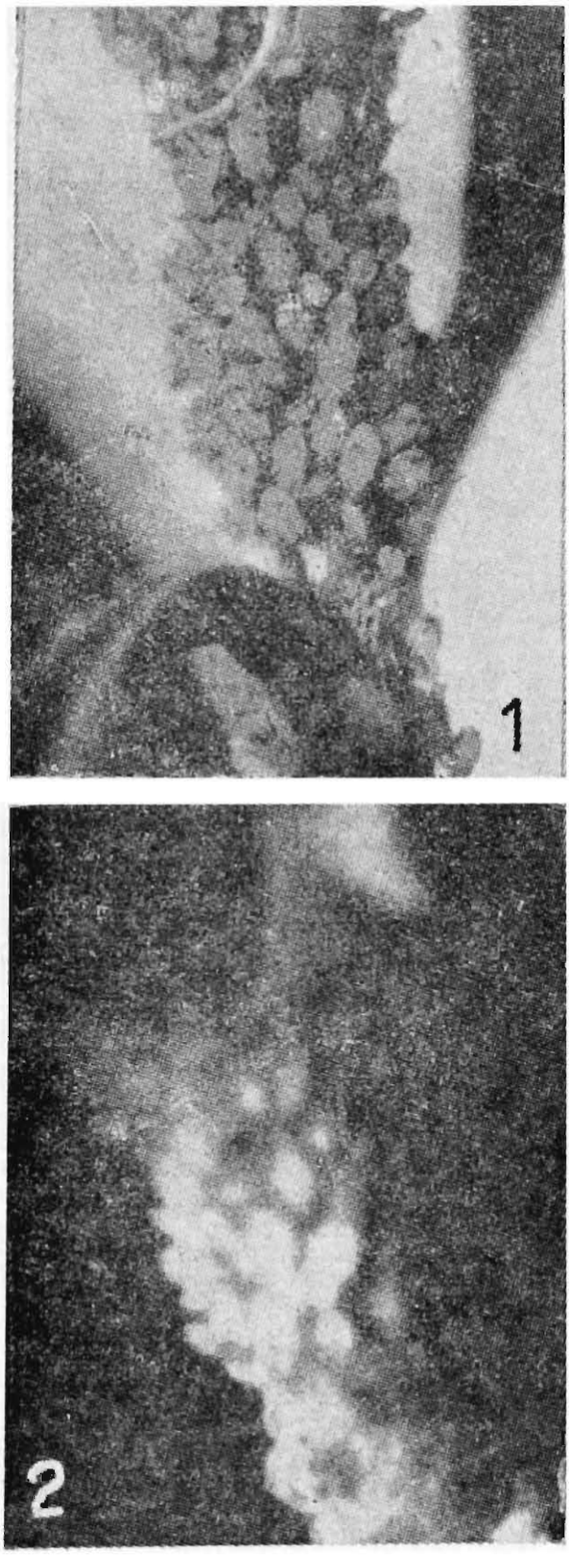


Fig. 1. Gregarious habit exhibited by *Aphis nerii* Boyer de Fonscolombe infesting *Asclepias* sp. (N. O. Asclepiadaceae).

Fig. 2. General devitalization of the plant *Eupatorium odoratum* Linnaeus (N. O. Compositae) caused by infestation with *Aphis citricola* van der Goot

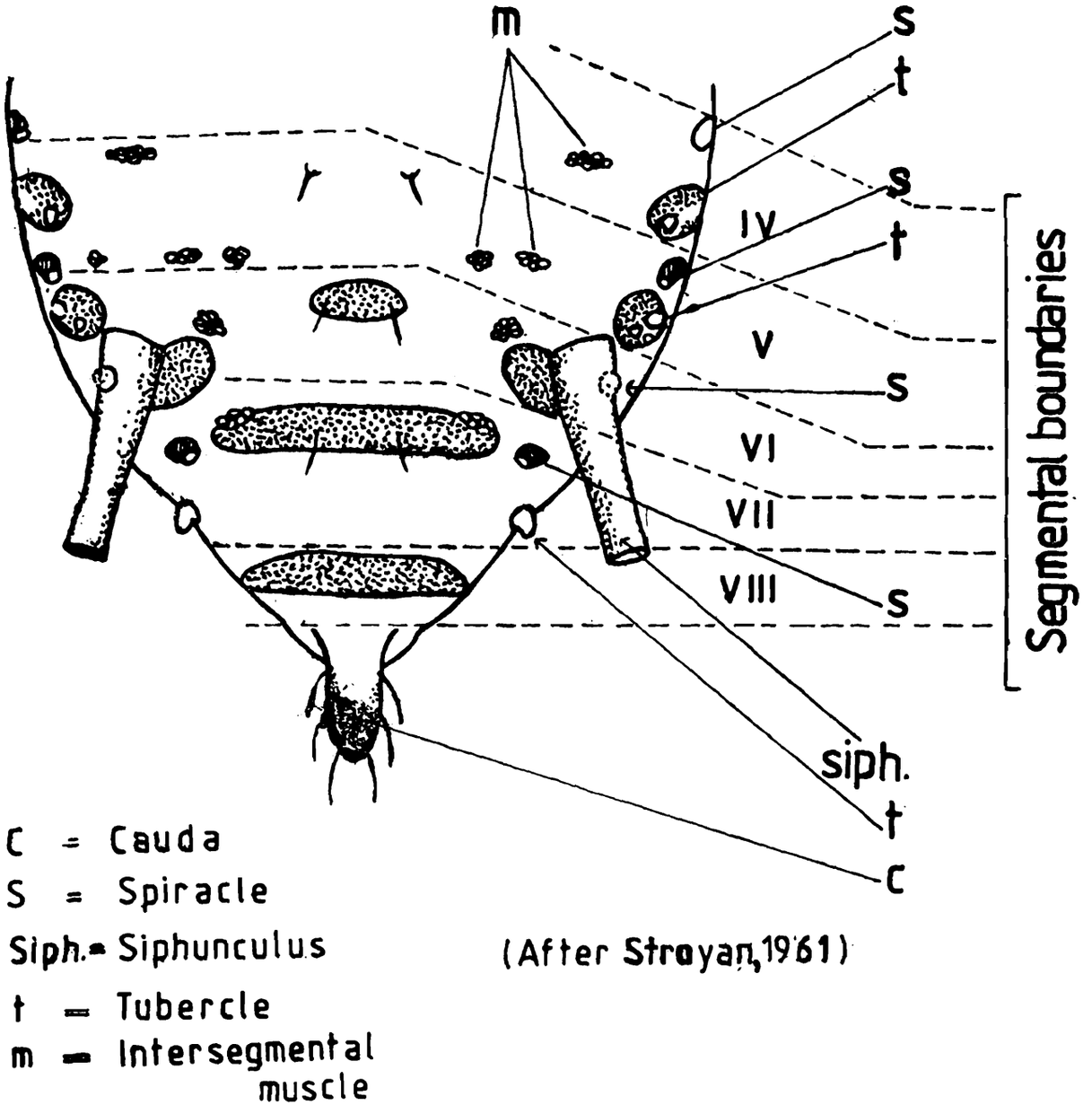


Fig. 3. Key diagram of posterior segments of abdomen of apterous viviparous female of genus *Aphis* L.

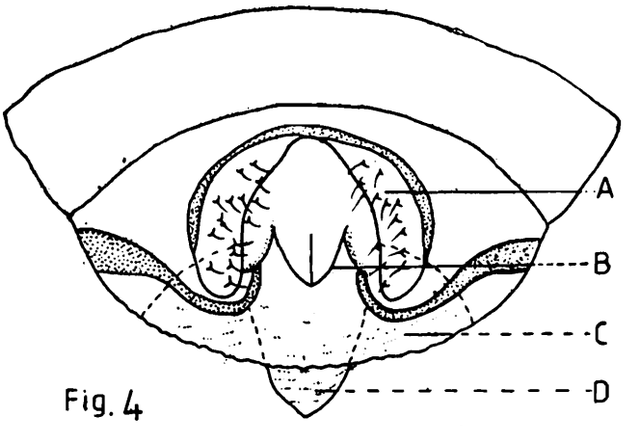
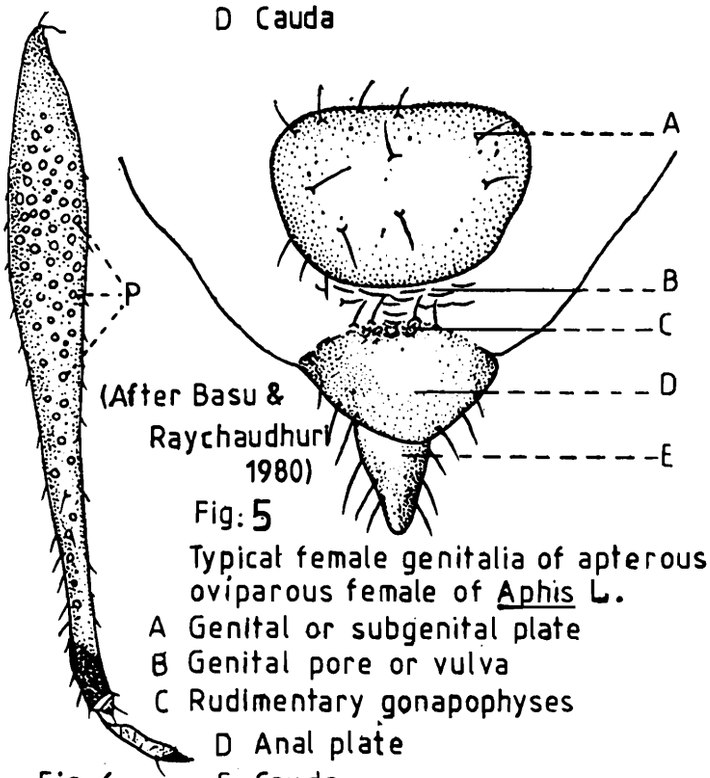


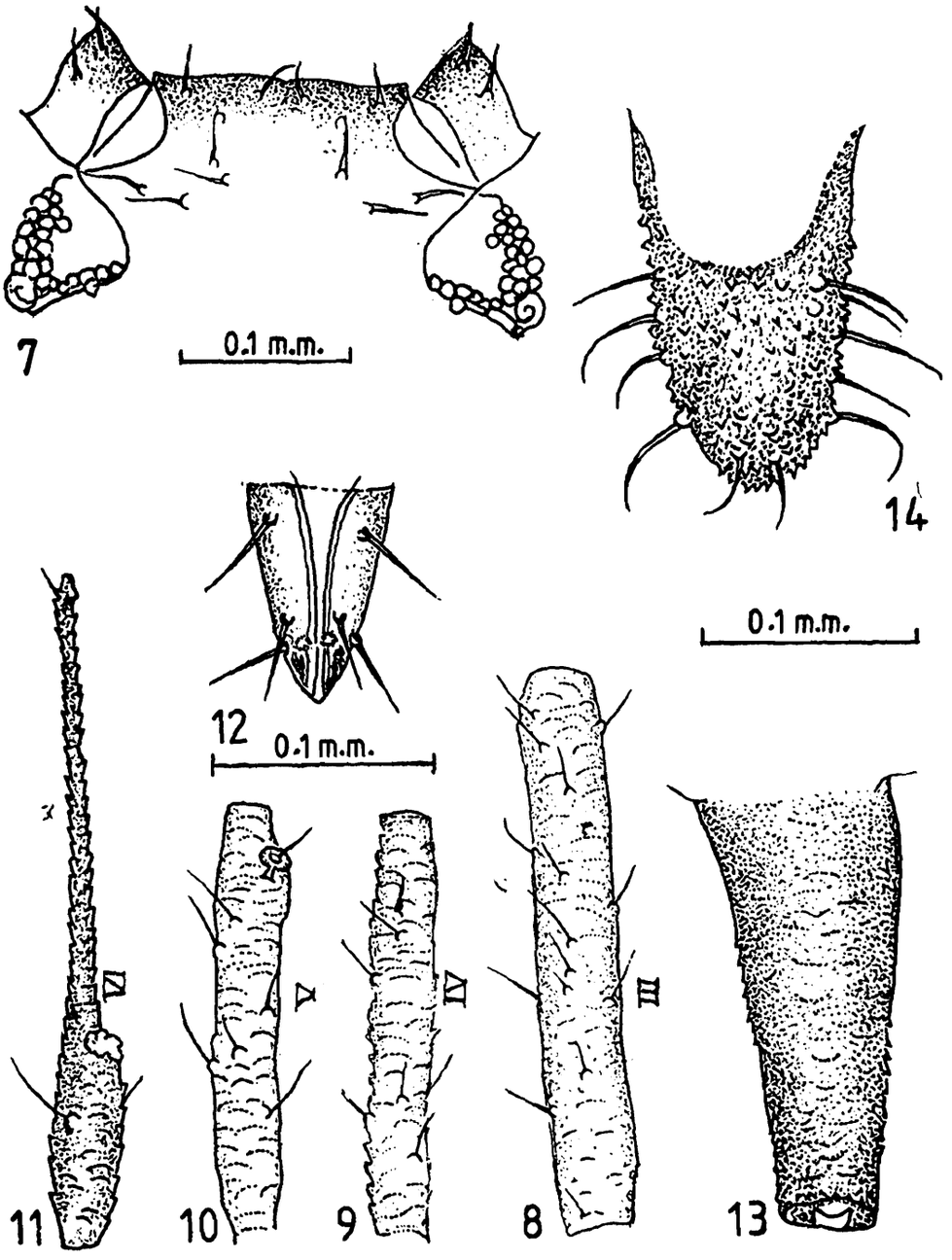
Fig. 4
Typical male appendages of Aphis L.
A Opercula
B Penis
C Anal plate
D Cauda
(After Cottier, 1953)



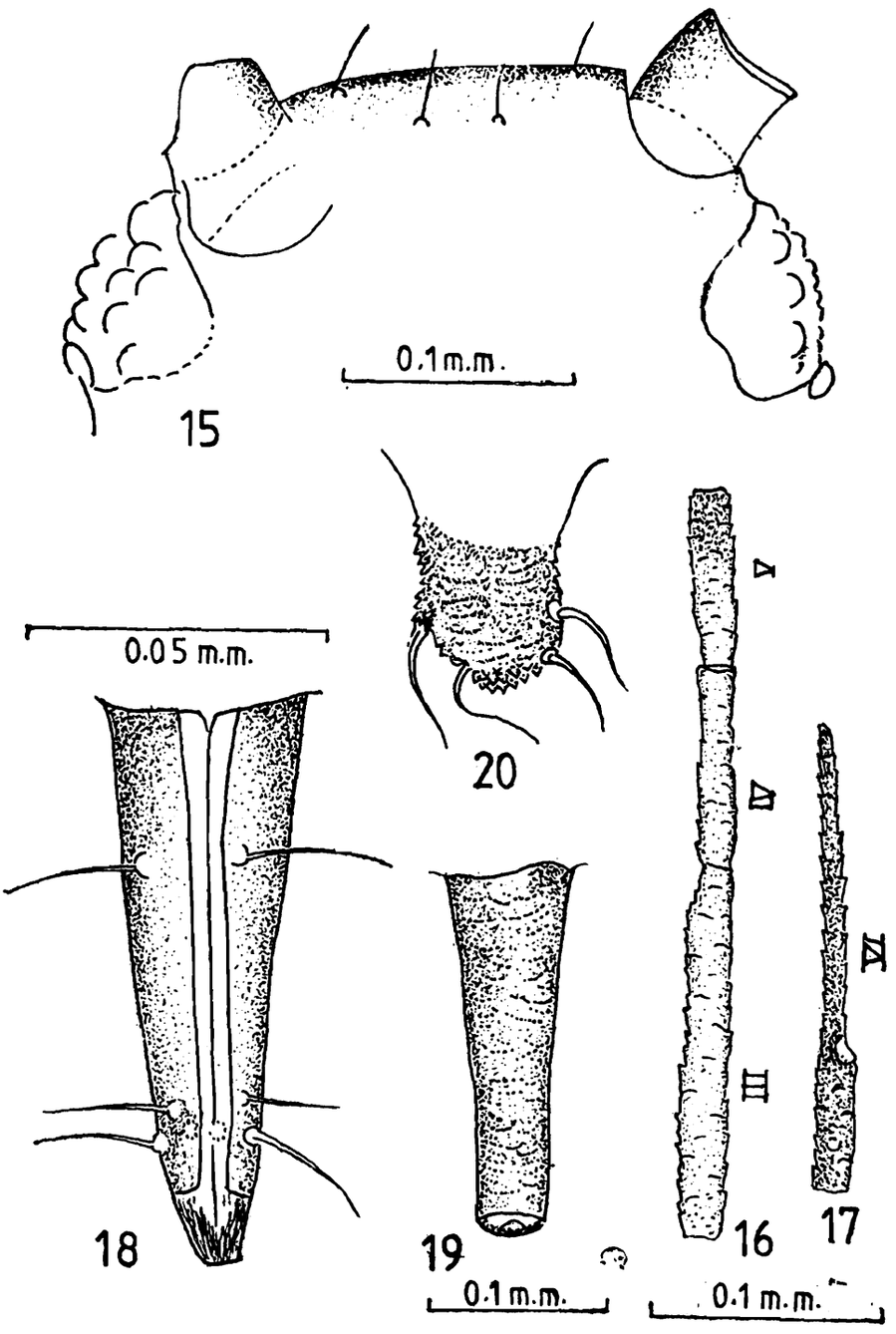
(After Basu & Raychaudhuri 1980)

Fig: 5
Typical female genitalia of apterous oviparous female of Aphis L.
A Genital or subgenital plate
B Genital pore or vulva
C Rudimentary gonapophyses
D Anal plate
E Cauda

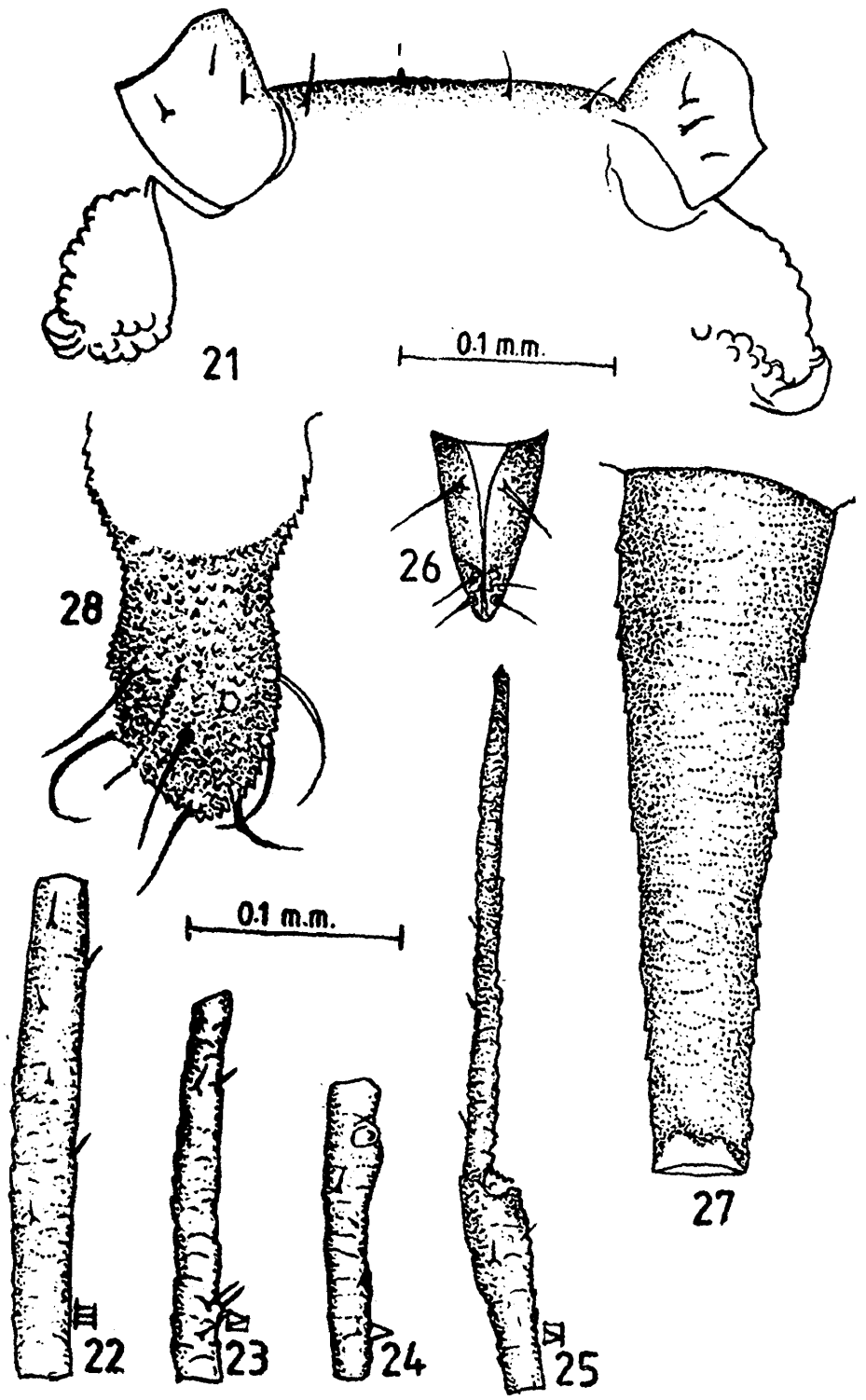
Fig. 6
Hind tibia showing pseudosensoria in apterous Oviparous female of Aphis L.
P = Pseudosensoria



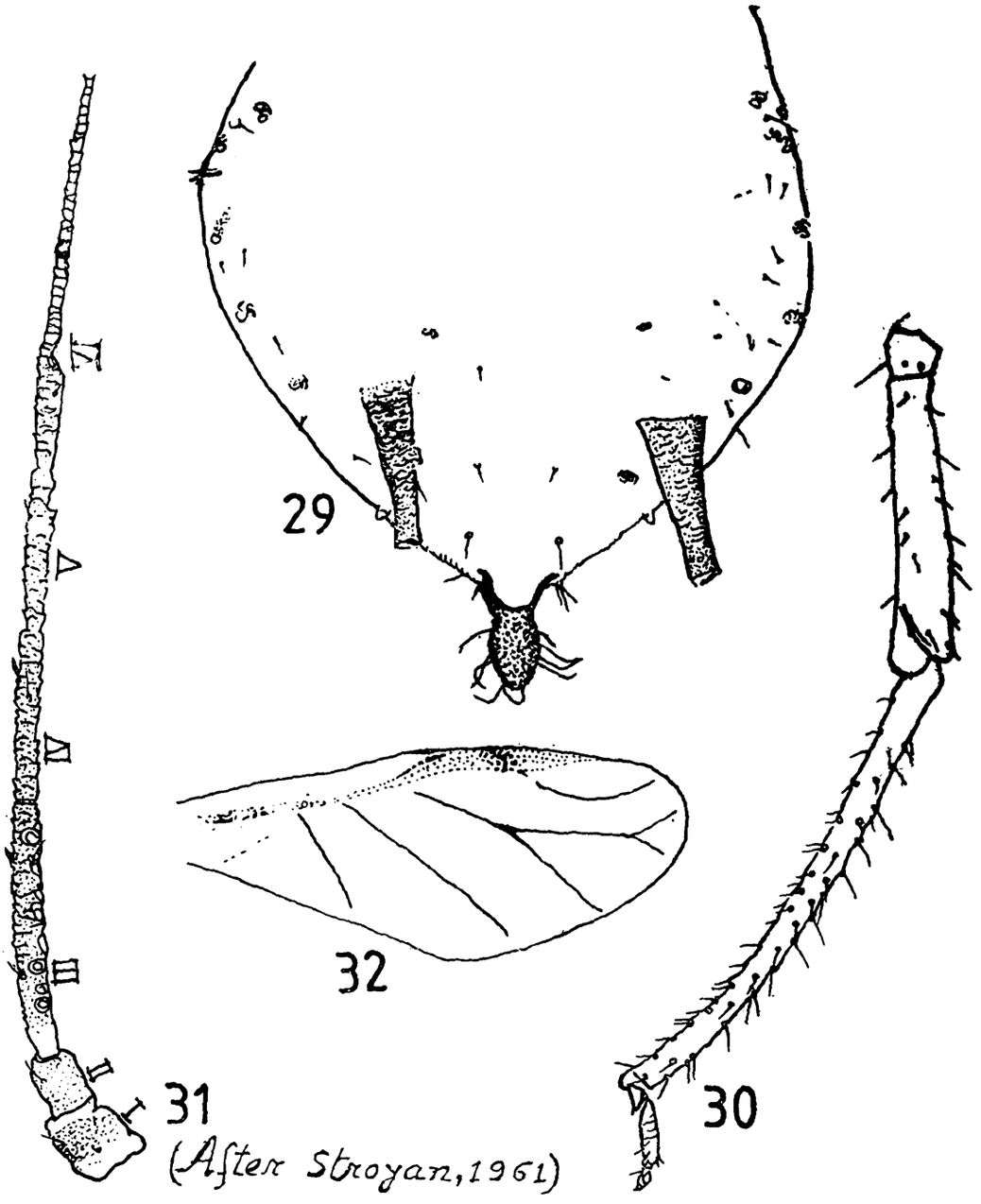
Figs. 7-14. *Aphis achyranthi* Theobald : Aptera. 7, Head ; 8, a. s. III ; 9, a. s. IV ; 10, a. s. V ; 11, a. s. VI ; 12, u. r. s. ; 13, Siphunculus ; 14, Cauda.



