

## 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 species of 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  $2 \times$  b.d. III ; u.r.s.  $1.3-1.5 \times ht_2$  ; 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  $1.5 \times$  base of antennal segment VI ; u.r.s.  $1.9-2.2 \times ht_2$  ; longest hair on anterior tergites  $1.50-3.0 \times b.d.$  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  $1.5 \times$  base of antennal segment VI ... 4
- 4. Ultimate rostral segment never more than  $1.7 \times ht_2$  ; dorsal abdominal hairs upto about  $55 \mu$  long, abdominal dorsum with polygonal reticulation, longest hair on anterior tergites  $0.7-1.2 \times b.d.$  III ... *kurosawai* Takahashi
- Ultimate rostral segment always more than  $2 \times ht_2$  ; dorsal abdominal hairs much longer, upto about  $105 \mu$  long, longest hair on anterior abdominal tergites at least  $1.5 \times b.d.$  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  $0.8-1.01 \times ht_2$  ; p.t.  $1.5-2.0 \times$  base of antennal segment VI ; longest hair on anterior tergites about  $0.6-0.7 \times b.d.$  III ; siphunculi about  $0.09-0.11 \times$  body ; dark brown in life ... *euphorbiae* Kaltenbach

- Siphunculi longer than cauda bearing 10-12 hairs ;  
u.r.s. about  $1.2-1.4 \times ht_2$  ; p.t. about  $3.8-4.3 \times$  base  
of antennal segment VI ; siphunculi  $0.20-0.23$   
 $\times$  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.  
 $1.3-1.6 \times$  base of antennal segment VI ; u.r.s. as  
long as or a little longer than  $ht_2$  ; siphunculi  
black, about  $1.5 \times$  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  $0.5-0.7 \times$  b.d. III ; siphun-  
culi much longer, about  $1.7-2.0 \times$  cauda bearing 14-  
18 hairs ; abdomen pale ; p.t. about  $2.8-3.1 \times$  base  
VI ; u.r.s.  $1.1-1.4 \times ht_2$  ; siphunculi  $0.15-0.18 \times$  body ;  
blackish in life ... *fabae* complex
- Dorsal abdominal hairs longer, those on anterior  
abdominal tergites about  $1.0-2.5 \times$  b.d. III. ... 10
- 10. Cauda dusky and with only 5 hairs ; siphunculi pig-  
mented on distal  $0.3-0.4$  portion (Fig. 39) and  
always more than  $1.4 \times$  cauda (usually  $2 \times$  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 through-  
out ... 11
- 11. Cauda with 9-11 hairs ; posterior abdominal dor-  
sum always pale ; 8th abdominal tergite with 4-6  
hairs ; post-siphuncular sclerite present ; siphun-  
culi about  $1.1-1.3 \times$  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 ter-  
gite 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                                                                              | ... | <i>craccivora</i> Koch     |
| —   | Posterior abdominal dorsum not as above; siphunculi (Fig. 71) shorter (0.6-0.9) than cauda (Fig. 72); never shiny in life                                                                                                                                                                                                                                                                           | ... | <i>euphorbiae</i> Thomas   |
| 14. | Hairs on posterior abdominal tergites longer, never less than $3.0 \times \text{b.d. III}$ and may be up to $4.0 \times \text{b.d. III}$ ; secondary hairs on u.r.s. as long as to longer than primary ones (Fig. 124); u.r.s. $1.30-1.50 \times \text{ht}_2$ ; p.t. about $2.5-3.0 \times \text{base VI}$ ; cauda with 7-9 hairs; brown to reddish brown in life                                   | ... | <i>longisetosa</i> Basu    |
| —   | Hairs on posterior abdominal tergites shorter, about $0.5-1.8 \times \text{b.d. III}$                                                                                                                                                                                                                                                                                                               | ... | 15                         |
| 15. | Siphunculi pale, smooth, dusky near apices (Fig. 85)                                                                                                                                                                                                                                                                                                                                                | ... | 16                         |
| —   | Siphunculi brown to blackish, imbricated                                                                                                                                                                                                                                                                                                                                                            | ... | 17                         |
| 16. | Processus terminalis about $2.5-3.1 \times \text{base of antennal segment VI}$ ; u.r.s. $1.2-1.4 \times \text{ht}_2$ ; a.s. III subequal to or slightly longer than siphunculi; cauda (Fig. 158) pale to blackish, about $0.6-1.1 \times \text{siphunculi}$ (Fig. 187) and bearing 6-10 hairs; siphunculi about $0.10-0.15 \times \text{body}$ ; pale greenish in life                              | ... | <i>punicae</i> Passerini   |
| —   | Processus terminalis about $1.8 \times \text{base of a.s. VI}$ ; u.r.s. shorter than or a little longer (at most 1.1 times) than $\text{ht}_2$ ; a.s. III much shorter (about $0.5 \times$ ) than siphunculi; cauda dark (Fig. 249) about $0.4 \times \text{flangeless siphunculi}$ and bearing about 14 hairs; siphunculi $0.25-0.33 \times \text{body}$ ; green, sometimes reddish yellow in life | ... | <i>farinosa</i> 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 $0.85-1.35 \times \text{b. d. III}$ ; p. t. subequal to a.s. III and about $2.0-2.4 \times \text{base VI}$ ; u.r.s. $1.0-1.1 \times \text{ht}_2$ ; siphunculi $0.9-1.8 \times \text{blackish}$ cauda bearing 8-15 hairs (Fig. 28); pale-brown to brown in life            | ... | <i>citricola</i> 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 abdominal tergites about  $2 \times$  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.  $1.8-2.4 \times$  base VI ; siphunculi  $1.1-1.5 \times$  cauda ; dusky to brownish ... *nasturtii* Kaltenbach
- Cauda always with more than 5 ; hairs on anterior abdominal tergites about  $0.5 \times$  b.d. III ; p.t. always more than  $2.5 \times$  base VI ; siphunculi more than  $1.5 \times$  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  $1.7-2.0 \times$   $ht_2$  ; siphunculi much longer ( $2.3-2.8 \times$ ) 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  $3 \times$  base of a.s. VI ... *rubifolli* (Thomas)
- Siphunculi always longer, even upto  $2 \times$  cauda ; p.t. usually less than  $3 \times$  base of a.s. VI ... 24
- 24. Hairs on 8th tergite much longer (at least  $2 \times$  b.d. III) ; dorsal hairs much longer ( $1.5-1.8 \times$  b.d. III) ... *polygonacea* Matsumura

- Hairs on 8th tergite shorter, hardly as long as b.d. III ; dorsal hairs much shorter ( $0.5-0.8 \times \text{b.d. III}$ ) ... 25
- 25. Siphunculi strongly tapering, about  $2 \times \text{cauda}$  ; cauda with 7-20 (usually 8) hairs ; u.r.s. somewhat elongated, about  $1.5 \times \text{ht}_2$  ; green in life ... *pomi* de Geer
- Siphunculi comparatively shorter and relatively thicker but not as above ; cauda bears fewer (5-7) hairs ... 26
- 26. Ultimate rostral segment somewhat pointed (Fig. 18),  $1.4-1.5 \times \text{ht}_2$  ; siphunculi longer,  $2.0-2.2 \times \text{cauda}$  bearing 5 hairs ... *affinis* del Guercio
- Ultimate rostral segment normal,  $1.0-1.3 \times \text{ht}_2$  ; siphunculi shorter,  $1.2-1.8 \times \text{cauda}$  bearing 4-7 hairs ; colour much variable ... *gossypii* Glover
- 27. Antennae always 6-segmented ; cauda with fewer (usually 7) hairs ; secondary hairs on u.r.s. usually 2 ; hairs on posterior abdominal tergites at most as long as b.d. III ; colour in life yellowish ... *glycines* 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  $1.6 \times \text{b.d. III}$  ; 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  $1.3 \times \text{base VI}$  ; cauda bears 6 hairs ; u.r.s.  $2.3 \times \text{ht}_2$  ... *paraverbasci* Chakrabarti
- Processus terminalis  $1.5-2.4 \times \text{base VI}$  ; cauda bears 8-14 hairs ; u.r.s.  $1.5-2.0 \times \text{ht}_2$  ... 3
- 3. Wings densely scaly ; secondary rhinaria distributed : a.s. III 3-7 ; IV 0, 0 ; V 0, 0 ; siphunculi shorter,  $1.2-1.3 \times \text{cauda}$  ; cauda thumb-shaped (Fig. 118) ; u.r.s.  $1.5 \times \text{ht}_2$  ... *kurosawai* Takahashi
- Wings not as above ; secondary rhinaria distributed : a.s. III 19-28, IV 3-9, V 0, 0 ; siphunculi longer,  $1.8-2.0 \times \text{cauda}$  ; cauda rather elongate (Fig. 233) ; u.r.s.  $2 \times \text{ht}_2$  ... *verbasci* Schrank

4. First tarsal chaetotaxy 3, 3, 3 ; u.r.s.  $1.2-1.5 \times ht_1$  ; dorsum of abdomen pale with well developed post-siphuncular sclerites ; longest hair on anterior tergites  $1.0-1.4 \times b.d. III$  ; siphunculi about  $0.18-0.20 \times$  body and  $1.7-2.0 \times$  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,  $0.13-0.18 \times$  body and  $1.3-2.0 \times$  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  $0.09 \times$  body and  $1.2 \times$  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 forefemora 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.  $2.0-2.7 \times$  base VI ; u.r.s.  $1.0-1.1 \times ht_2$  ; dorsum of abdomen pale, longest hair on abdominal dorsum  $0.8-1.0 \times b.d. III$  ; siphunculi  $0.11-0.12 \times$  body and  $1.1-1.4 \times$  cauda bearing 7-14 hairs ... *citricola* v.d.G.
- Femoral hairs short ; longest hair on the forefemora 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 ( $2.5-4.0 \times b.d. III$ ) ; 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.  $2.7-3.3 \times$  base VI ; u.r.s.  $1.1-1.4 \times ht_2$  ; 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 ( $0.3-1.6 \times \text{b.d. III}$ ) ;  
post-siphuncular sclerite distinct ... 9
- 9. Longest hair on a.s. III less than half ( $0.40-0.45 \times$   
b.d. III ; cauda dark ; secondary rhinaria distri-  
buted : a.s. III 4-8, IV 0-1, V 0, 0 ; u.r.s.  $0.80-0.90$   
 $\times \text{ht}_2$  ; siphunculi  $0.10-0.15 \times \text{body}$  and about  $1.5 \times$   
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  $2.0 \times \text{base of segment VI}$  ; abdominal  
dorsum pale, with scattered brown sclerites ; long-  
est hair on anterior abdominal tergites as long as  
b.d. III ; siphunculi  $0.1 \times \text{body}$  and  $1.4-1.7 \times \text{cauda}$   
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 ( $2.5-3.7$ )  
 $\times \text{base of segment VI}$  ... 11
- 11. Siphunculi less than 1.5 (usually 1.4)  $\times \text{cauda}$  ;  
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  $1.5 \times \text{cauda}$  ( $1.5-1.9$  times) ;  
cauda dusky, rounded apically, with 4-6 (normally  
5-6) hairs ; abdominal dorsum pale with scattered  
segmental sclerites, post-siphuncular sclerites  
present ; siphunculi  $0.10-0.13 \times \text{body}$  and  $1.5-1.9 \times$   
cauda with 4-7 hairs ; secondary rhinaria distribu-  
ted : a.s. III 5-7, IV 0, 0, V 0, 0 ... *gossypii* Glover

**Male :**

- 1. Siphunculi much longer (about  $3.5 \times \text{cauda}$ ) ; 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  $2 \times \text{cauda}$ ) ;  
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 rhina-  
ria 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  $2 \times$  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  $2.0 \times$  base VI ; cauda with blunt apices ... 4
- 4. p.t.  $2.2-2.5 \times$  base VI ; secondary rhinaria distributed : III 31-37, IV 21-26, V 12-18 ... *gossypii* Glover
- p.t. about  $3.0 \times$  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  $46\mu$  long and about 1.3 times as long as antennal hairs. Femoral hairs about  $36\mu$  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 0.75 mm as its maximum width. Dorsum smooth. Head (Fig. 15) with small antennal tubercles not exceeding beyond vertex width. Antennae 0.4--0.6 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 0.11, 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 from 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. spiraeicola* Patch, *Bull. Me. agric. exp. stn.*, 233 : 270 ; 1931. Krishnamurthi, *J. Bombay nat. Hist. Soc.*, 34 : 411-419 ; 1948. Krishnamurthi, *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 Raychaudhuri, 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 Rhynt, *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. Hist. 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 Univ. 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. *Acyrtosiphon 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 0.16, VI (0.09+0.24) ; u.r.s. 0.10 ;  $ht_2$  0.09 ; Siphunculus 0.21, cauda 0.16 ;

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

*Apterous oviparous female* : Body 1.60mm 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 evaluate. 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 agrestis*, 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<sub>2</sub> and with 2 secondary hairs. Abdominal dorsum pale, dorsal hairs about 10 $\mu$  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<sub>2</sub> 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.

*Distribution* : 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. Ent.*, 24 : 135-136 ;

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1969. Ramaseshiah and Dharmadhikari, *CIBC Tech. Bull.*, No. 11 : 156-164 ;
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1970. Ghosh, L. K. *Sci. Cult.*, 36 : 419-420 ;
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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 Familien 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* : Apteræ, on *Dolichos* sp., New forest (U. P.), 18.vi.1976, coll. S. C. ; Apteræ and alatae, on *Polygonum* sp., date ?, coll. "C. U." ; 6 apteræ and 1 alata, on *Phaseolus* sp., Saproon (H. P.), 2.ix.1969, coll. O. B. Chhotani ; Apteræ and alatae, on *Dolichos lablab*, 12.i.1975, coll. L.K.G. ; many apteræ and alatae, on *Lagenaria vulgaris*, Kalambar, Nanded Distt. (Maharashtra) 6.xii.1974, coll. P. P. Kulkarni ; Apteræ, on *Hibiscus rosasinensis*, Tocklai, Shillong (Assam), 18.1.1969,

coll. ? Ten apterae 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 wrinklins, 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 female* : Body oval, 1.6-1.7 mm long with 0.90-0.95 mm as maximum width. Head dark brown, with antennal tubercles, a.s. I and II concolourous with head, flagellum distinctly imbricated with a few short hairs (about  $9\mu$  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 extended 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 siphunculi and bearing 6-16 hairs ; 2nd segment of hind tarsus with a pair of secondary hairs on lower surface and sometimes also on upper ; Legs pale brown except the apices of tibiae and 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  $ht_2$ . Abdominal dorsum pigmented with a dorsal patch and with polygonal reticulations ; longest hair on anterior tergites about 0.6-0.8 times as long as b.d. III ; 8th tergite with 2 hairs. Siphunculi (Fig. 71) darker, 0.09-0.11 times as long as body and 0.89-0.95 times as long as dark cauda (Fig. 72) bearing 5-8 hairs. F. T. C. 3, 3, 3.

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

**Colour :** Dark brown in life.

**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 carniolica* : 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  
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 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. & Rhynt, M. R., *Sci. Cult.*, 41 : 386-388 ;
1980. Raychaudhuri, D. N., Ghosh, L. K. and Das, S. K., *Ins. matsum.*, 20 : 1-42 ;
1980. Raychaudhuri, D. N. (ed.) *Aphids of N. E. India and Bhutan*, The Zoological Society, Calcutta : 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 Raychaudhuri, 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. Raychaudhuri, D. N. Dutta, Agarwala, Raha and Raychaudhuri, D., *Entomon*, 4 : 163-166.
1914. *Aphis solanella* Theobald, *Bull. ent. Res.*, 4 : 313-337 ;
1969. Ramaseshiah and Dharmadhikari, *CIBC Tech. Bull. No. 11* : 156-164 ;

1969. Rao, *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  $18\mu$ - $35\mu$  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 tergite with 3-5 hairs, upto about 2.0-2.5 times as long as b.d. III. Siphunculi (Fig. 77) dark, cylindrical, about 0.15-0.18 times as long as body and 1.5-2.0 times the length of broad and blackish cauda (Fig. 78) bearing 12-18 hairs. Distal 0.65 portion of femora, apices of tibiae and tarsi dark brownish ; F. T. C. 3, 3, 2.

*Measurements (in mm) 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 hind legs pale brown except distal half of femora, apices of tibiae and tarsi dark brownish ; hind legs darker ; F. T. C. 3, 3, 2.

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

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

abdominal tergites about twice as long as b.d. III. Siphunculi a little longer than cauda. Other characters as in alate viviparous female.

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

*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 Familien 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<sub>2</sub> 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 Bhutan*. 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 dilated 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<sub>2</sub>. 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<sub>2</sub> 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'. 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 ; Malaysia ; 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 ;
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- 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 ;
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- 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.
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1967. Joshi and Mathur, *Madras agric. J.*, 54 : 239-243 ;
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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 ;
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1976. Ghosh, L. K., *Newsl. zool. Surv. India*, 2 : 239-242 ;
1978. Misra and Kurl, *Geobios*, 5 : 83 ;
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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 ;
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1980. Agarwala and Raychaudhuri, D. N., *Entomon*, 5 : 39-42 ;
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1981. Agarwala and 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 ;
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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.
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1845. *Aphis frangulae* Kaltenbach, in Koch, 1855. *Die Pflanzen. Aphide* : 142 ;
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1854. *Aphis malvae* Koch, *Die Pflanzen Aphiden.*, Nunberg : 1-134 ;
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*Material examined* : 20 apterae, on undet. host, Badkhal Lake (Haryana), 22.x.1978, coll. M. R. G. & P. K. M. ; 1 aptera, on *Anaphalis contorta*, Solan (H. P.), 20.x.78, coll. M. R. G. & P. K. M. ; apterae and 1 nymph, on *Goldfussia 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 *Strobilanthus 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  $20\mu$ . 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 except 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 occurrence 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 *Colorado 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. Cult.*, 44 : 89-92 ;
1979. Rishi, *Symp. on recent trends in aphidological studies. Bhubaneswar* : 52 ;
1980. Raychaudhuri, D.N., Aphids of Northeast India and Bhutan. The Zoological Society, Calcutta : 1-521 ;
1980. Raychaudhuri, D. N., Ghosh, L. K. and Das, S. K., *Insecta matsum.*, 20 : 1-42 ;
1980. Maity, Bhattacharya and Chakrabarti., *Sci. Cult.*, 46 : 311-312 ;
1981. Agarwala and Raychaudhuri, D. N., *Entomon*, 6 : 207-209 ;
1981. Bhagat, *Sci. Cult.*, 47 : 134-136.

*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<sub>2</sub>. 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<sub>2</sub> 0.08 ; siphunculus 0.17 ; cauda 0.14.

*Alate viviparous female* : Body pale, 1.5-2.4 mm long with 0.4-0.9 mm as the maximum width near the middle of the abdomen. Head brownish. Antennae 0.4-0.9 times as long as the body, p.t. shorter than a.s. III and hardly twice the base of a.s. VI, a.s. III with 3-7 secondary rhinaria in a row. Rostrum reaches mid coxae, u.r.s. 1.5-1.6 times as long as  $ht_2$  ; Abdominal dorsum pale and with pale brownish sclerites ; longest hair on 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 *Artemisia* and characterised by stiletto-shaped ultimate rostral segment. According to Basu, A. N. (1969) the aphid is quite common in the hills of the Darjeeling district, being most abundant from March to May and again from September to November. The species leads anholocyclic life cycle throughout the year.

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

### 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. *Ori. nt. 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<sub>2</sub>. 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<sub>2</sub> 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<sub>2</sub>. 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<sub>2</sub> 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., Raychaudhuri, 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, Khadrula (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<sub>2</sub>. 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 ;  
Raychaudhuri, 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 viviparous 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 ( $40\mu$  to  $90\mu$  long); genital plate entire, oval and bears about 15-20 hairs. F.T.C. 3, 3, 3; second tarsal segment with both dorsal and ventral secondary hairs.

*Alate viviparous female*: Body pale, 1.6-2.4 mm long and with 0.6-1.0 mm as its maximum width. Head brownish, broader than long. Antennae 6-segmented, about 0.7-0.9 times as long as body, a.s. III. with 6-14 small to large more or less circular secondary rhinaria distributed over entire length, a.s. IV with 0-2 secondary rhinaria. Rostrum extends beyond hind coxae, u.r.s. 1.20-1.25 times as long as  $ht_2$ . Abdominal dorsum pale, smooth with well developed postsiphuncular sclerite and scattered pale 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, imbricated 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 examined* : 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<sub>2</sub> 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* : Length 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<sub>2</sub> 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  $25\mu$  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  $35\mu$  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 little known species which is characterised by its light brown to brownish-red colour with very marked white wax pattern, pale thick and long siphunculi with the very tips blackish and almost black cauda.

*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<sub>2</sub> 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, Chamba-ghat, 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<sub>2</sub>. 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<sub>2</sub>, 0.10 ; siphunculus 0.35 ; cauda 0.19.

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

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

## 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. *Orient. 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  $100\mu$  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 30-40 $\mu$ . Antennae about 0.50-0.65 times as long as body, flagellum (Figs. 196-199) progressively imbricated, flagellar hairs sparse, acute 9-15 $\mu$ , 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<sub>2</sub>, 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, (30 $\mu$  - 60 $\mu$ ) 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<sub>2</sub> 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. Zool. 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  $40\mu$  long. Antennae about half as long as body ; a.s. I and II concolourous with head, a.s. III and IV pale brown, V and VI darker, flagellum (Figs. 205-208) progressively imbricated ; antennal hairs sparse, longest hair  $7\mu$ - $20\mu$  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  $50\mu$ - $60\mu$  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<sub>2</sub> 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 and 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*, Khadralla, (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  $9\mu$ ) 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 ( $30-38\mu$  long) about as long as or just a longer than b.d. III. 8th tergite with 2 hairs and  $50\mu$  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  $12\mu$  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  $22\mu$  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 hederæ** Kaltenbach, 1843

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

**Aphis umbrella** (Börner, 1950)

= **A. malvæ** 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 verbenæ** 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

| <i>Name of Aphid</i>             | <i>Host Plant</i>                 | <i>Plant Family</i> |
|----------------------------------|-----------------------------------|---------------------|
| <i>Aphis (Aphis) achyranthi</i>  | <i>Achyranthes</i> sp.            | Amaranthaceae       |
| Theobald                         | <i>Punica granatum</i> L.         | Lythraceae          |
| <i>Aphis (Aphis) affinis</i> del | <i>Mentha longifolia</i> (L.)     |                     |
|                                  | Huds                              | Labiatae            |
| Guercio                          | <i>Mentha viridis</i> L.          | Labiatae            |
| <i>Aphis (Aphis) asclepiadis</i> | <i>Asclepias</i> sp.              | Asclepiadaceae      |
| Fitch                            | <i>Calotropis gigantea</i> Br.    | Asclepiadaceae      |
|                                  | <i>Calotropis procera</i> Br.     | Asclepiadaceae      |
|                                  | <i>Calotropis grandiflora</i> Br. | Asclepiadaceae      |
|                                  | <i>Cynanchum dalhousiae</i>       |                     |
|                                  | Wt.                               | Asclepiadaceae      |
|                                  | <i>Pengularia daemia</i>          |                     |
|                                  | (Forek) Chiov                     | Asclepiadaceae      |
|                                  | <i>Dregea volubilis</i> (L. f.)   |                     |
|                                  | Bth ex Hk. f                      | Asclepiadaceae      |
|                                  | <i>Hoya longifolia</i> Wall.      |                     |
|                                  | ex. Wt.                           | Asclepiadaceae      |
|                                  | <i>Hoya</i> sp.                   | Asclepiadaceae      |
|                                  | <i>Leptadenia reticulata</i>      |                     |
|                                  | Wt. & Arn.                        | Asclepiadaceae      |
|                                  | <i>Nerium indicum</i> Miil        | Apocynaceae         |
| <i>Aphis (Aphis) astragali</i>   | <i>Astragalus</i> sp.             | Fabaceae            |
| Ossiannilsson                    |                                   |                     |
| <i>Aphis (Aphis) citricola</i>   |                                   |                     |
| v.d.G.                           |                                   |                     |
| = <i>A. bidentis</i> Theobald    | <i>Achyranthes</i> sp.            | Amaranthaceae       |
| = <i>A. malvoides</i> Das        | <i>Adhatoda vasica</i> Nees.      | Acanthaceae         |
| = <i>A. pomi</i> de Geer         | <i>Ageratum conyzoides</i> L.     | Compositae          |
| = <i>A. spiraecola</i> Patch     | <i>Alnus nepalensis</i> D. Drn.   | Betulaceae          |
| = <i>Acyrtosiphon citricola</i>  | <i>Alstonia scholaria</i> Br.     | Apocynaceae         |
| van der Goot                     |                                   |                     |
|                                  | <i>Amaranthus vicidis</i> L.      | Amaranthaceae       |
|                                  | <i>Ambrosia artemisiaefolia</i>   | Compositae          |
|                                  | Bess.                             |                     |

