ch- VI

SUMMARY

VI. S U M M A R Y

Studies on host-plants, biology, population and biometry of the common phytophagous aphid - Aphis gossypii Glov., on brinjal (Solanum melongena) were undertaken at Bhubaneswar (Orissa) during 1974-79. The findings are summarised below :

1. A. gossypii is a polyphagous insect pest affecting mainly crops like cotton, brinjal, chillies, gourd, melon and ladies finger (Okra). In India it is reported on as many as 163 host-plants. It infects a total of 220 plants belonging to 46 families in the world. The families preferred by A. gossypii are Solanaceae (30 species), Asteraceae (22 species), Cucurbitaceae (19 species), Malvaceae (17 species) and Fabaceae (10 species).

2. A. gossypii feeds on the undersurface of leaf indicating thereby their negative phototaxis. In case of severe infestation flower, buds and fruit bases are infested.

3. Life-history of A. gossypii reared on brinjal (variety Pusa purple cluster) studied in the Zoology Laboratory, College of Basic Sciences and Humanities (O.U.A.T.) during winter, 1974, showed the following :

(i) mean longevity in 3 progenies is about 256.6 hrs and fecundity 20.7 nymphs/aphid

when mean temperatures was recorded at 20°C and R.H. 67 %,

(ii) from a comparative study of life-histories of *A. gossypii* on host plants like *Hibiscus rosasinensis* and *Psidium guajava* it is observed that longevity varies from 10 - 19 days with fecundity of 21.8 nymphs/aphid.

4. Altogether 4 ant species attend *A. gossypii* namely *Camponotus compressus* Fabr., *Bothriomyrmex dalyi* Fabr., *Meranoplus bicolor* Guer. and *Solenopsis geminata* Fabr., (Myrmecinae : Formicidae).

5. Population studies of *A. gossypii* on brinjal (var. Pusa purple cluster) were made during July,1974 to June, 1975. The brinjal plants were transplanted on four dates eg., 20th June, 6th August, 11th September and 7th November in the year 1974 as a result of which plants of different age groups were available around the year of investigation. Analysis of data of aphid population for different seasons and months indicate that :

(i) Winter is the most suitable period for aphid multiplication in comparison to other seasons. The seasonal variation in the population of aphid is in the following

order winter/rainy/ spring/ summer. Summer is the most dormant period of aphid activity. The meterological data during winter was mean temperature 23.2° C, relative humidity 68.7 % and total rainfall of 274.3 mm.

(ii) Peak aphid population (apterae, alatae and nymphs) was noticed during the second third week of November when mean air temperature was 24.0° C, mean relative humidity 71 % and rainfall 26.5 mm. wind velocity 9.2 Km/hr and sunshine 5.1 hrs.

(iii) Maximum alataes were observed in the 1st week of November when mean temperature stood at 23.8° C, R.H. 71 %, sunshine 10.4 hrs/day and wind velocity 2.0 Km/hr without rainfall. Correlation of meteorological factors with aphid population indicated that although mean temperature was negatively correlated yet did not show any significance (at P = 0.05). But mean relative humidity was discovered to be positively correlated and statistically significant. The rainfall being non-significant although negatively correlated with A. gossypii population. Wind velocity is negatively significant with relation to

aphid population (at P = 0.05).Sunshine was not significant in nature.

(iv) In eleven brinjal varieties (like Arka shirish, Arka sheel, Arka kusmakar, Muktakeshi, Annamalai, Azad kranti, Shankar vijai, F_1-Bhagalpur, PPL NAC, PPL-IARI and PPC1 -Pusa purple cluster) aphid population was observed to be greater on 78 - 150 days old plants i.e., during flowering and fruiting stage. Aphid species prefer neither too young nor too old plants for feeding.

6. A varietal trial for brinjal was also conducted during January to June, 1979 in order to assess varietal preference of A. gossypii by population studies. In the experiment eleven varieties of brinjal (including Pusa purple cluster) seedlings were planted on 7.12.78. The results indicated that variety Shankar vijai was most preferred whereas PPC1, PPL NAC, Arka kusmakar, Arka shirish and PPL IARI were the least preferred by the aphid species. 'F' test for analysis of variance indicated significant variation existing in this trial both in 0.05 % and 0.01 % probabilities.

7. Morphology and biometry of adult apterous and alate A. gossypii collected on brinjal (Var : Pusa purple cluster) is described below :

A. Apterous viviparous female ;

These are yellow or light green aphids with black

cornicles measuring 1.209 mm. in length and 0.664 mm. in breadth. Head bears 5 - 8 hairs, small antennal tubercles. U.r.s. is conical bearing 5 - 8 hairs measuring 0.090 mm. in length. Antenna is six segmented, 5th segment bears primary sensoria, total length of antenna 0.959 mm, seg. III - 0.207 mm, seg. IV 0.154 mm, seg.V 0.138 mm. The fore-leg (including all segments) measures 0.947 mm. The mid-leg 1.004 mm, the hind-leg 1.286 mm. On abdomen about 30 hairs are observed. 2 pairs of abdominal tubercles on 1st and 7th abdominal segments. Cornicle measures in length 0.243 mm, the breadth (at the base) 0.062 mm. Anal plate oval bearing 8 - 10 hairs. Cauda ensiform bearing 6 hairs (3/3 on either side). Cauda length 0.125 mm, breadth (at the base) 0.068 mm.