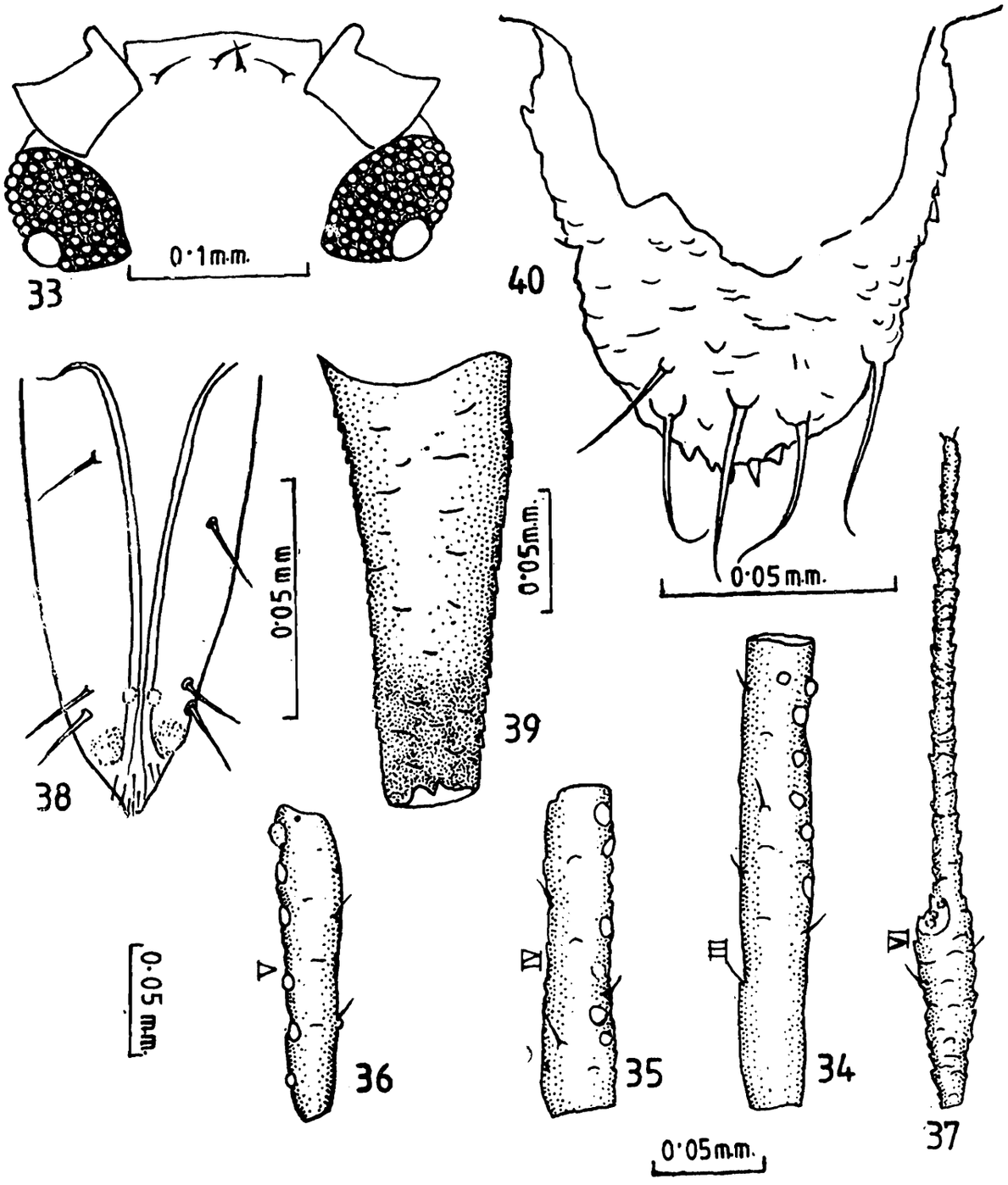
Figs. 15-20. *Aphis affinis* del Guercio : Aptera. 15, Head ; 16, a. s. III-V ; 17, a. s. VI ; 18, u. r. s. ; 19, Siphunculus ; 20, Cauda.



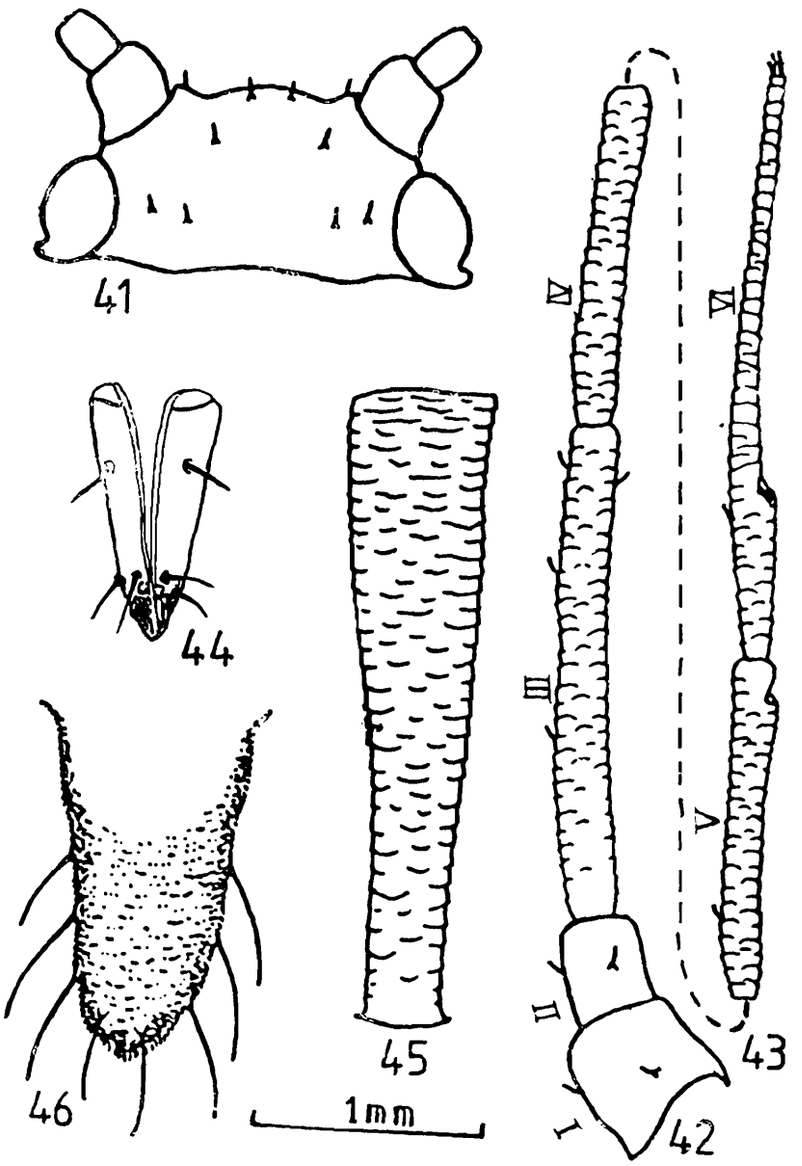
Figs. 21-28. *Aphis citricola* van der Goot : Aptera. 21, Head ; 22, a. s. III ; 23, a. s. IV ; 24, a. s. V ; 25, a. s. VI ; 26, u. r. s. ; 27, Siphunculus ; 28, Cauda ;



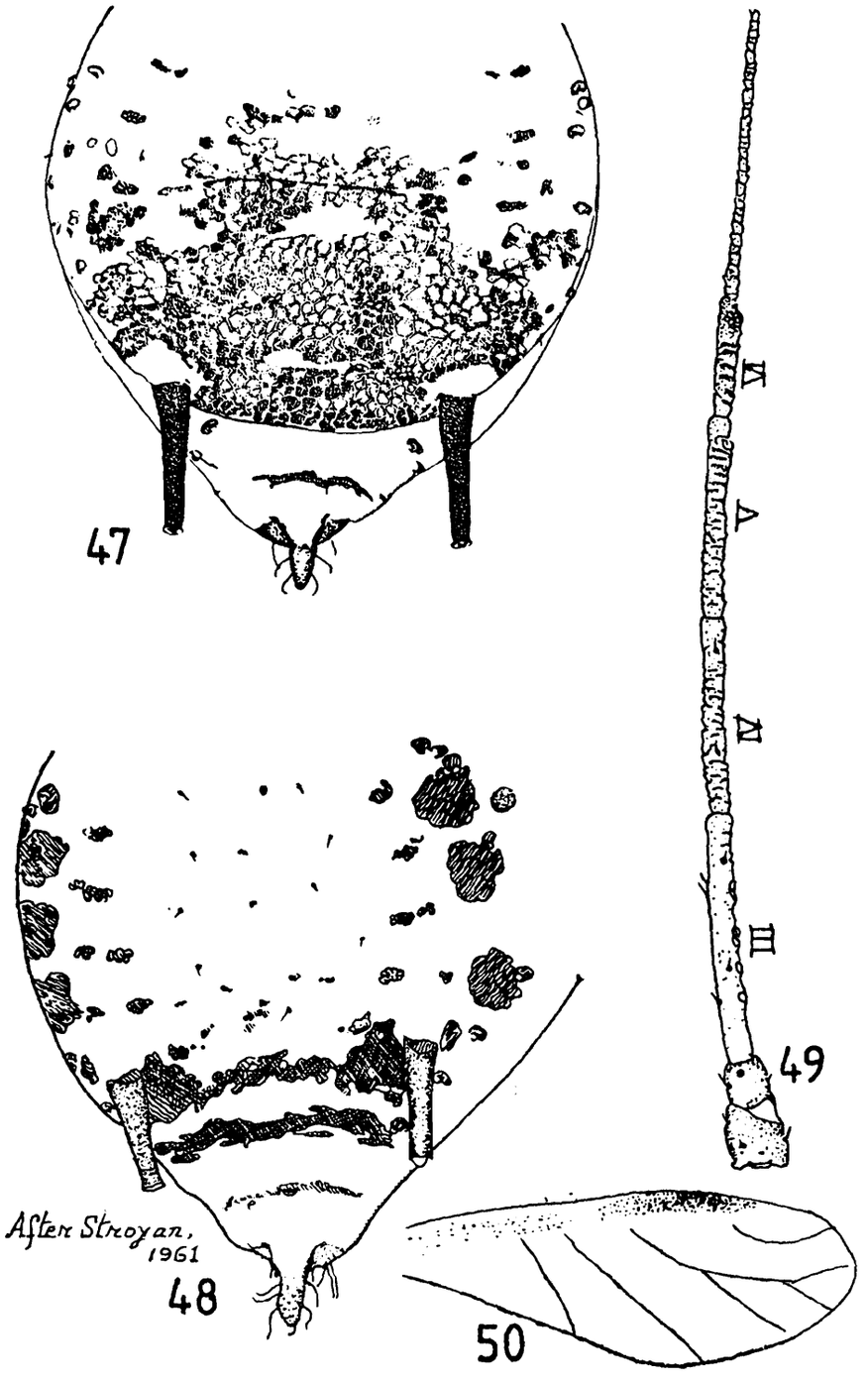
Figs 29-32. *Aphis citricola* v. d. Goot : Aptera. 29, posterior abdominal dorsum ; 30, hind leg showing femoral hairs ; Alata. 31, Antenna showing secondary rhinaria ; 32, hind wing.



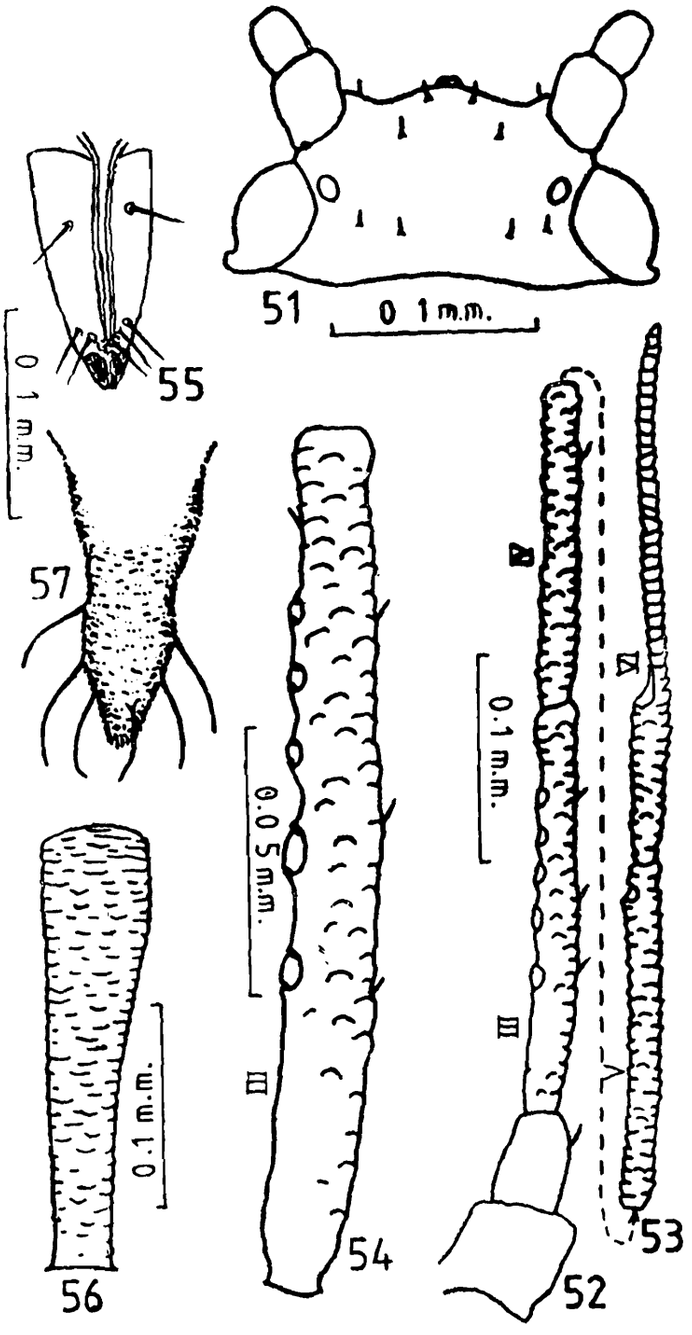
Figs. 33-40. *Aphis clematidis simlaensis* Kumar & Burkhardt : Aptera. 33, Head ; 34, a, s. III ; 35, a. s. IV ; 36, a. s. V ; 37, a. s. VI ; 38, u. r. s. ; 39, Siphunculus ; 40, Cauda.



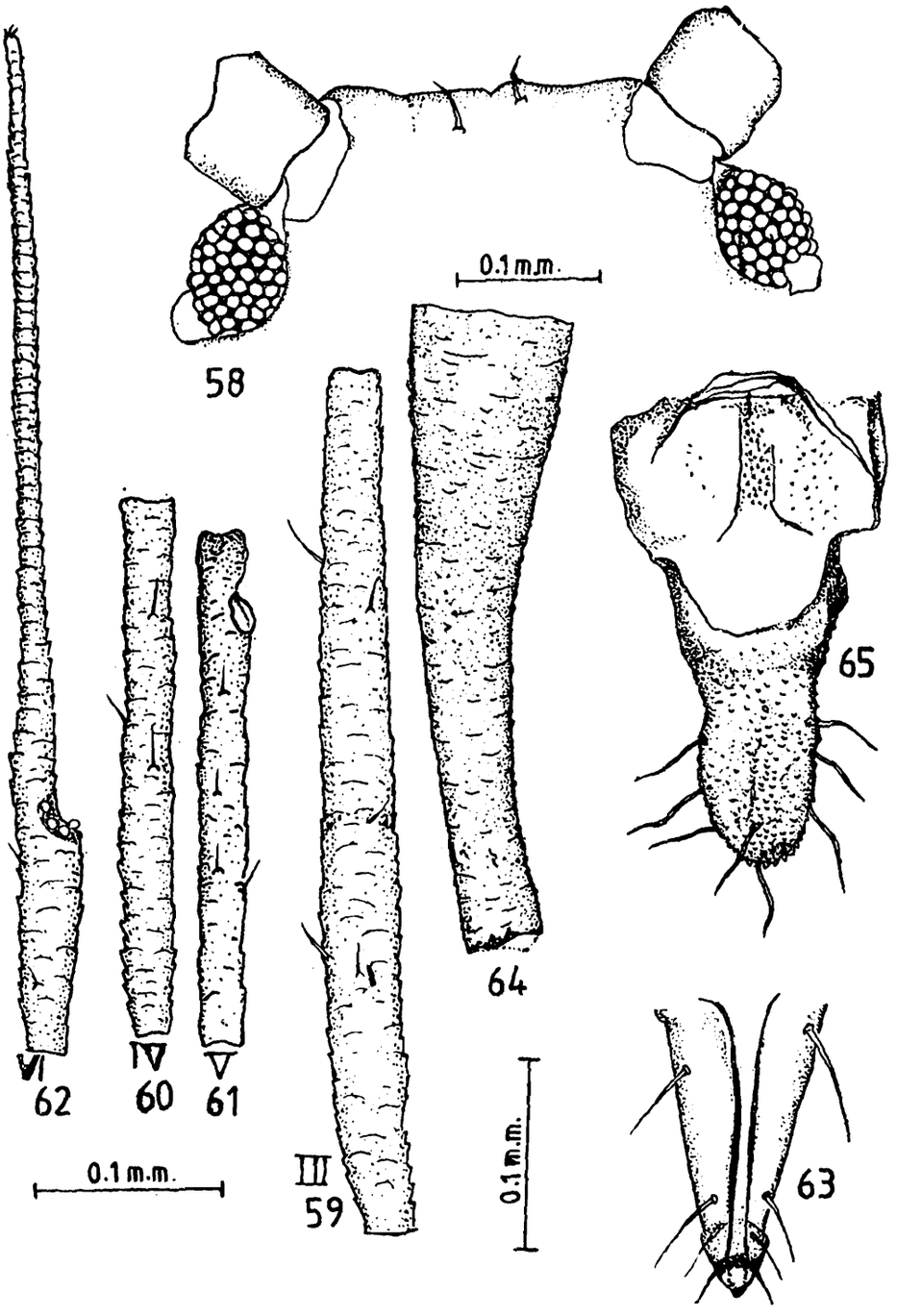
Figs. 41-46. *Aphis craccivora* Koch : Aptera. 41, Head ; 42, a. s. I-IV ; 43, a. s. V-VI ; 44, u. r. s. ; 45, Siphunculus ; 46, Cauda.