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

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                       | <i>Plant Family</i> |
|----------------------|-----------------------------------------|---------------------|
|                      | <i>Duranta repens</i> Jacq.             | Verbenaceae         |
|                      | <i>Eleusine coracana</i><br>Gaertn.     | Gramineae           |
|                      | <i>Emilia sonchifolia</i> DC            | Compositae          |
|                      | <i>Erechtites valerianefolia</i><br>DC  | Compositae          |
|                      | <i>Erechtites</i> spp.                  | Compositae          |
|                      | <i>Erigeron</i> sp.                     | Compositae          |
|                      | <i>Eupatorium adenophorum</i><br>Spreng | Compositae          |
|                      | <i>Eupatorium cannabinum</i> L.         | Compositae          |
|                      | <i>Eupatorium odoratum</i> L.           | Compositae          |
|                      | <i>Eupatorium ripavium</i><br>Regel     | Compositae          |
|                      | <i>Eupatorium wallichii</i> DC.         | Compositae          |
|                      | <i>Eupatorium</i> spp.                  | Compositae          |
|                      | <i>Euphorbia hirta</i> L.               | Euphorbiaceae       |
|                      | <i>Euphorbia nerifolia</i> L.           | Euphorbiaceae       |
|                      | <i>Eurva japonica</i> Thunb.            | Ternstroemiceae     |
|                      | <i>Fagopyrum</i> sp.                    | Polygonaceae        |
|                      | <i>Ficus</i> spp.                       | Urticaceae          |
|                      | <i>Galium</i> sp.                       | Rubiaceae           |
|                      | <i>Gardenia</i> sp.                     | Rubiaceae           |
|                      | <i>Gerbera</i> sp.                      | Compositae          |
|                      | <i>Glycosmis arborea</i> DC             | Rutaceae            |
|                      | <i>Gnaphalium luteoalbum</i> L.         | Compositae          |
|                      | <i>Gynura angulosa</i> DC               | Compositae          |
|                      | <i>Gynura crepidioides</i> Benth        | Compositae          |
|                      | <i>Gynura nepalensis</i> DC             | Compositae          |
|                      | <i>Gynura</i> sp.                       | Compositae          |
|                      | <i>Hamiltonia suaveolens</i><br>Roxb    | Rubiaceae           |
|                      | <i>Hedera nepalensis</i> L.             | Araliaceae          |
|                      | <i>Helianthus annus</i> L.              | Compositae          |
|                      | <i>Helianthus</i> spp.                  | Compositae          |
|                      | <i>Helichrysum</i> sp.                  | Compositae          |
|                      | <i>Heliotropium indicum</i> L.          | Boraginaceae        |

| <i>Name of Aphis</i> | <i>Host Plant</i>                          | <i>Plant Family</i> |
|----------------------|--------------------------------------------|---------------------|
|                      | <i>Hibiscus esculentus</i> (L.)<br>Moench. | Malvaceae           |
|                      | <i>Hibiscus rosa-sinensis</i> L.           | Malvaceae           |
|                      | <i>Hibiscus sabdariffa</i> L.              | Malvaceae           |
|                      | <i>Hibiscus</i> spp.                       | Malvaceae           |
|                      | <i>Holarrhena antidysenterica</i><br>Wall. | Apocynaceae         |
|                      | <i>Holmskioldia sanguinea</i> Retz         | Verbenaceae         |
|                      | <i>Hydrangea</i> sp.                       | Hydrangeaceae       |
|                      | <i>Hypericum</i> sp.                       | Hypericaceae        |
|                      | <i>Hypochaeris radicata</i> L.             | Compositae          |
|                      | <i>Ichnocarpus frutescens</i> Br.          | Apocynaceae         |
|                      | <i>Ilex</i> sp.                            | Diclinaceae         |
|                      | <i>Impatiens balsamina</i> L.              | Geraniaceae         |
|                      | <i>Impatiens falcifer</i> Hook-f.          | Geraniaceae         |
|                      | <i>Impatiens</i> sp.                       | Geraniaceae         |
|                      | <i>Inula cuspidata</i> Clarke              | Compositae          |
|                      | <i>Ipomoea hederacea</i> Jacq.             | Convolvulaceae      |
|                      | <i>Jacaranda mimosaeifolia</i><br>D. Don   | Bignoniaceae        |
|                      | <i>Jasminum</i> sp.                        | Oleaceae            |
|                      | <i>Jatropha curcas</i> L.                  | Euphorbiaceae       |
|                      | <i>Lactuca sativa</i> L,                   | Compositae          |
|                      | <i>Lagenaria leucantha</i>                 | Cucurbitaceae       |
|                      | <i>Lagenaria vulgaris</i> Ser.             | Cucurbitaceae       |
|                      | <i>Lagerstroemia indica</i> L.             | Lythraceae          |
|                      | <i>Lantana camara</i> L.                   | Verbenaceae         |
|                      | <i>Leucas aspera</i> Spreng.               | Labiatae            |
|                      | <i>Leucas linifolia</i> Spreng.            | Labiatae            |
|                      | <i>Leucas</i> sp.                          | Labiatae            |
|                      | <i>Lindera</i> sp.                         | Lauraceae           |
|                      | <i>Litsea polyantha</i> Juss.              | Lauraceae           |
|                      | <i>Litsea</i> sp.                          | Lauraceae           |
|                      | <i>Lonicera macrantha</i> DC               | Caprifoliaceae      |
|                      | <i>Luculia</i> spp.                        | Rubiaceae           |
|                      | <i>Ludwigia suffruticosa</i> Walt          | Onagraceae          |
|                      | <i>Luffa</i> sp.                           | Cucurbitaceae       |

| <i>Name of Aphid</i> | <i>Host Plant</i>                   | <i>Plant Family</i> |
|----------------------|-------------------------------------|---------------------|
|                      | <i>Lycopersicum esculentum</i>      |                     |
|                      | Miller                              | Solanaceae          |
|                      | <i>Lyonia ovalifolia</i> Wall.      | Ericaceae           |
|                      | <i>Maesa indica</i> Wall.           | Myrsinaceae         |
|                      | <i>Maesa</i> sp.                    | Myrsinaceae         |
|                      | <i>Malus sylvestris</i> Mill        | Rosaceae            |
|                      | <i>Melanthesa patens</i>            | Euphorbiaceae       |
|                      | <i>Melastoma indica</i>             | Melastomaceae       |
|                      | <i>Azudiracta indica</i>            |                     |
|                      | <i>Melia azadirachta</i> L.         | Meliaceae           |
|                      | <i>Mikania cordifolia</i> Willd.    | Compositae          |
|                      | <i>Mikania scandens</i> Willd.      | Compositae          |
|                      | <i>Mirabilis jalapa</i> L.          | Nyctaginaceae       |
|                      | <i>Momordica charantia</i> L.       | Cucurbitaceae       |
|                      | <i>Montanoa bipinnatifida</i>       |                     |
|                      | C. Koch                             | Compositae          |
|                      | <i>Morus alba</i> L.                | Urticaceae          |
|                      | <i>Morus</i> sp.                    | Urticaceae          |
|                      | <i>Musa sapientum</i> L.            | Musaceae            |
|                      | <i>Mussaenda</i> sp.                | Rubiaceae           |
|                      | <i>Myriactis wallichii</i> Less     | Compositae          |
|                      | <i>Nasturtium indicum</i> DC        | Cruciferae          |
|                      | <i>Nerium</i> sp.                   | Apocynaceae         |
|                      | <i>Nicotiana tabacum</i> L.         | Solanaceae          |
|                      | <i>Ocimum</i> sp.                   | Labiatae            |
|                      | <i>Oenanthe stolonifera</i> Wall.   | Umbelliferae        |
|                      | <i>Ophiorrhiza</i> sp.              | Rubiaceae           |
|                      | <i>Passiflora</i> sp.               | Passifloraceae      |
|                      | <i>Paedenia foetida</i> L.          | Rubiaceae           |
|                      | <i>Photinia integrifolia</i> Lindl. | Rosaceae            |
|                      | <i>Photinia</i> sp.                 | Rosaceae            |
|                      | <i>Phyllanthus reticulatus</i> Poir | Euphorbiaceae       |
|                      | <i>Phyllanthus</i> sp.              | Euphorbiaceae       |
|                      | <i>Pieris ovalifolia</i> D. Don     | Ericaceae           |
|                      | <i>Pinus</i> sp.                    | Pinaceae            |

| <i>Name of Aphid</i> | <i>Host Plant</i>                           | <i>Plant Family</i> |
|----------------------|---------------------------------------------|---------------------|
|                      | <i>Pisum sativum</i> L.                     | Fabaceae            |
|                      | <i>Polyalthia longifolia</i> Benth<br>& HKf | Anonaceae           |
|                      | <i>Polygonum alatum</i><br>Buch-Ham         | Polygonaceae        |
|                      | <i>Polygonum berbatum</i> L.                | Polygonaceae        |
|                      | <i>Polygonum chincnse</i> L.                | Polygonaceae        |
|                      | <i>Polygonum hydropiper</i> L.              | Polygonaceae        |
|                      | <i>Polygonum serrulatum</i><br>Lagasc       | Polygonaceae        |
|                      | <i>Polygonum</i> spp.                       | Polygonaceae        |
|                      | <i>Pouzolzia hirta</i> Hasrk.               | Urticaceae          |
|                      | <i>Prunus anygdalus</i> Baill               | Rosaceae            |
|                      | <i>Prunus cerasus</i> L.                    | Rosaceae            |
|                      | <i>Prunus domestica</i>                     | Rosaceae            |
|                      | <i>Prunus nepalensis</i> Koch               | Rosaceae            |
|                      | <i>Prnnus persica</i> Benth &<br>HKf        | Rosaceae            |
|                      | <i>Prnnus</i> spp.                          | Rosaceae            |
|                      | <i>Psidium guajava</i> L.                   | Myrtaceae           |
|                      | <i>Punica granatum</i> L.                   | Punicaceae          |
|                      | <i>Pyrus communis</i> L.                    | Rosaceae            |
|                      | <i>Pyrus kumaoni</i> Dene                   | Rosaceae            |
|                      | <i>Pyrus malus</i> L.                       | Rosaceae            |
|                      | <i>Pyrus pashia</i> Buch-Ham                | Rosaceae            |
|                      | <i>Raphanus sativus</i> L.                  | Cruciferae          |
|                      | <i>Rhamnus nepalensis</i> Laws              | Rhamnaceae          |
|                      | <i>Rhododendron</i> sp.                     | Ericaceae           |
|                      | <i>Richardia pilosa</i> Ruiz-Pov            | Rubiaceae           |
|                      | <i>Ricinus communis</i> L.                  | Euphorbiaceae       |
|                      | <i>Rosa canina</i> S.                       | Rosaceae            |
|                      | <i>Rosa</i> sp.                             | Rosaceae            |
|                      | <i>Rubia cordifolia</i> L.                  | Rubiaceae           |
|                      | <i>Rubus ellipticus</i> Sm.                 | Rosaceae            |
|                      | <i>Rudbeckia tagetes</i> James              | Asteraceae          |
|                      | <i>Rumex acetosella</i> L.                  | Polygonaceae        |
|                      | <i>Rumex nepalensis</i> Spreng              | Polygonaceae        |

| <i>Name of Aphid</i> | <i>Host Plant</i>                               | <i>Plant Family</i> |
|----------------------|-------------------------------------------------|---------------------|
|                      | <i>Salvia coccinea</i> L.                       | Labiataeae          |
|                      | <i>Sambucus javanica</i> Bl.                    | Sambucaceae         |
|                      | <i>Schima wallichii</i> Chois                   | Ternstroemiaceae    |
|                      | <i>Schima edule</i> Forsk.                      | Ternstroemiaceae    |
|                      | <i>Senecio</i> sp.                              | Compositae          |
|                      | <i>Sida acuta</i> Burm.                         | Malvaceae           |
|                      | <i>Sida rhombifolia</i> L.                      | Malvaceae           |
|                      | <i>Sida</i> sp,                                 | Malvaceae           |
|                      | <i>Smilax</i> sp.                               | Smilacaceae         |
|                      | <i>Solanum clavatum</i>                         | Solanaceae          |
|                      | <i>Solanum melongena</i> L.                     | Solanaceae          |
|                      | <i>Solanum nigrum</i> L.                        | Solanaceae          |
|                      | <i>Solanum sisyrbifolium</i> Lam.               | Solanaceae          |
|                      | <i>Solanum torvum</i> SW.                       | Solanaceae          |
|                      | <i>Solanum tuberosum</i> L.                     | Solanaceae          |
|                      | <i>Solanum</i> spp.                             | Solanaceae          |
|                      | <i>Solidago canadensis</i> L.                   | Compositae          |
|                      | <i>Sonchus arvensis</i> L.                      | Compositae          |
|                      | <i>Spilanthus acmella</i> L.                    | Compositae          |
|                      | <i>Spinacia oleracea</i> L.                     | Chenopodiaceae      |
|                      | <i>Spiraea bella</i> Slms                       | Rosaceae            |
|                      | <i>Spiraea cantonensis</i> Lour                 | Rosaceae            |
|                      | <i>Spiraea chanoidri</i>                        | Rosaceae            |
|                      | <i>Spiraea collosa</i> Wall.                    | Rosaceae            |
|                      | <i>Spiraea corymbosa</i> Roxb.                  | Rosaceae            |
|                      | <i>Spiraea</i> spp.                             | Rosaceae            |
|                      | <i>Symplocos cyatocrataegoides</i><br>Buch-Hax. | Symplocaceae        |
|                      | <i>Symplocos</i> sp.                            | Symplocaceae        |
|                      | <i>Synedrella nudiflora</i> Gaertn.             | Compositae          |
|                      | <i>Tagetes patula</i> L.                        | Compositae          |
|                      | <i>Tagetes</i> sp.                              | Compositae          |
|                      | <i>Terminalia arjuna</i> W & A.                 | Combretaceae        |
|                      | <i>Thunbergia coccinea</i> Wall                 | Acanthaceae         |
|                      | <i>Tibouchina semidecandra</i><br>Cogn.         | Melastomaceae       |
|                      | <i>Tridax procumbens</i> L.                     | Compositae          |

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                 | <i>Plant Family</i> |
|----------------------|-----------------------------------|---------------------|
|                      | var. <i>oleracea</i>              | Amaranthaceae       |
|                      | <i>Amaranthus gangeticus</i> L.   |                     |
|                      | var. <i>tristis</i>               | Amaranthaceae       |
|                      | <i>Amaranthus gracilis</i> Desj.  | Amaranthaceae       |
|                      | <i>Amaranthus spinosus</i> L.     | Amaranthaceae       |
|                      | <i>Antigonon leptopus</i> HK& An  | Polygonaceae        |
|                      | <i>Arachis hypogaea</i> L.        | Fabaceae            |
|                      | <i>Benincasa hispida</i> Cogn.    | Cucurbitaceae       |
|                      | <i>Beta vulgaris</i> L.           | Chenopodiaceae      |
|                      | <i>Bidens biternata</i> (Lour.)   |                     |
|                      | Mem. & Sherff.                    | Compositae          |
|                      | (= <i>Bidens pilosa</i> )         |                     |
|                      | <i>Boerhaavia diffusa</i> L.      | Nyctaginaceae       |
|                      | <i>Bougainvillea spectabilis</i>  |                     |
|                      | Willd.                            | Nyctaginaceae       |
|                      | <i>Bougainvillea</i> spp.         | Nyctaginaceae       |
|                      | <i>Cajanus cajan</i>              | Fabaceae            |
|                      | <i>Cajanus</i> sp.                | Fabaceae            |
|                      | <i>Calotropis gigantea</i> R. Br. | Asclepiadaceae      |
|                      | <i>Camellia theifera</i> Griff.   | Theaceae            |
|                      | <i>Canavalia ensiformis</i> DC.   | Fabaceae            |
|                      | <i>Carica papaya</i> L.           | Caricaceae          |
|                      | <i>Carrissa</i> sp.               | Apocynaceae         |
|                      | <i>Carthamus tinctorius</i> L.    | Compositae          |
|                      | <i>Cassia auriculata</i> L.       | Caesalpiniaceae     |
|                      | <i>Cassia hirsuta</i> L.          | Caesalpiniaceae     |
|                      | <i>Cassia javanica</i> L.         | Caesalpiniaceae     |
|                      | <i>Cassia sophora</i> L.          | Caesalpiniaceae     |
|                      | <i>Cassia tora</i> L.             | Caesalpiniaceae     |
|                      | <i>Cassia</i> spp.                | Caesalpiniaceae     |
|                      | <i>Cestrum nocturnum</i> Lam.     | Solanaceae          |
|                      | <i>Cestrum</i> sp.                | Solanaceae          |
|                      | <i>Chenopodium album</i> L.       | Chenopodiaceae      |
|                      | <i>Chenopodium ravelly</i>        | Chenopodiaceae      |
|                      | <i>Chrysanthemum indicum</i> L.   | Compositae          |
|                      | <i>Chrysanthemum</i> sp.          | Compositae          |
|                      | <i>Cicer arietinum</i> L.         | Fabaceae            |

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                     | <i>Plant Family</i> |
|----------------------|---------------------------------------|---------------------|
|                      | <i>Heliotropium indicum</i> L.        | Boraginaceae        |
|                      | <i>Hibiscus esculentus</i> L.         | Malvaceae           |
|                      | <i>Hibiscus rosa sinensis</i> L.      | Malvaceae           |
|                      | <i>Holoptelea integrifolia</i>        |                     |
|                      | Planch                                | Urticaceae          |
|                      | <i>Indigofera enneaphylla</i> L.      | Papilionaceae       |
|                      | <i>Indigofera nigra</i>               | Papilionaceae       |
|                      | <i>Indigofera oblongifolia</i> Forsk. | Fabaceae            |
|                      | <i>Indigofera purpurea</i> Pers       | Fabaceae            |
|                      | <i>Indigofera tinctoria</i> L.        | Fabaceae            |
|                      | <i>Indigofera trita</i> L. f.         | Fabaceae            |
|                      | <i>Indigofera</i> spp.                | Fabaceae            |
|                      | <i>Ipomoea</i> sp.                    | Convolvulaceae      |
|                      | <i>Kochia</i> sp.                     | Chenopodiaceae      |
|                      | <i>Lagereria vulgaris</i> Ser.        | Cucurbitaceae       |
|                      | <i>Lagerstroemia flos-reginae</i>     |                     |
|                      | Rez.                                  | Lythraceae          |
|                      | <i>Lantana</i> sp.                    | Verbenaceae         |
|                      | <i>Lathyrus aphaca</i> L.             | Fabaceae            |
|                      | <i>Lathyrus sativus</i> L.            | Fabaceae            |
|                      | <i>Lens esculenta</i> Moench          | Fabaceae            |
|                      | <i>Litchi chinensis</i> Sonner        | Sapindaceae         |
|                      | <i>Luffa acgyptiaca</i> Mill.         | Cucurbitaceae       |
|                      | <i>Lycopersicum esculentum</i>        |                     |
|                      | Mill.                                 | Solanaceae          |
|                      | <i>Lycopersicum</i> sp.               | Solanaceae          |
|                      | <i>Lyonia ovalifolia</i> (Wall.)      |                     |
|                      | Drude                                 | Ericaceae           |
|                      | <i>Mangifera indica</i> L.            | Anacardiaceae       |
|                      | <i>Medicago denticulata</i> Willd.    | Fabaceae            |
|                      | <i>Medicago lupulina</i> L.           | Fabaceae            |
|                      | <i>Medicago sativa</i> L.             | Fabaceae            |
|                      | <i>Melilotus indica</i> All.          | Fabaceae            |
|                      | <i>Melilotus parviflora</i> Desf.     | Fabaceae            |
|                      | <i>Mimosa pudica</i> L.               | Mimosaceae          |
|                      | <i>Mimosa</i> sp.                     | Mimosaceae          |
|                      | <i>Mirabilis jalapa</i> L.            | Nyctaginaceae       |

| <i>Name of Aphis</i> | <i>Host Plant</i>                  | <i>Plant Family</i> |
|----------------------|------------------------------------|---------------------|
|                      | <i>Nicotiana tabacum</i> L.        | Solanaceae          |
|                      | <i>Oenanthe stolonifera</i> Wall   | Umbelliferae        |
|                      | <i>Petunia alba</i>                | Solanaceae          |
|                      | <i>Petunia violacea</i> Lindl.     | Solanaceae          |
|                      | <i>Phaseolus aureus</i> Buch-Ham.  | Fabacere            |
|                      | <i>Phaseolus mungo</i> L.          | Fabaceae            |
|                      | <i>Phaseolus radiatus</i> L.       | Fabaceae            |
|                      | <i>Phaseolus roxburghii</i>        |                     |
|                      | W. & A.                            | Fabaceae            |
|                      | <i>Phaseolus trilobus</i> Ait      | Fabaceae            |
|                      | <i>Phaseolus vulgaris</i> L.       | Fabaceae            |
|                      | <i>Phaseolus</i> sp.               | Fabaceae            |
|                      | <i>Phyllanthus niruri</i> L.       | Euphorbiaceae       |
|                      | <i>Pisum sativum</i> L.            | Fabaceae            |
|                      | <i>Plantago zeylanica</i> L.       | Plantaginaceae      |
|                      | <i>Polygonum</i> sp.               | Polygonaceae        |
|                      | <i>Portulaca oleracea</i> L.       | Portulacaceae       |
|                      | <i>Psophocarpus tetragonolobus</i> |                     |
|                      | DC                                 | Papilionaceae       |
|                      | <i>Raphanus sativus</i> L.         | Brassicaceae        |
|                      | <i>Rumex nepalensis</i> Spring     | Polygonaceae        |
|                      | <i>Sesamum indicum</i> DC          | Pedaliaceae         |
|                      | <i>Sesbania bispinosa</i> Stend    | Fabaceae            |
|                      | <i>Sesbania cannabina</i> Pers.    | Fabaceae            |
|                      | <i>Sesbania grandiflora</i> Pers.  | Fabaceae            |
|                      | <i>Sesbania speciosa</i>           | Fabaceae            |
|                      | <i>Smithia semsitiva</i> Ait       | Fabaceae            |
|                      | <i>Solanum clavatum</i>            | Solanaceae          |
|                      | <i>Solanum melongena</i> L.        | Solanaceae          |
|                      | <i>Solanum nigrum</i> L.           | Solanaceae          |
|                      | <i>Solanum tuberosum</i> L.        | Solanaceae          |
|                      | <i>Solanum</i> spp.                | Solanaceae          |
|                      | <i>Tagets</i> sp.                  | Compositae          |
|                      | <i>Tephrosia candida</i> DC.       | Fabaceae            |
|                      | <i>Tinospora cordifolia</i> Miers  | Menispermiceae      |
|                      | <i>Tribulus terrestris</i> L.      | Zygophydaceae       |

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

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

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

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

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

| <i>Name of Aphis</i> | <i>Host Plant</i>                | <i>Plant Family</i> |
|----------------------|----------------------------------|---------------------|
|                      | <i>Cajanus cajan</i> (L.) Millap | Fabaceae            |
|                      | <i>Calaminthe umbrosa</i>        | Labiatae            |
|                      | <i>Calceolaria esculenta</i> (?) | Scrophulariaceae    |
|                      | <i>Calceolaria mexicana</i>      |                     |
|                      | Benth.                           | Scrophulariaceae    |
|                      | <i>Calendula</i> spp.            | Compositae          |
|                      | <i>Calliandra haematocephala</i> |                     |
|                      | Hassk.                           | Mimaceae            |
|                      | <i>Callicarpa macrophylla</i>    |                     |
|                      | Vahl                             | Verbenaceae         |
|                      | <i>Callicarpa</i> sp.            | Verbenaceae         |
|                      | <i>Calotropis gigantea</i> Br.   | Asclepiadaceae      |
|                      | <i>Calotropis procera</i> Br.    | Asclepiadaceae      |
|                      | <i>Calotropis</i> sp.            | Asclepiadaceae      |
|                      | <i>Camellia sinensis</i> (L) Kun | Theaceae            |
|                      | <i>Canna</i> spp.                | Cannaceae           |
|                      | <i>Cannabis sativa</i> L.        | Urticaceae          |
|                      | <i>Capparis stylosa</i> DC.      | Capparidaceae       |
|                      | <i>Capsella bursa-pastoris</i>   |                     |
|                      | Moench.                          | Cruciferae          |
|                      | <i>Capsicum annum</i> L.         | Solanaceae          |
|                      | <i>Capsicum frutescens</i> L.    | Solanaceae          |
|                      | <i>Capsicum</i> spp.             | Solanaceae          |
|                      | <i>Carica papaya</i> L.          | Caricaceae          |
|                      | <i>Cassia hirsuta</i> L.         | Caesalpiniaceae     |
|                      | <i>Cassia sophora</i> L.         | Caesalpiniaceae     |
|                      | <i>Cassia</i> spp.               | Caesalpiniaceae     |
|                      | <i>Caiharanthus roseus</i>       |                     |
|                      | G. Drn.                          | Cynaceae            |
|                      | <i>Celosia argentea</i> L.       | Amaranthaceae       |
|                      | <i>Cestrum diurnum</i> L.        | Solanaceae          |
|                      | <i>Cestrum nocturnum</i> Lam.    | Solanaceae          |
|                      | <i>Cestrum</i> spp.              | Solanaceae          |
|                      | <i>Chenopodium album</i> L.      | Chenopodiaceae      |
|                      | <i>Chrysanthemum coronarium</i>  |                     |
|                      | L.                               | Compositae          |

| <i>Name of Aphid</i> | <i>Host Plant</i>                | <i>Plant Family</i> |
|----------------------|----------------------------------|---------------------|
|                      | <i>Chrysanthemum hortorum</i>    |                     |
|                      | sp.                              | Compositae          |
|                      | <i>Chrysanthemum sinense</i>     |                     |
|                      | Sabine                           | Compositae          |
|                      | <i>Chrysanthemum</i> spp.        | Compositae          |
|                      | <i>Citrullus vulgaris</i> Schrad | Cucurbitaceae       |
|                      | <i>Citrus aurantium</i> L.       | Rutaceae            |
|                      | <i>Citrus decumina</i>           | Rutaceae            |
|                      | <i>Citrus limonum</i> Wall       | Rutaceae            |
|                      | <i>Citrus maxima</i> (Burm.)     |                     |
|                      | Merr.                            | Rutaceae            |
|                      | <i>Citrus paradisi</i> Macfad    | Rutaceae            |
|                      | <i>Citrus reticulata</i> Blanco  | Rutaceae            |
|                      | <i>Citrus sinensis</i> Pers.     | Rutaceae            |
|                      | <i>Citrus</i> spp.               | Rutaceae            |
|                      | <i>Cleome chelidenii</i> L.      | Capparidaceae       |
|                      | <i>Cleome pentaphylla</i> L.     | Capparidaceae       |
|                      | <i>Clerodendrum incana</i>       | Verbenaceae         |
|                      | <i>Clerodendrum viscosum</i>     |                     |
|                      | Vent.                            | Verbenaceae         |
|                      | <i>Clerodendrum serratum</i>     |                     |
|                      | Spreng                           | Verbenaceae         |
|                      | <i>Clerodendrum</i> spp.         | Verbenaceae         |
|                      | <i>Clitoria ternatea</i> L.      | Papilionaceae       |
|                      | <i>Coccinea cordifolia</i> (L.)  | Cucurbitaceae       |
|                      | Cogn.                            |                     |
|                      | <i>Coccinea</i> spp.             | Cucurbitaceae       |
|                      | <i>Cocos</i> sp.                 | Palmae              |
|                      | <i>Colocasia antiquorum</i>      |                     |
|                      | Schott                           | Araceae             |
|                      | <i>Colocasia</i> spp.            | Araceae             |
|                      | <i>Commelina benghalensis</i> L. | Commelinaceae       |
|                      | <i>Commelina</i> spp.            | Commelinaceae       |
|                      | <i>Commiphora berryi</i> Engl.   | Burseraceae         |
|                      | <i>Conyza japonica</i> Less.     | Compositae          |
|                      | <i>Conyza</i> spp.               | Compositae          |
|                      | <i>Corchorus capsularis</i> L.   | Tiliaceae           |

| <i>Name of Aphis</i> | <i>Host Plant</i>                   | <i>Plant Family</i> |
|----------------------|-------------------------------------|---------------------|
|                      | <i>Corchorus olitorius</i> L.       | Tiliaceae           |
|                      | <i>Corchorus</i> sp.                | Tiliaceae           |
|                      | <i>Cordia dichotessa</i> Forst.     | Boraginaceae        |
|                      | <i>Coriandrum sativum</i> L.        | Umbelliferae        |
|                      | <i>Cosmos</i> sp.                   | Compositae          |
|                      | <i>Crepis</i> sp.                   | Compositae          |
|                      | <i>Crinum</i> sp.                   | Amaryllidaceae      |
|                      | <i>Crotalaria alata</i>             |                     |
|                      | Buch-Ham.                           | Fabaceae            |
|                      | <i>Crotalaria brown</i> Rehb.       | Fabaceae            |
|                      | <i>Crotalaria juncea</i> L.         | Fabaceae            |
|                      | <i>Crotalaria</i> sp.               | Fabaceae            |
|                      | <i>Cryptostegia grandiflora</i> Br. | Asclepiadaceae      |
|                      | <i>Cucumis melo</i> L.              | Cucurbitaceae       |
|                      | <i>Cucumis melo</i> var             | Cucurbitaceae       |
|                      | <i>Cucumis sativus</i> L.           | Cucurbitaceae       |
|                      | <i>Cucurbita maxima</i>             |                     |
|                      | Duchesne                            | Cucurbitaceae       |
|                      | <i>Cucurbita moschata</i>           |                     |
|                      | Duchesne                            | Cucurbitaceae       |
|                      | <i>Cucurbita pepo</i> DC            | Cucurbitaceae       |
|                      | <i>Cucurbita</i> ?                  | Cucurbitaceae       |
|                      | <i>Cucurbita</i> spp.               | Cucurbitaceae       |
|                      | <i>Cuphea</i> sp.                   | Lythraceae          |
|                      | <i>Cupressus</i> sp.                | Cupressaceae        |
|                      | <i>Curcuma longa</i> L.             | Scitaminaceae       |
|                      | <i>Cuscuta reflexa</i> Roxb.        | Convolvulaceae      |
|                      | <i>Cyamopsis tetragonoloba</i>      | Fabaceae            |
|                      | <i>Cyanotis axillaris</i> R. & S.   | Commelinaceae       |
|                      | <i>Dynoglossum lanceolatum</i>      |                     |
|                      | Heyne                               | Boraginaceae        |
|                      | <i>Cyperus rotundus</i> L.          | Cyperaceae          |
|                      | <i>Cyphomandra betaceae</i>         |                     |
|                      | Sendt.                              | Solanaceae          |
|                      | <i>Cypripedium</i> sp.              | Orchidaceae         |
|                      | <i>Dahlia variabilis</i> Desf.      | Compositae          |
|                      | <i>Dahlia</i> sp.                   | Compositae          |