B. Alate viviparous female :

These are yellow or green aphids with black cornicles measuring 1.193 mm. in length and 0.532 mm. in breadth. Head bears 8 - 11 hairs having small antennal tubercle. The u.r.s. is horny, 5 - 6 hairs are borne on rostrum. The u.r.s. measures 0.093 mm. Antenna six segmented. Seg.III long rod like having 5 - 9 cup like secondary sensoria. Accessory sensoria present in a bundle at the junction of the base and flagellum. 7 - 11 hairs are observed on antenna. Total length of antenna 1.029 mm. Seg. III 0.209 mm, seg. IV 0.168 mm, seg.V 0.156 mm.

Total fore-leg 1.114 mm, total mid-leg 1.073 mm. and total hind leg 1.364 mm. Forewing length 2.084 mm., breadth 0.756 mm. Hind wing length 1.214 mm; breadth 0.382 mm. Abdomen has 15 - 18 hairs, 2 pairs of abdominal tubercles on 1st and 7th segments. Cornicle length 0.189 mm; breadth (at the base) 0.048 mm. Genital plate bearing 9 - 10 hairs, anal plate semicircular provided with 6 - 13 hairs. Cauda length 0.097 mm; breadth (at the base) 0.064 mm.

8. Biometry of taxonomically important morphological characters of A. gossypii modified after Eastop (1961) for the two morphs are as follows :

(i) Apterae : Medium sized aphids, usually yellow sometimes pale green, 1.2 mm in length. Antenna about 4/5 as long as body, usually 6 segmented. Ratio of ant. seg. IV/seg.III 0.74; ant. seg. V/seg. III 0.66, ant. seg.VI (flag) is 2.72 x base VI and 1.23 x seg.III, u.r.s. 0.090 mm. i.e. $1\frac{1}{10}$ x hind tarsus II. Siphunculli black 1.94 x cauda, cauda bearing 6 hairs.

(ii) Alatae : Medium sized aphids, usually yellow sometimes dark green 1.1 mm in length, antenna about 4/5 as long as body identical with apterae, ant. seg.IV/seg.III 0.80, ant. seg.V/seg.III 0.74. Seg.III bearing 5 - 9 cup like secondary sensoria, u.r.s. 0.093 mm, siphunculi black 1.94 x cauda. Cauda

bearing 6 hairs.

9. Biometry of important morphological characters of A. gossypii of different areas of world like Rocky mountain region (U.S.A.), Middle East, New Zealand, West Africa have been compared with the Orissa specimens collected by the author indicate following variations.

(i) In apterae total body length is greatest in West African specimens (2 mm) and smallest in New Zealand specimen (1.5 mm). The measurements are in the following gradation; New Zealand (1.5 mm), Orissa (1.7 mm), Rocky mountain region (1.8 mm) and West African (2 mm.).

(ii) In alates total body length is greatest in Rocky mountain region (1.7 mm) and smallest in New Zealand (1.4 mm). The measurements are in the following gradation; New Zealand (1.4 mm), Orissa (1.6 mm) and Rocky mountain (1.7 mm.).

(iii) Apart from above, u.r.s, and hind tarsus II relationship, cornicle, ratio of antenna and total body length, flagellum VI. and base VI, cauda to cornicle ratio are variable amongst aphid species of different areas in both the morphos of A. gossypii.

10. Seasonal variation in the body growth of the aphid species in a number of morphological characters has been studied. From the biometry it is evident that a large number of characters attain maximum apparent growth during winter and more specifically during November and December months when mean temperature was at 22.2°C, relative humidity at 63.5 % and rainfall of 26.5 mm. The characters are total body length, antenna, ant. seg.III, seg.V, cornicle (breadth), fore-leg and hind-leg.

11. Length of fore-femur and fore-leg are smaller in comparison to mid-femur and mid-leg respectively and the latter are smaller than hind-femur and hind-leg in apterous forms of A. gossypii, while in alate, length of mid-femur and mid-leg, are smaller in comparison to fore-femur and fore-leg and the latter are smaller than hind-femur and hind-legs.

12. Significance of dimorphism in a number of biometrical characters in A. gossypii has also been studied in different seasons. Following variations are observed in adult apterae and alate aphids at 5 % probabilities.

(i) Body length in apterae is significant over alate in winter.

(ii) Hind-leg length in apterae is significant over alate in spring and winter.

(iii) Fore-leg length in alate is significant over apterae in rainy season.

(iv) Hind-leg length in alate is significant over apterae in rainy season.