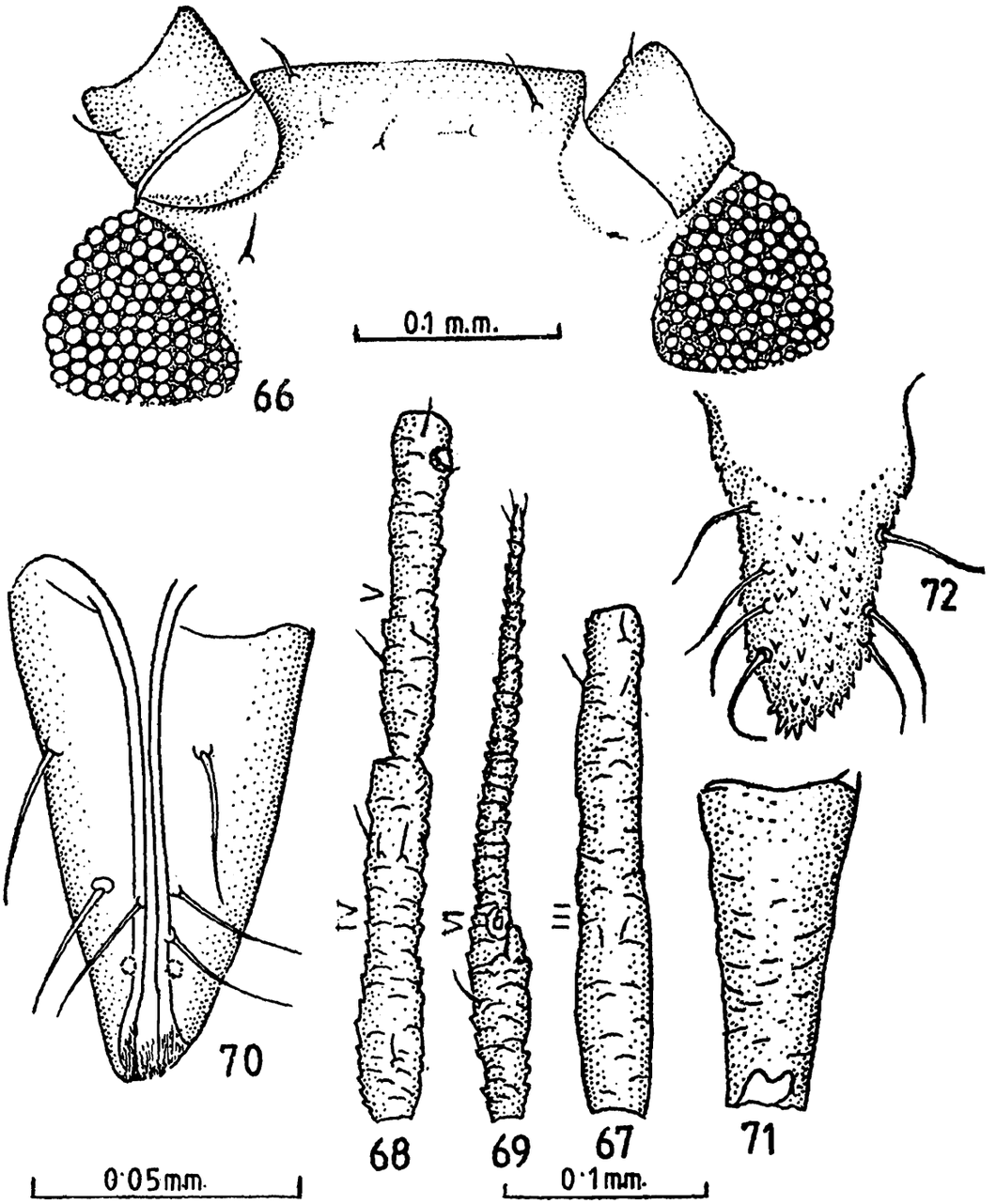
Figs. 47-50, *Aphis craccivora* Koch : Aptera. 47, posterior abdominal dorsum ; Alata. 48, posterior abdominal dorsum ; 49, Antenna ; 50, Hind wing.



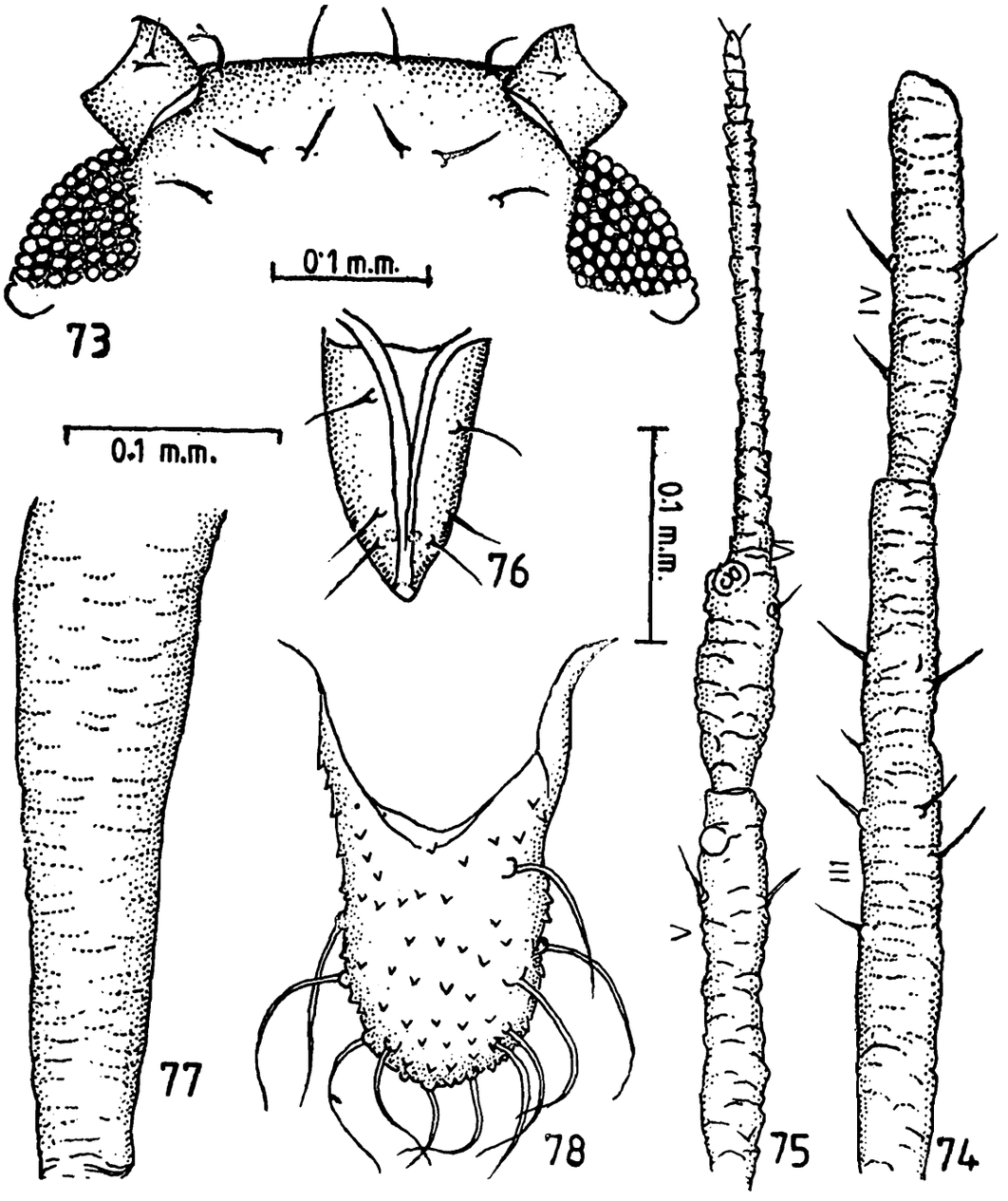
Figs. 51-57. *Aphis craccivora* Koch : Alata. 51, Head ; 52, a. s. III & IV ; 53, a. s. V & VI ; 54, a. s. III enlarged ; 55, u. r. s. ; 56, Siphunculus ; 57, Cauda.



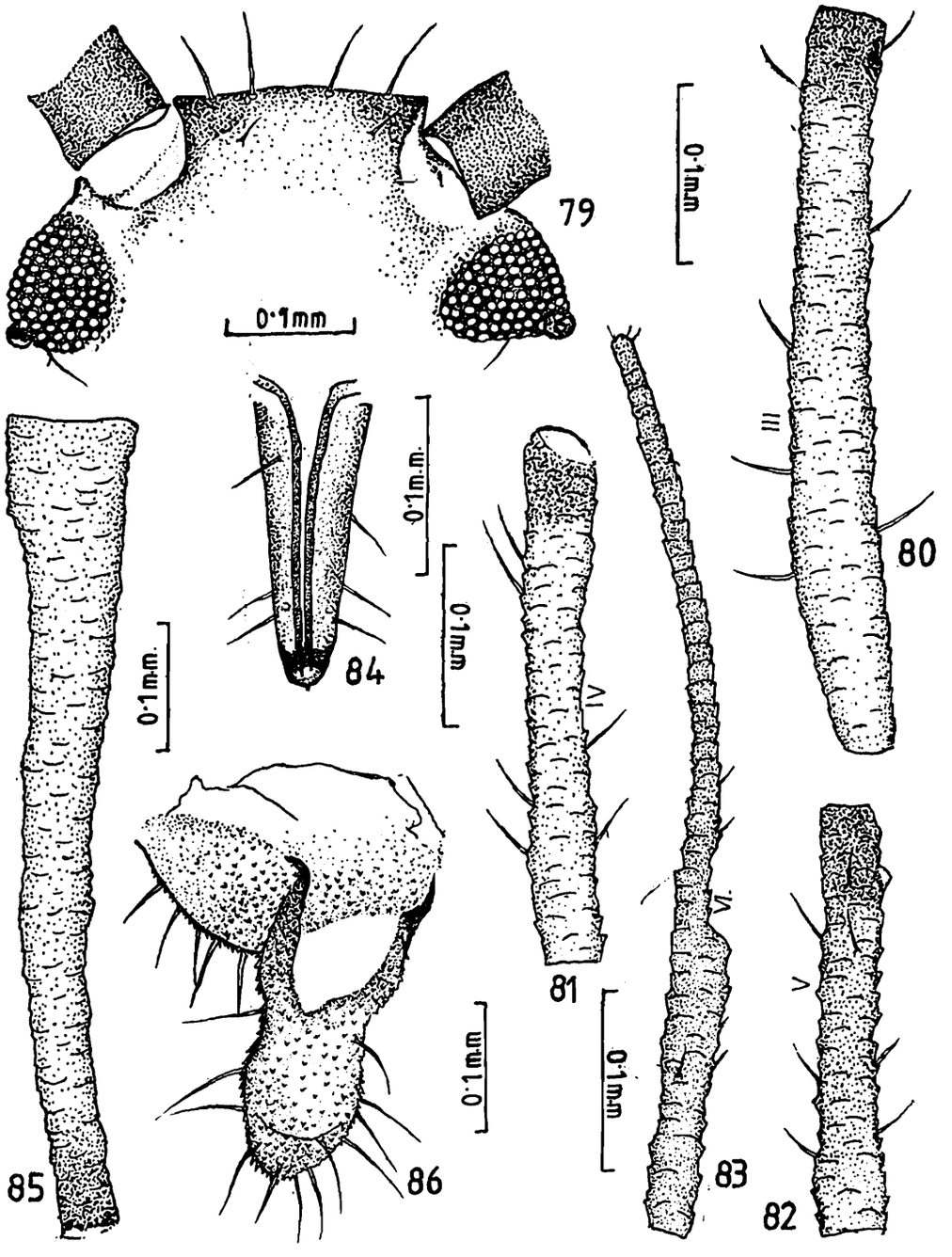
Figs. 58-65. *Aphis eugenie* v. d. Goot : Aptera. 58, Head ; 59, a.s. III ; 60, a. s. IV ; 61, a. s. V ; 62, a. s. VI ; 63, u. r. s. ; 64, Siphunculus ; 65, Cauda.



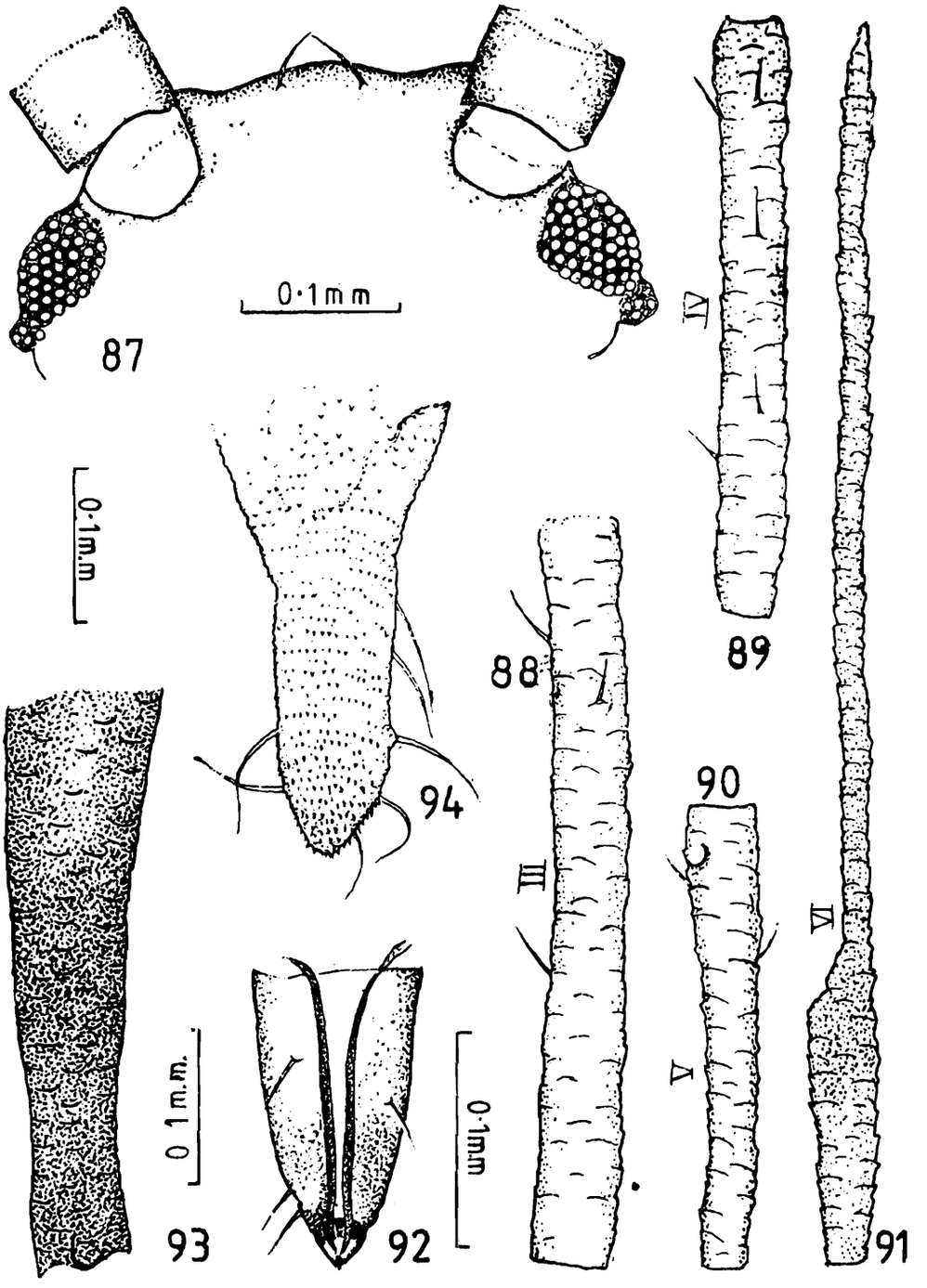
Figs. 66-72. *Aphis euphorbiae* Kaltenbach : Aptera. 66, Head ; 67, a. s. III ; 68, a. s. IV & V ; 69, a. s. VI ; 70, u. r. s. ; 71, Siphunculus ; 72, Cauda.



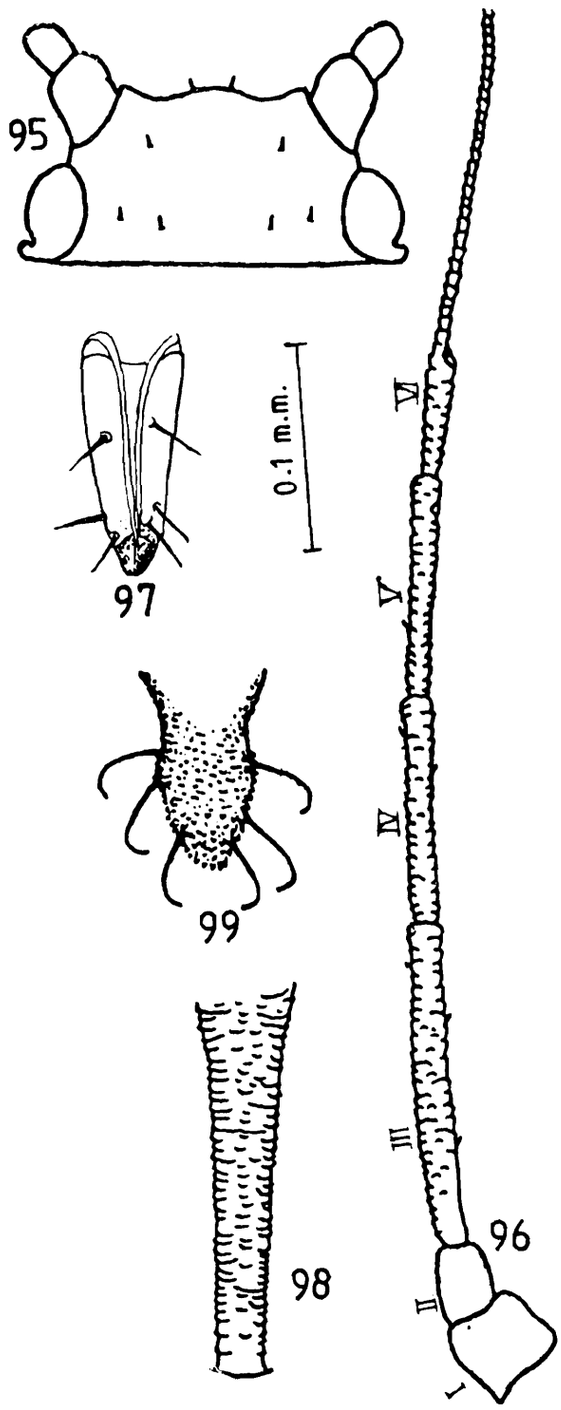
Figs. 73-78. *Aphis fabae* Scopoli Complex : Aptera. 73, Head ; 74, a. s. III & IV ; 75, a. s. V & VI ; 76, u. r. s. ; 77, Siphunculus ; 78, Cauda.



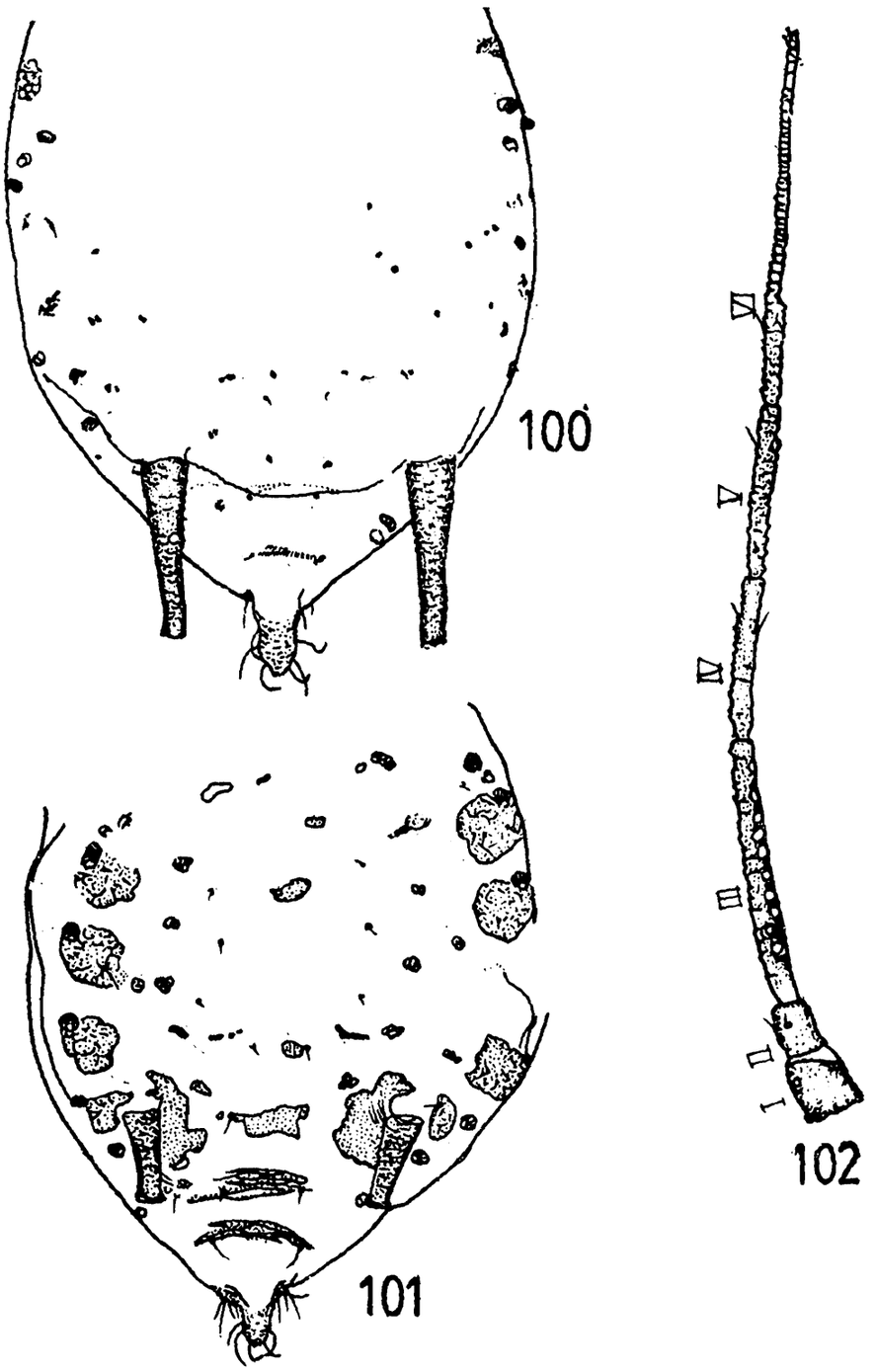
Figs. 79-86. *Aphis farinosa* Gmelin : Aptera. 79, Head ; 80, a. s. III ; 81, a. s. IV ; 82. a. s. V ; 83, a. s. VI ; 84, u. r. s. ; 85, Siphunculus : 86, Cauda.



