

BIO-ECOLOGICAL STUDY OF FEW SPECIES OF *APHIS* LINN. IN NORTHEAST BIHAR AND THEIR ASSOCIATION WITH FOOD PLANTS AND NATURAL ENEMIES FOR POSSIBLE USE IN THE BIOLOGICAL CONTROL

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ABSTRACT: Aphids are small, soft bodied, polyphagic and polymorphic sap sucking insects. During the extensive survey of different localities of 10 districts of northeast Bihar in different seasons, 41 species of aphids were recorded on more than 122 plant species belong to 35 families. Among these, only 09 species of *Aphis* viz., *Aphis affinis* Del Guercio, *Aphis craccivora* Koch, *Aphis fabae* Scopoli, *Aphis glycine* Matsumura, *Aphis gossypii* Glover, *Aphis nasturtii* Kaltentbach, *Aphis nerii* Boyer de Fonscolombe, *Aphis puniceae* Passerini and *Aphis spiraeicola* Patch were recorded in the target area. The maximum number of plants were infested by *A. gossypii* (46 plants), followed by *A. craccivora* (36 plants), *A. nasturtii* (18 plants) and *A. spiraeicola* (18 plants).

Six species of coccinellids (*Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricius, *Micraspis discolor* (Fabricius), *Pseudospidimerus circumflexa* var. *testaceus* (Weise) and *Scymnus pyrocheilus* (Mulsant) and six species of syrphid predators (*Allograpta javana* (Wiedemann), *Asarkina ericetorum* (Fabricius), *Episyrphus balteatus* (DeGeer), *Ischiodon scutellaris* (Fabricius), *Melanostoma orientale* (Wiedemann) and *Paragus serratus* (Fabricius)) were recorded on *Aphis* spp. in the target area. Seven species of parasitoids viz, *Aphelinus albipodus* Fatima & Hayat, *Aphelinus basilicas* Fatima & Hayat, *Aphelinus gossypii* Timberlake, *Aphelinus* sp., *Aphidius* sp., *Binodoxys indicus* Subba Rao & Sharma and *Lipolexis oregmae* (= *scutellaris*) (Gahan) were also recorded on *Aphis* spp. in the target area.

Six species of predators (*C. sexmaculata*, *C. septempunctata*, *C. transversalis*, *E. balteatus*, *I. scutellaris* and *P. serratus*) and three species of the parasitoids (*A. gossypii*, *B. indicus* and *L. oregmae*) were found abundantly on *Aphis* spp. in the target area and may be utilised in the biological control programme after further study.

KEYWORDS: Aphid, food plants, parasitoids, coccinellids, syrphids, predator

INTRODUCTION

Aphids are small, soft-bodied hemipteran bugs and most destructive pest of agriculture and horticulture crops. They increase their numbers very fast in favourable climatic condition due to parthenogenesis, viviparity and fast development¹³. They attack all parts of plants and damage the crop directly by drawing sap from plant tissue⁹. They have also remarkable ability of transmitting plant

viral diseases. Thus, the management of these aphids are essential to increase crop production³². The biological control is one of the most important methods in Integrated Pest Management (IPM).³² The records of aphids along with their food plants, their parasitoids and predators in varying ecological conditions are essential to understand their relationships for the effective control measure. This source of information is considered as the first step

in the biological control programme.

Several aphidiid parasitoids have been successfully used for the control of aphids. The active biological control attempts have been made by introduction of *Diaeretiella rapae* against the *Diuraphis noxia*¹⁸. *Lysiphlebus testides* and *Aphidius colemani* were used successfully for the control of *Pentalonia nigronervosa* in South Pacific⁴³. In India a lot of works have been done on different aspects of aphid parasitoids ^{3,7,8,17,36,37,39,41}

Majority of coccinellid beetles are predaceous and play an important role in checking the population of many harmful insects such as aphids, coccids, scale insect, plant mites, thrips, leaf hoppers and other soft bodied insect. Several workers have surveyed the different parts of India and studied the coccinellid predators and their association with prey ^{1,12,21,24,25,26,27,28,35,38}.

Syrphids are commonly known as hoverflies. The larvae of syrphid rank as the major natural enemies and play an important role in the suppression of aphid population¹⁵. Considerable amount of research has been conducted on the taxonomy, biology, ecology and feeding potential of syrphids by several workers ^{2,4,10,16,19,20,22,23,29,30,31,34,42}

Northeast Bihar has rich agriculture lands where farmers face a lot of problems due to heavy infestation of crops by aphids. Thus, the extensive survey of the aphids along with their food plants in different seasons and their natural enemies are

essential to understand their inter-relationships for the effective control of economically important aphids. Keeping in view, the importance of bio-taxonomy and ecology, different localities of districts of Northeast Bihar, viz., Araria, Begusarai, Bhagalpur, Katihar, Kishanganj, Khagaria, Madhepura, Munger, Purnea and Saharsa were extensively surveyed in different seasons to obtain the records of the aphids, their parasitoids and predators to provide the raw materials (bio-agents) to evaluate their biotic potential for the possible use in the biological control programme.