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

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                      | <i>Plant Family</i> |
|----------------------|----------------------------------------|---------------------|
|                      | <i>Holmskioldia sanguinea</i> Retz.    | Verbenaceae         |
|                      | <i>Holoptelea integrifolia</i> Planch  | Ulmaceae            |
|                      | <i>Hydrangea</i> spp.                  | Saxifragaceae       |
|                      | <i>Hypericum oblongifolium</i> Choiss  | Hypericaceae        |
|                      | <i>Hypericum patulum</i> Thumb         | Hypericaceae        |
|                      | <i>Hypochaeris radicata</i> L.         | Compositae          |
|                      | <i>Ichinocarpus frutescens</i> Br.     | Apocynaceae         |
|                      | <i>Impatiens balsamina</i> L.          | Balsaminaceae       |
|                      | <i>Impatiens</i> spp.                  | Balsaminaceae       |
|                      | <i>Indigofera</i> sp.                  | Fabaceae            |
|                      | <i>Inula cappa</i> DC                  | Compositae          |
|                      | <i>Ipomoea batatas</i> Lamk.           | Convolvulaceae      |
|                      | <i>Ipomoea carnea</i> Jacq.            | Convolvulaceae      |
|                      | <i>Ipomoea fistulosa</i> Martex Choisy | Convolvulaceae      |
|                      | <i>Ipomoea hederaces</i> Jacq.         | Convolvulaceae      |
|                      | <i>Ipomoea</i> spp.                    | Convolvulaceae      |
|                      | <i>Ixora chinensis</i> Lam.            | Rubiaceae           |
|                      | <i>Ixora coccinea</i> L.               | Rubiaceae           |
|                      | <i>Jacaranda mimosifolia</i> D. Drn.   | Bignoniaceae        |
|                      | <i>Lagenaria siceraria</i> Standl      | Cucurbitaceae       |
|                      | <i>Lagenaria vulgaris</i> Ser.         | Cucurbitaceae       |
|                      | <i>Lagerstroemia flos-reginae</i> Rets | Lythraceae          |
|                      | <i>Lagerstroemia</i> sp.               | Lythraceae          |
|                      | <i>Lantana camara</i> L.               | Verbenaceae         |
|                      | <i>Lantana</i> sp.                     | Verbenaceae         |
|                      | <i>Lawsonia inermis</i> Roxb.          | Lythraceae          |
|                      | <i>Lens esculenta</i> Moench           | Fabaceae            |
|                      | <i>Leptodermis griffithi</i> HKf.      | Rubiaceae           |
|                      | <i>Leucaena glauca</i> Benth           | Fabaceae            |

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

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

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                 | <i>Plant Family</i> |
|----------------------|-----------------------------------|---------------------|
|                      | <i>Rhododendron arboreum</i>      |                     |
|                      | Sm.                               | Ericaceae           |
|                      | <i>Rhododendron</i> sp.           | Ericaceae           |
|                      | <i>Ricinus communis</i> L.        | Euphorbiaceae       |
|                      | <i>Rosa alba</i> L.               | Rosaceae            |
|                      | <i>Rosa cania</i> L.              | Rosaceae            |
|                      | <i>Rosa</i> spp.                  | Rosaceae            |
|                      | <i>Rotala</i> sp.                 | Lythraceae          |
|                      | <i>Rubia cordifolia</i> L.        | Rubiaceae           |
|                      | <i>Rubus ellipticus</i> Sm.       | Rosaceae            |
|                      | <i>Rubus moluccanas</i> L.        | Rosaceae            |
|                      | <i>Rubus</i> sp.                  | Rosaceae            |
|                      | <i>Rudbeckia tagetes</i>          | Asteraceae          |
|                      | <i>Ruellia prostrata</i> Lamk     | Acanthaceae         |
|                      | <i>Rumex nepalensis</i> Spreng    | Polygonaceae        |
|                      | <i>Rumex</i> spp.                 | Polygonaceae        |
|                      | <i>Saccharum officinarum</i> L.   | Gramineae           |
|                      | <i>Salvia aspera</i> Mart. & Gal. | Labiatae            |
|                      | <i>Salvia</i> spp.                | Labiatae            |
|                      | <i>Schima wallichii</i> Chois     | Ternstroemiaceae    |
|                      | <i>Scutellaria repens</i>         |                     |
|                      | Buch-Ham.                         | Labiatae            |
|                      | <i>Scutellaria scandens</i>       |                     |
|                      | D. Don                            | Labiatae            |
|                      | <i>Sechium edule</i> SW.          | Cucurbitaceae       |
|                      | <i>Sechium</i> sp.                | Cucurbitaceae       |
|                      | <i>Senecio densiflorus</i> DC     | Compositae          |
|                      | <i>Senecio</i> spp.               | Compositae          |
|                      | <i>Sesamum orientale</i> L.       | Pedaliaceae         |
|                      | <i>Sesbania grandiflora</i> Pers. | Papilionaceae       |
|                      | <i>Shorea robusta</i> Gartn.      | Dipterocarpaceae    |
|                      | <i>Shorea talura</i> Roxb.        | Dipterocarpaceae    |
|                      | <i>Sida acuta</i> Burm.           | Malvaceae           |
|                      | <i>Sida palmata</i> Cav.          | Malvaceae           |
|                      | <i>Sida rhombifolia</i> Linn.     | Malvaceae           |
|                      | <i>Sida</i> sp.                   | Malvaceae           |

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                       | <i>Plant Family</i>      |
|----------------------|-----------------------------------------|--------------------------|
|                      | <i>Tagetes erecta</i> L.                | Compositae               |
|                      | <i>Tagetes patula</i> L.                | Compositae               |
|                      | <i>Taraxacum officinale</i> Wigg.       | Compositae               |
|                      | <i>Tecoma</i> sp.                       | Bignoniaceae             |
|                      | <i>Tectona grandis</i> L. f.            | Verbenaceae              |
|                      | <i>Terminalia arjuna</i><br>W. & A.     | Combretaceae             |
|                      | <i>Tibouchina rosaeiformis</i>          | Melastomaceae            |
|                      | <i>Tibouchina semidecandra</i><br>Cogn. | Melastomaceae            |
|                      | <i>Tinospora</i> sp.                    | Melastomaceae            |
|                      | <i>Trichosanthes anguina</i> L.         | Cucurbitaceae            |
|                      | <i>Trichosanthes dioica</i> Roxb.       | Cucurbitaceae            |
|                      | <i>Tridax procumbens</i> L.             | Compositae               |
|                      | <i>Tridax</i> spp.                      | Compositae               |
|                      | <i>Trigonella foenum-graecum</i><br>L.  | Papilionaceae            |
|                      | <i>Tropaeolum majus</i> L.              | Tropeolaceae             |
|                      | <i>Typhonium trilobatum</i><br>Schott.  | Araceae                  |
|                      | <i>Urtica parviflora</i> Roxb.          | Urticaceae               |
|                      | <i>Urtica</i> sp.                       | Urticaceae               |
|                      | <i>Verbena officinalis</i> L.           | Verbenaceae              |
|                      | <i>Vernonia cinerea</i> Less.           | Compositae               |
|                      | <i>Vernonia</i> sp.                     | Compositae               |
|                      | <i>Viburnum foetidum</i> Wall.          | Caprifoliaceae           |
|                      | <i>Vicia faba</i> L.                    | Papilionaceae            |
|                      | <i>Vigna catjang</i> Endl.              | Papilionaceae            |
|                      | <i>Viola tricolor</i> L.                | Violaceae                |
|                      | <i>Vitex zeylanica</i> Moldenke         | Verbenaceae              |
|                      | <i>Vitex negundo</i> L.                 | Verbenaceae              |
|                      | <i>Vitex trifolia</i> L.f.              | Verbenaceae              |
|                      | <i>Vitis vinifera</i> L.                | Ampelideae<br>(Vitaceae) |
|                      | <i>Wedelia</i> sp.                      | Compositae               |
|                      | <i>Wendlandia glabrata</i> DC           | Rubiaceae                |

| <i>Name of Aphis</i>                                                       | <i>Host Plant</i>                                                                                                                         | <i>Plant Family</i>                                  |
|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
|                                                                            | <i>Woodfordia fruticosa</i><br>Kurg.                                                                                                      | Lythraceae                                           |
|                                                                            | <i>Melothria heterophylla</i><br>(Loun) Cogn.                                                                                             | Cucurbitaceae                                        |
|                                                                            | <i>Zingiber officinale</i> Rusc.                                                                                                          | Zingiberaceae                                        |
|                                                                            | <i>Zinnia elegans</i> Jacq.                                                                                                               | Compositae                                           |
|                                                                            | <i>Zinnia</i> 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                                          |
| <i>Aphis (Aphis) ? gossypii</i><br>Glover = <i>Aphis ficus</i><br>Theobald | <i>Calendula</i> sp.<br><i>Ficus bengalensis</i> L.                                                                                       | Compositae<br>Moraceae                               |
| <i>Aphis (Aphis) gossypii / nasturtii</i> Complex                          | <i>Mentha arvensis</i> L.                                                                                                                 | Labiatae                                             |
| <i>Aphis (Aphis) hederæ</i><br>Kaltenbach                                  | <i>Hedera</i> sp.                                                                                                                         | Araliaceae                                           |
| <i>Aphis (Aphis) kurosawai</i><br>Takahashi                                | <i>Artemisia caruifolia</i> Buch<br>Ham.<br><i>Artemisia milagrica</i> (Cl)<br>Pamp.<br><i>Artemisia</i> spp.<br><i>Chrysanthemum</i> sp. | Compositae<br>Compositae<br>Compositae<br>Compositae |

| <i>Name of Aphid</i>                                                                                                                                   | <i>Host Plant</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <i>Plant Family</i>                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                        | <i>Daphne</i> sp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Thymelaeaceae                                                                                                                                                                                                                                  |
|                                                                                                                                                        | <i>Eupatorium</i> sp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Compositae                                                                                                                                                                                                                                     |
|                                                                                                                                                        | <i>Helianthus annuus</i> L.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Compositae                                                                                                                                                                                                                                     |
|                                                                                                                                                        | <i>Rhododendron</i> sp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Ericaceae                                                                                                                                                                                                                                      |
|                                                                                                                                                        | <i>Rudbeckia tagetes</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Asteraceae                                                                                                                                                                                                                                     |
| <i>Aphis (Aphis)</i>                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                |
| <i>leptorhyncha</i> David,<br>Sekhon and Bindra                                                                                                        | <i>Cyathula tomentosa</i> Moq.<br>Plants of indet families                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Amaranthaceae                                                                                                                                                                                                                                  |
| <i>Aphis (Aphis) longisetosa</i><br>Basu, A. N. = <i>Aphis</i><br><i>ruborum</i> (Börner) = <i>Aphis</i><br><i>ruborum longisetosus</i><br>Basu. A. N. | <i>Cucurbita moschata</i><br>Duchesne                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Cucurbitaceae                                                                                                                                                                                                                                  |
| <i>Aphis (Aphis) nasturtii</i><br>Kaltenbach                                                                                                           | <i>Achyranthes aspera</i> L.<br><i>Arachis hypogaea</i> L.<br><i>Brunella vulgaris</i> L.<br><i>Clinopodium</i> sp.<br><i>Calotropis</i> sp.<br><i>Capsicum annum</i> L.<br><i>Capsicum frutescens</i> L.<br><i>Cestrum</i> spp.<br><i>Chenopodium</i> sp.<br><i>Chrysanthemum indicum</i> L.<br><i>Clematis</i> spp.<br><i>Clerodendrum viscosum</i><br>Venta<br><i>Clerodendrum</i> sp.<br><i>Coccinea cordifolia</i> (L.)<br>Cogn.<br><i>Coccinea indica</i> W. & A.<br><i>Colocasia antiquorum</i><br>Schott | Amaranthaceae<br>Papilionaceae<br>Labiatae<br>Labiatae<br>Asclepiadaceae<br>Solanaceae<br>Solanaceae<br>Solanaceae<br>Chenopodiaceae<br>Compositae<br>Ranunculaceae<br>Verbenaceae<br>Verbenaceae<br>Cucurbitaceae<br>Cucurbitaceae<br>Araceae |

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

| <i>Name of Aphid</i> | <i>Host Plant</i>                           | <i>Plant Family</i> |
|----------------------|---------------------------------------------|---------------------|
|                      | <i>Osbeckia capitata</i> Benth              | Melastomataceae     |
|                      | <i>Osbeckia chinensis</i> L.                | Melastomataceae     |
|                      | <i>Oxalis corniculata</i> L.                | Oxalidaceae         |
|                      | <i>Oxalis</i> sp.                           | Oxalidaceae         |
|                      | <i>Perilla ocimoides</i> L.                 | Labiatae            |
|                      | <i>Plantago major</i> L.                    | Plantaginaceae      |
|                      | <i>Polygonum perfoliatum</i> L.             | Polygonaceae        |
|                      | <i>Polygonum runcinatum</i><br>Buch-Ham.    | Polygonaceae        |
|                      | <i>Polygonum</i> sp.                        | Polygonaceae        |
|                      | <i>Pouzolzia hirta</i> Horsk.               | Urticaceae          |
|                      | <i>Prunella vulgaris</i> L.                 | Labiatae            |
|                      | <i>Schima wallichii</i> Choiss              | Ternstroemiaceae    |
|                      | <i>Sesamum indicum</i> DC.                  | Pedaliaceae         |
|                      | <i>Shorea robusta</i> Gaertn                | Dipterocarpaceae    |
|                      | <i>Sida</i> sp.                             | Malvaceae           |
|                      | <i>Solanum melongena</i> L.                 | Solanaceae          |
|                      | <i>Solanum nigrum</i> L.                    | Solanaceae          |
|                      | <i>Strobilanthes atropurpureus</i><br>Nees. | Acanthaceae         |
|                      | <i>Strobilanthes</i> sp.                    | Acanthaceae         |
|                      | <i>Tagetes patula</i> L.                    | Compositae          |
|                      | <i>Tectona grandis</i> R. f.                | Verbenaceae         |
|                      | <i>Tibouchina semidecandra</i><br>Cogn.     | Melastomaceae       |
|                      | <i>Toddalia venosa</i> D. Don.              | Rutaceae            |
|                      | <i>Torenia</i> sp.                          | Scrophulariaceae    |
|                      | <i>Vaccinium griffithianum</i><br>Wight     | Ericaceae           |
|                      | <i>Woodfordia fruticosa</i> (L)<br>Kurg     | Lythraceae          |
|                      | <i>Xanthochymus ovalifolius</i><br>Roxb.    | Guthferae           |
|                      | <i>Zinnia elegans</i> Jacq.                 | Compositae          |
|                      | Indet                                       | Labiatae            |
|                      | Indet                                       | Rhamnaceae          |
|                      | Plants of indet families                    |                     |

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

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

| <i>Name of Aphis</i>                         | <i>Host Plant</i>                            | <i>Plant Family</i> |
|----------------------------------------------|----------------------------------------------|---------------------|
|                                              | <i>Rubus palmataus</i> Thunb.                | Rosaceae            |
|                                              | <i>Rubus rosaefolius</i> Sm.                 | Rosaceae            |
|                                              | <i>Rubus</i> sp.                             | Rosaceae            |
|                                              | <i>Saussurea nepalensis</i><br>Spreng.       | Compositae          |
|                                              | Plant of indet family                        |                     |
| <i>Aphis ruborum</i> Börner                  | <i>Rubus lineatus</i> Reinw                  | Rosaceae            |
| <i>Aphis (Aphis) ? ruborum</i><br>(Börner)   | <i>Rubus ellipticus</i> Sm.                  | Rosaceae            |
| <i>Aphis (Aphis) rumicis</i><br>Linnaeus     | <i>Benincasa hispida</i> Cogn.               | Cucurbitaceae       |
|                                              | <i>Dolichos lablab</i> L.                    | Fabaceae            |
|                                              | <i>Solanum nigrum</i> L.                     | Solanaceae          |
|                                              | <i>Vigna catjang</i> Endl.                   | Fabaceae            |
| <i>Aphis (Aphis) nr. rumicis</i><br>Linnaeus | <i>Rumex acetosella</i> L.                   | Polygonaceae        |
| <i>Aphis (Aphis) umbrella</i><br>(Börner)    |                                              |                     |
| = <i>Aphis malvae</i> Koch                   | <i>Abetisosbus egcerlentu</i>                | ?                   |
|                                              | <i>Abutilon indicum</i> D. Don               | Malvaceae           |
|                                              | <i>Althaea rosea</i> L.                      | Malvaceae           |
|                                              | <i>Benincasa hispida</i> Cogn.               | Cucurbitaceae       |
|                                              | <i>Cineraria</i> sp.                         | Compositae          |
|                                              | <i>Citrullus vulgaris</i> Schrad             | Cucurbitaceae       |
|                                              | <i>Citrus aurantium</i> L.                   | Rutaceae            |
|                                              | <i>Coccinea indica</i> W. & A.               | Cucurbitaceae       |
|                                              | <i>Colocasia</i> sp.                         | Araceae             |
|                                              | <i>Convallaria majalis</i> L.                | Liliaceae           |
|                                              | <i>Crotalaria juncea</i> L.                  | Fabaceae            |
|                                              | <i>Cucumis melo</i> var.<br><i>momordica</i> | Cucurbitaceae       |
|                                              | <i>Cucumis sativus</i> L.                    | Cucurbitaceae       |
|                                              | <i>Cucurbita maxima</i><br>Duchesne          | Cucurbitaceae       |
|                                              | <i>Cucurbita moschata</i><br>Duchesne        | Cucurbitaceae       |
|                                              | <i>Cucurbita pepo</i> DC                     | Cucurbitaceae       |

| <i>Name of Aphid</i>                                                        | <i>Host Plant</i>                          | <i>Plant Family</i> |
|-----------------------------------------------------------------------------|--------------------------------------------|---------------------|
|                                                                             | <i>Cucurbita</i> spp.                      | Cucurbitaceae       |
|                                                                             | <i>Dianthus caryophyllus</i> L.            | Caryophyllaceae     |
|                                                                             | <i>Eriobotrya japonica</i> Lindl.          | Rosaceae            |
|                                                                             | <i>Gossypium</i> sp.                       | Malvaceae           |
|                                                                             | <i>Hibiscus cannabinus</i> L.              | Malvaceae           |
|                                                                             | <i>Hibiscus esculentus</i> L.              | Malvaceae           |
|                                                                             | <i>Hibiscus rosa-sinensis</i> L.           | Malvaceae           |
|                                                                             | <i>Jasminum</i> sp.                        | Oleaceae            |
|                                                                             | <i>Lageneria vulgaris</i> Ser.             | Cucurbitaceae       |
|                                                                             | <i>Leucas</i> sp.                          | Labiatae            |
|                                                                             | <i>Luffa acutangula</i> Roxb.              | Cucurbitaceae       |
|                                                                             | <i>Malva sylvestris</i> L.                 | Malvaceae           |
|                                                                             | <i>Malvestrum tricuspidatum</i><br>A. Gray | Malvaceae           |
|                                                                             | <i>Momordica charantia</i> L.              | Cucurbitaceae       |
|                                                                             | <i>Momordica cochinchinensis</i><br>Spreng | Cucurbitaceae       |
|                                                                             | <i>Nepeta</i> sp.                          | Labiatae            |
|                                                                             | <i>Peganum harmala</i> L.                  | Zygophyllaceae      |
|                                                                             | <i>Pyrus communis</i> L.                   | Rosaceae            |
|                                                                             | <i>Rosa damascens</i> Mill.                | Rosaceae            |
|                                                                             | <i>Rubus ellipticus</i> Sm.                | Rosaceae            |
|                                                                             | <i>Rudbeckia</i> spp.                      | Asteraceae          |
|                                                                             | <i>Salvia</i> sp.                          | Labiatae            |
|                                                                             | <i>Solanum nigrum</i> L.                   | Solanaceae          |
|                                                                             | <i>Trichosanthes anguina</i> L.            | Cucurbitaceae       |
|                                                                             | <i>Trichosanthes dioica</i> Roxb.          | Cucurbitaceae       |
|                                                                             | <i>Viola tricolor</i> L.                   | Violaceae           |
|                                                                             | <i>Withania semnifera</i> Dun              | Solanaceae          |
|                                                                             | <i>Woodfordia fruticosa</i> Koz            | Lythraceae          |
| <i>Aphis (Aphis) ? umbrella</i><br>(Börner) = <i>Aphis ? malvae</i><br>Koch | Plant of indet. family                     |                     |
| <i>Aphis (Aphis) verbasci</i><br>Schrank                                    | <i>Buddleja paniculata</i> Wall.           | Buddlejaceae        |

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

| <i>Name of Aphid</i> | <i>Host Plant</i>          | <i>Plant Family</i> |
|----------------------|----------------------------|---------------------|
|                      | <i>Psidium</i> sp.         | Myrtaceae           |
|                      | <i>Pyrus communis</i> L.   | Rosaceae            |
|                      | <i>Pyrus malus</i> L.      | Rosaceae            |
|                      | <i>Rubus moluccanus</i> L. | Rosaceae            |
|                      | <i>Rubus niveus</i> Wall.  | Rosaceae            |
|                      | <i>Rubus</i> 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.  | <i>Aphis achyranthi</i> Theobald            | 2             | 2           | 2            |
| 2.  | <i>A. affinis</i> del Guercio               | 2             | 1           | 1            |
| 3.  | <i>A. citricola</i> v. d. Goot              | 255           | 175         | 68           |
| 4.  | <i>A. clematidis simlaensis</i> Kr. & Burk. | 2             | 2           | 2            |
| 5.  | <i>A. craccivora</i> Koch                   | 163           | 100         | 39           |
| 6.  | <i>A. eugeniae</i> v. d. Goot               | 1             | 1           | 1            |
| 7.  | <i>A. euphorbiae</i> Thomas                 | 1             | 1           | 1            |
| 8.  | <i>A. fabae</i> Scopoli complex             | 77            | 62          | 30           |
| 9.  | <i>A. farinosa</i> Gmelin                   | 1             | 1           | 1            |
| 10. | <i>A. glycines</i> Mats.                    | 1             | 1           | 1            |
| 11. | <i>A. gossypii</i> Glover                   | 459           | 275         | 76           |
| 12. | <i>A. kurosawai</i> Takahashi               | 9             | 7           | 3            |
| 13. | <i>A. longisetosa</i> Basu                  | 10            | 5           | 5            |
| 14. | <i>A. nasturtii</i> Kalt.                   | 74            | 64          | 37           |
| 15. | <i>A. nerii</i> B. d. F.                    | 15            | 11          | 6            |
| 16. | <i>A. paraverbasci</i> Chakrabarti          | 1             | 1           | 1            |
| 17. | <i>A. pollinosa</i> Walker                  | 1             | 1           | 1            |
| 18. | <i>A. polygonacea</i> Mats.                 | 1             | 1           | 1            |
| 19. | <i>A. pomi</i> de Geer                      | 3             | 2           | 1            |
| 20. | <i>A. punicae</i> Pass.                     | 5             | 5           | 4            |
| 21. | <i>A. raji</i> Kr. & Burk.                  | 1             | 1           | 1            |
| 22. | <i>A. rhamniphila</i> David <i>et al.</i>   | 2             | 2           | 2            |
| 23. | <i>A. rhoicola</i> H. R. L.                 | 2             | 1           | 1            |
| 24. | <i>A. rubifolii</i> (Thomas)                | 2             | 2           | 1            |
| 25. | <i>A. rumicis</i> Linn.                     | 4             | 4           | 4            |
| 26. | <i>A. verbasci</i> Schrank                  | 7             | 6           | 6            |
| 27. | <i>A. (Protaphis) carthami</i> (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. paraverbaschi* 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

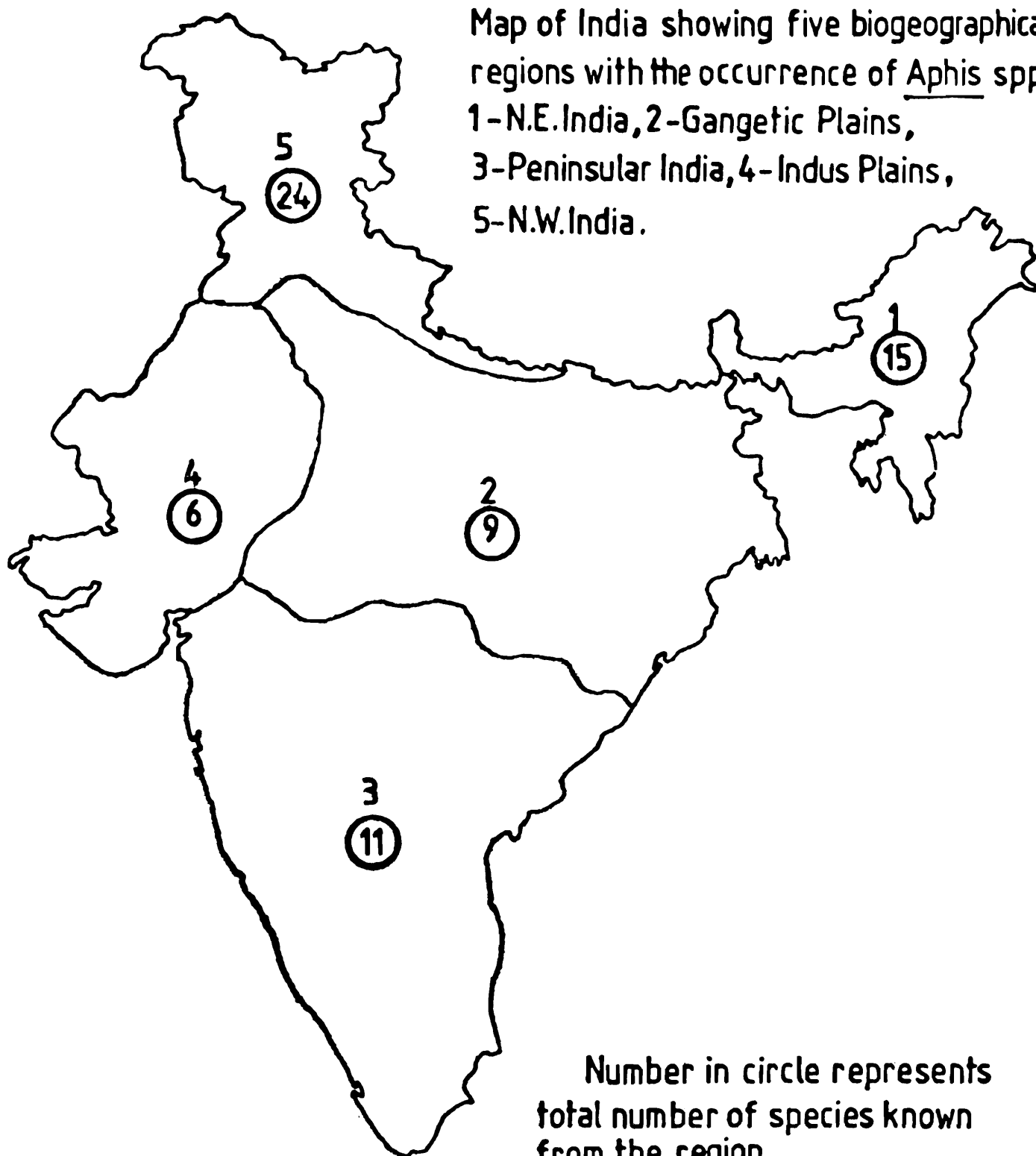
antennal segments are more in numbers than alate viviparous females. The sexual females are chiefly characterised by swollen hind tibiae with numerous pseudosensoria (Fig. 6.) besides other characters (Fig. 5). The sensoria-like glands on the tibiae of most sexual females, which apparently do not serve 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. paraverbaschi* 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. & Burkdt. 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.