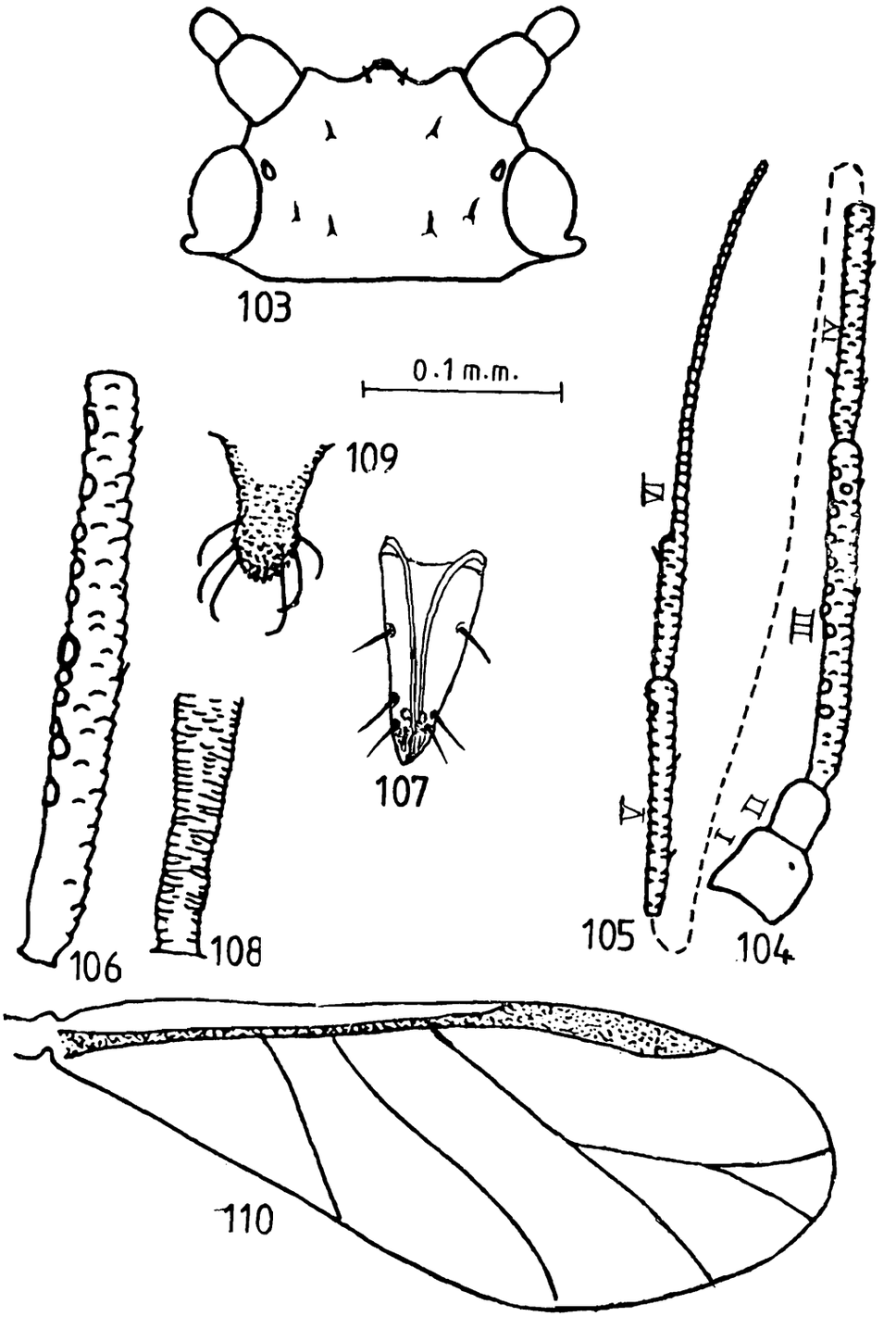
Figs. 87-94. *Aphis glycines* Matsumura : Aptera. 87, Head ; 88, a. s. III ; 89, a. s. IV ; 90, a. s. V ; 91, a. s. VI ; 92, u. r. s. ; 93, Siphunculus ; 94, Cauda.



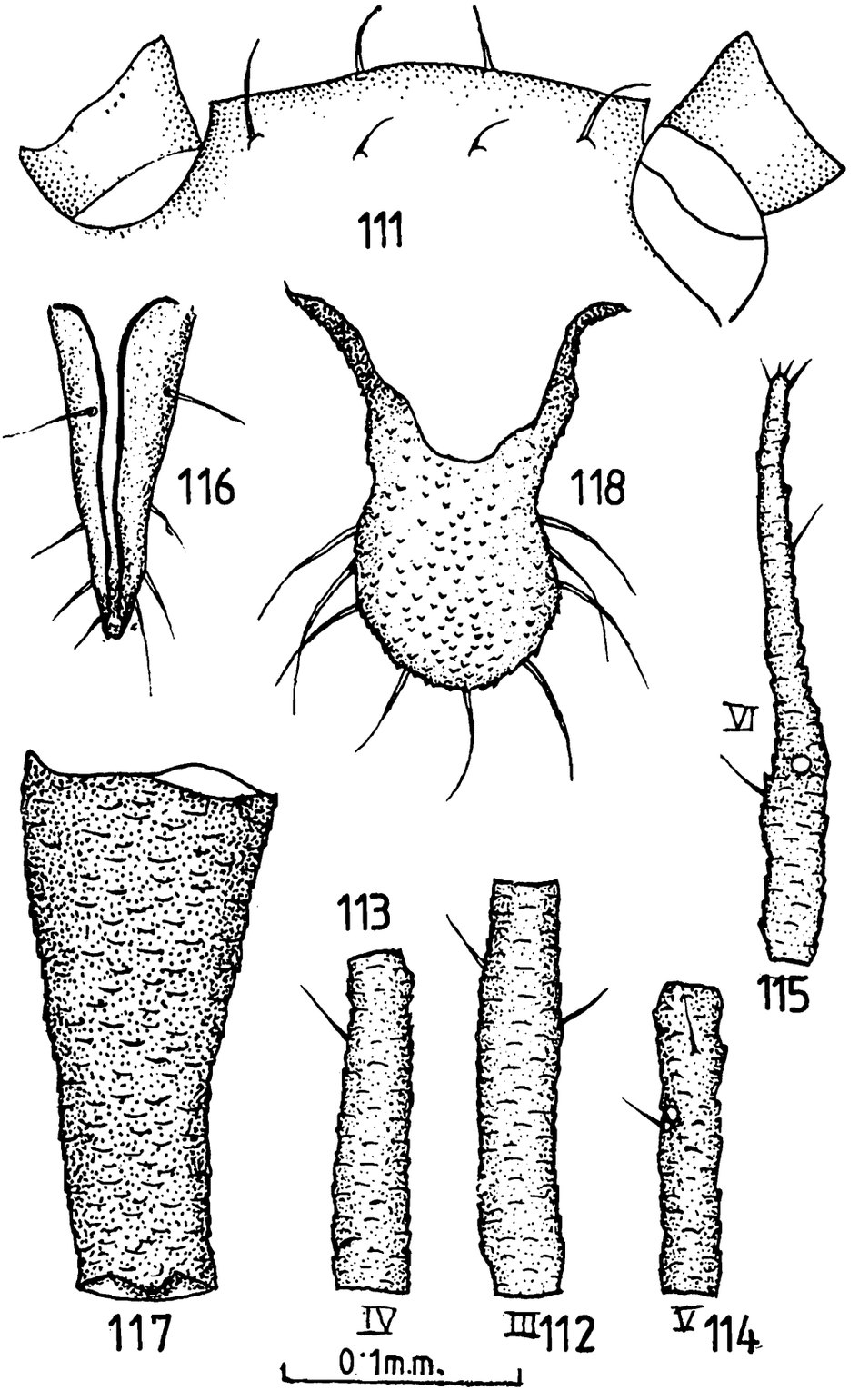
Figs. 95-99. *Aphis gossypii* Glover : Aptera. 95, Head ; 96, antenna ; 97, u. r. s. ; 98, Siphunculus ; 99, Cauda.



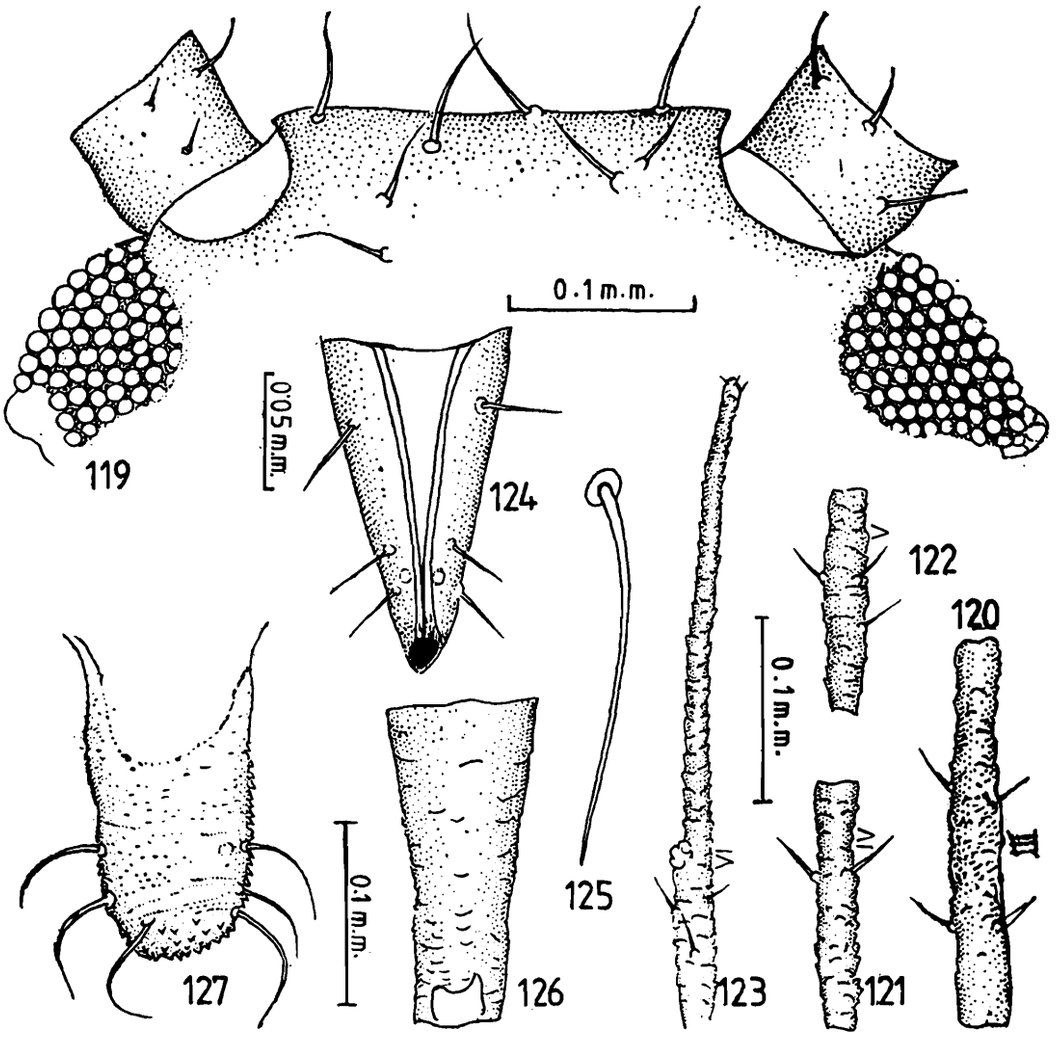
Figs. 100-102. *Aphis gossypii* Glover : Aptera. 100, posterior abdominal dorsum ; 101, Alata. posterior abdominal dorsum ; 102, Alata. antenna.



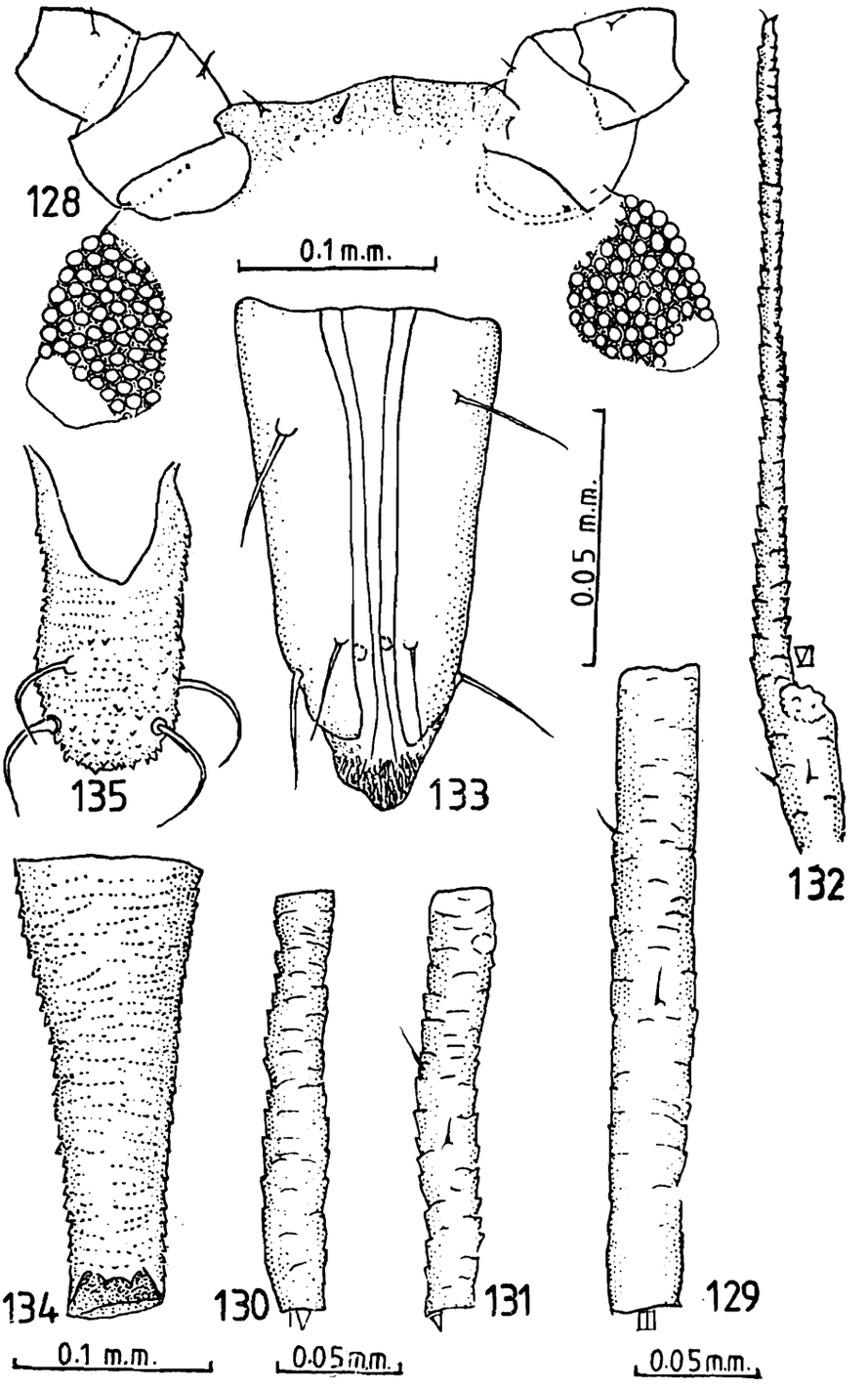
Figs. 103-110. *Aphis gossypii* Glover : Alata. 103, Head ; 104, a. s. I-IV ; 105, a. s. V & VI ; 106, a. s. III enlarged, showing secondary rhinaria ; 107, u. r. s. ; 108, Siphunculus ; 109, Cauda ; 110, Hindwing.



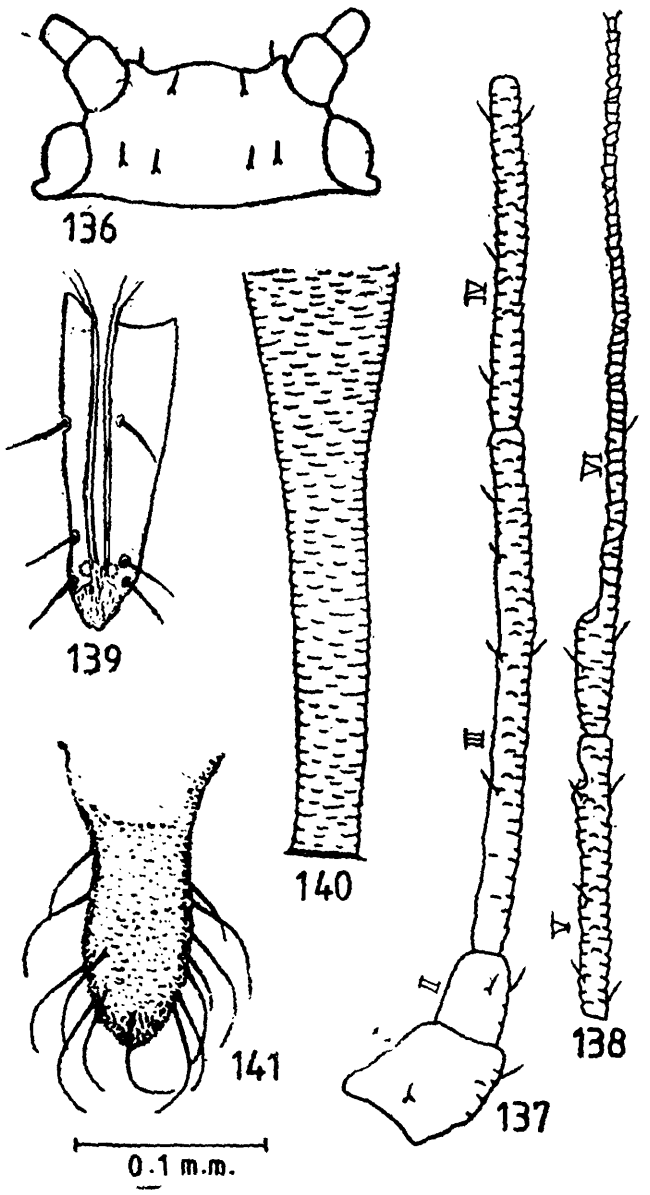
Figs. 111-118. *Aphis kurosawai* Takahashi : Aptera. III, Head ; 112, a. s. III ; 113, a. s. IV ; 114, a. s. V ; 115, a. s. VI ; 116, u. r. s. ; 117, Siphunculus ; 118, Cauda.



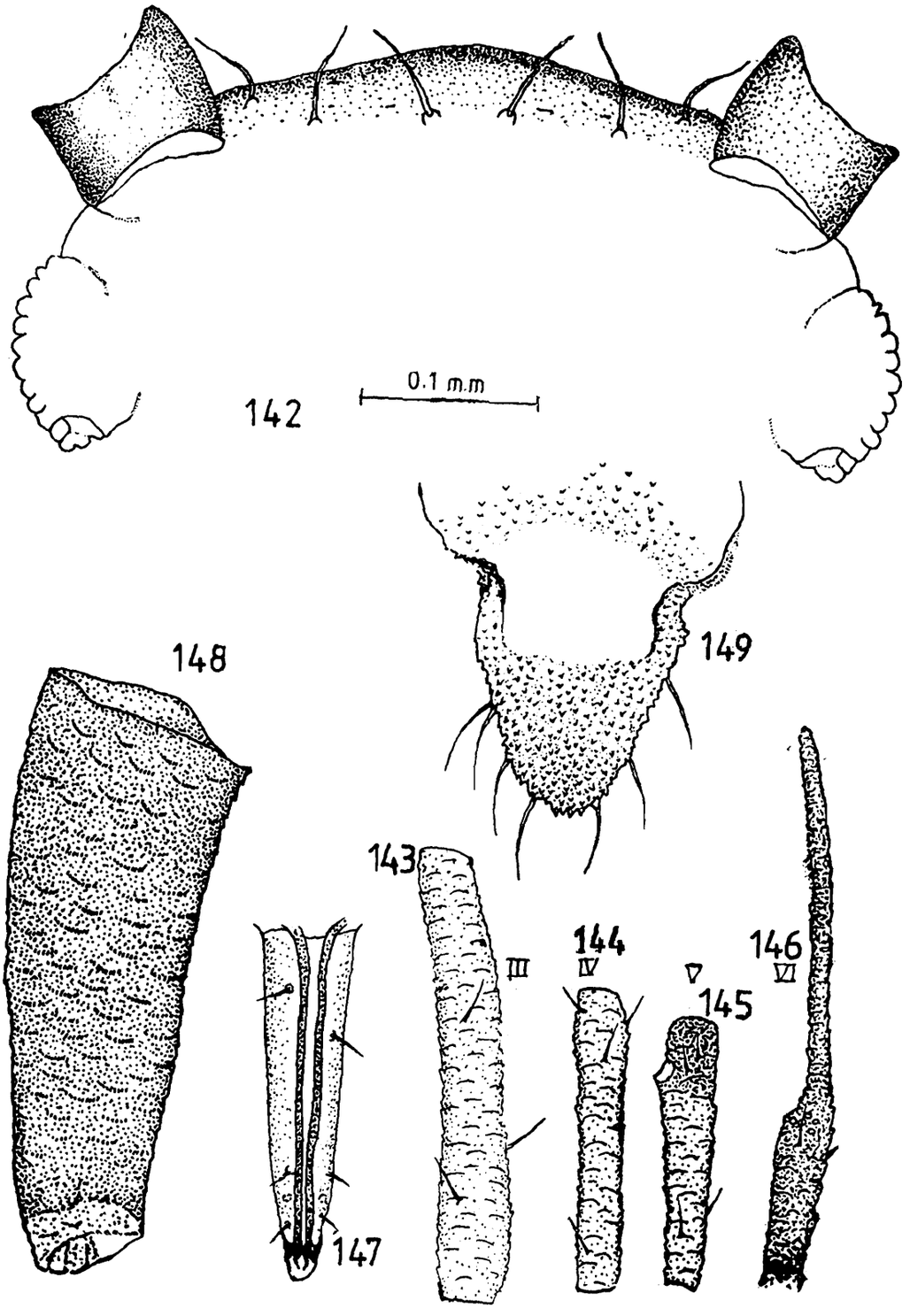
Figs. 119-127. *Aphis longisetosus* Basu : Aptera. 119, Head ; 120, a. s. III ; 121, a. s. IV ; 122, a. s. V ; 123, a. s. VI ; 124, u. r. s. ; 125, dorsal hair ; 126, Siphunculus ; 127, Cauda.