MATERIALS AND METHOD

Aphids, their parasitoids and predators (coccinellids and syrphids) were collected from different agricultural and horticultural plants from different localities of most of the districts of Northeast Bihar. Collected aphids were preserved in 70% ethyl alcohol and glycerine (5:1) for taxonomical study. The systematical study of aphids was carried out by observing various taxonomical characters as given by^{1,11,33}. Live aphids along with the food plants parts as well as the mummies were put into a translucent plastic vials (2.5 x 10 cm) with wetted cotton at the bottom for the emergence of the parasitoids. Parasitoids were preserved in 70% alcohol for identification. Parasitoids were directly identified on the basis of Stary and Ghosh.⁴⁰

Collected coccinellid larvae were kept in glass jar (25x10 cm) with particular fresh aphids and reared in the laboratory till the

emergence of adults. Taxonomical study of syrphids was done by observing various taxonomical characters mentioned by Dutta et. al.¹⁴. Few predators were sent to Zoological Survey of India, Kolkata for identification and confirmation.

RESULTS AND DISCUSSION

During the extensive survey of different localities of 10 districts of northeast Bihar in different seasons, 41 species of aphids on more than 122 plant species, 7 species of parasitoids, 6 species of coccinellids and 7 species of syrphids were recorded in the target area. Earlier, preliminary work has been done in few localities of this target area on aphids and their parasitoids³⁻⁸.

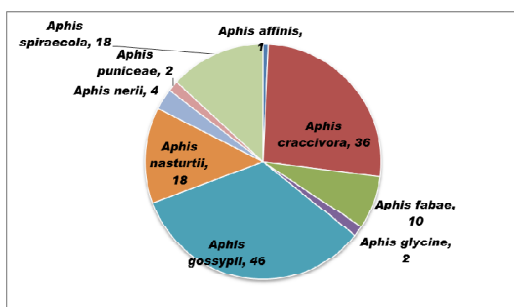


Fig. 1- Number of host plants infested by *Aphis* spp.

Among these, only 09 species of *Aphis* viz., *Aphis affinis* Del Guercio, *Aphis craccivora* Koch, *Aphis fabae* Scopoli, *Aphis glycine* Matsumura, *Aphis gossypii* Glover, *Aphis nasturtii* Kaltenbach, *Aphis nerii* Boyer de Fonscolombe, *Aphis puniceae* Passerini and *Aphis spiraecola* Patch were recorded in the target area (Fig.-1). The maximum number of plants were infested

by *A. gossypii* (46 plants), followed by *A. craccivora* (36 plants), *A. nasturtii* (18 plants) and *A. spiraecola* (18 plants).

Six species of coccinellids (*Cheilomenes sexmaculata* (Fabricius), *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricius, *Micraspis discolor* (Fabricius), *Pseudospidimerus circumflexa* var. *testaceus* (Weise) and *Scymnus pyrocheilus* (Mulsant) and six species of syrphid predators (*Allograpta javana* (Wiedemann), *Asarkina ericetorum* (Fabricius), *Episyrphus balteatus* (DeGeer), *Ischiodon scutellaris* (Fabricius), *Melanostoma orientale* (Wiedemann) and *Paragus serratus* (Fabricius)) were recorded on *Aphis* spp. in the target area.

These aphids were found to be parasitized by seven species of parasitoids viz., *Aphelinus albipodus* Fatima & Hayat, *Aphelinus basilicas* Fatima & Hayat, *Aphelinus gossypii* Timberlake, *Aphelinus* sp., *Aphidius* sp., *Binodoxys indicus* Subba Rao & Sharma and *Lipolexis oregmae* (= *scutellaris*) (Gahan) in the target area (Table-1).

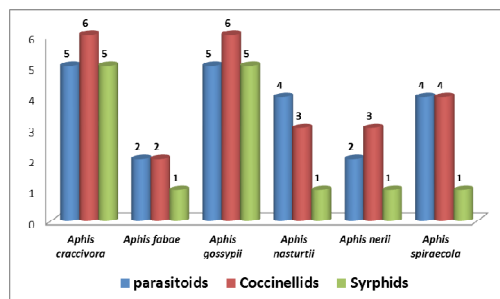


Fig.-2: Number of parasitoids and predators (coccinellids & syrphids) recorded on important *Aphis* spp.