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.



## 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 Anholocyclic (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.

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# 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



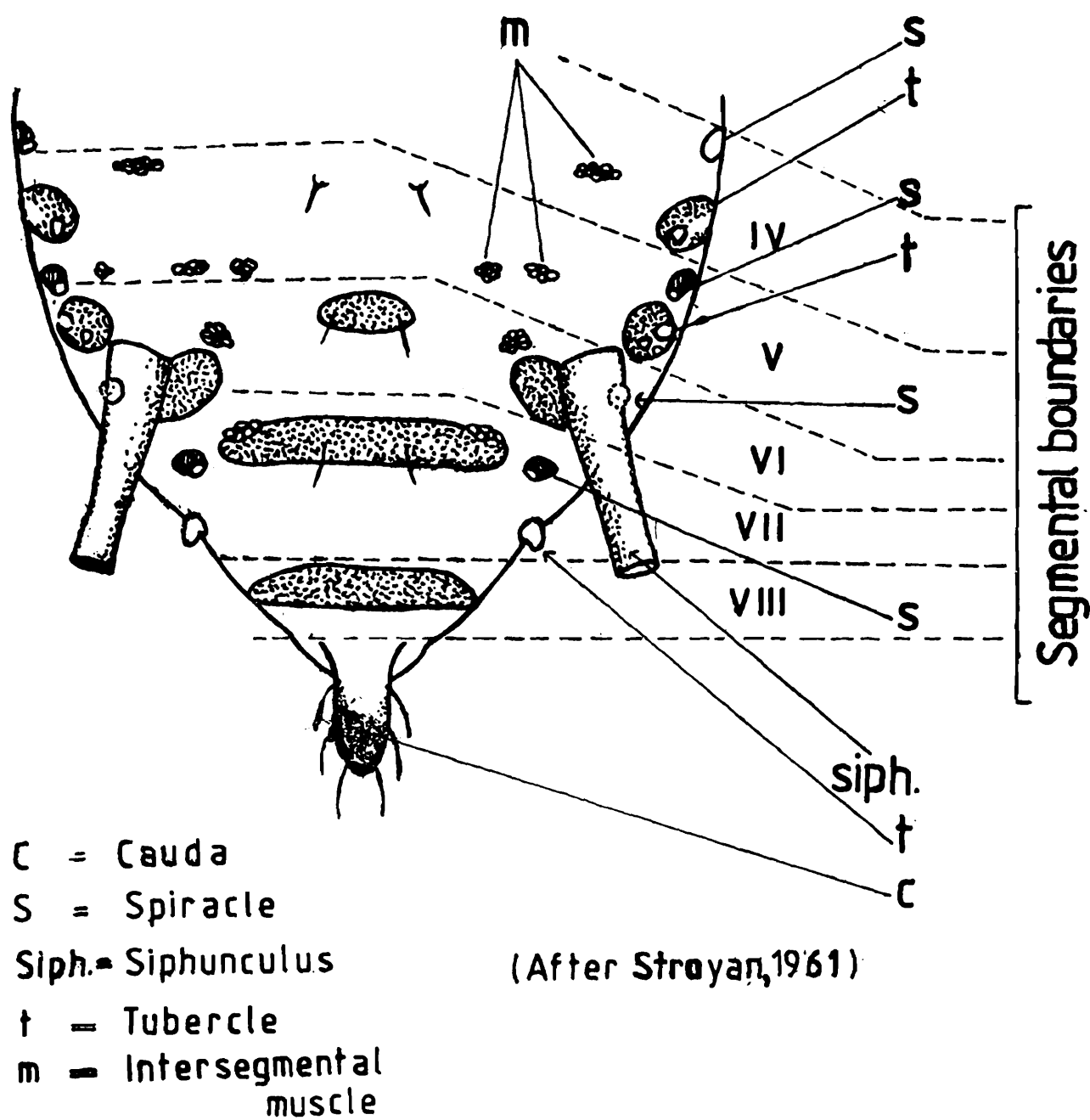


Fig. 3. Key diagram of posterior segments of abdomen of apterous viviparous female of genus *Aphis* L.

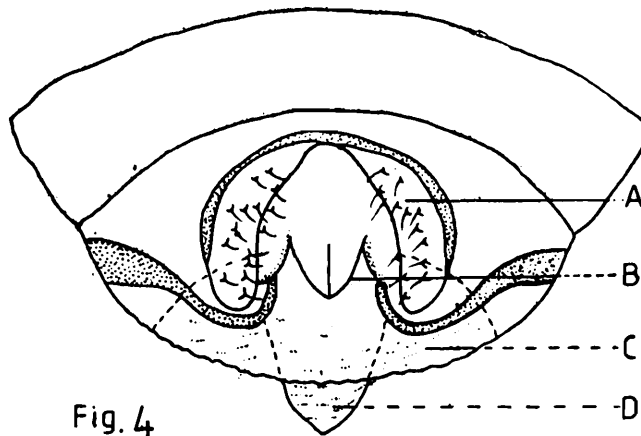
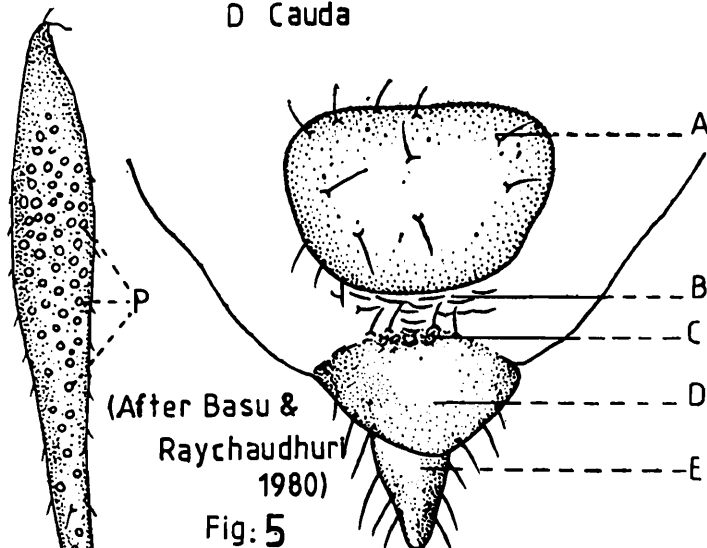


Fig. 4  
Typical male appendages of Aphis L.

- A Opercula  
B Penis (After Cottler, 1953)  
C Anal plate  
D Cauda



(After Basu &  
Raychaudhuri  
1980)

Fig. 5

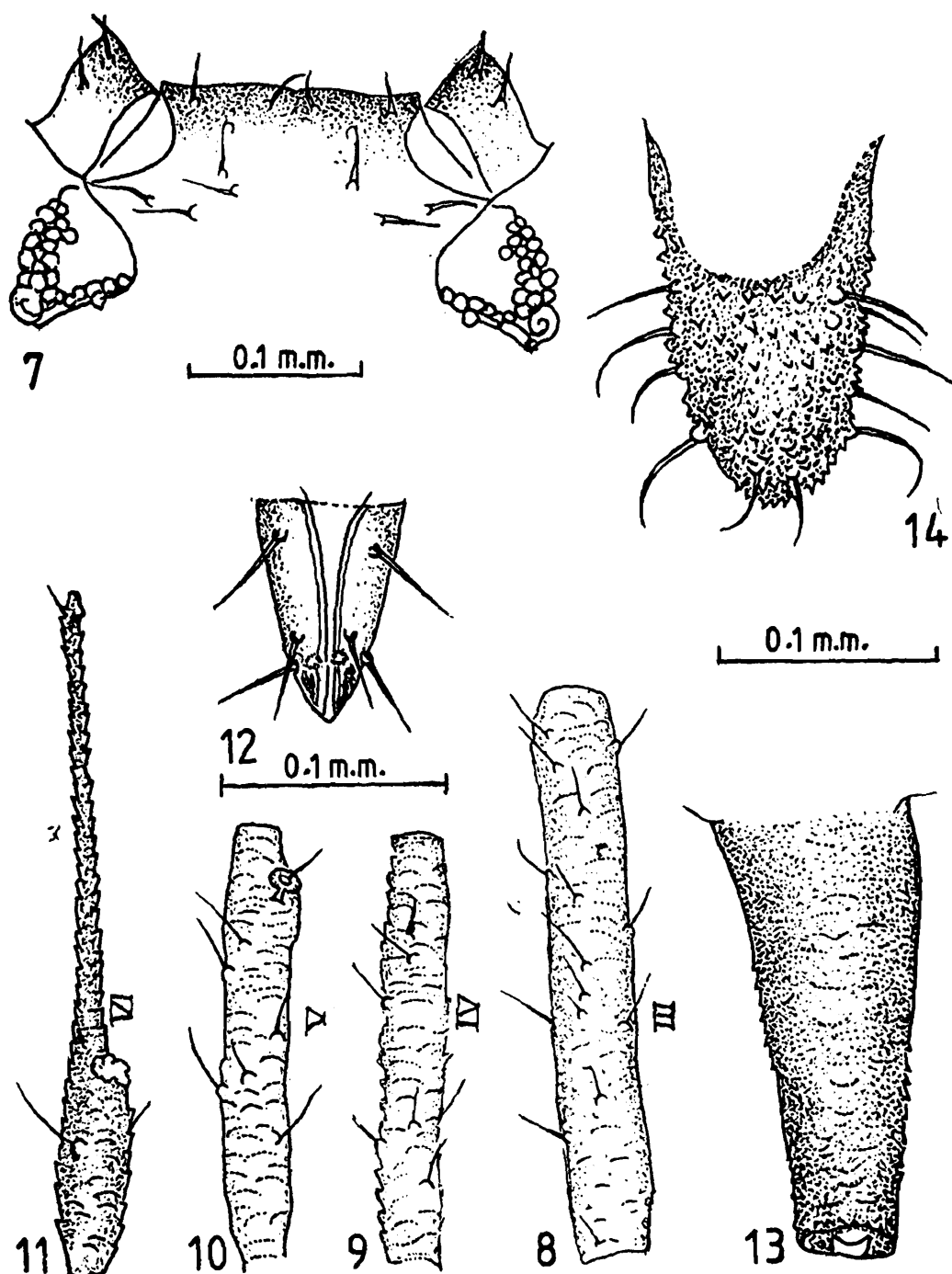
Typical female genitalia of apterous  
oviparous female of Aphis L.

- A Genital or subgenital plate  
B Genital pore or vulva  
C Rudimentary gonapophyses  
D Anal plate  
E Cauda

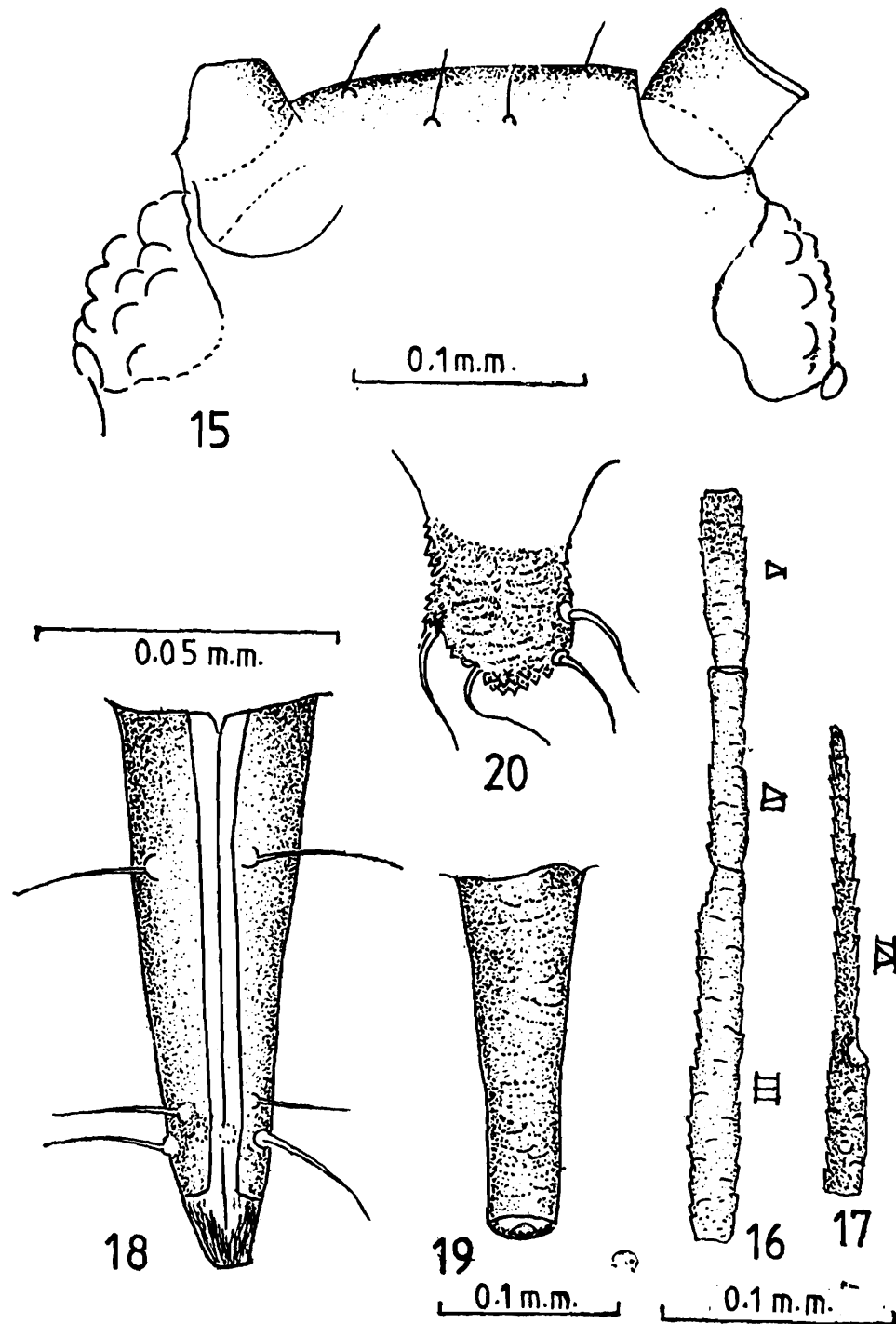
Fig. 6

Hind tibia showing pseudosensoria in apterous  
Oviparous female of Aphis L.

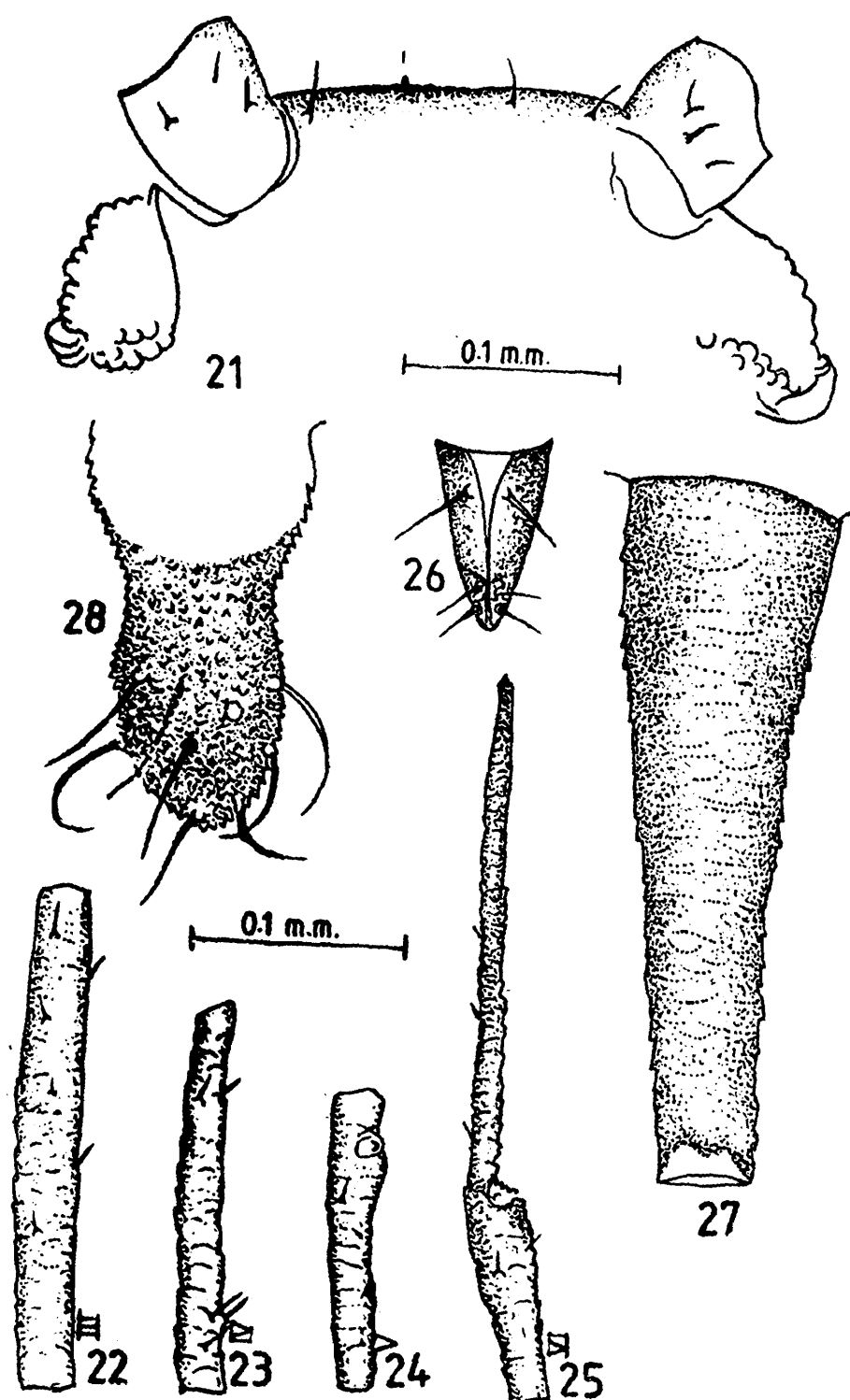
P = Pseudosensoria



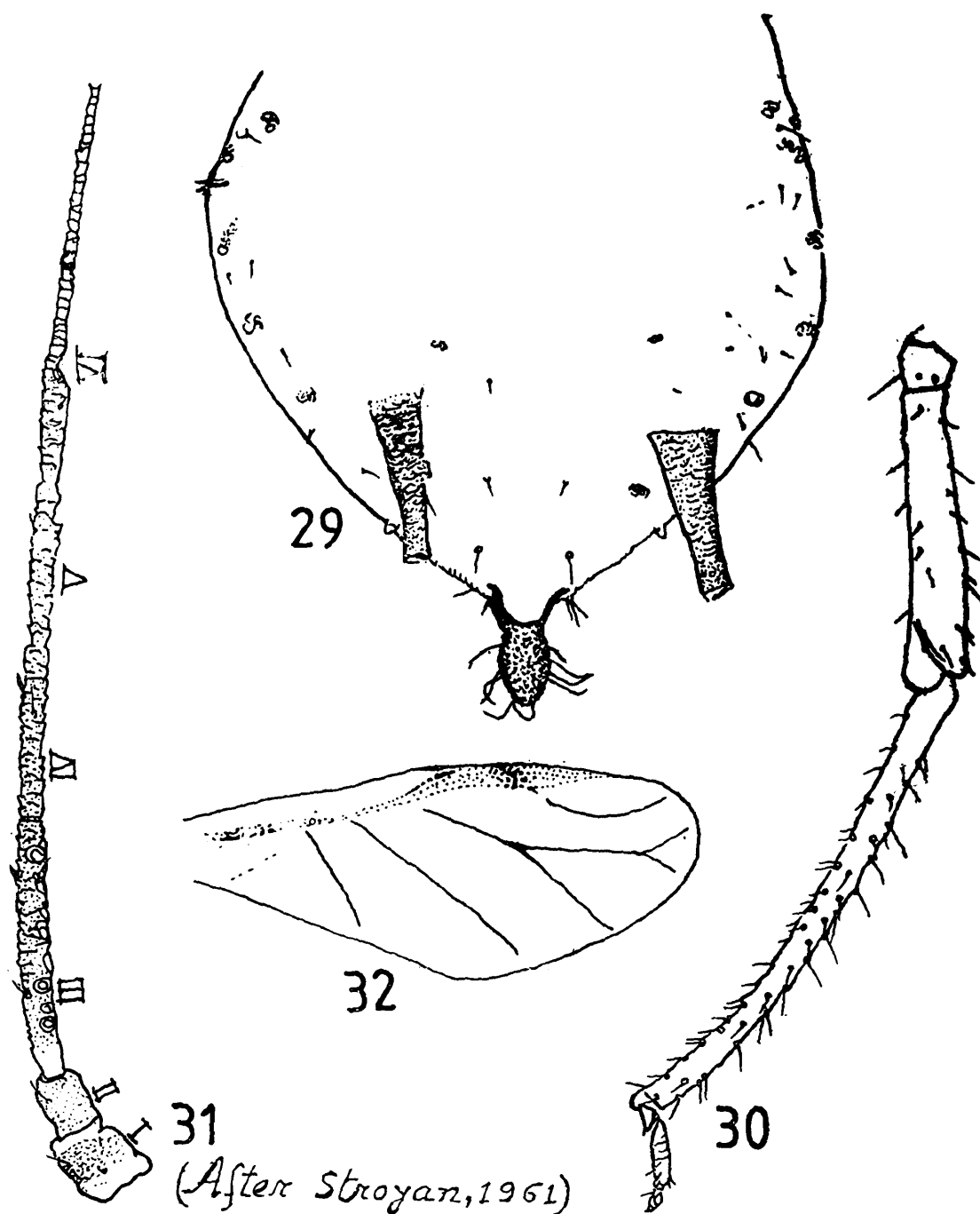
Figs. 7-14. *Aphis achyranthi* Theobald : Aptera. 7, Head ; 8, a. s. III ; 9, a. s. IV ; 10, a. s. V ; 11, a. s. VI ; 12, u. r. s. ; 13, Siphunculus ; 14, Cauda.



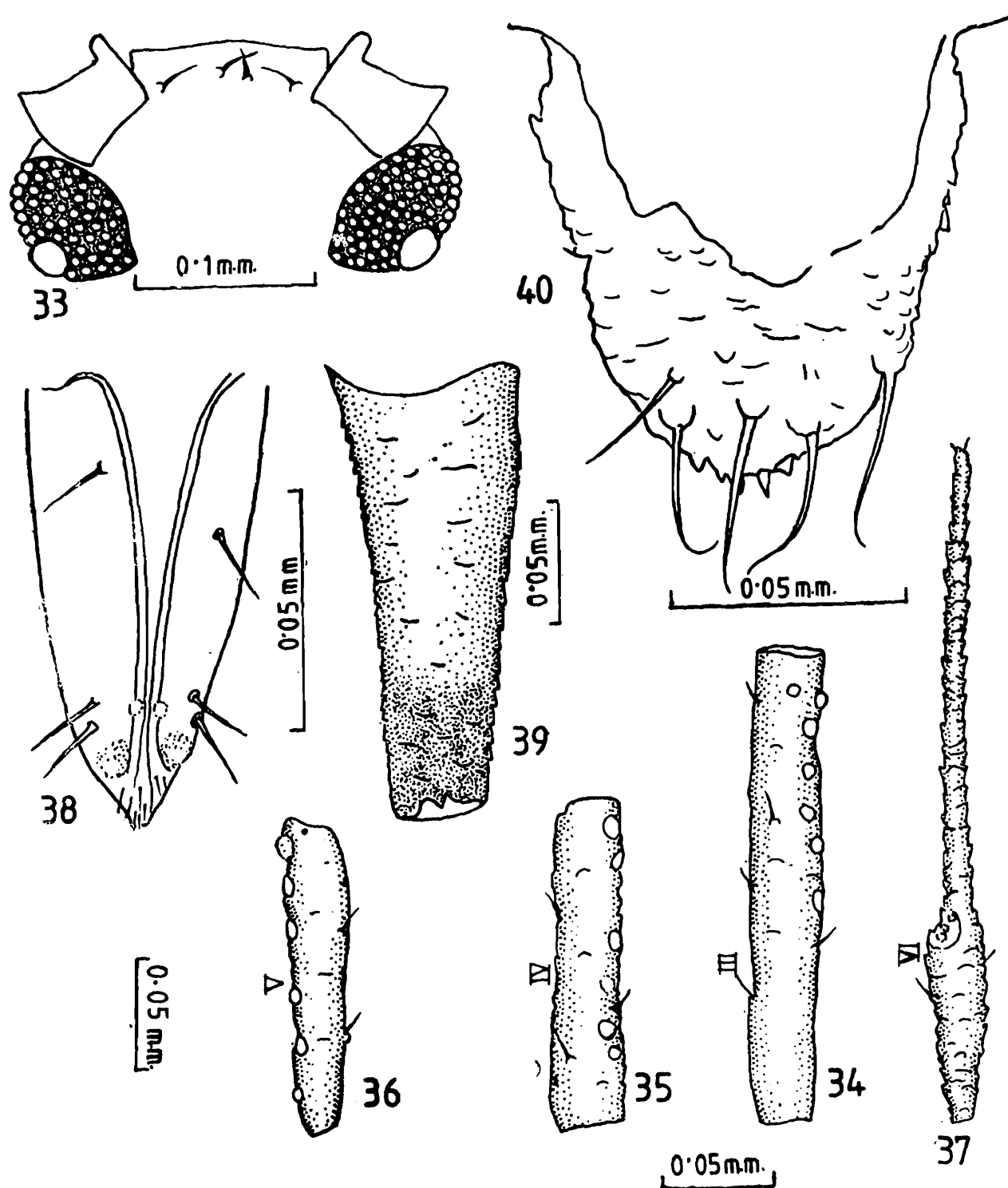
Figs. 15-20. *Aphis affinis* del Guercio : Aptera. 15, Head ; 16, a. s. III-V ; 17, a. s. VI ; 18, u. r. s. ; 19, Siphunculus ; 20, Cauda.