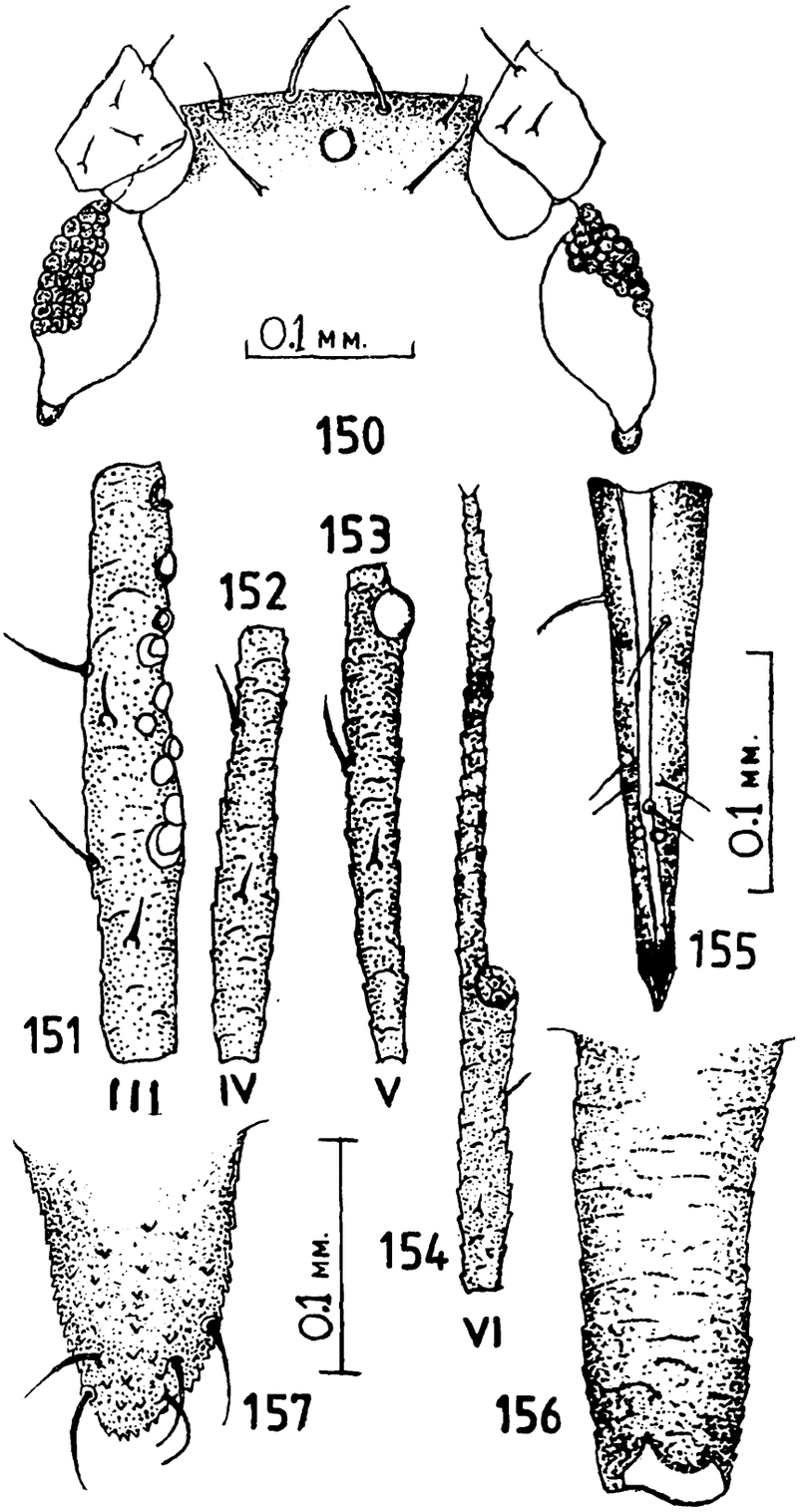
Figs. 128-135. *Aphis nasturtii* Kaltenbach : Aptera. 128, Head ; 129, a. s. III ; 130, a. s. IV ; 131, a. s. V ; 132, a. s. VI ; 133 u. r. s. ; 134, Siphunculus ; 135, Cauda.



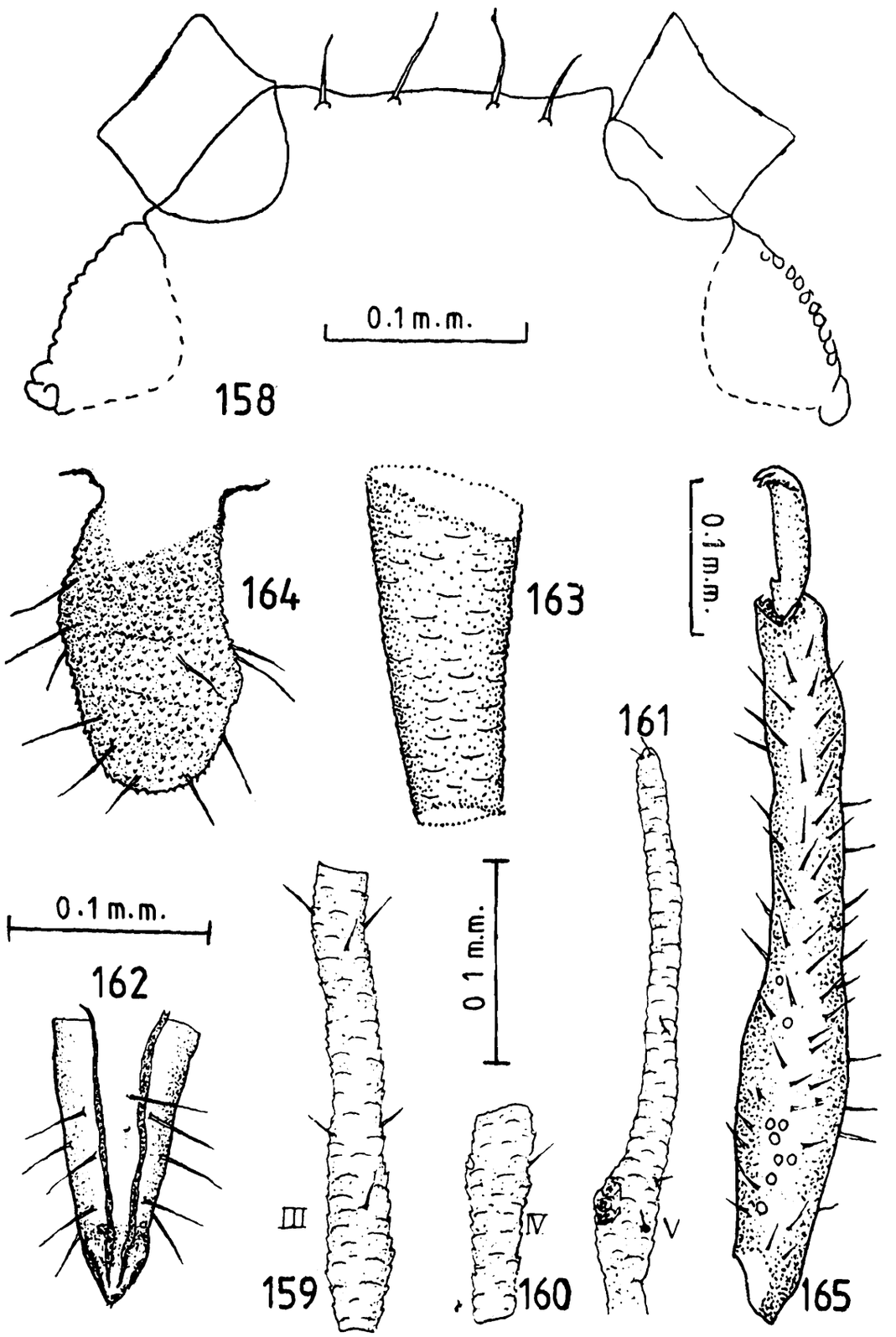
Figs. 136-141. *Aphis nerii* B. d. F. : Aptera 136, Head ; 137, a. s. I-IV ; 138, a. s. V-VI ; 139, u. r. s ; 140, Siphunculus ; 141, Cauda.



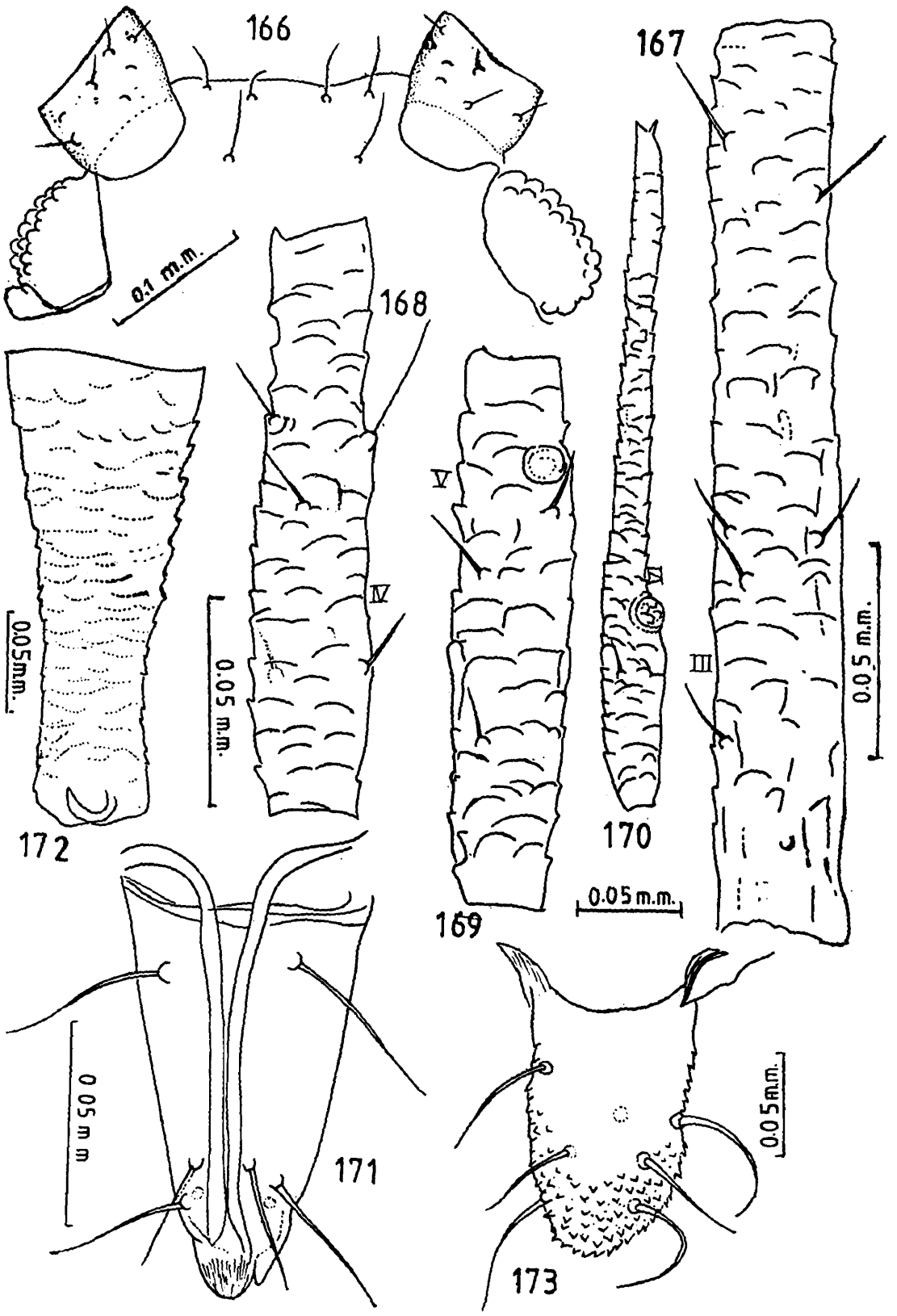
Figs. 142-149. *Aphis paraverbasci* Chakrabarti : Aptera. 142, Head ; 143, a. s. III ; 144, a. s. IV ; 145, a. s. V ; 146, a. s VI ; 147, u. r. s. ; 148, Siphunculus ; 149, Cauda.



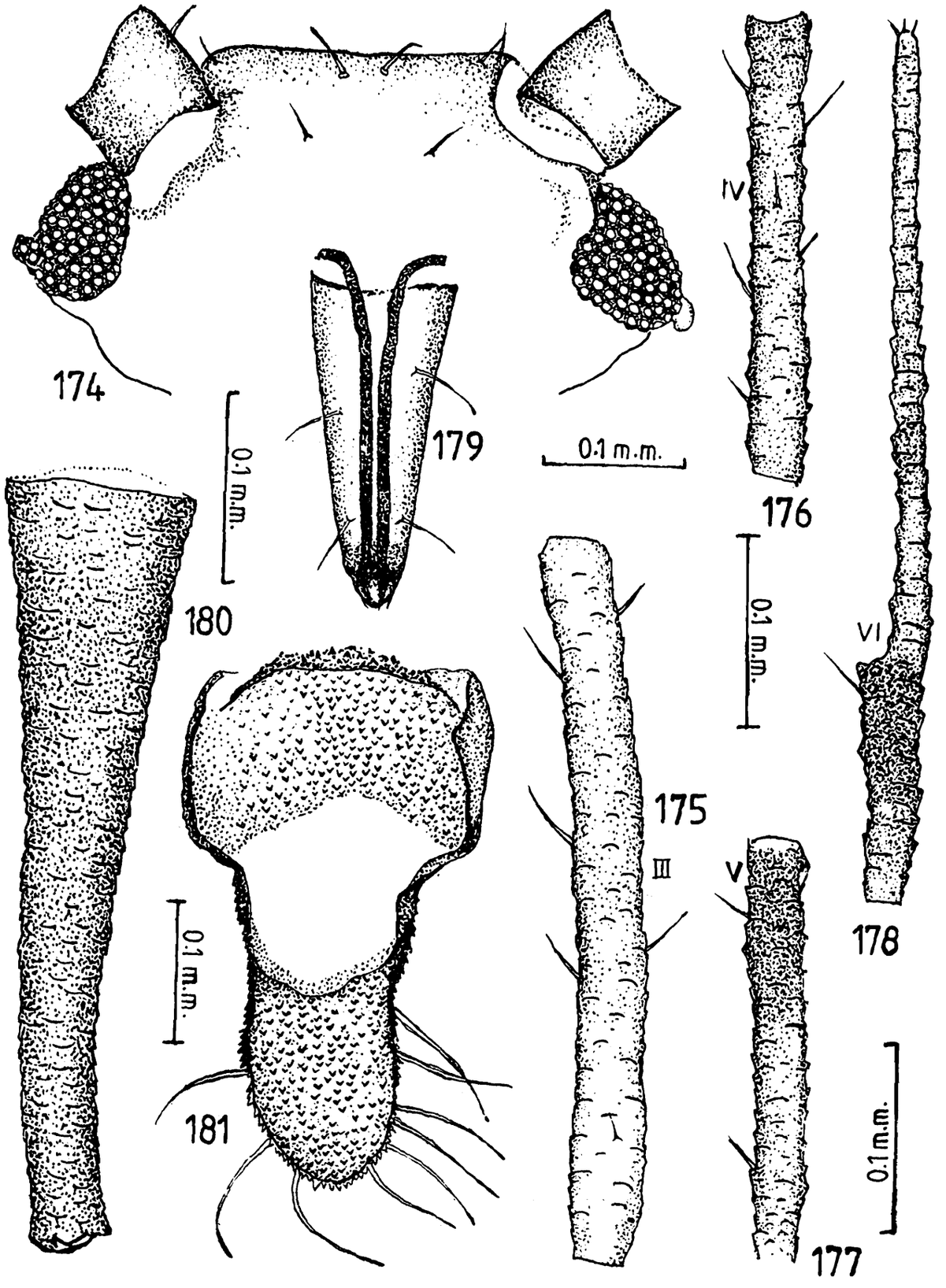
Figs. 150-157. *Aphis paraverbasci* Chakrabarti : Alata. 150, Head ; 151, a. s. III ; 152, a. s. IV ; 153, a. s. V ; 154, a. s. VI ; 155, u. r. s. ; 156, Siphunculus ; 157, Cauda,



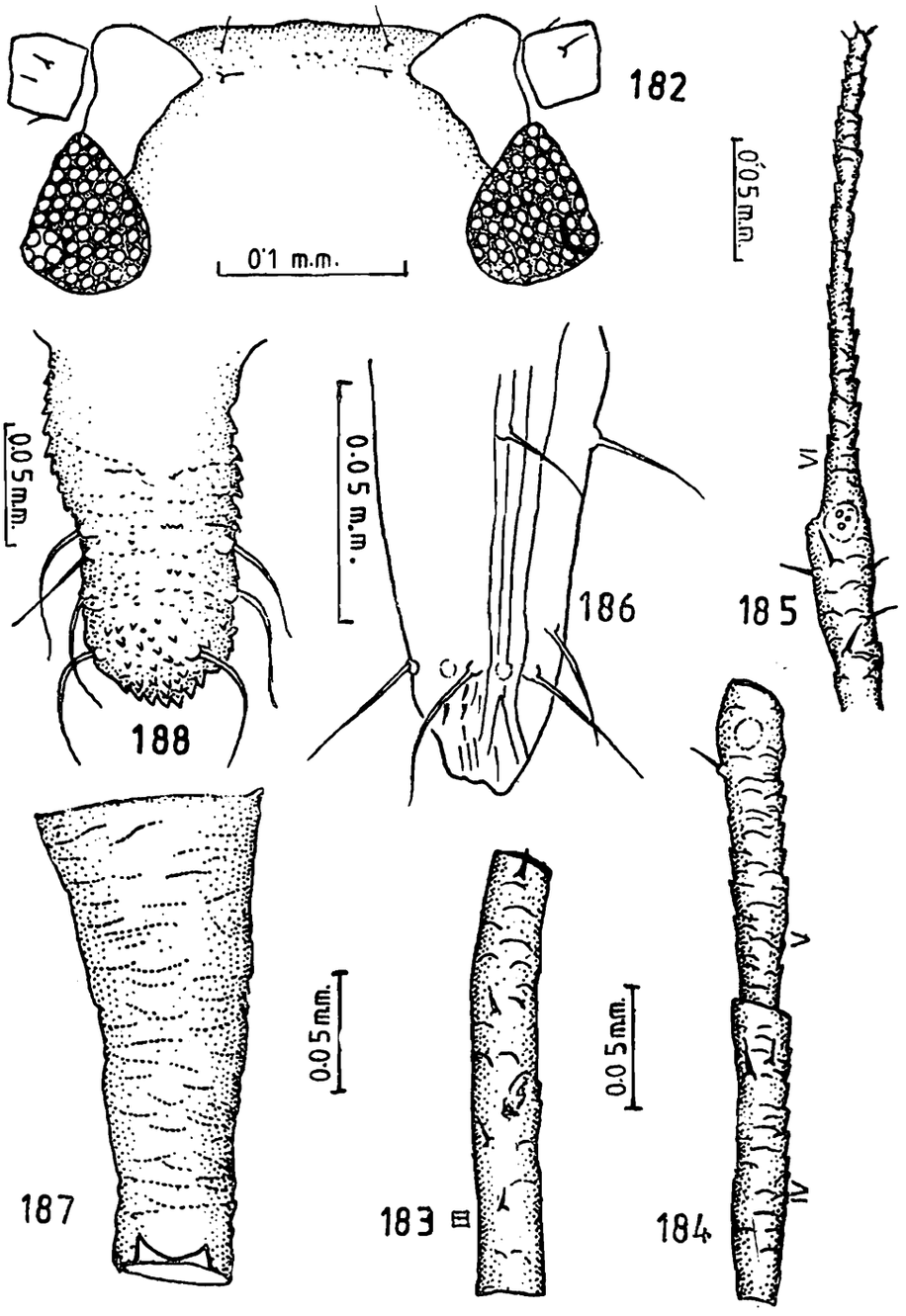
Figs. 158-165. *Aphis pollinosa* Walker : Ovipara. 158, Head ; 159, a. s. III ; 160, a. s. IV ; 161, a. s. V ; 162, u. r. s. ; 163, Siphunculus ; 164, Cauda ; 165, Hind tibia.



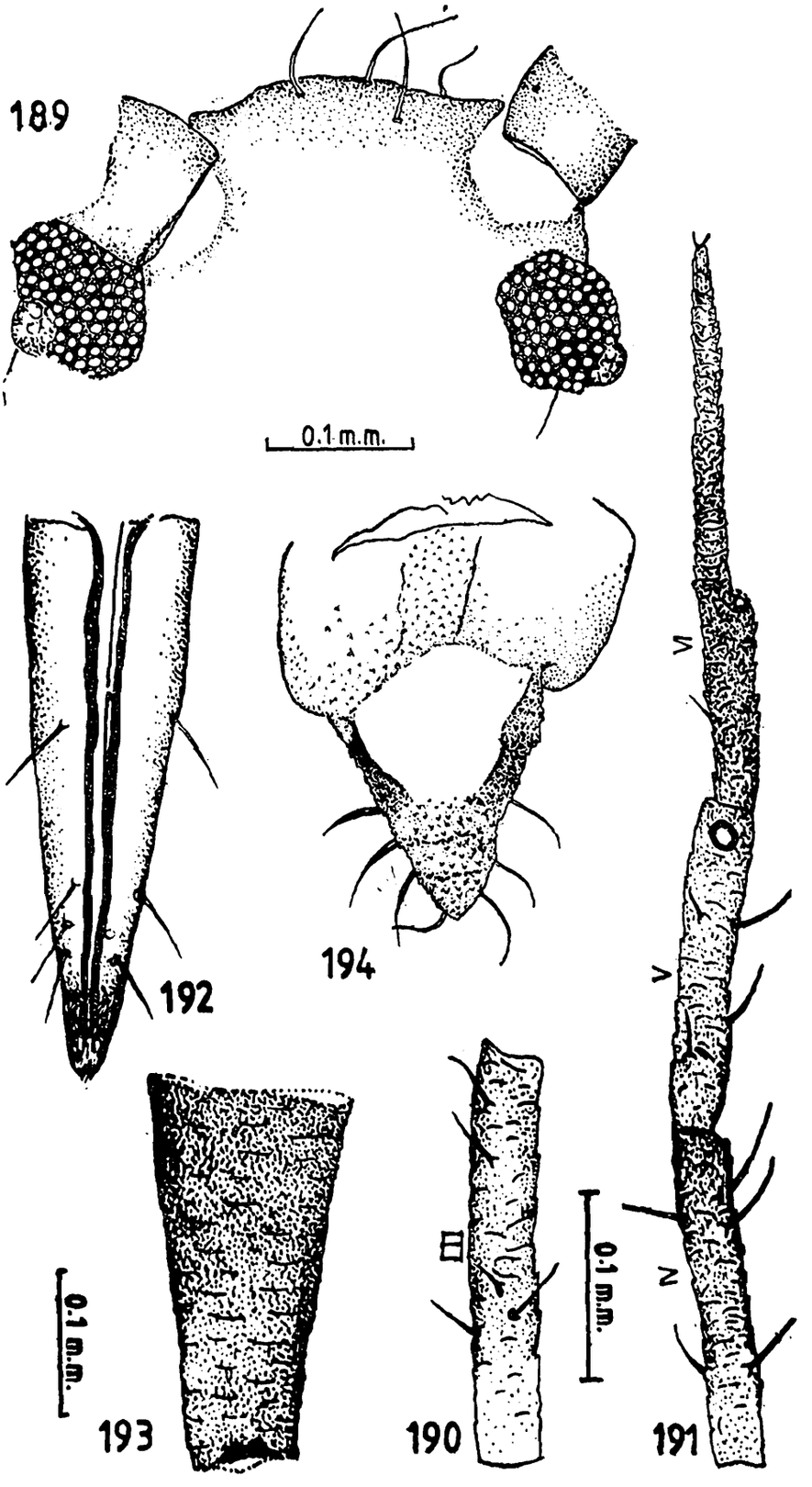
Figs. 166-173. *Aphis polygonacea* Matsumura : Aptera. 166, Head ; 167, a. s. III ; 168, a. s. IV ; 169, a. s. V ; 170, a. s. VI ; 171, u r. s. ; 172, Siphunculus ; 173, Cauda.