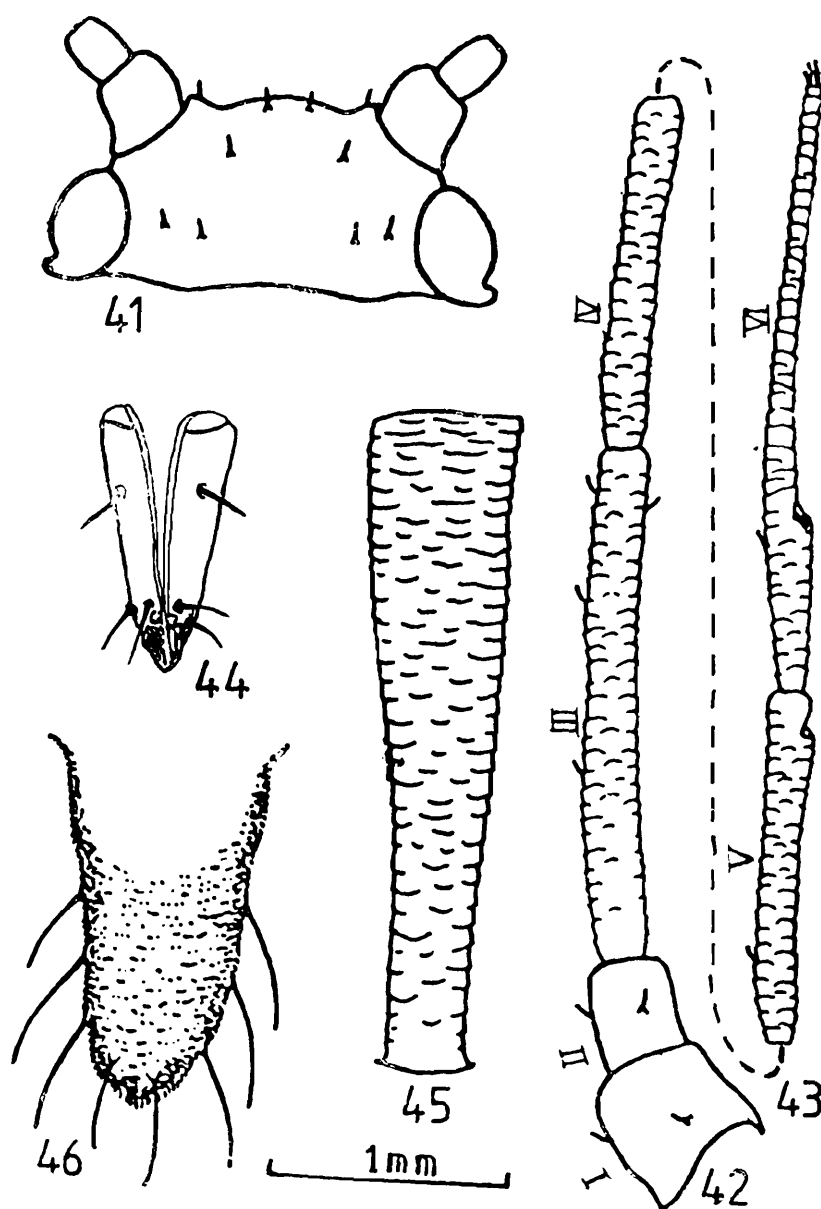
Figs. 21-28. *Aphis citricola* van der Goot : Aptera. 21, Head ; 22, a. s. III ; 23, a. s. IV ; 24, a. s. V ; 25, a. s. VI ; 26, u. r. s. ; 27, Siphunculus ; 28, Cauda ;



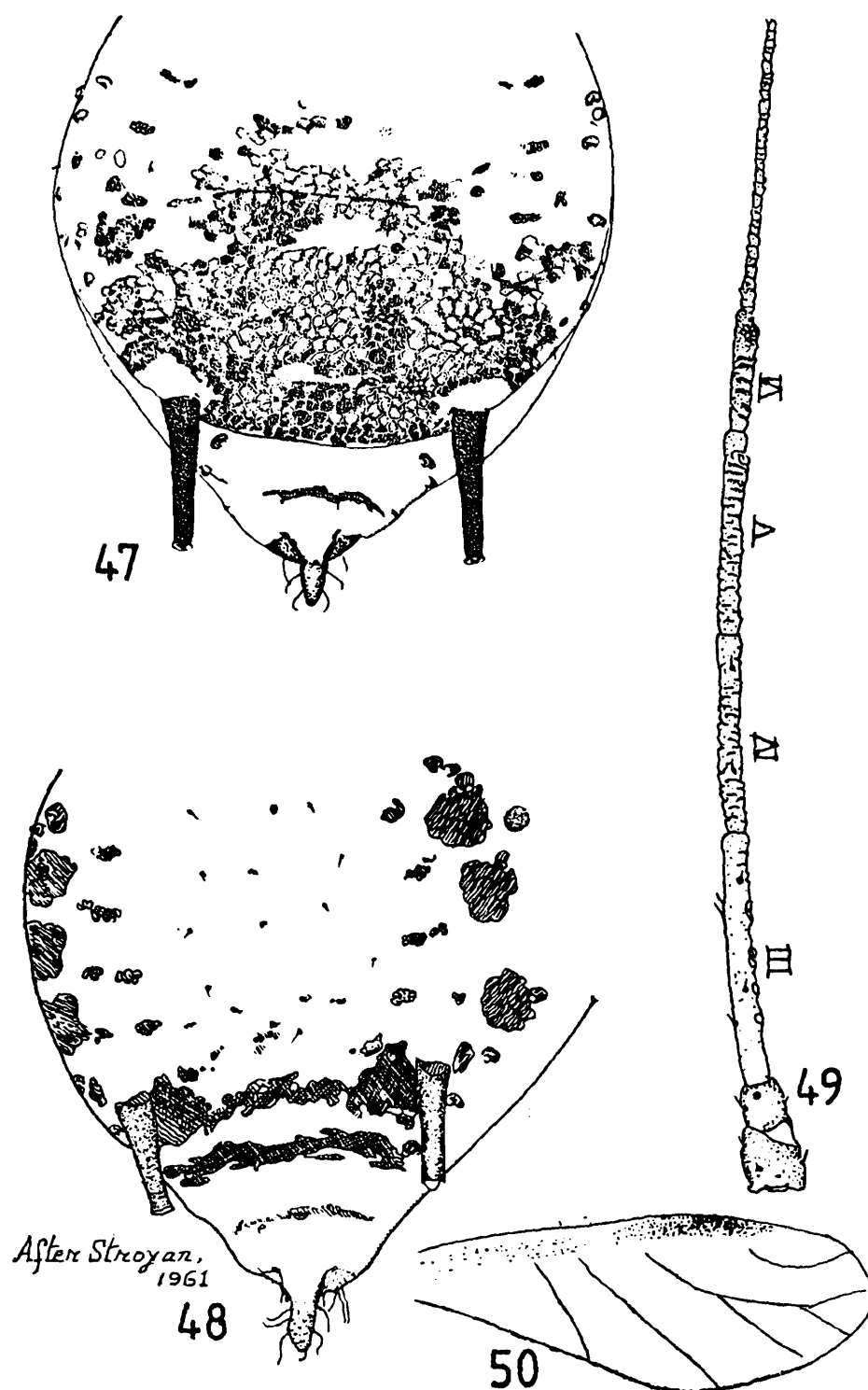
Figs 29-32. *Aphis citricola* v. d. Goot : Apter. 29, posterior abdominal dorsum ; 30, hind leg showing femoral hairs ; Alata. 31, Antenna showing secondary rhinaria ; 32, hind wing.



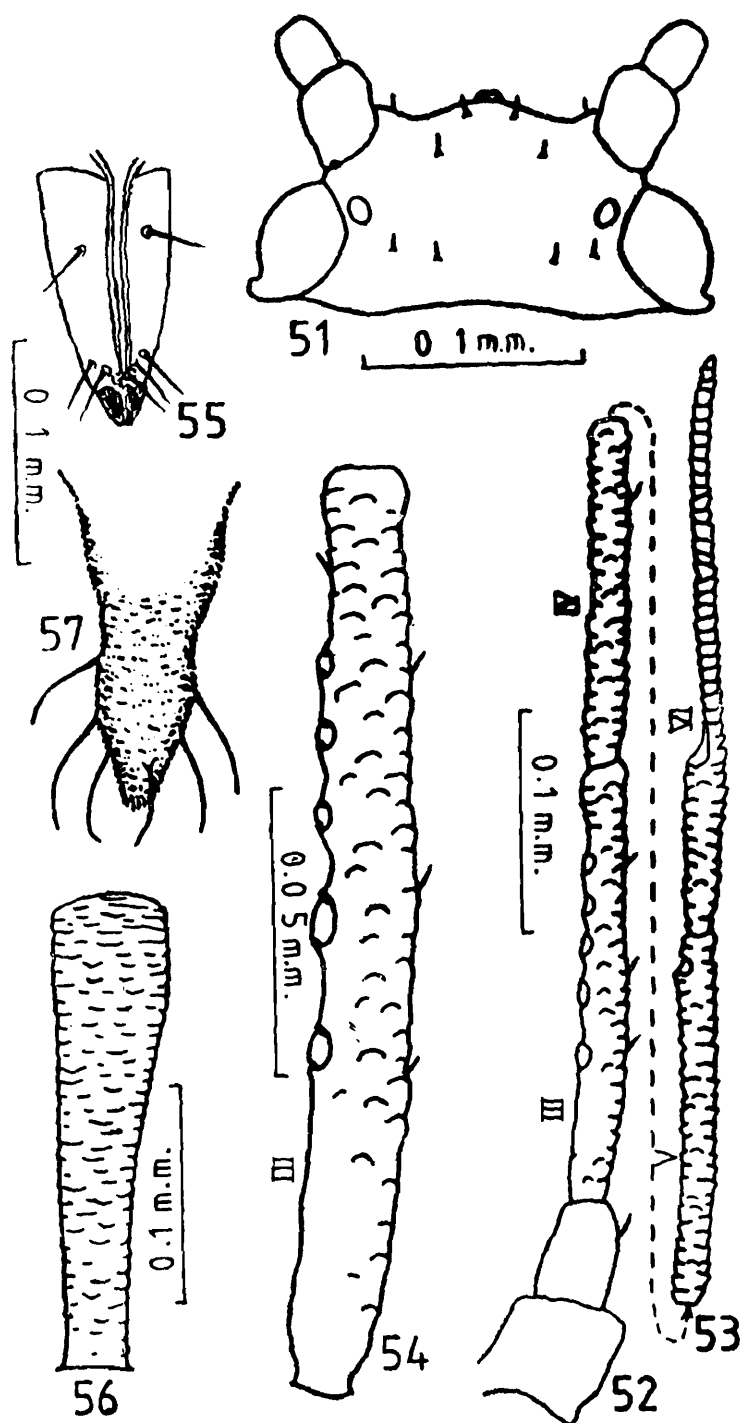
Figs. 33-40. *Aphis clematidis simlaensis* Kumar & Burkhardt : Apter. 33, Head ; 34, a. s. III ; 35, a. s. IV ; 36, a. s. V ; 37, a. s. VI ; 38, u. r. s. ; 39, Siphunculus ; 40, Cauda.



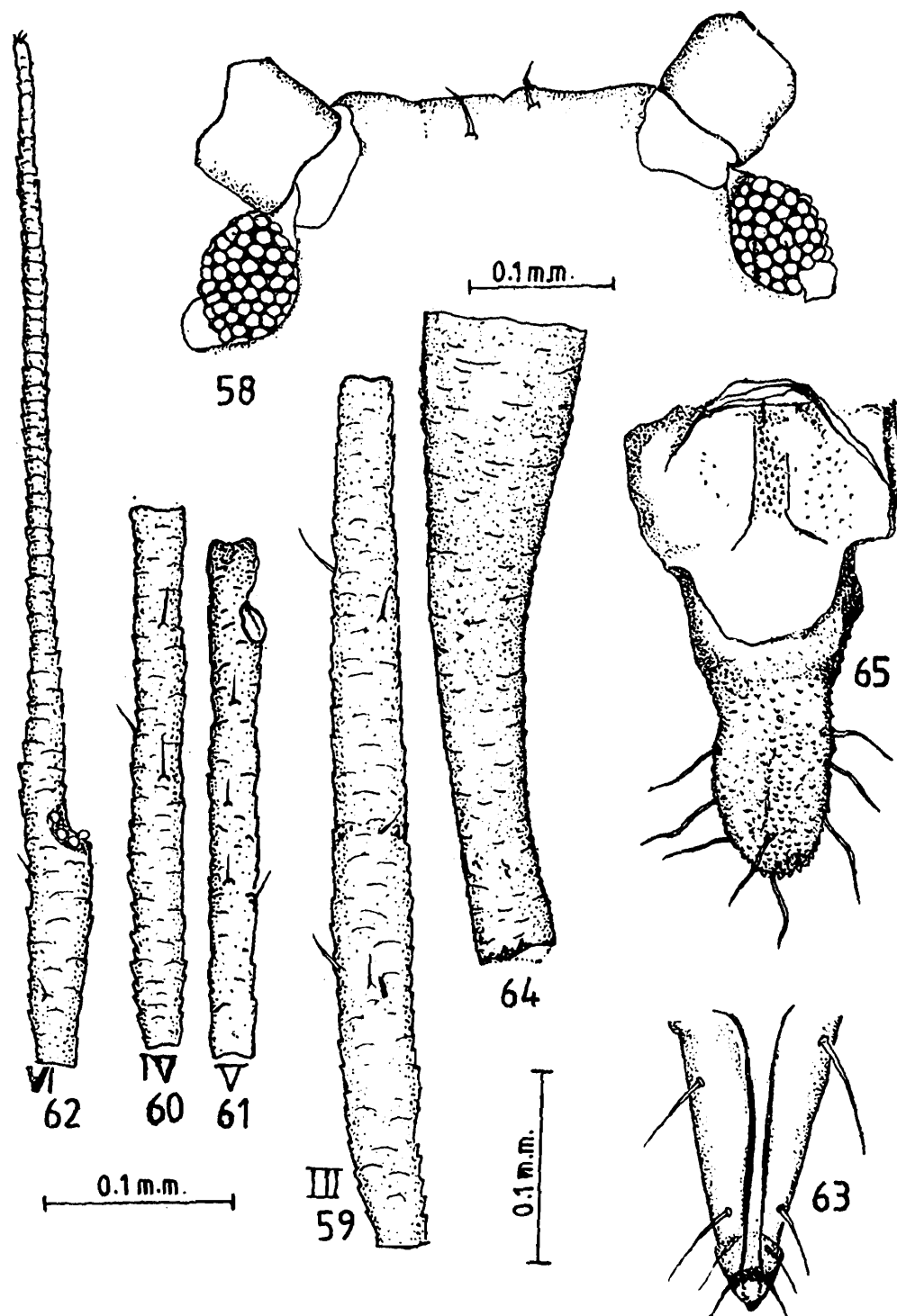
Figs. 41-46. *Aphis craccivora* Koch : Apter. 41, Head ; 42, a. s. I-IV ; 43, a. s. V-VI ; 44, u. r. s. ; 45, Siphunculus ; 46, Cauda.



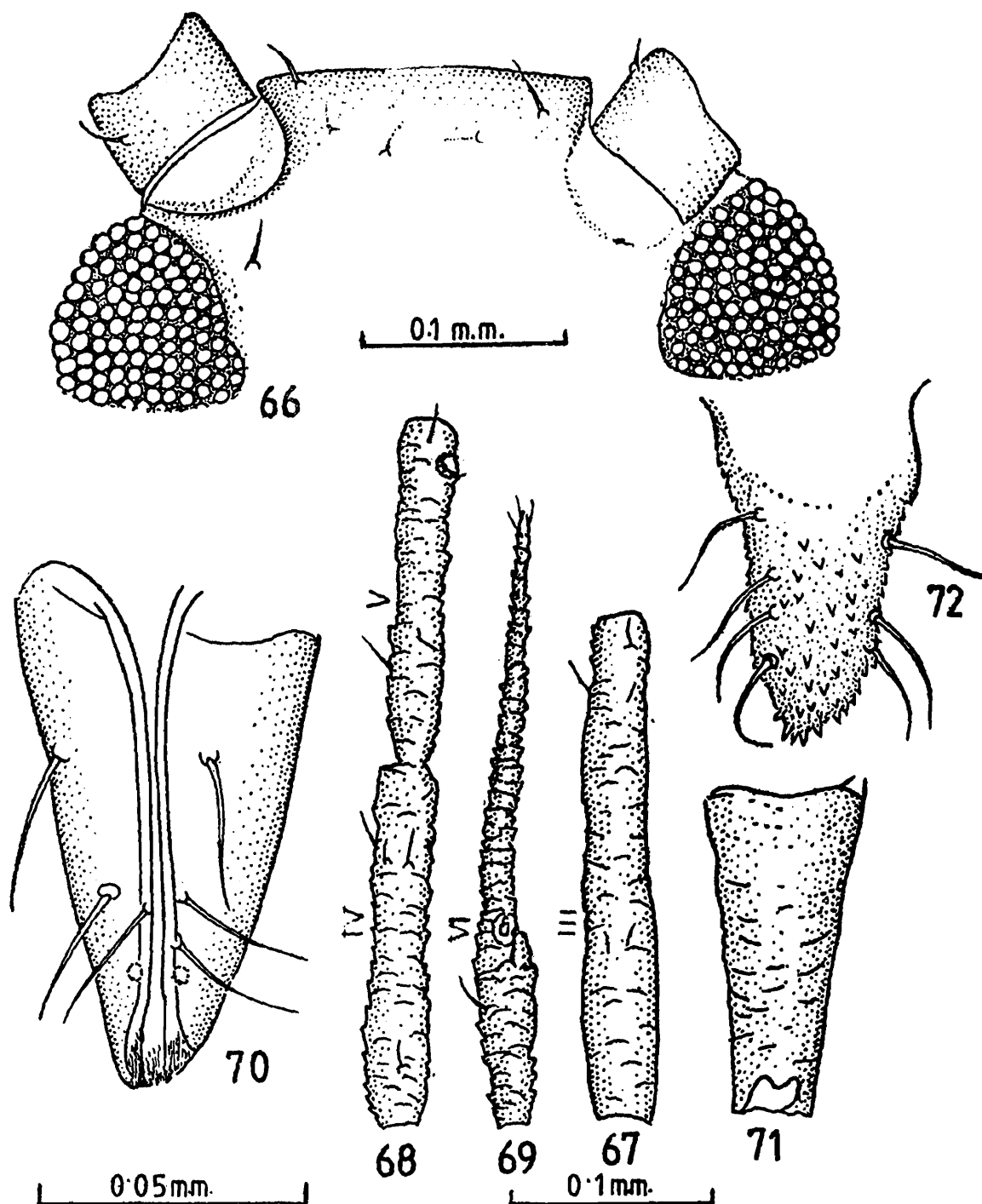
Figs. 47-50, *Aphis craccivora* Koch : Apterous, 47, posterior abdominal dorsum ; Alate. 48, posterior abdominal dorsum ; 49, Antenna ; 50, Hind wing.



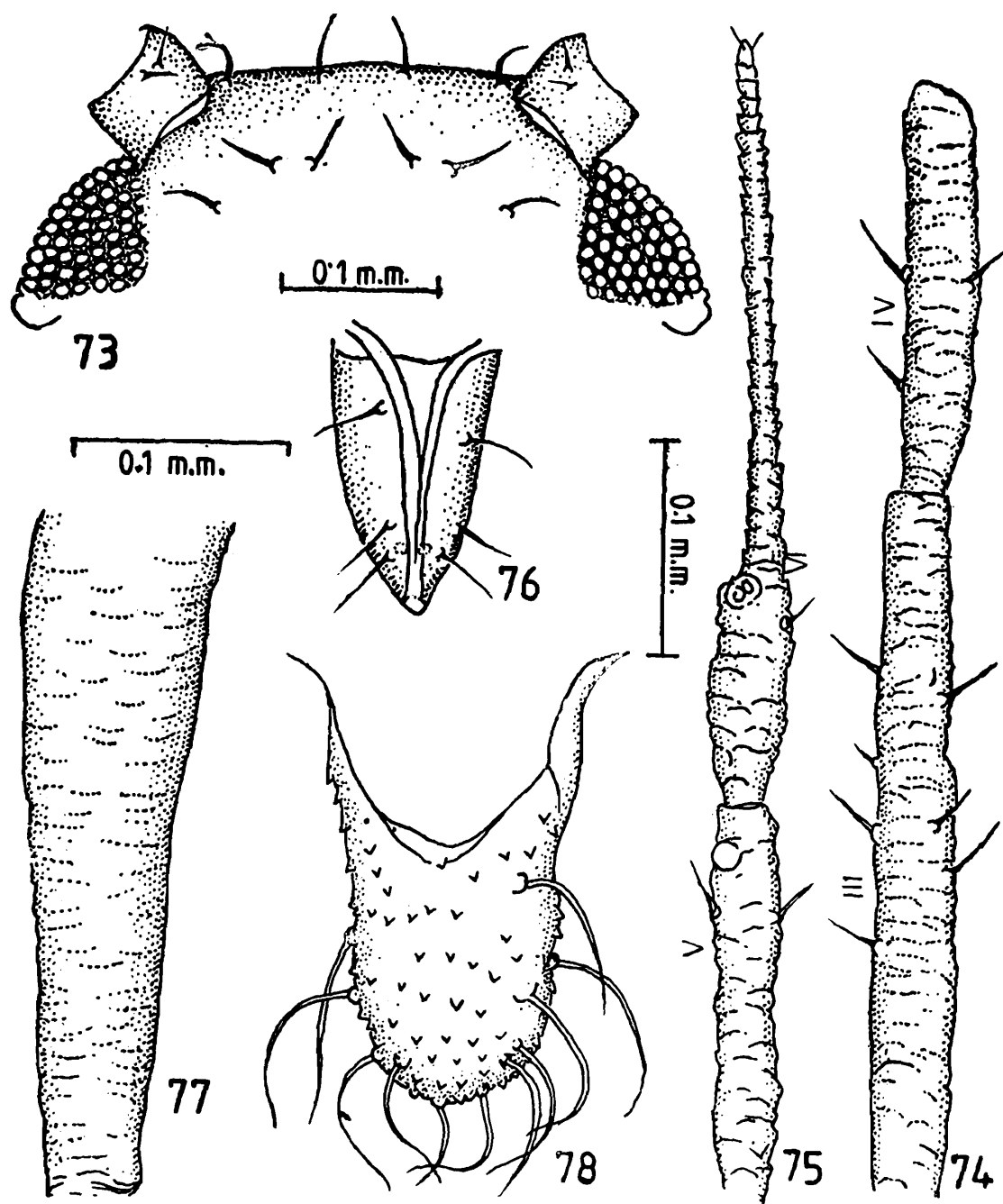
Figs. 51-57. *Aphis craccivora* Koch : Alata. 51, Head ; 52, a. s. III & IV ; 53, a. s. V & VI ; 54, a. s. III enlarged ; 55, u. r. s. ; 56, Siphunculus ; 57, Cauda.



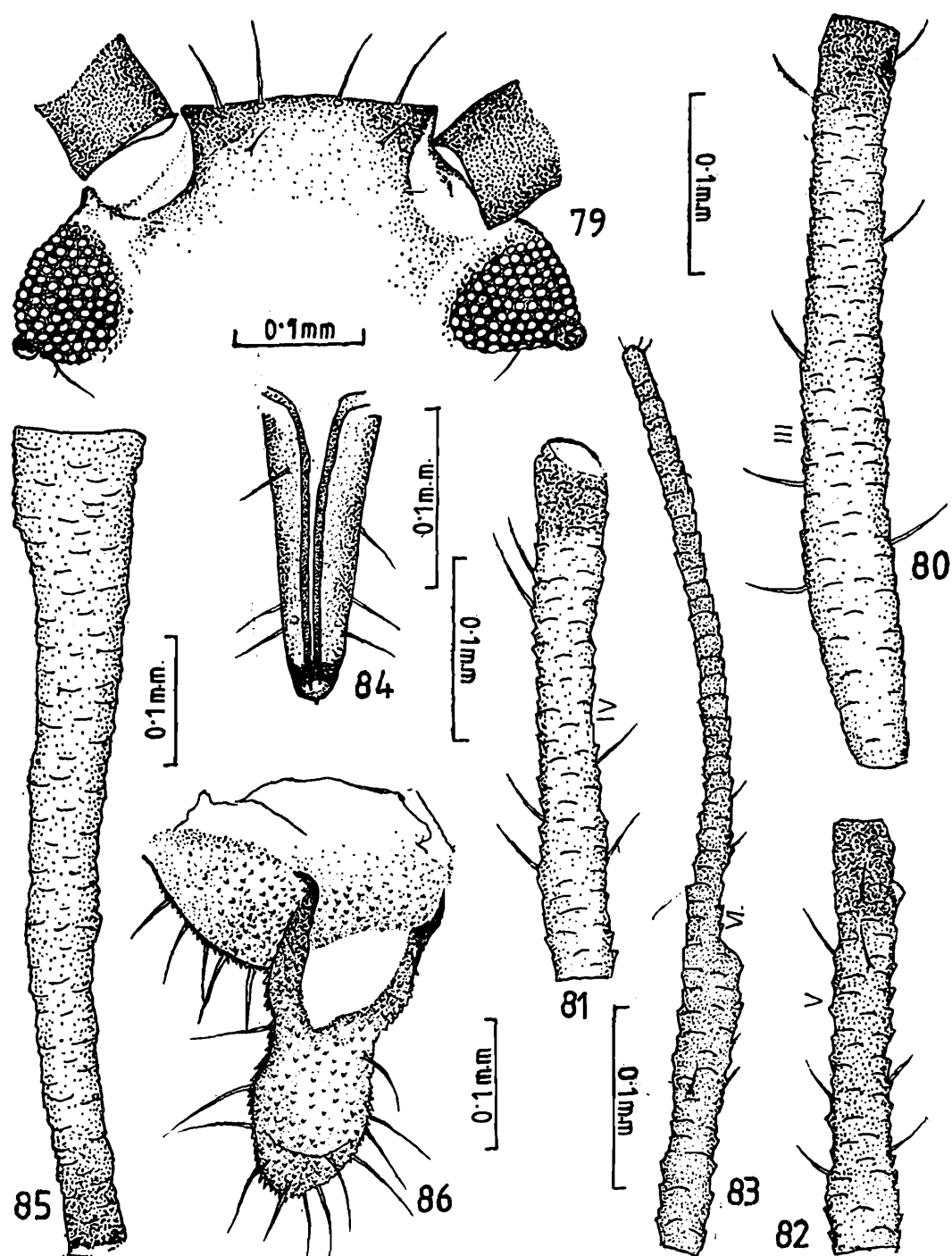
Figs. 58-65. *Aphis eugenie* v. d. Goot : Apterous. 58, Head ; 59, a.s. III ; 60, a. s. IV ; 61, a. s. V ; 62, a. s. VI ; 63, u. r. s. ; 64, Siphunculus ; 65, Cauda.



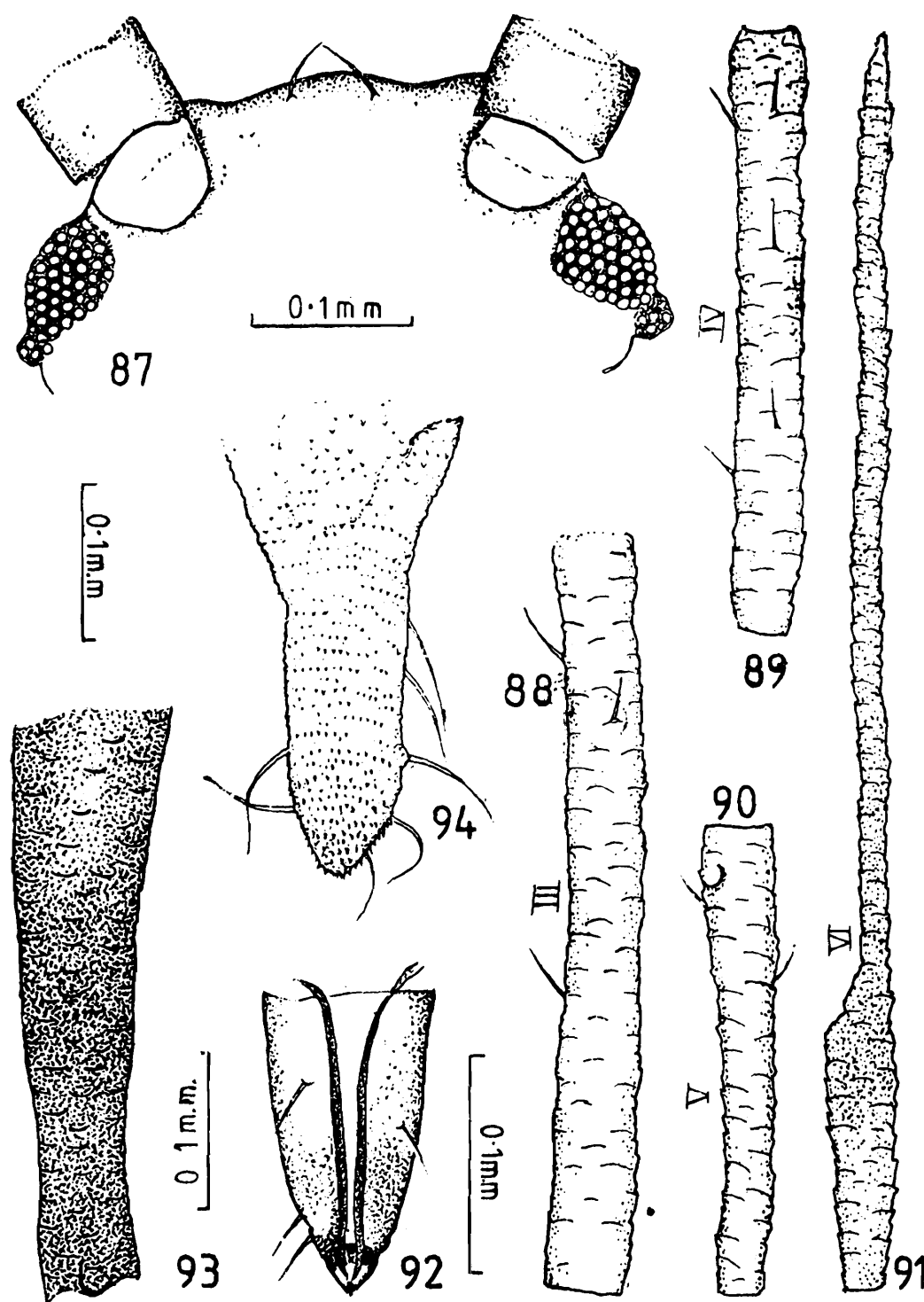
Figs. 66-72. *Aphis euphorbiae* Kaltenbach : Aptera. 66, Head ; 67, a. s. III ; 68, a. s. IV & V ; 69, a. s. VI ; 70, u. r. s. ; 71, Siphunculus ; 72, Cauda.



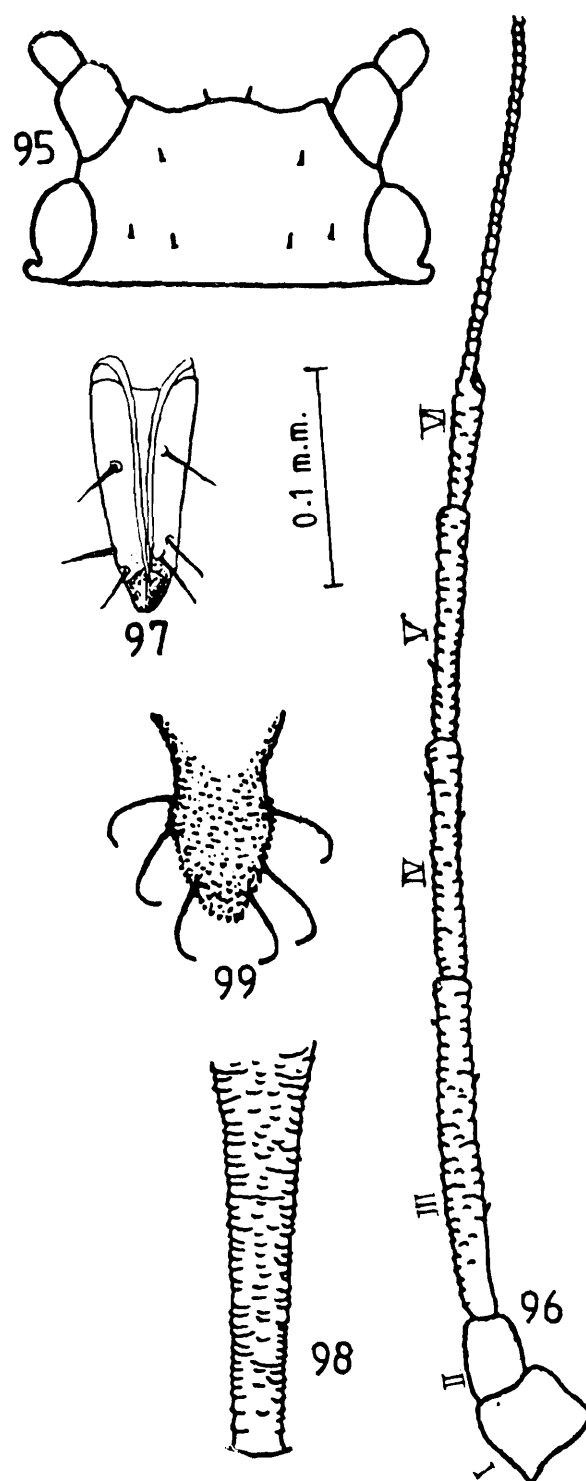
Figs. 73-78. *Aphis fabae* Scopoli Complex : Aptera. 73, Head ; 74, a. s. III & IV ; 75, a. s. V & VI ; 76, u. r. s. ; 77, Siphunculus ; 78, Cauda.



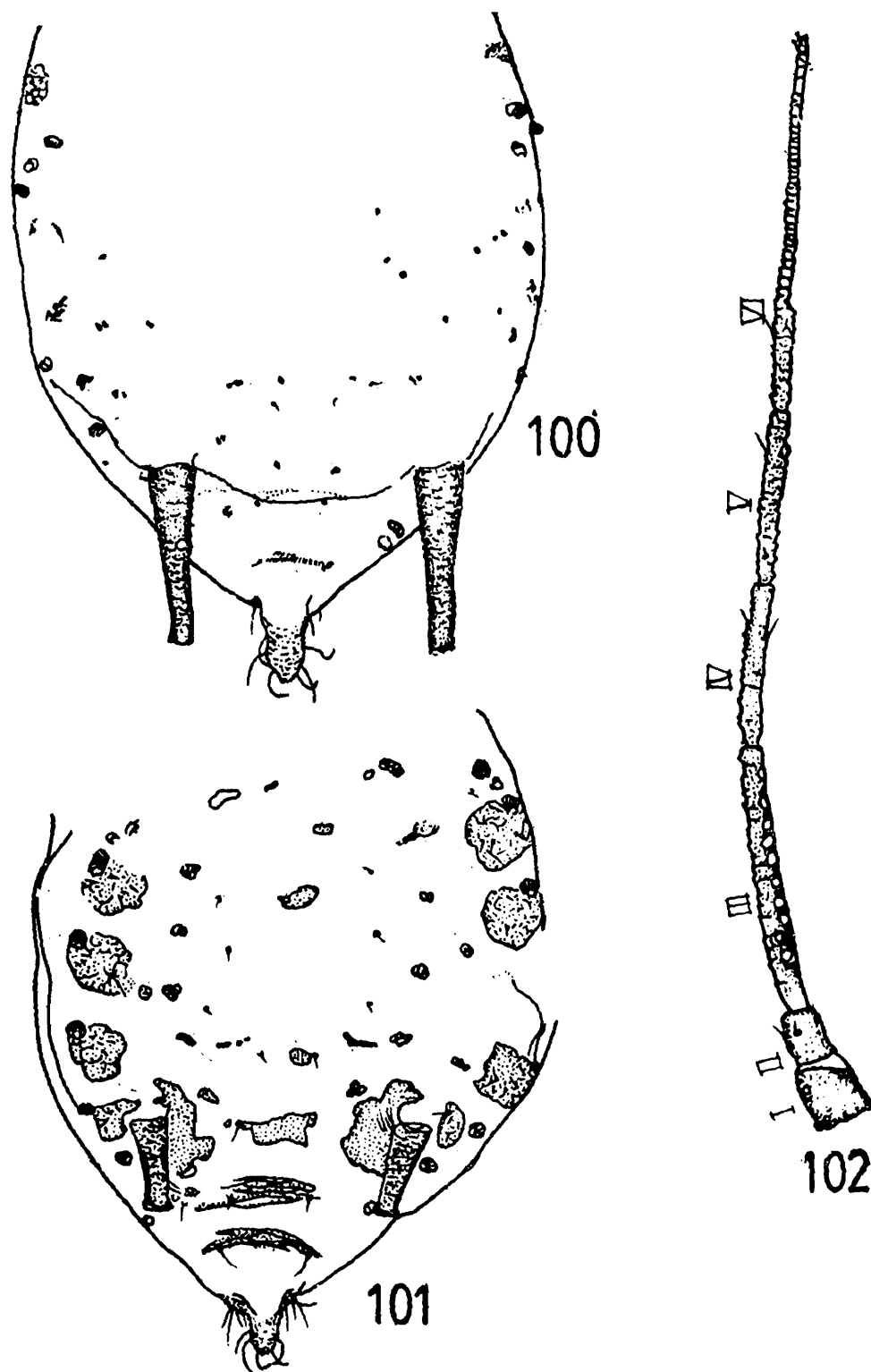
Figs. 79-86. *Aphis farinosa* Gmelin : Apter. 79, Head ; 80, a. s. III ; 81, a. s. IV ; 82, a. s. V ; 83, a. s. VI ; 84, u. r. s. ; 85, Siphunculus ; 86, Cauda.



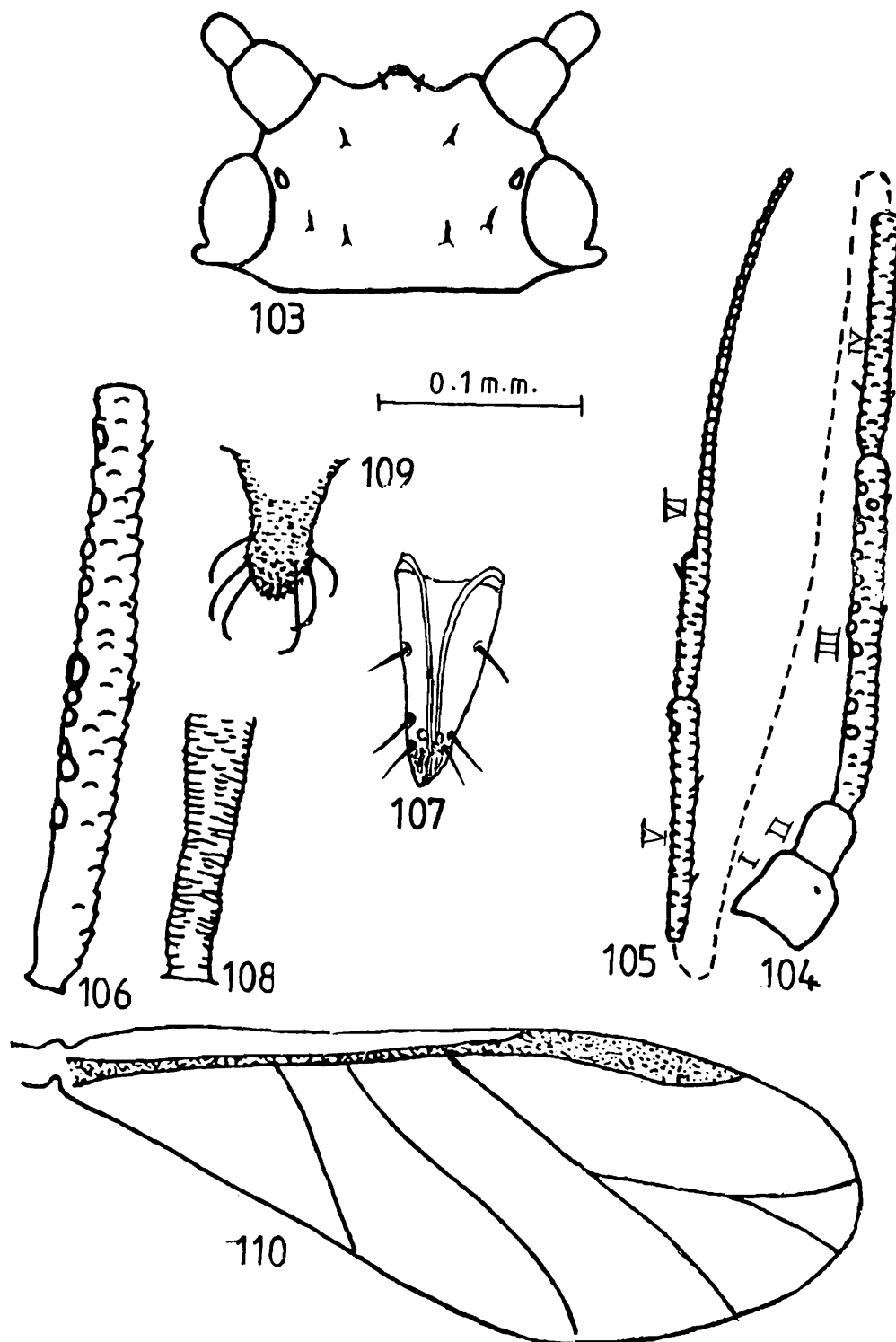
Figs. 87-94. *Aphis glycines* Matsumura : Apter. 87, Head ; 88, a. s. III ; 89, a. s. IV ; 90, a. s. V ; 91, a. s. VI ; 92, u. r. s. ; 93, Siphunculus ; 94, Cauda.



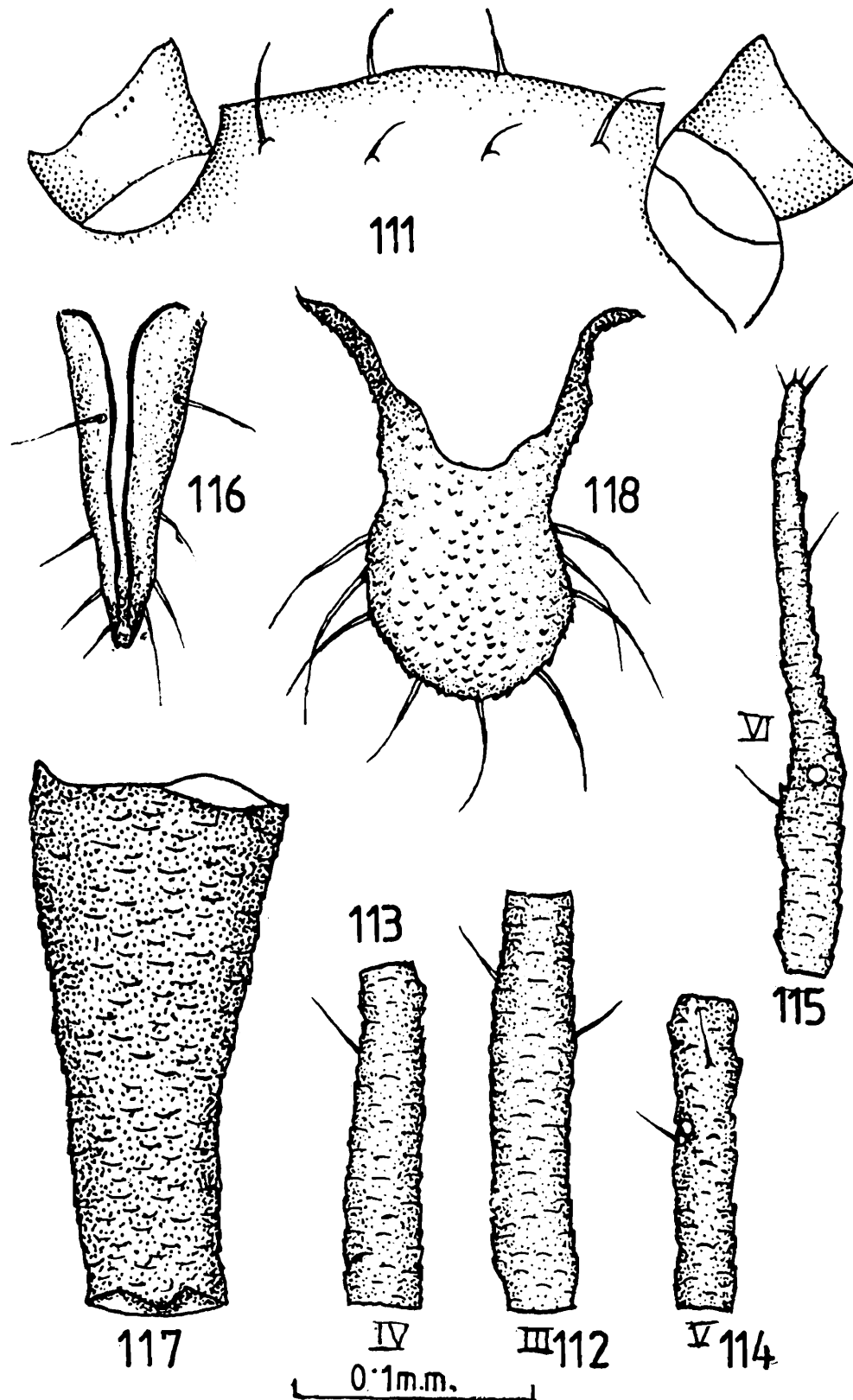
Figs 95-99. *Aphis gossypii* Glover : Apter. 95, Head ; 96, antenna ; 97, u. r. s. ; 98, Siphunculus ; 99, Cauda,



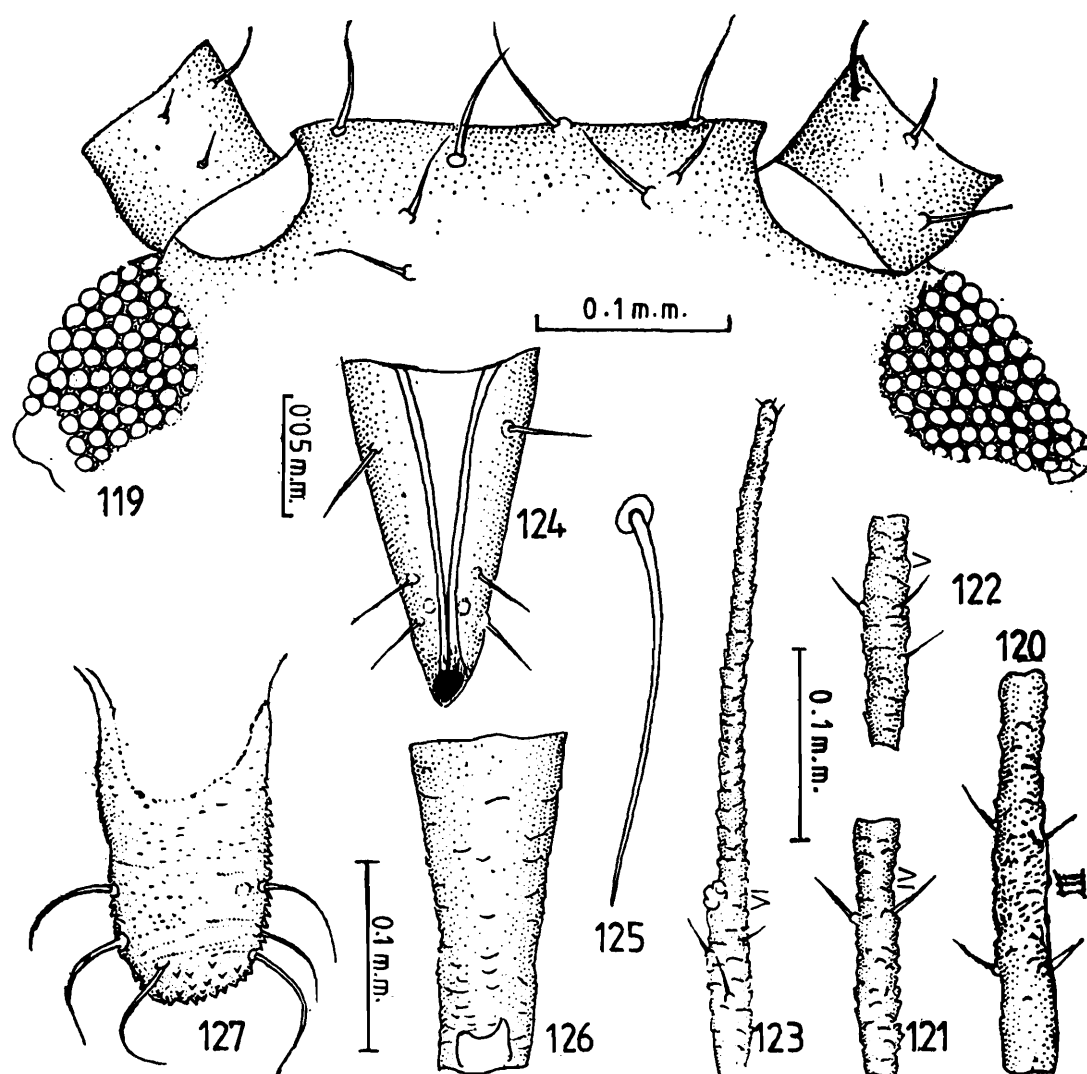
Figs. 100-102. *Aphis gossypii* Glover : Apter. 100, posterior abdominal dorsum ; 101, Alata. posterior abdominal dorsum ; 102, Alata. antenna.



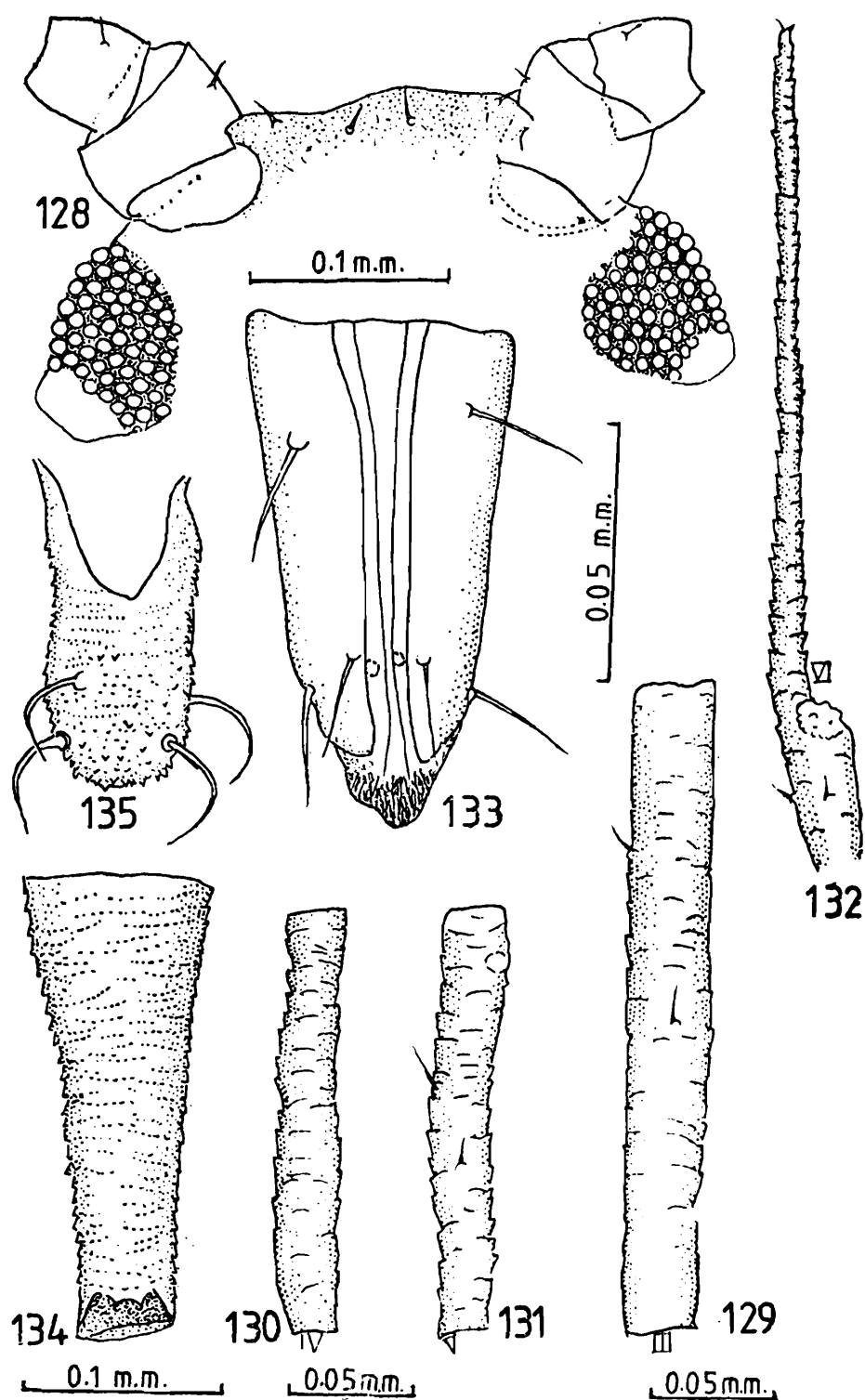
Figs. 103-110. *Aphis gossypii* Glover : Alata. 103, Head ; 104, a. s. I-IV ; 105, a. s. V & VI ; 106, a. s. III enlarged, showing secondary rhinaria ; 107, u. r. s. ; 108, Siphunculus ; 109, Cauda ; 110, Hindwings



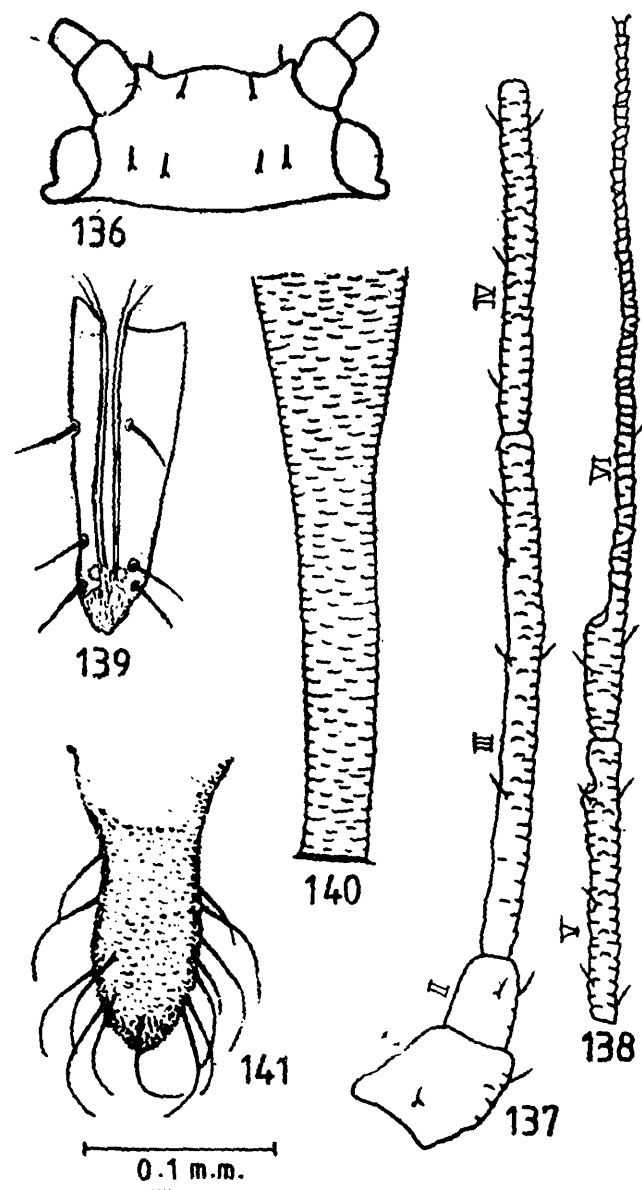
Figs. 111-118. *Aphis kurosawai* Takahashi : Apter. III, Head ; 112, a. s. III ; 113, a. s. IV ; 114, a. s. V ; 115, a. s. VI ; 116, u. r. s. ; 117, Siphunculus ; 118, Cauda.