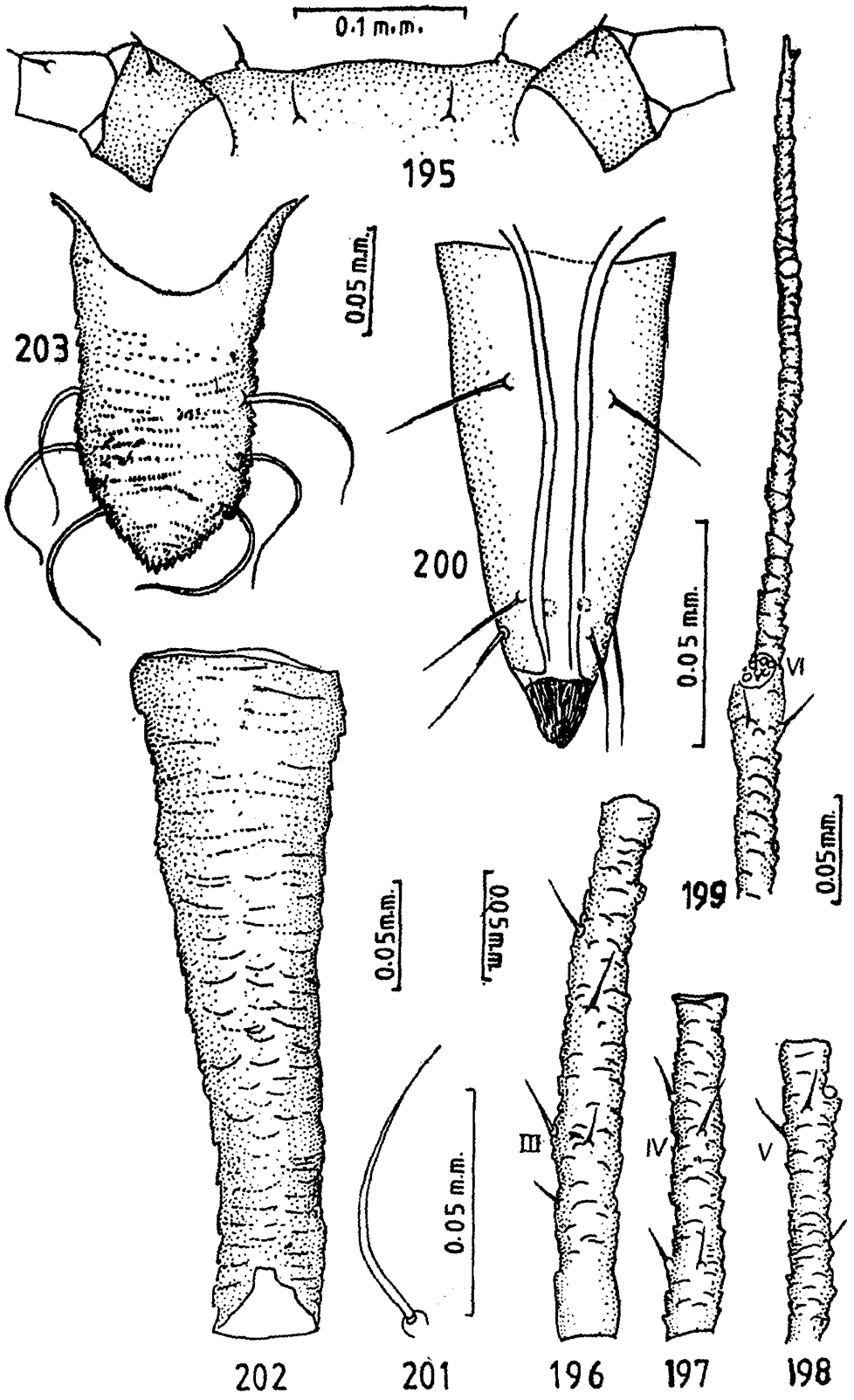
Figs. 174-181. *Aphis pomi* de Geer: Aptera. 174, Head; 175, a. s. III; 176, a. s. IV; 177, a. s. V; 178, a. s. VI; 179, u. r. s.; 180, Siphunculus; 181, Cauda.



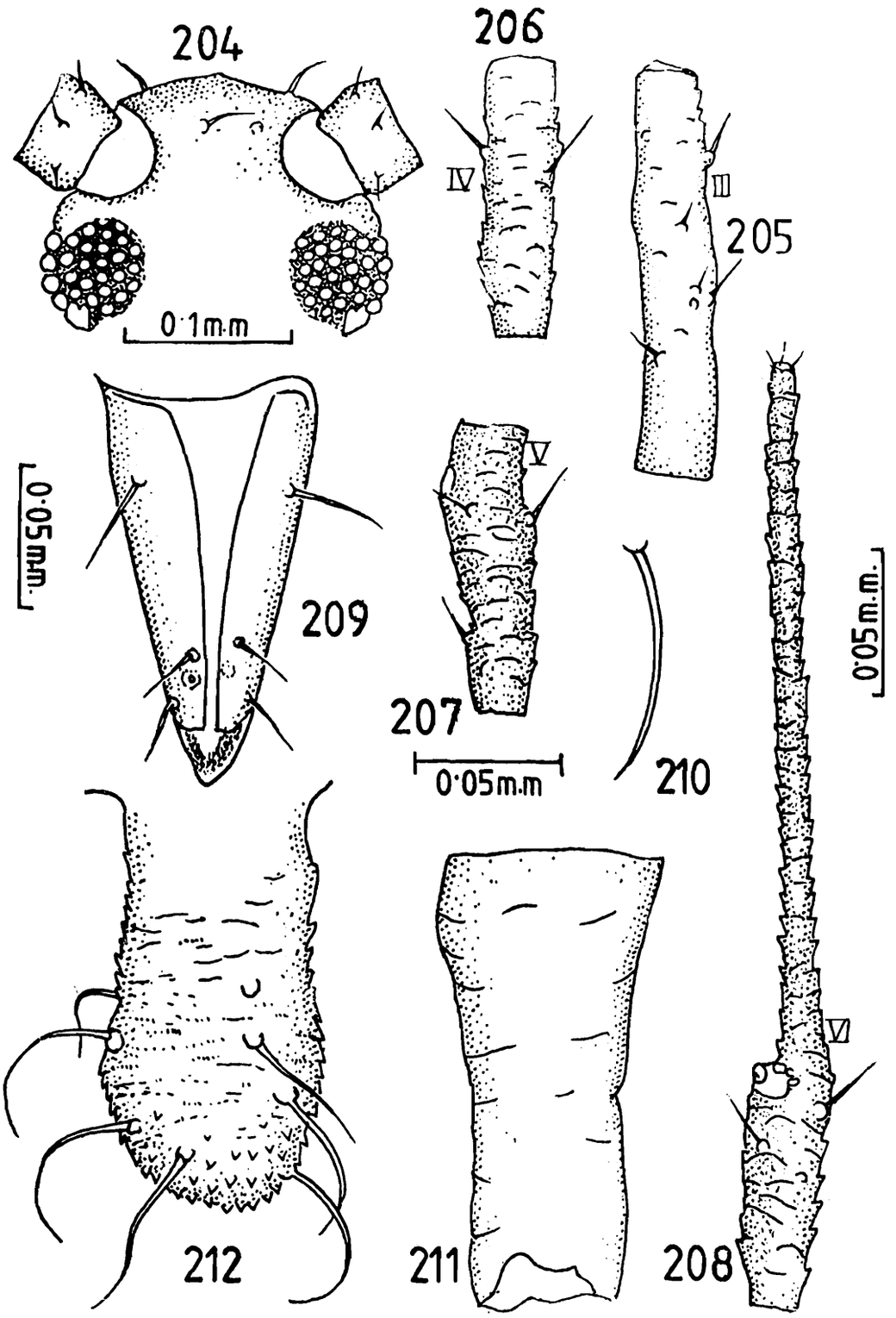
Figs. 182-188. *Aphis punicae* Passerini : Aptera. 182, Head ; 183, a. s. III ; 184, a. s. IV-V ; 185, a. s. VI ; 186, u. r. s. ; 187, Siphunculus ; 188, Cauda.



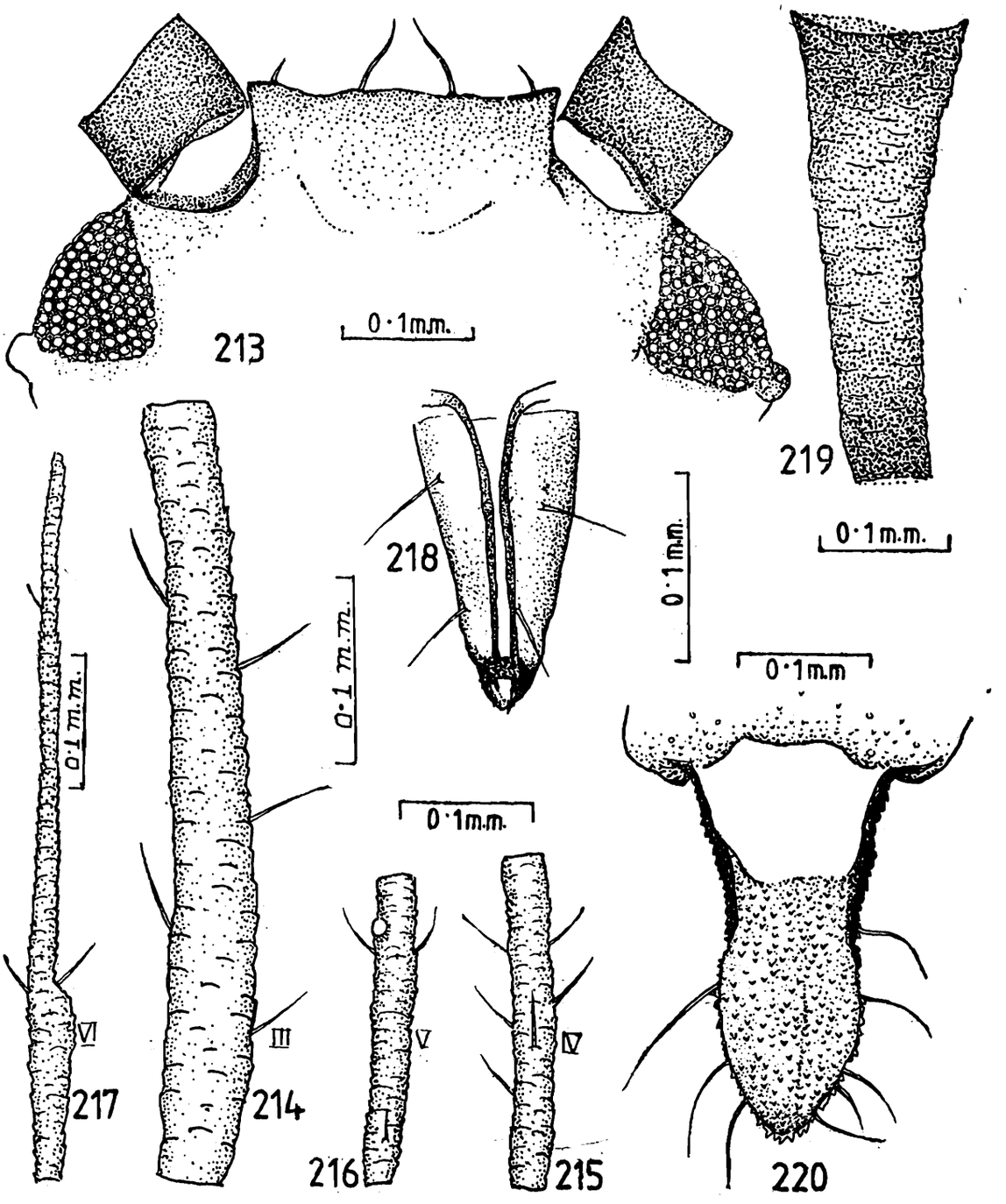
Figs. 189-194. *Aphis raji* Kumar and Burkhardt : Aptera. 189, Head ; 190, a. s. III ; 191, a. s. IV-VI ; 192, u. r. s. ; 193, Siphunculus ; 194, Cauda.



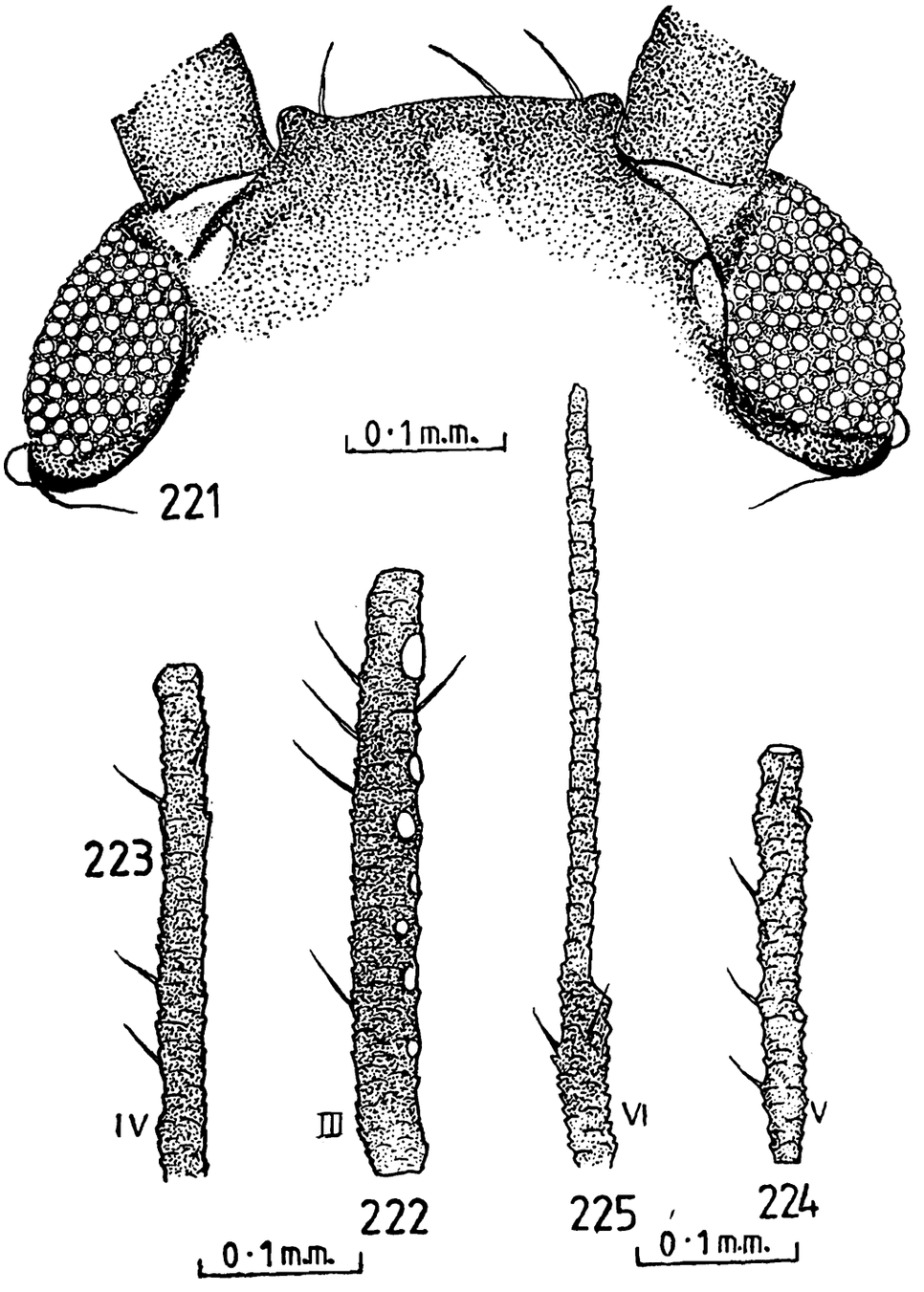
Figs. 195-203. *Aphis rhamniphila* David *et al.*: Aptera. 195, Head; 196, a. s. III; 197, a. s. IV; 198, a. s. V; 199, a. s. VI; 200, u. r. s.; 201, dorsal hair; 202, Siphunculus; 203, Cauda.



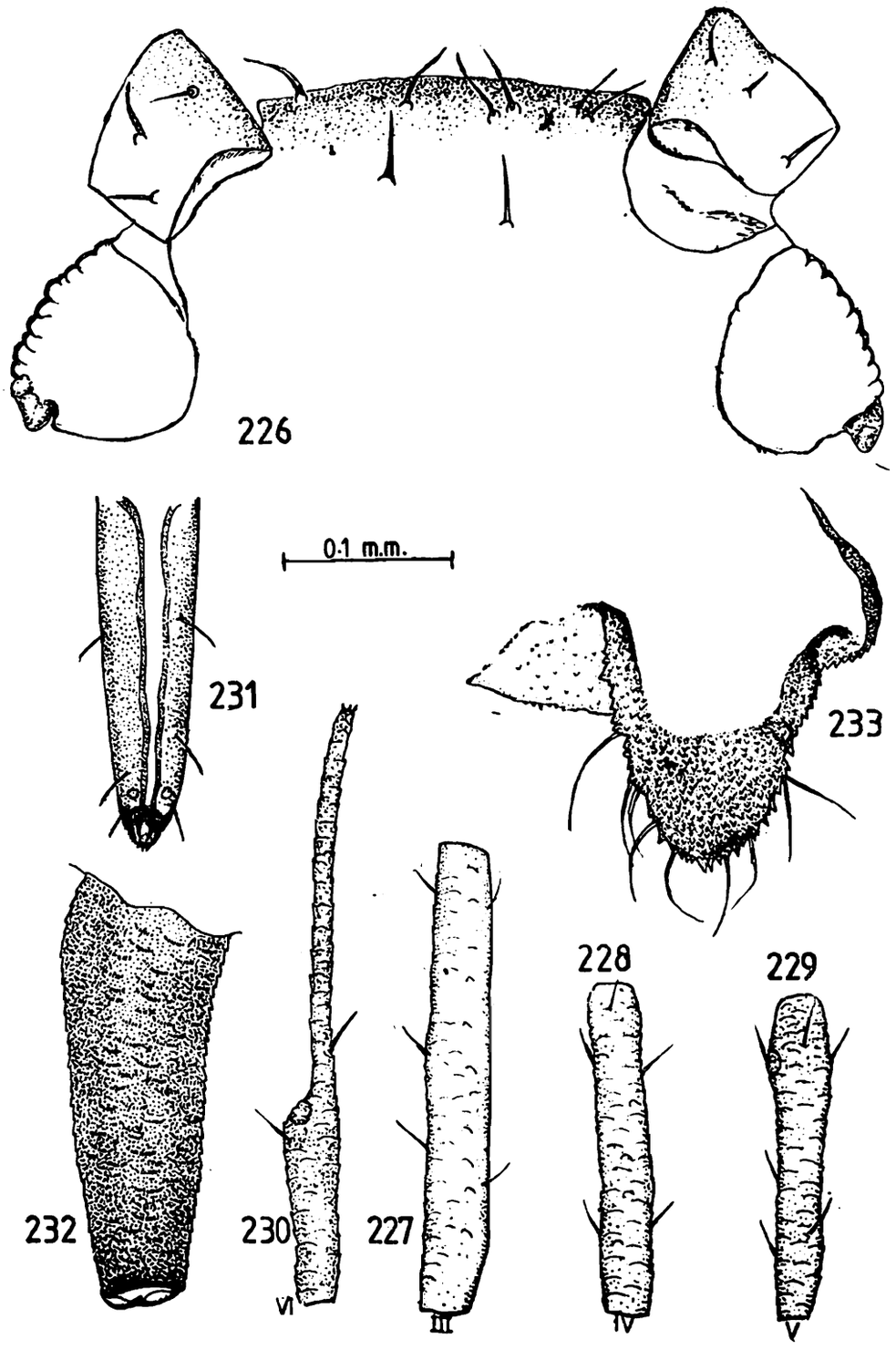
Figs. 204-212. *Aphis rubifolii* (Thomas): Aptera. 204, Head ; 205, a. s. III ; 206, a. s. IV ; 207, a. s. V ; 208, a. s. VI ; 209, u. r. s. ; 210, dorsal hair ; 211, Siphunculus ; 212, Cauda.



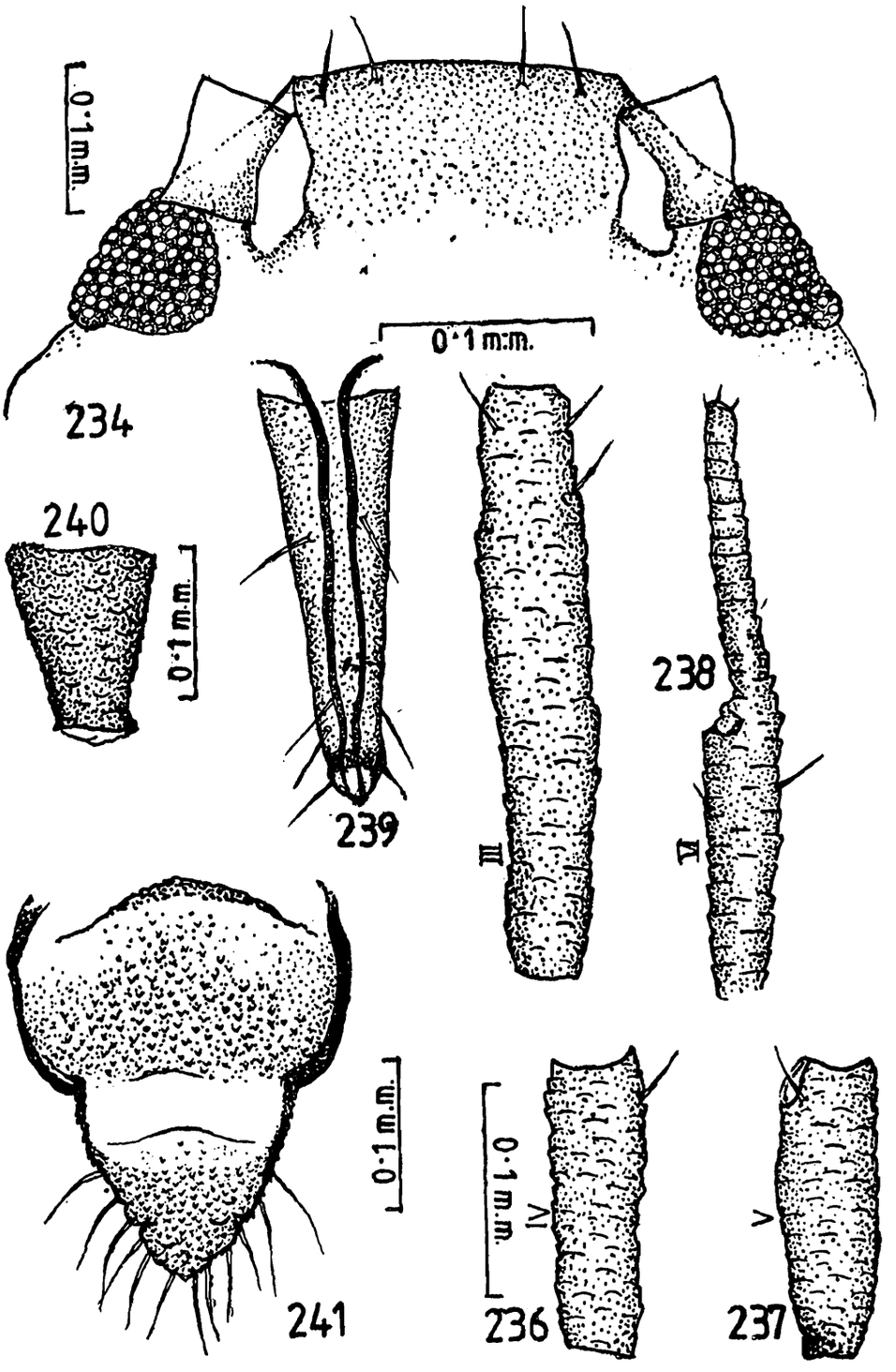
Figs. 213-220. *Aphis rumicis* Linnaeus: Aptera. 213, Head; 214, a. s. III; 215, a. s. IV; 216, a. s. V; 217, a. s. VI; 218, u. r. s.; 219, Siphunculus; 220, Cauda.



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



Figs. 226-233. *Aphis 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.



Figs. 234-241. *Aphis* (*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.

PLATES

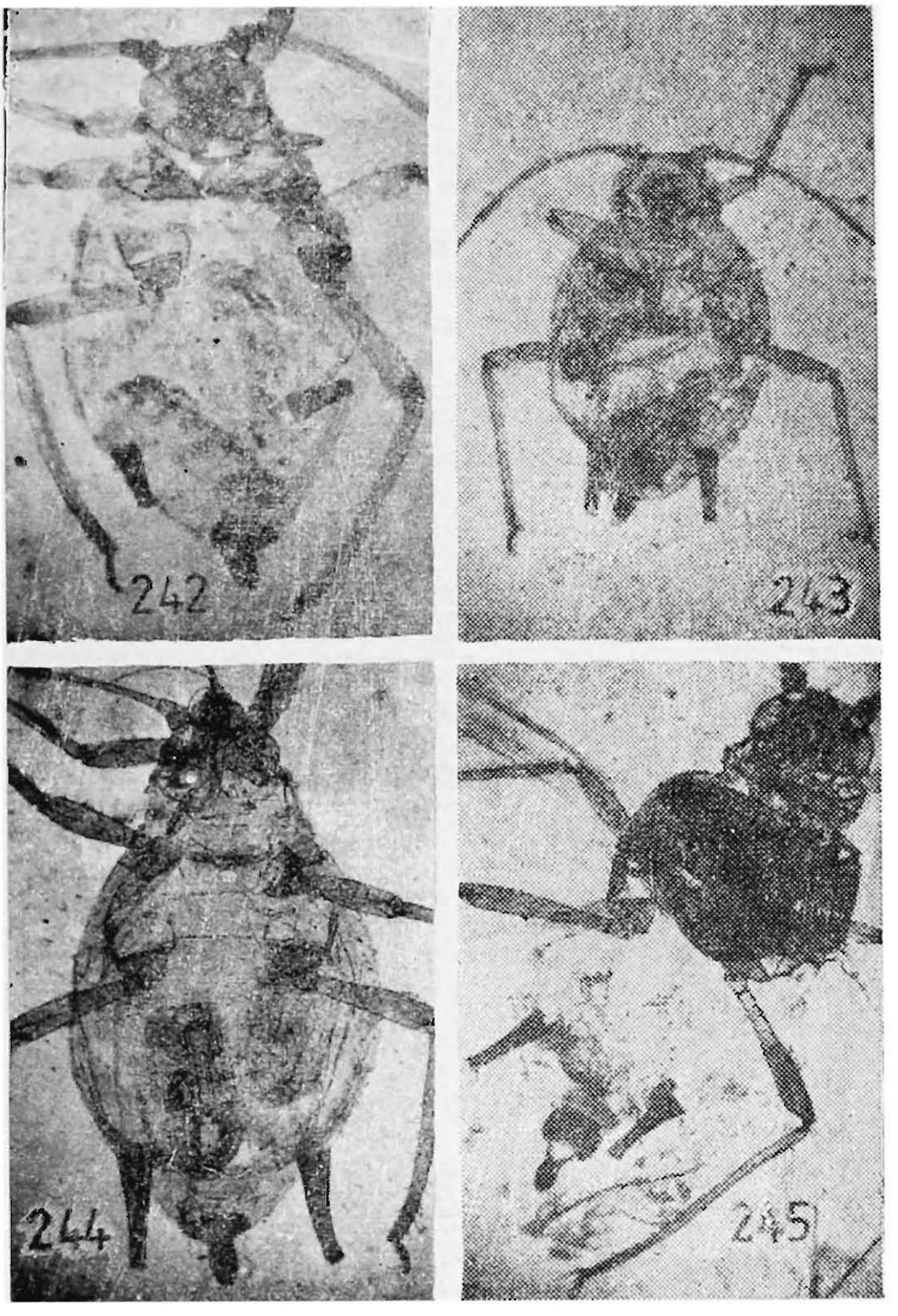


Fig. 242. *Aphis achyranthi* Theobald, Apterous viviparous female

Fig. 243. *Aphis affinis* del Guercio, Apterous viviparous female

Fig. 244. *Aphis citricola* v. d. Goot, Apterous viviparous female

Fig. 245. *Aphis citricola* v. d. Goot, Alate viviparous female

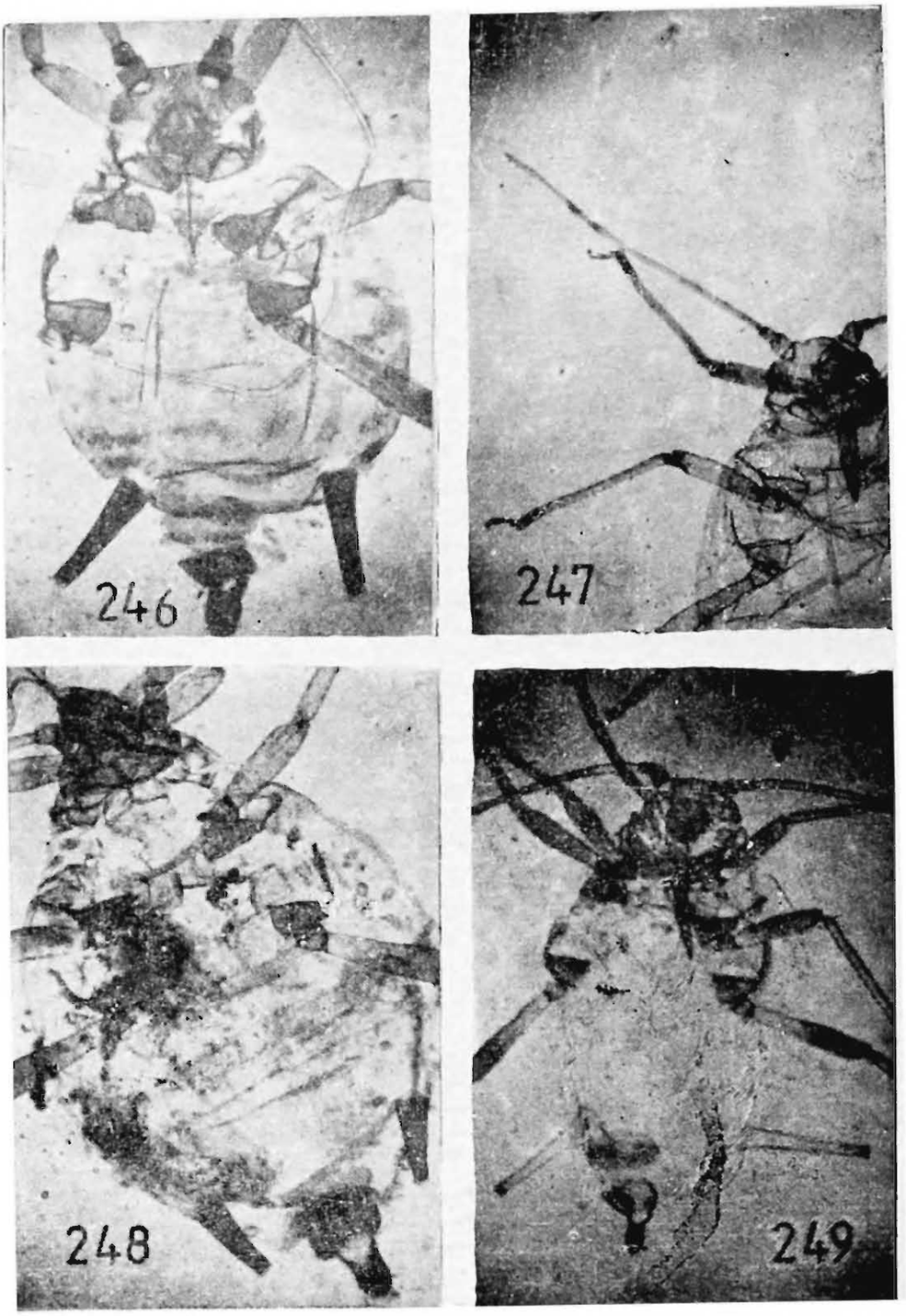


Fig. 246. *Aphis craccivora* Koch, Apterous viviparous female

Fig. 247. *Aphis eugeniae* v. d. Goot, Apterous viviparous female : anterior part showing head

Fig. 248. *Aphis fabae* Complex, Apterous viviparous female

Fig. 249. *Aphis farinosa* Gmelin, Apterous viviparous female

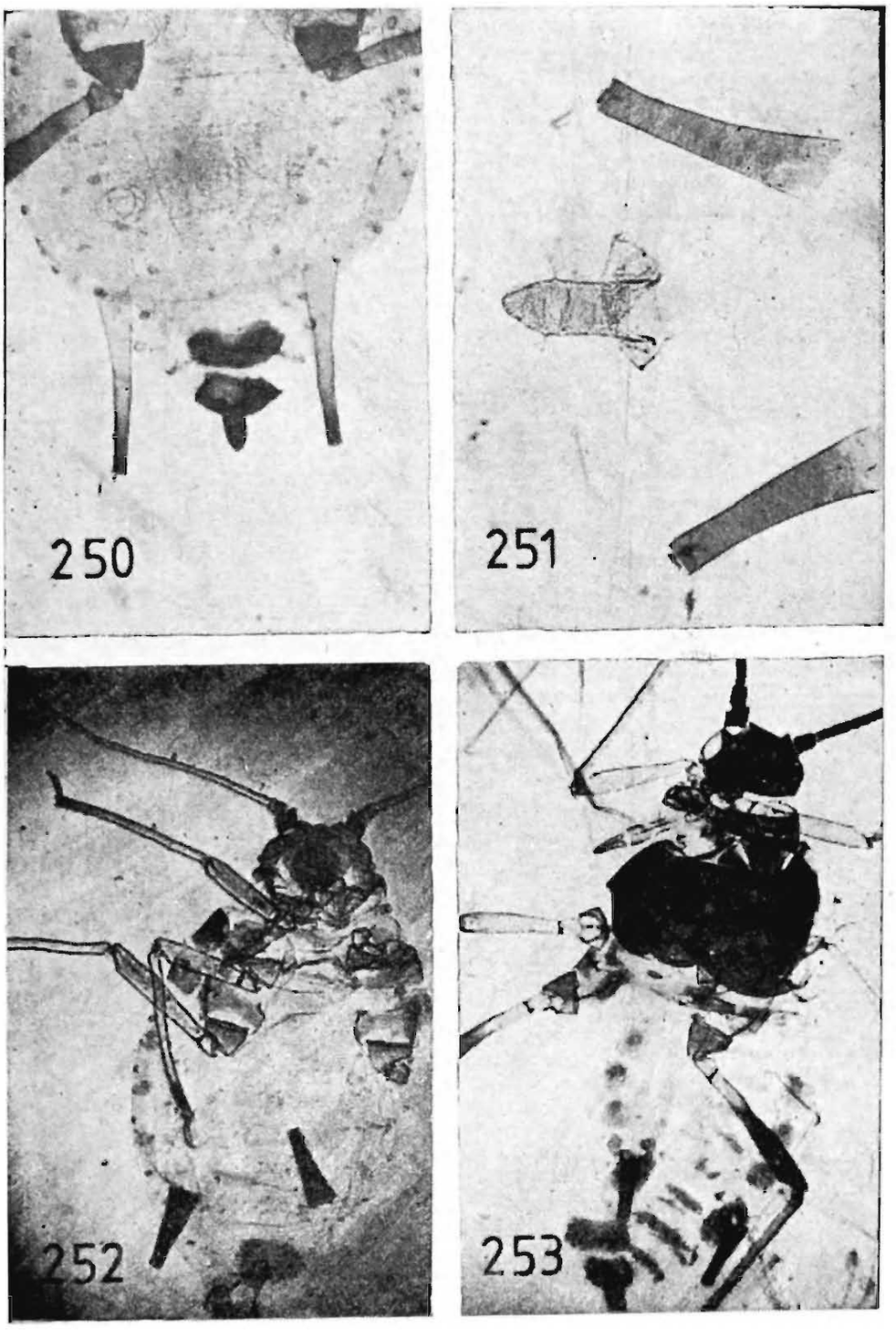


Fig. 250. *Aphis farinosa* Gmelin, Apterous viviparous female : posterior abdominal dorsum

Fig. 251. *Aphis glycines* Matsumura., Apterous viviparous female : posterior part of abdomen

Fig. 252. *Aphis gossypii* Glover, Apterous viviparous female

Fig. 253. *Aphis gossypii* Glover, Alate viviparous female

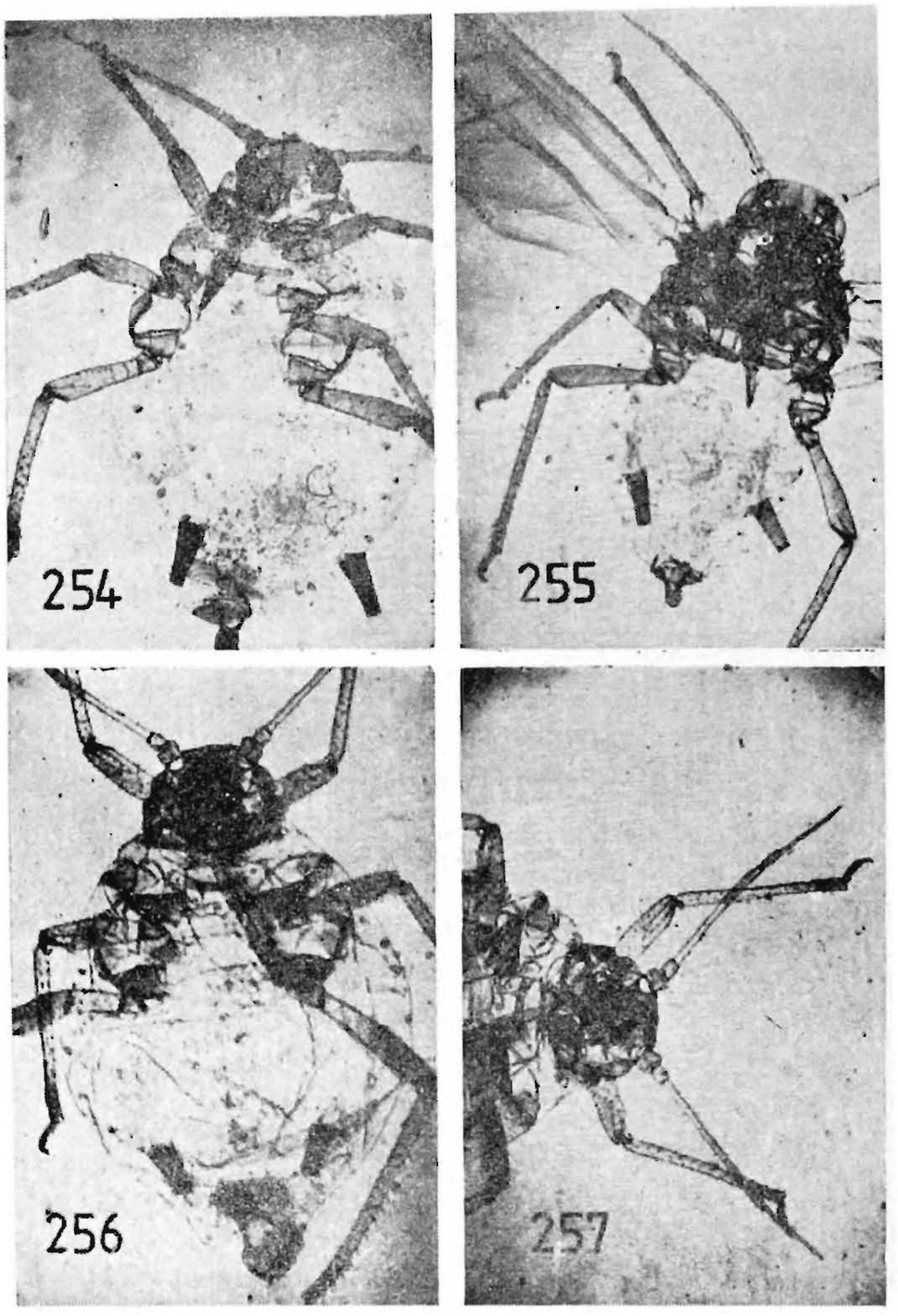


Fig. 254. *Aphis kurosawai* Takahashi, Apterous viviparous female

Fig. 255. *Aphis kurosawai* Takahashi, Alate viviparous female

Fig. 256. *Aphis longisetosa* Basu, Apterous viviparous female

Fig. 257. *Aphis longisetosa* Basu, Apterous viviparous female : anterior part showing head

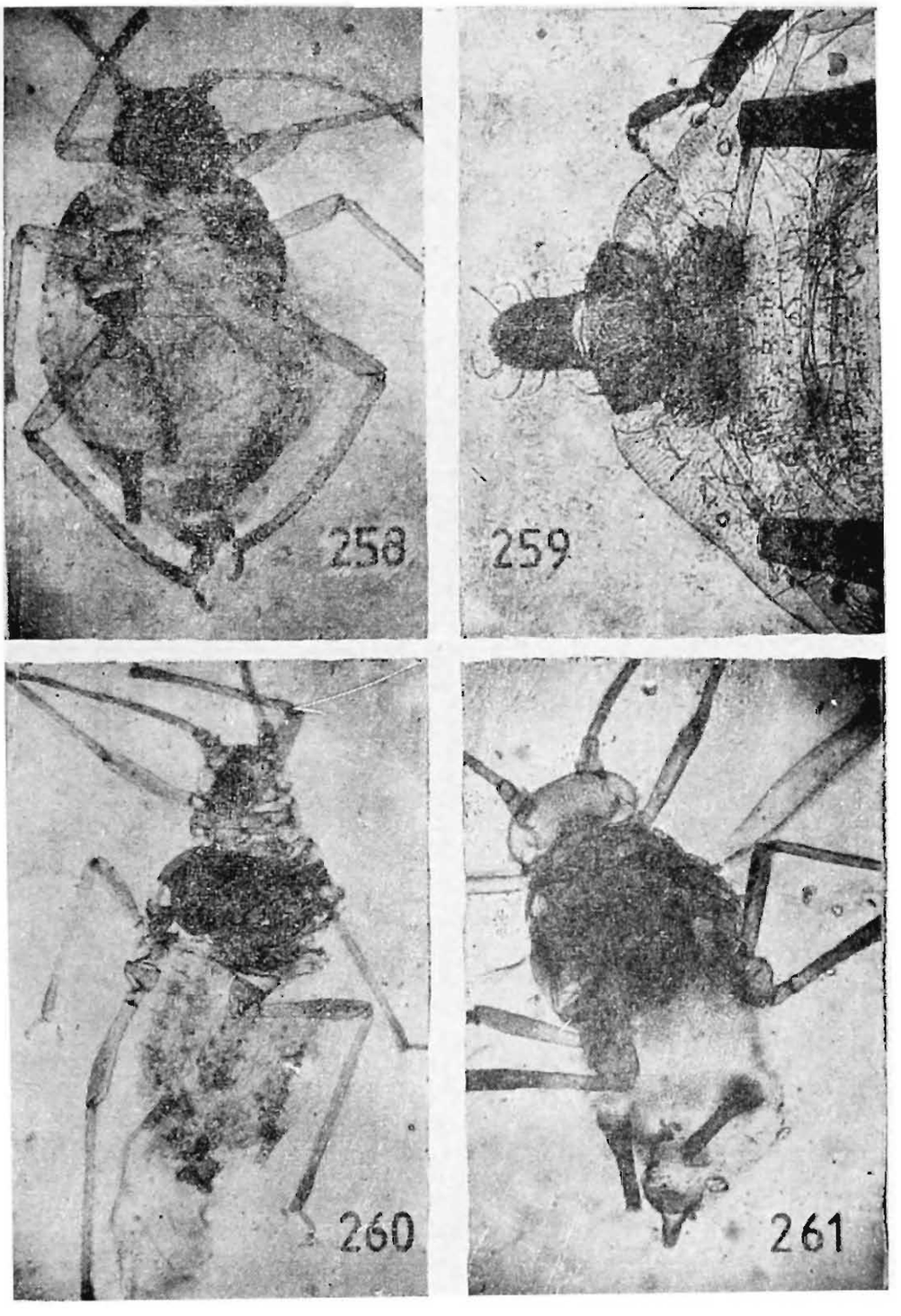


Fig. 258. *Aphis nasturtii* Kaltenbach, Apterous viviparous female

Fig. 259. *Aphis longisetosa* Basu, Apterous viviparous female : posterior abdominal portion