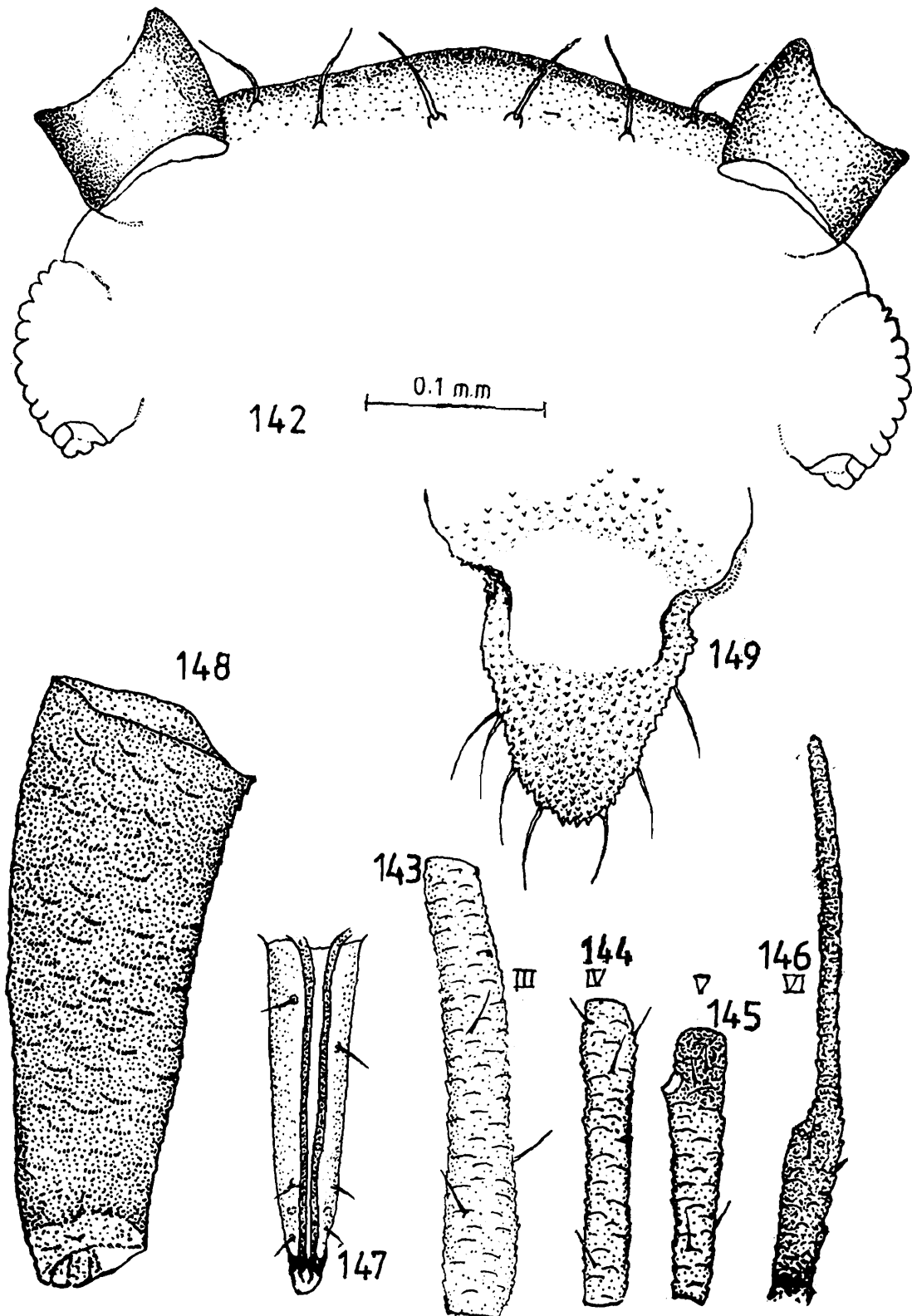
Figs. 119-127. *Aphis longisetosus* Basu : Apterous. 119, Head ; 120, a. s. III ; 121, a. s. IV ; 122, a. s. V ; 123, a. s. VI ; 124, u. r. s. ; 125, dorsal hair ; 126, Siphunculus ; 127, Cauda.



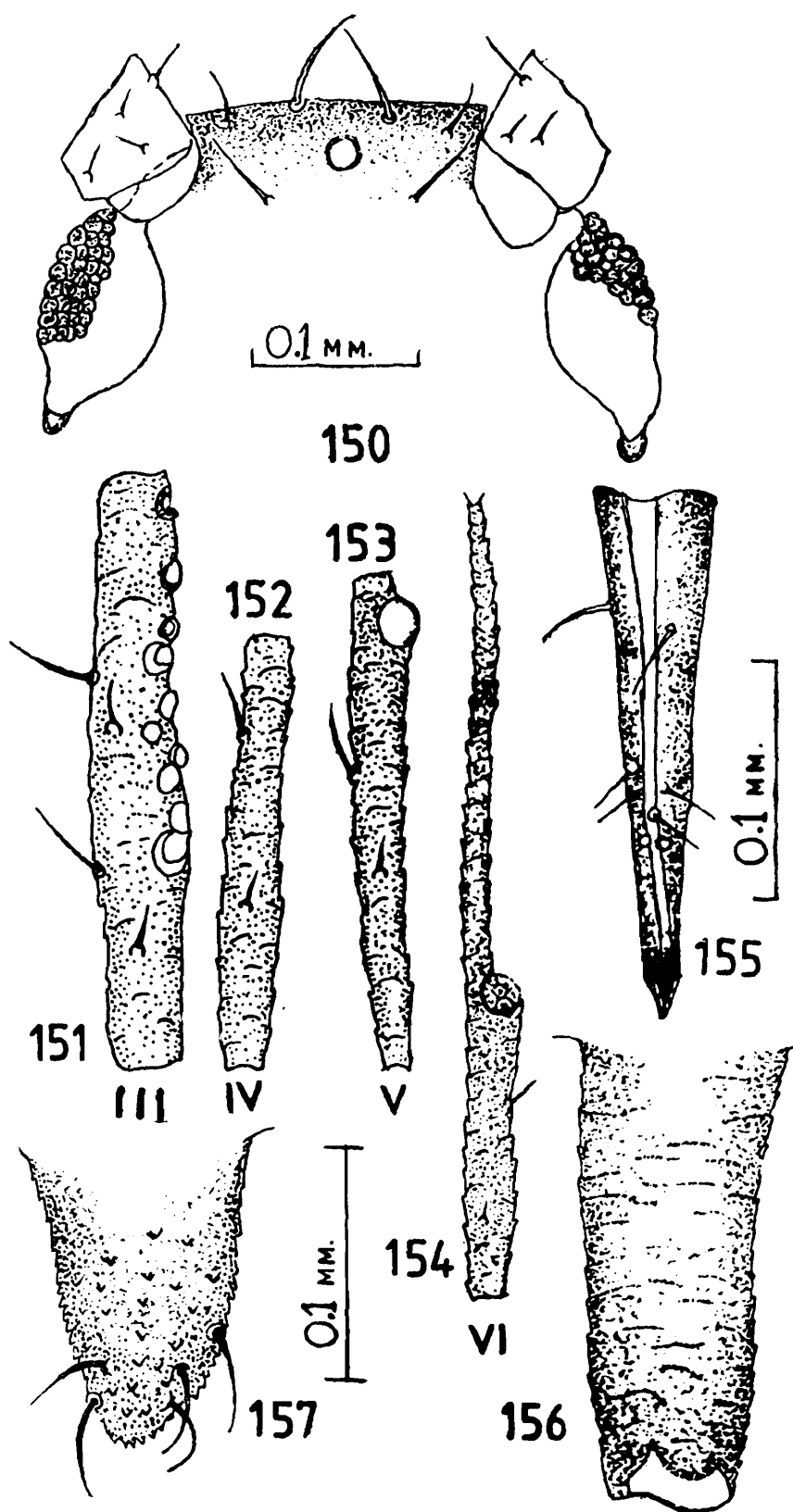
Figs. 128-135. *Aphis nasturtii* Kaltenbach: Apter. 128, Head; 129, a. s. III; 130, a. s. IV; 131, a. s. V; 132, a. s. VI; 133 u. r. s.; 134, Siphunculus; 135, Cauda.



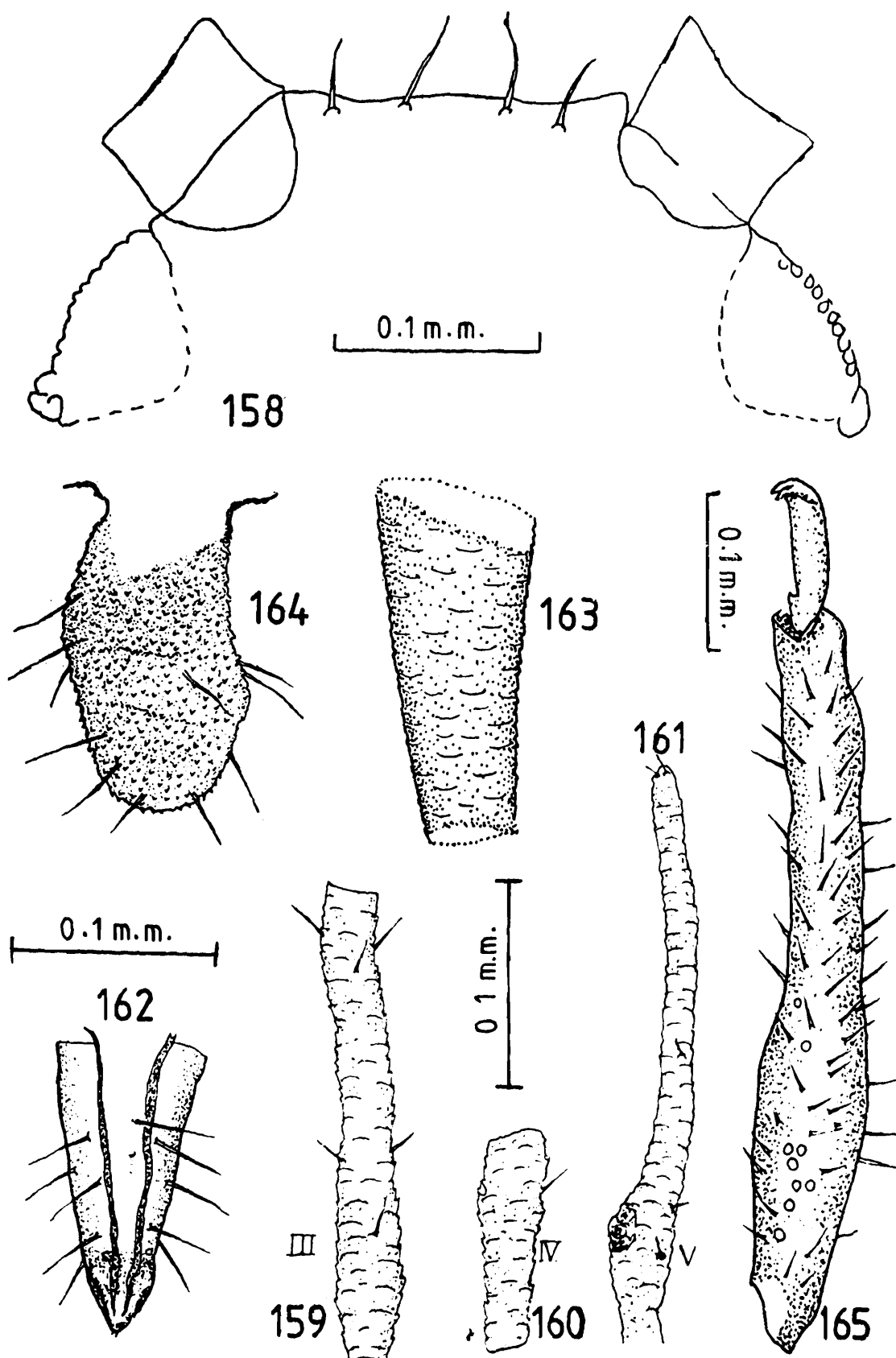
Figs. 136-141. *Aphis nerii* B. d. F. : Apterous 136, Head ; 137, a. s. I-IV ; 138, a. s. V-VI ; 139, u. r. s ; 140, Siphunculus ; 141, Cauda.



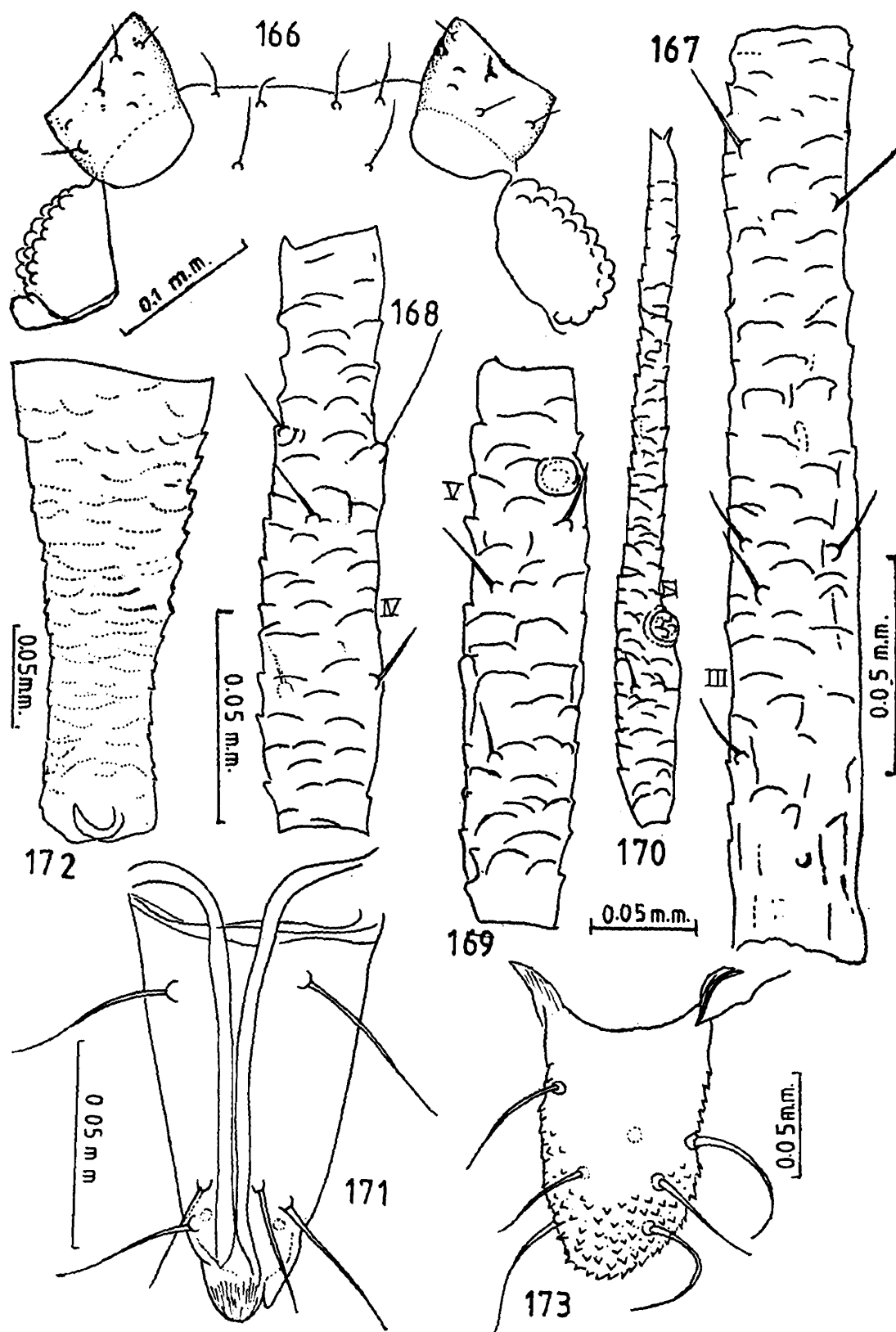
Figs. 142-149. *Aphis paraverbasci* Chakrabarti : Apter. 142, Head ; 143, a. s. III ; 144, a. s. IV ; 145, a. s. V ; 146, a. s. VI ; 147, u. r. s. ; 148, Siphunculus ; 149, Cauda.



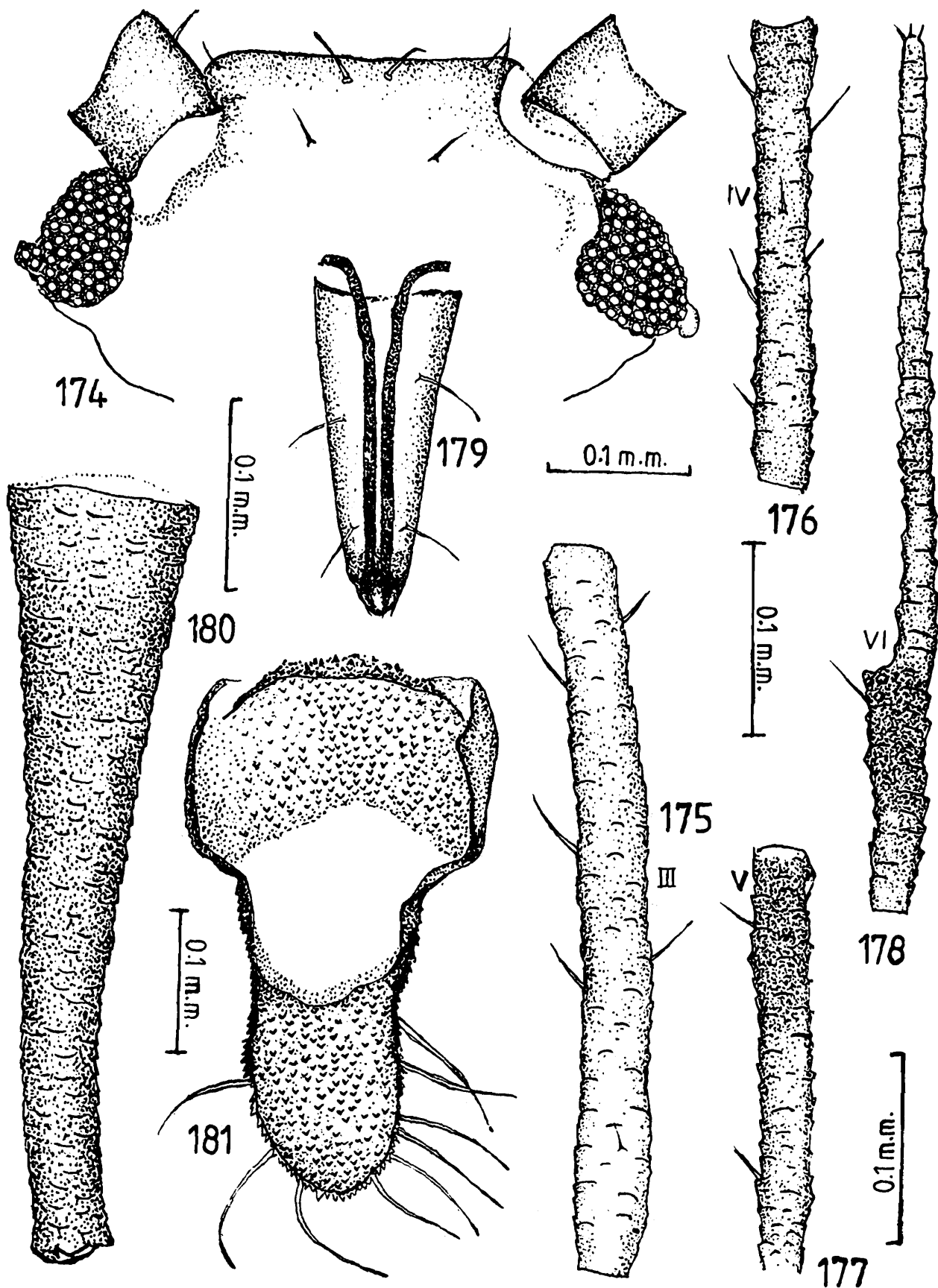
Figs. 150-157. *Aphis paraverbasci* Chakrabarti : Alata. 150, Head ; 151, a. s. III ; 152, a. s. IV ; 153, a. s. V ; 154, a. s. VI ; 155, u. r. s. ; 156, Siphunculus ; 157, Cauda,



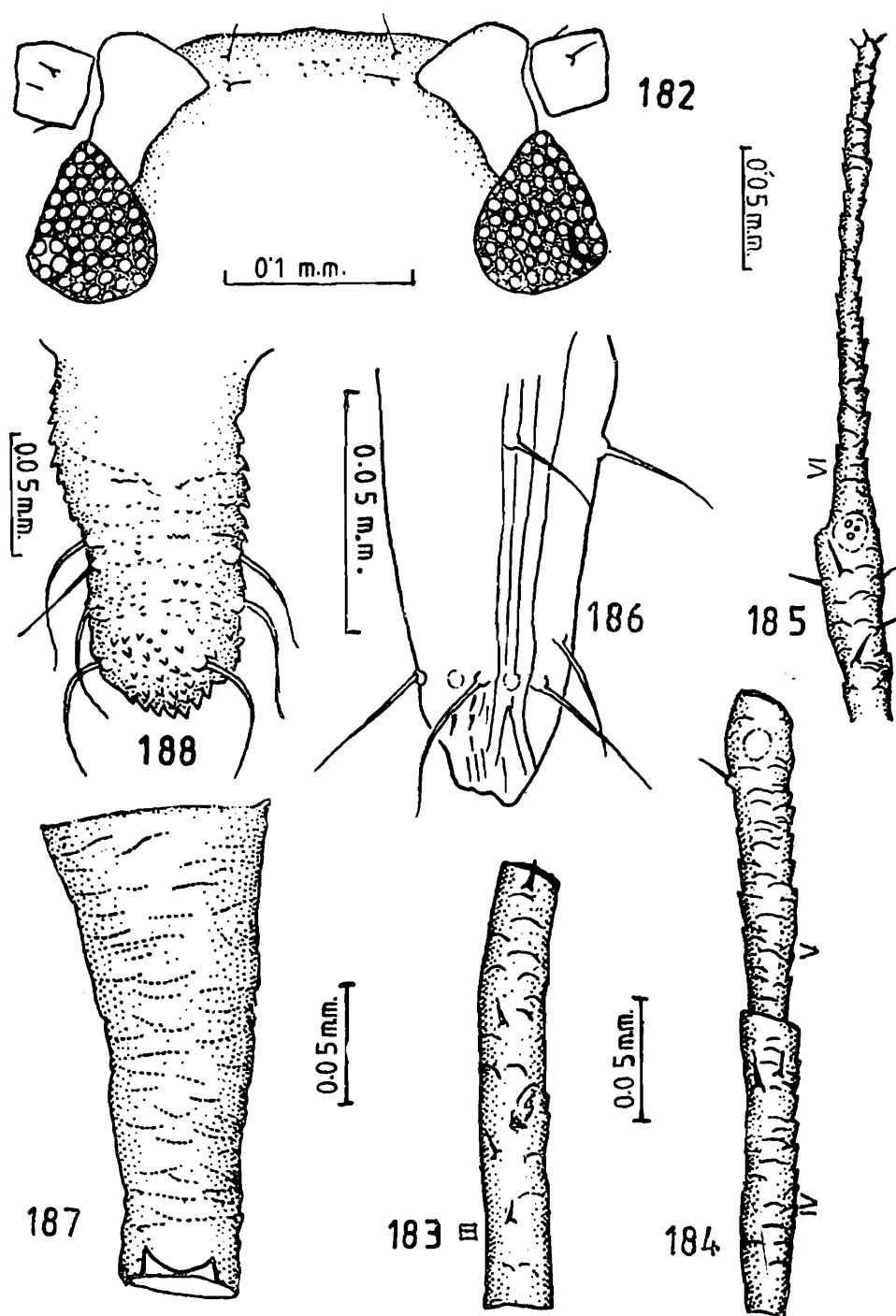
Figs. 158-165. *Aphis pollinosa* Walker : Ovipara. 158, Head ; 159, a. s. III ; 160, a. s. IV ; 161, a. s. V ; 162, u. r. s. ; 163, Siphunculus ; 164, Cauda ; 165, Hind tibia.