Fig. 260. *Aphis nasturtii* Kaltenbach, Alate viviparous female

Fig. 261. *Aphis nerii* Boyer de Fonscolombe, Alate viviparous female

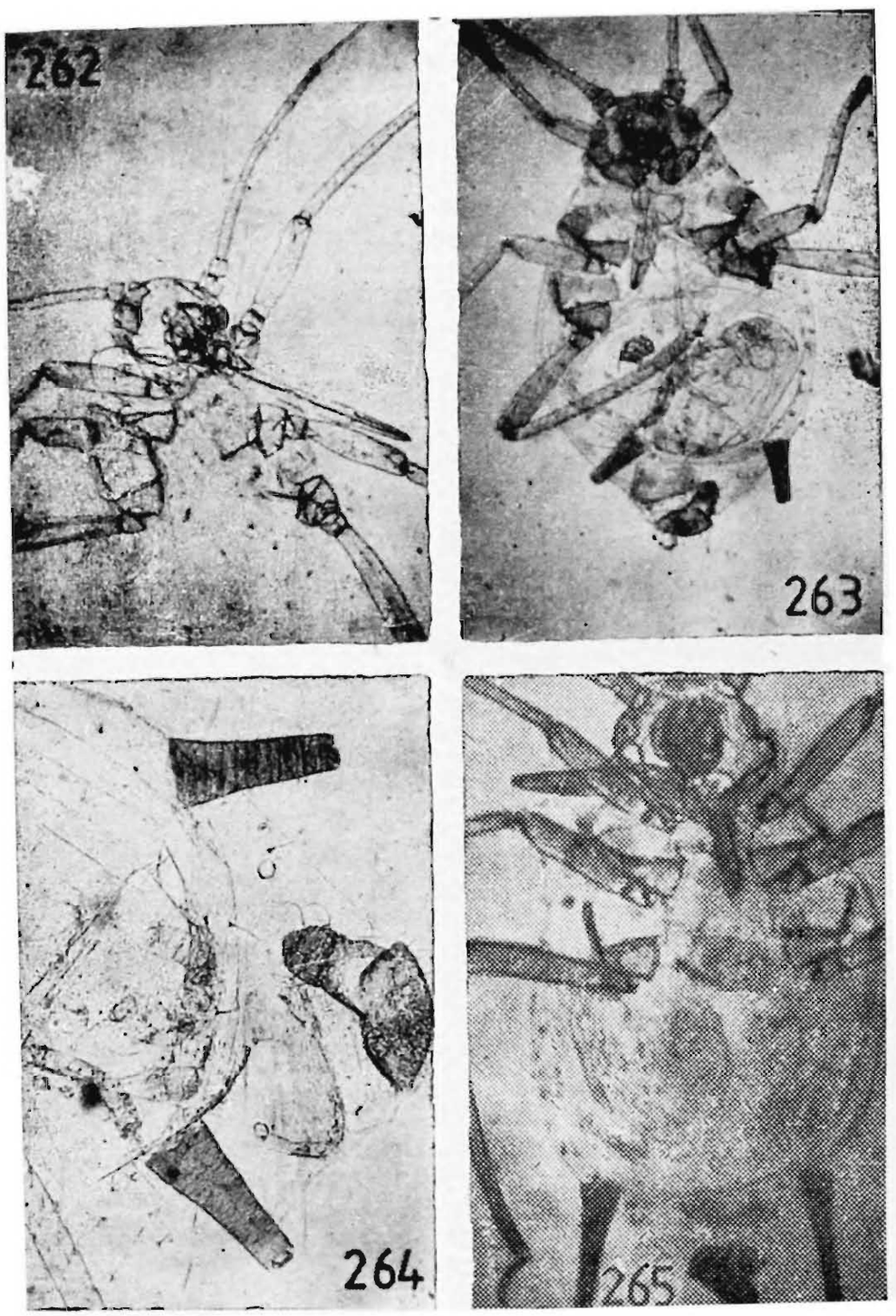


Fig. 262. *Aphis paraverbasci* Chakrabarti, Apterous viviparous female : Anterior part showing rostrum

Fig. 263. *Aphis polygonacea* Matsumura, Apterous viviparous female

Fig. 264. *Aphis polygonacea* Matsumura, Apterous viviparous female : posterior abdominal dorsum

Fig. 265. *Aphis pomi* de Geer, Apterous viviparous female

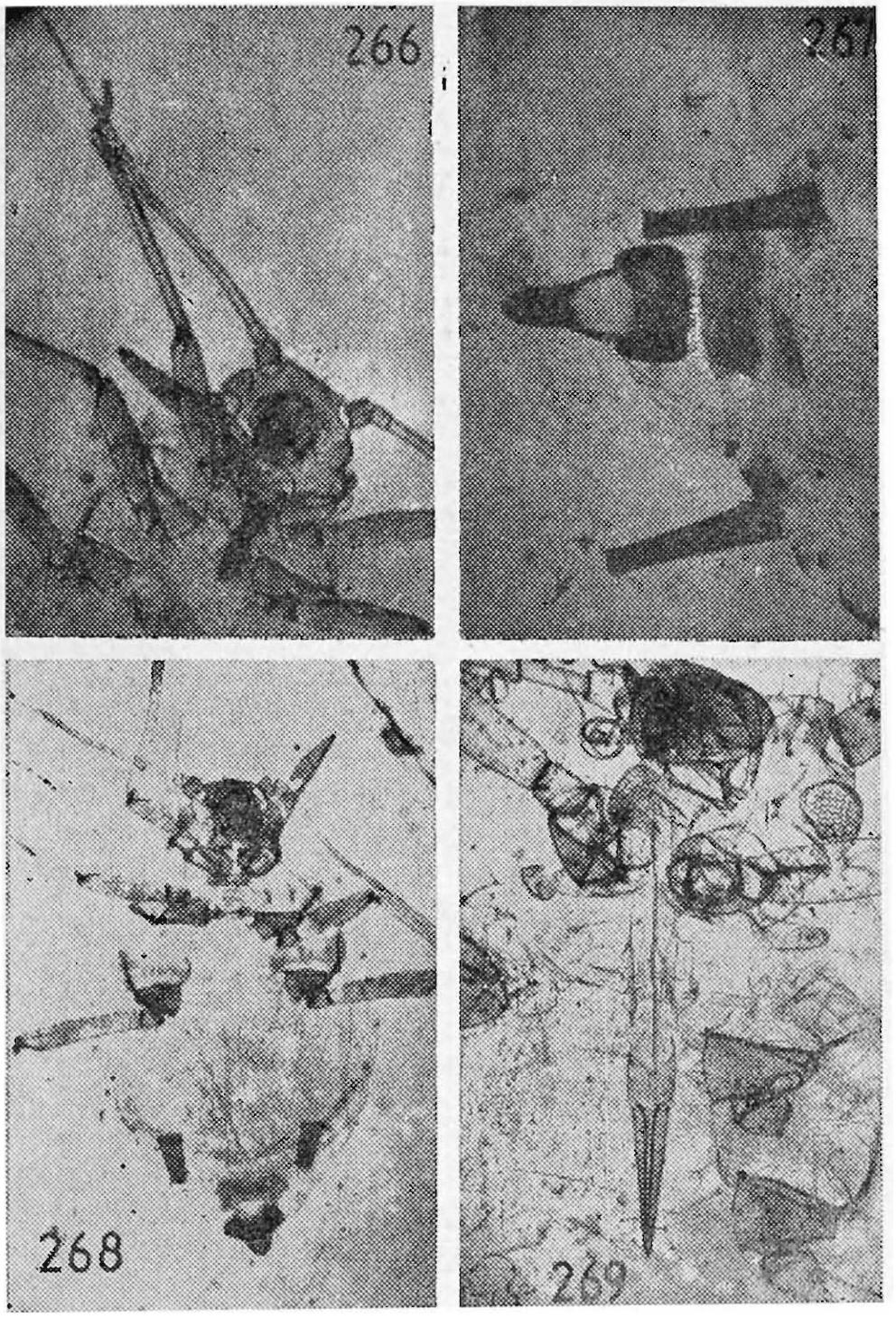


Fig. 266. *Aphis pomi* de Geer, Apterous viviparous female : anterior portion

Fig. 267. *Aphis pomi* de Geer, Apterous viviparous female : posterior abdominal dorsum

Fig. 268. *Aphis raji* Kumar and Burkhardt, Apterous viviparous female

Fig. 269. *Aphis raji* Kumar & Burkhardt, Apterous viviparous female : anterior portion showing ultimate rostral segment

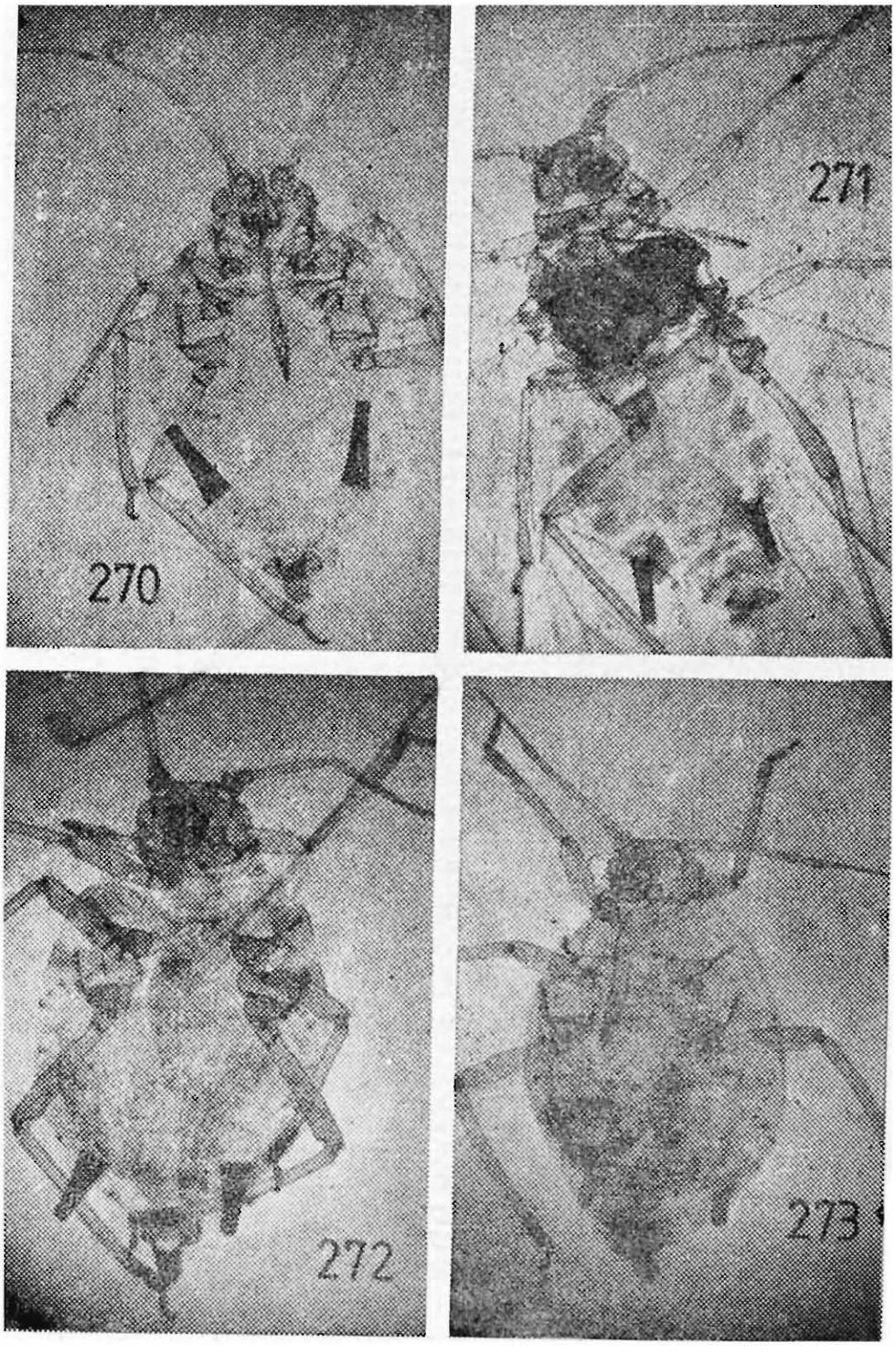


Fig. 270. *Aphis rhamniphila* Narayanan and Rajasingh, Apterous viviparous female

Fig. 271. *Aphis rhamniphila* Narayanan and Rajasingh, Alate viviparous female

Fig. 272. *Aphis rhoicola* Hille Ris Lambers, Apterous viviparous female

Fig. 273. *Aphis rubifolii* (Thomas), Apterous viviparous female

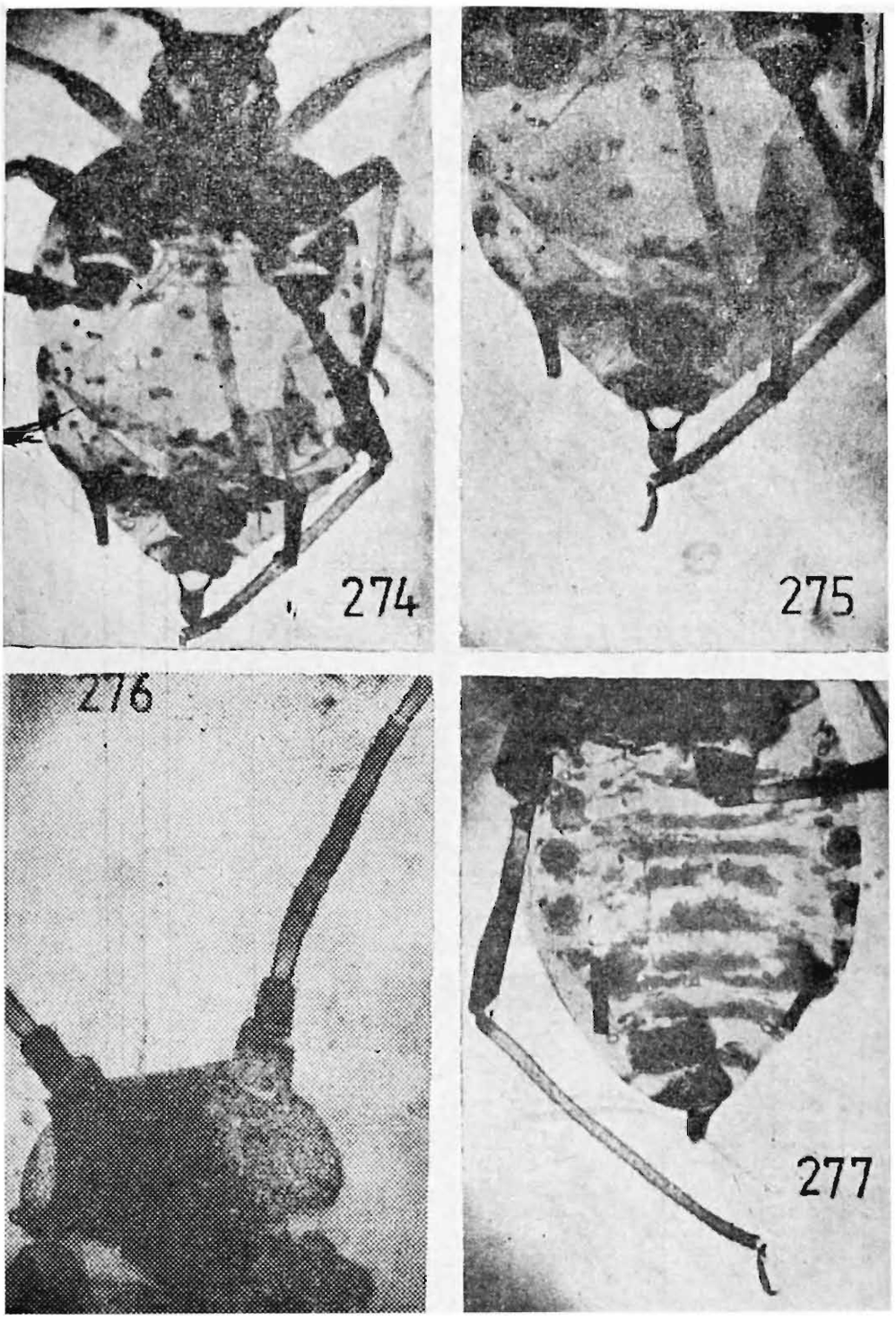


Fig. 274. *Aphis rumicis* Linnaeus, Apterous viviparous female

Fig. 275. *Aphis rumicis* Linnaeus, Apterous viviparous female : posterior abdominal dorsum

Fig. 276. *Aphis rumicis* Linnaeus, Alate viviparous female : Head

Fig. 277. *Aphis rumicis* Linnaeus, Alate viviparous female : posterior part of abdomen

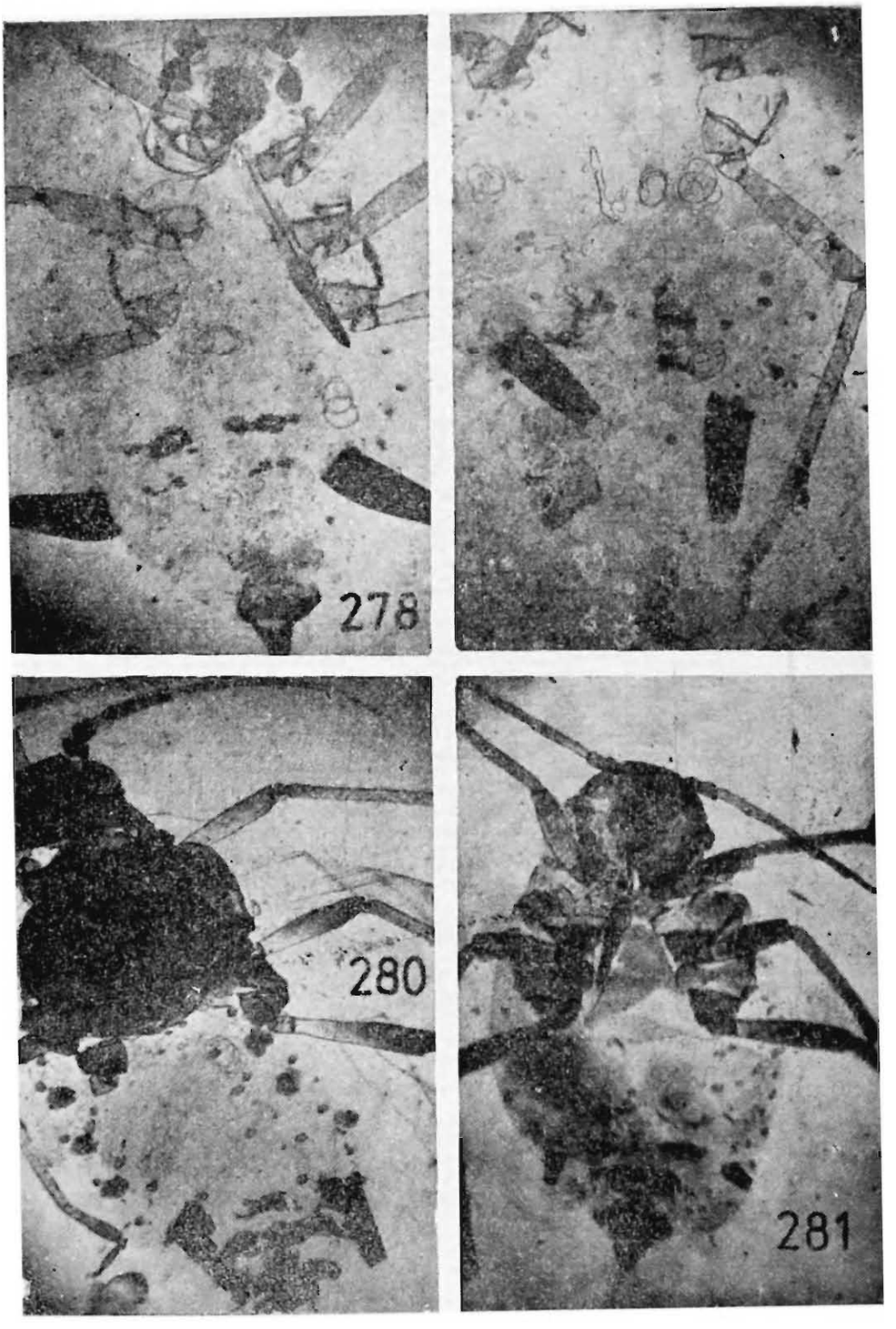


Fig. 278. *Aphis verbasci* Schrank, Apterous viviparous female

Fig. 279. *Aphis verbasci* Schrank, Apterous viviparous female: posterior abdominal dorsum

Fig. 280. *Aphis verbasci* Schrank, Alate viviparous female

Fig. 281. *Aphis* (*Protaphis*) *carthami* (Das), Apterous viviparous female

ERRATA

Page	*Line*	*Read*	*Instead of*
3	T 1	others	othes
13	B 1	Walker	walker
18	T 16	to	t-o
19	B 4	evaluate	evalute
22	T 13	Nunburg	Nnnburg
22	B 1	*Ent.*	*Eni*
23	T 20	*Tech.*	*Teeh.*
26	T 15	+ ·32	+ 3.2
27	B 1	involved.	involved,
28	T 5	postsiphuncular	postiphuncular
30	B 4	Raychaudhuri	Rsychaudhuri
30	B 4	Raychaudhuri	Rauchaudhuri
30	B 5	Chakrabarti	Chakrabarty
31	B 17	segmentally	segmntlly
31	B 18	muskel-platten	muskel-paatten
33	T 1	tergites	tergits
35	T 4	a.s. III	a.s. II
35	T 14	*Aphis*	*Aphs*
36	B 18	Uddin	Uddln
38	B 12	*Strobilanthes*	*Strobitanthes*
45	B 9	258—260	259—260
48	T 5	penis	pennis
49	B 18	*Surv.*	*Serv.*
50	T 12	with	thih
50	T 15	Antennae	Anatennae
53	T 20	sp.	ap.
55	B 17	*viviparous*	*ovi parous*
64	B 4	*Cedrus*	*Cedrum*

Page	*Line*	*Read*	*Instead of*
65	T 17 & 18	Siphunculi, 1.2 times	Siphunculi, times
65	T 17 & 18	brown with	brown 1.2 with
81	B 4	*Tagetes*	*Tagets*
81	T 6	Fabaceae	Fabcere
82	B 13-20	deleted	
84	B 18	Polygonaceae	Polygonacae
85	T 17	*A. ficus*	*Ficus*
89	B 13	Cupressaceae	Cupressceae
92	T 17	Convolvulaceae	Convoluvlaceae
100	B 17	*vulgaris*	*yulgaris*
101	T 1	*Aphis*	*Aph*
101	B 14	Geraniaceae	Geranicceae
111	T 8	*punicae*	*punricae*
114	T 6	1—71	1—17

T = from top
B = from bottom