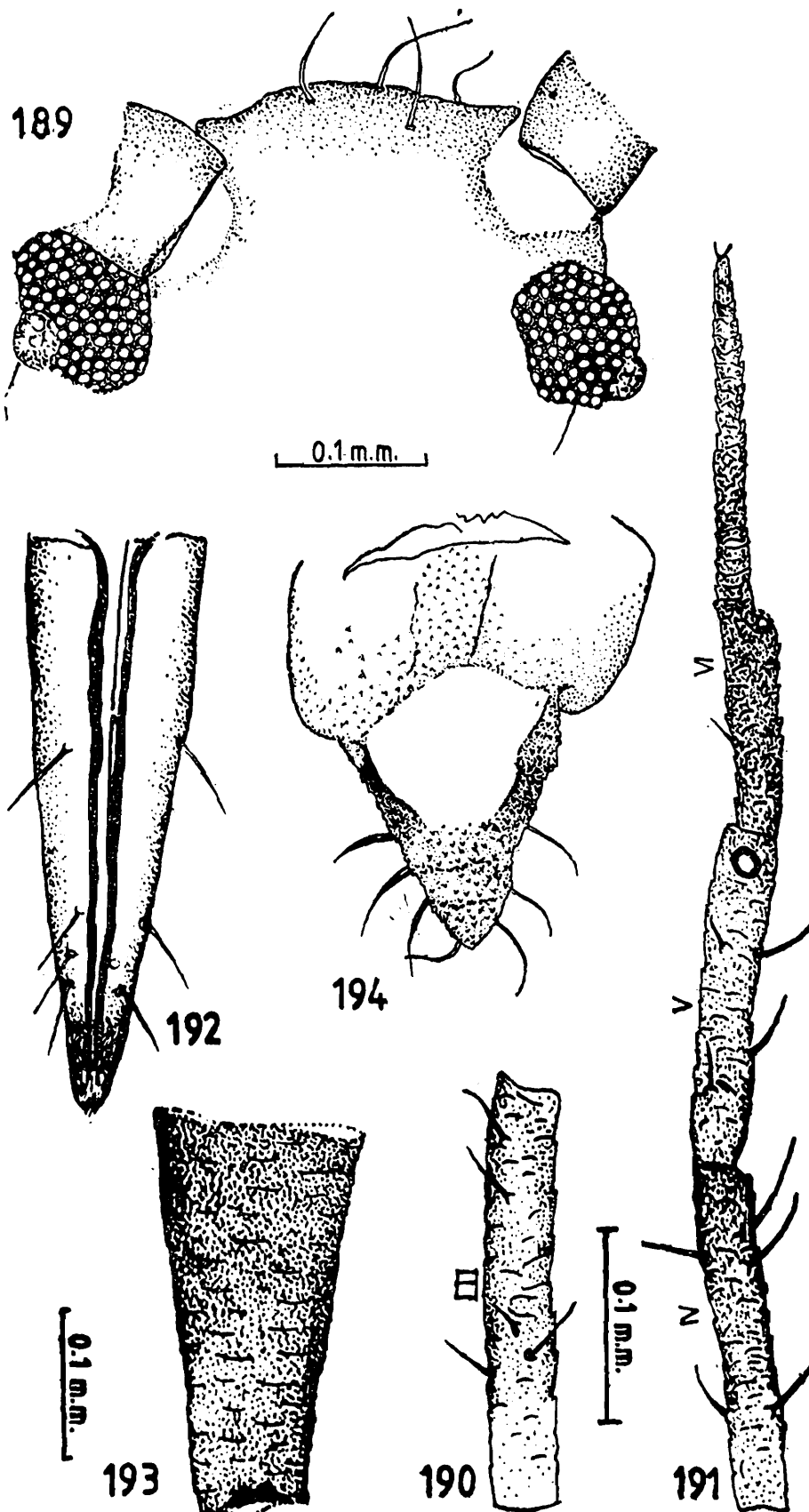
Figs. 166-173. *Aphis polygonacea* Matsumura : Apteræ. 166, Head ; 167, a. s. III ; 168, a. s. IV ; 169, a. s. V ; 170, a. s. VI ; 171, u. r. s. ; 172, Siphunculus ; 173, Cauda.



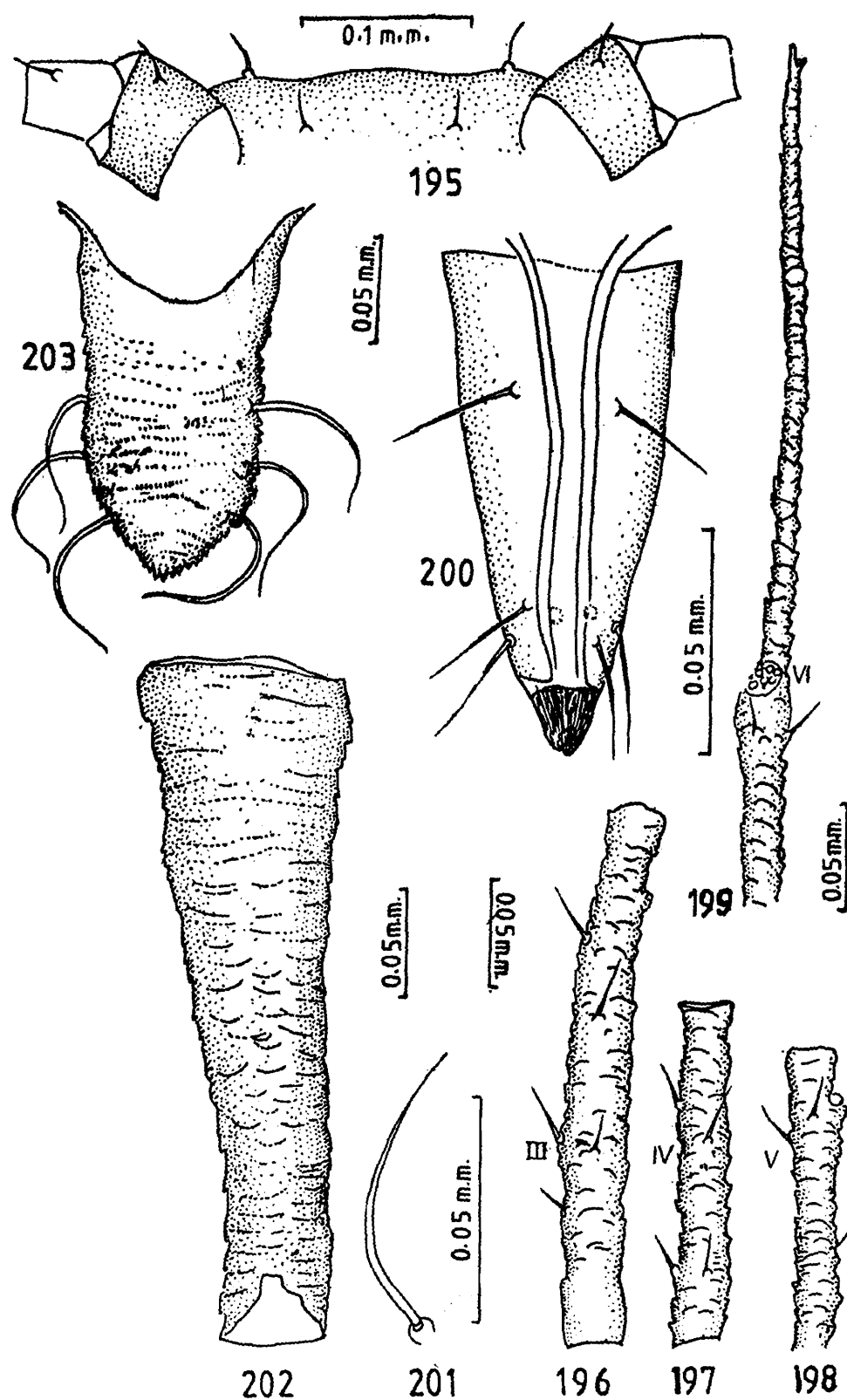
Figs. 174-181. *Aphis pomi* de Geer: Aptera. 174, Head; 175, a. s. III; 176, a. s. IV; 177, a. s. V; 178, a. s. VI; 179, u. r. s.; 180, Siphunculus; 181, Cauda.



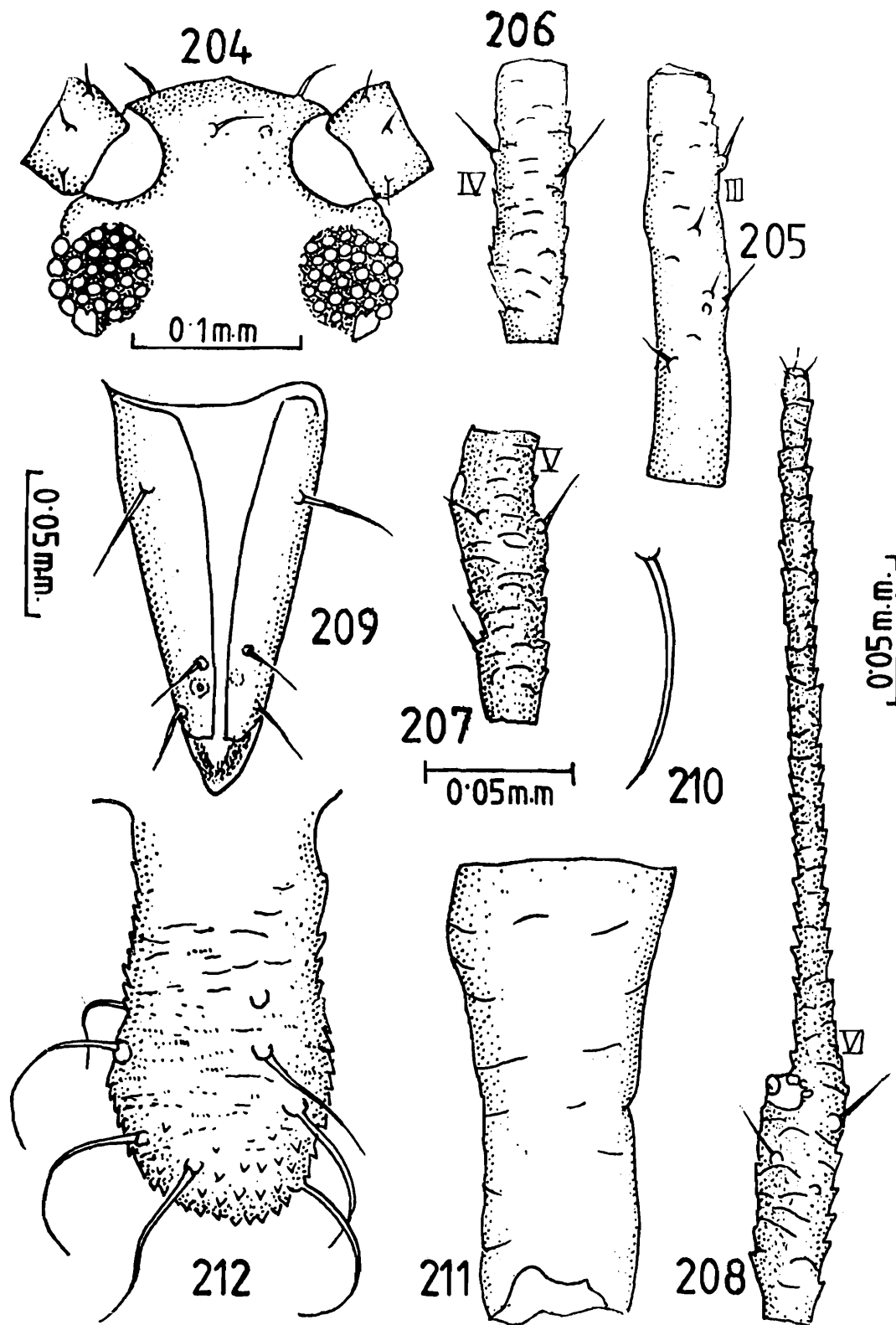
Figs. 182-188. *Aphis punicae* Passerini: Aptera. 182, Head; 183, a. s. III; 184, a. s. IV-V; 185, a. s. VI; 186, u. r. s.; 187, Siphunculus; 188, Cauda.



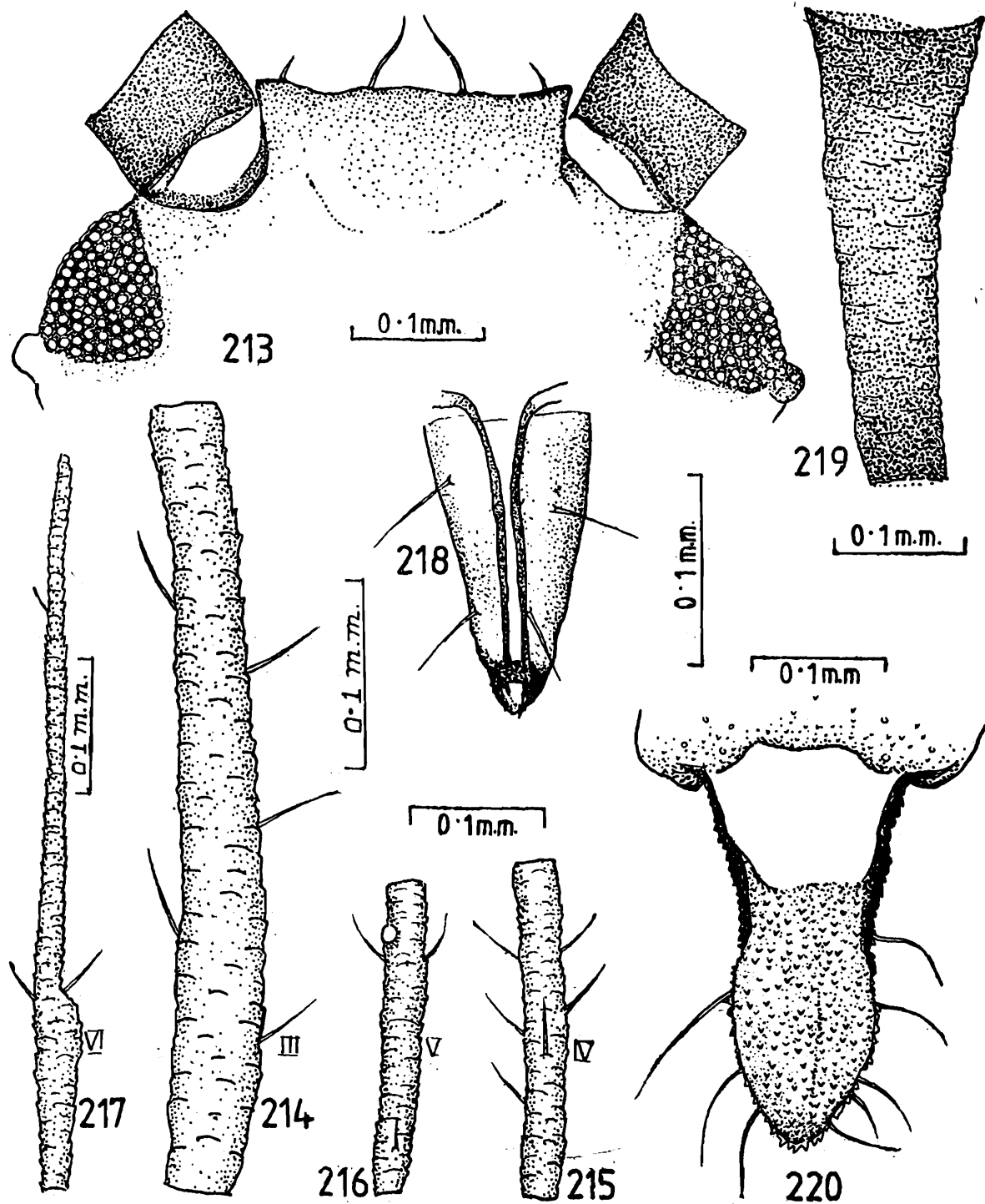
Figs. 189-194. *Aphis raji* Kumar and Burkhardt: Apter. 189, Head ; 190, a. s. III ; 191, a. s. IV-VI ; 192, u. r. s. ; 193, Siphunculus ; 194, Cauda.



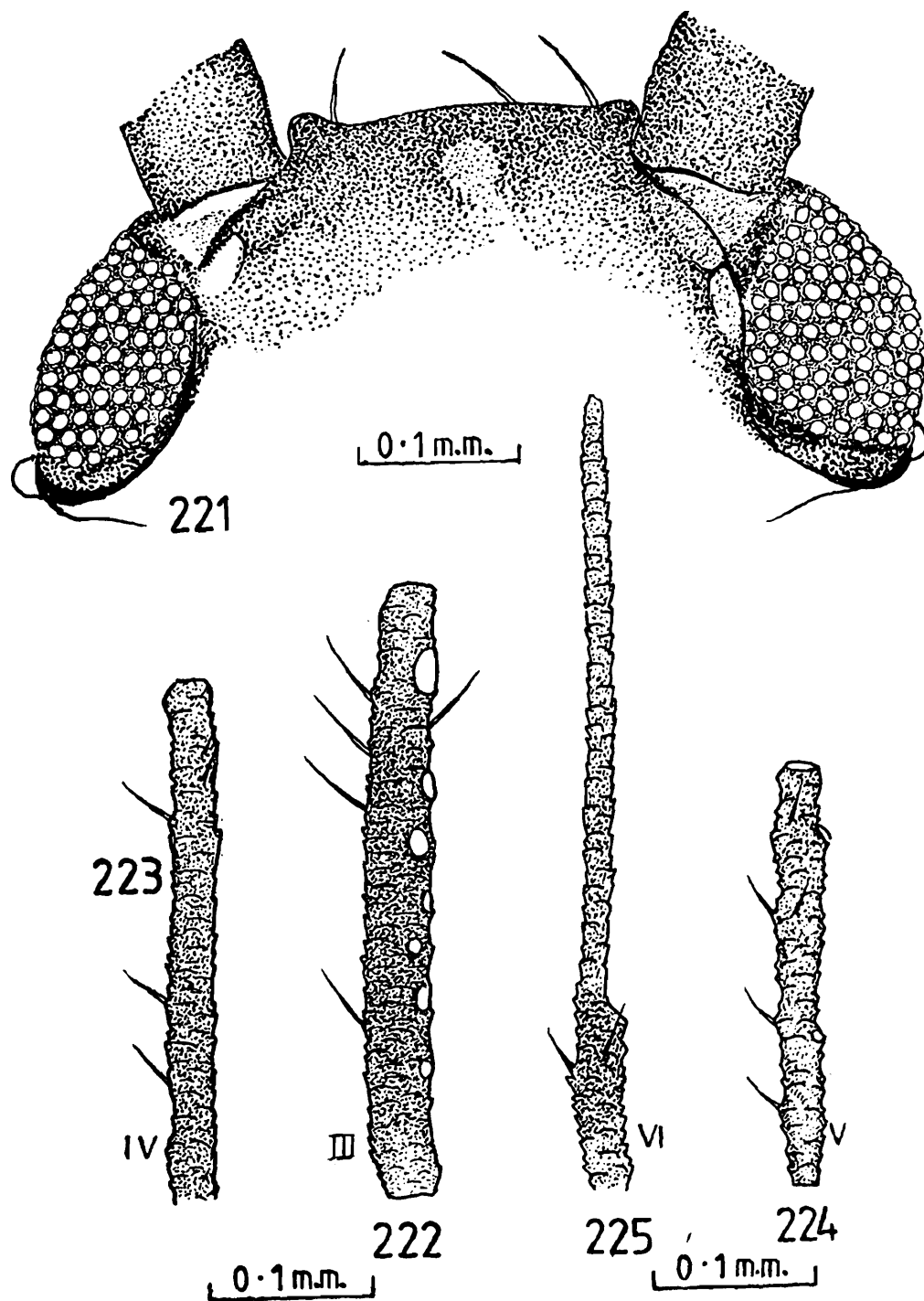
Figs. 195-203. *Aphis rhamniphila* David *et al.*: Aptera. 195, Head; 196, a. s. III; 197, a. s. IV; 198, a. s. V; 199, a. s. VI; 200, u. r. s.; 201, dorsal hair; 202, Siphunculus; 203, Cauda.



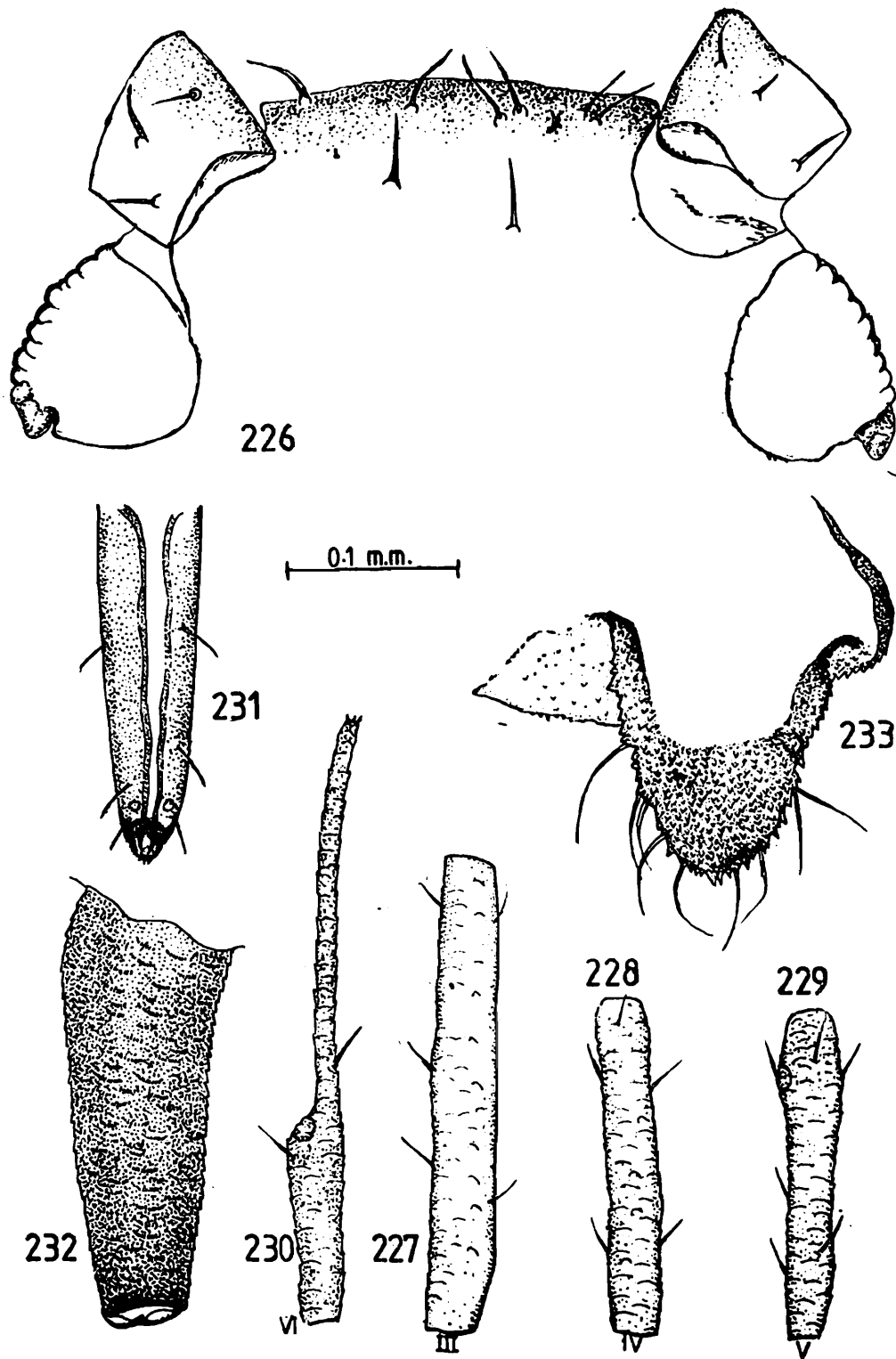
Figs. 204-212. *Aphis rubifolii* (Thomas): Apterous. 204, Head ; 205, a. s. III ; 206, a. s. IV ; 207, a. s. V ; 208, a. s. VI ; 209, u. r. s. ; 210, dorsal hair ; 211, Siphunculus ; 212, Cauda.



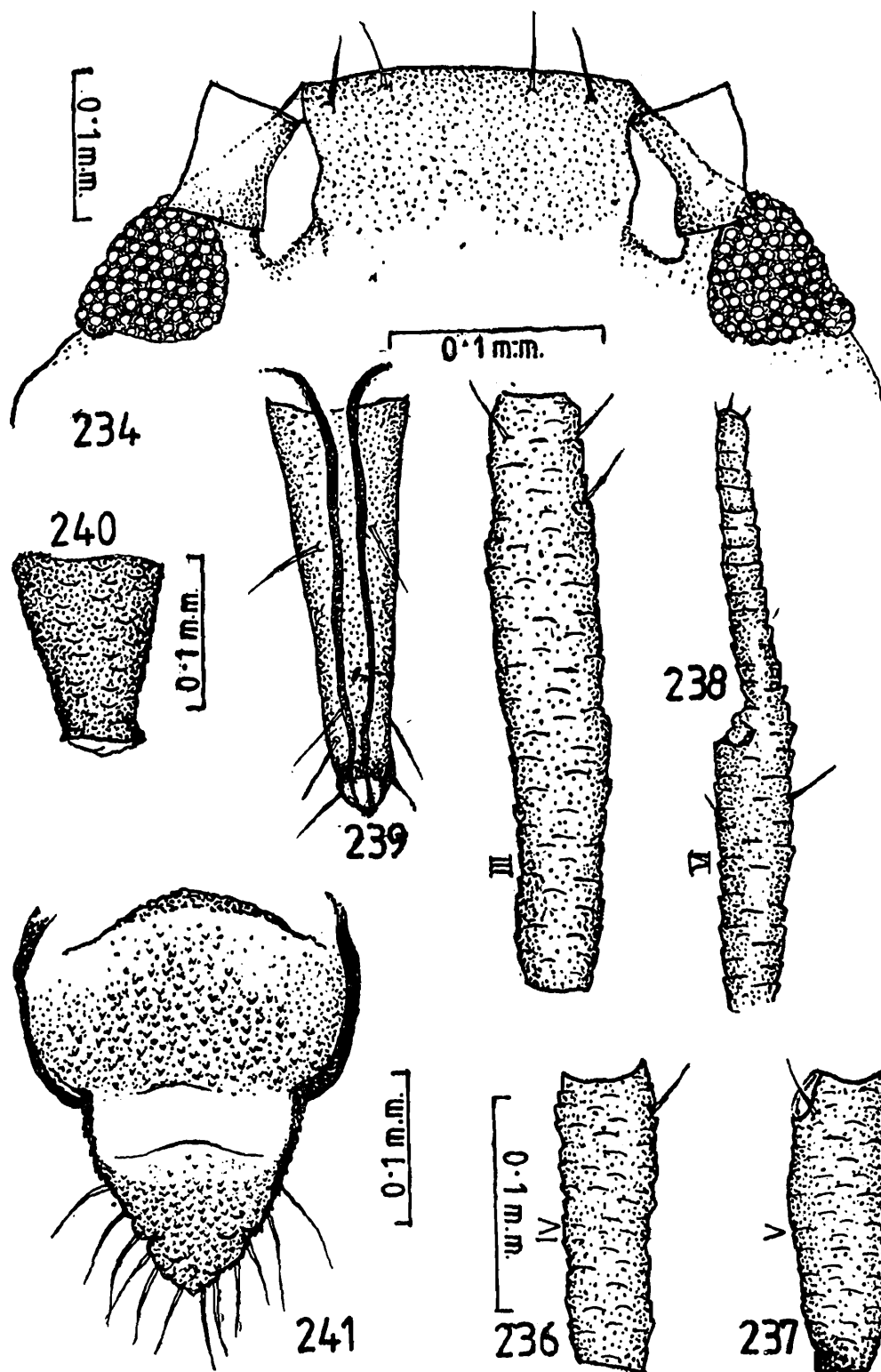
Figs. 213-220. *Aphis rumicis* Linnaeus: Apterous. 213, Head; 214, a. s. III; 215, a. s. IV; 216, a. s. V; 217, a. s. VI; 218, u. r. s.; 219, Siphunculus; 220, Cauda.



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) : Apterous. 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.