Table -1 Association of few species of *Aphis* with their food plants and natural enemies

| Aphids /Plants/ Family | Coccinellids/Intensity of predation | Syrphids/Intensity of predation | Parasitoids/Intensity of parasitisation |
|--|--|--|--|
| 1. APHIS AFFINIS | | | |
| 1. <i>Mentha spicata</i> (Labiatae) | - | - | - |
| 2. APHIS CRACCIVORA | | | |
| 1. <i>Abelmoschus esculentus</i> (Malvaceae) | - | - | <i>A.gossypii</i> + <i>B. indicus</i> ++ |
| 2. <i>Ageratum conyzoides</i> (Asteraceae) | - | - | <i>A. gossypii</i> ++ <i>B.indicus</i> ++++ <i>L. oregmae</i> +++ |
| 3. <i>Brassica. oleracea</i> var. <i>botrytis</i> (Brassicaceae) | - | - | <i>A.gossypii</i> ++ |
| 4. <i>Cajanus cajan</i> (Fabaceae) | <i>C. sexmaculata</i> ++ <i>S. pyrocheilus</i> ++ | <i>E. balteatus</i> ++ | <i>A. gossypii</i> +++ <i>B. indicus</i> ++++ <i>L. oregmae</i> +++. |
| 5. <i>Hibiscus sabdariffa</i> (Malvaceae) | | | <i>L. oregmae</i> + |
| 6. <i>Lablab purpureus</i> (Fabaceae) | <i>C. sexmaculata</i> +++ <i>C. septempunctata</i> ++ <i>M. discolor</i> +++ <i>P. circumflexa</i> ++++ <i>S. pyrocheilus</i> ++ | <i>A. javana</i> + <i>A. ericetorum</i> ++ <i>E. balteatus</i> ++ <i>I. scutellaris</i> +++ <i>P. serratus</i> +++ | <i>A.albipodus</i> ++++ <i>A. basilicus</i> ++ <i>A. gossypii</i> ++++ <i>B. indicus</i> ++++ <i>L. oregmae</i> ++++ |
| 7. <i>Lagenaria siceraria</i> (= <i>Lagenaria vulgaris</i>) (Cucurbitaceae) | - | - | <i>A. gossypii</i> ++++ <i>B. indicus</i> ++++ <i>L. oregmae</i> ++++ |
| 8. <i>Melilotus alba</i> (Fabaceae) | - | - | <i>B. indicus</i> + |
| 9. <i>Moringa oleifera</i> (Morigiaceae) | | | <i>L. oregmae</i> + |
| 10. <i>Phaseolus sinensis</i> (Fabaceae) | <i>C. sexmaculata</i> ++ <i>C. septempunctata</i> +++ <i>S. pyrocheilus</i> ++ | <i>I. scutellaris</i> +++ <i>P. serratus</i> +++ | <i>B. indicus</i> ++ <i>L. oregmae</i> ++++ |
| 11. <i>Trigonella foenumgraecum</i> (Fabaceae) | - | - | <i>B. indicus</i> + |
| 12. <i>Vicia faba</i> (Fabaceae) | <i>C. sexmaculata</i> + | - | <i>A. gossypii</i> +++ <i>B. indicus</i> ++ <i>L. oregmae</i> ++++ |
| 13. <i>Vigna mungo</i> var. <i>mungo</i> (Fabaceae) | <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | <i>I. scutellaris</i> ++ <i>P. serratus</i> ++ | <i>B. indicus</i> ++ <i>L. oregmae</i> +++ |

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| 14. <i>Vigna sativa</i> (Fabaceae) | - | - | <i>B. indicus</i> + |
| 3. APHIS FABAE | | | |
| 1. <i>Lagenaria siceraria</i> (Cucurbitaceae) | <i>C. sexmaculata</i> ++ <i>S. pyrocheilus</i> ++ | - | <i>B. indicus</i> ++ <i>L. oregmae</i> ++ |
| 2. <i>Luffa cylindrica</i> (Cucurbitaceae) | <i>C. septempunctata</i> ++ | <i>I. scutellaris</i> +++ | <i>B. indicus</i> ++ |
| 4. APHIS GLYCINE | | | |
| 1. <i>Catheranthus roseus</i> (Apocynaceae) | - | - | - |
| 2. <i>Lycopersicon esculentum</i> (Solanaceae) | - | - | - |
| 5. APHIS GOSSYPHII | | | |
| 1. <i>Abelmoschus esculentus</i> (Malvaceae) | <i>C. sexmaculata</i> +++ <i>C. septempunctata</i> +++ <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | - | <i>A. gossypii</i> + <i>L. oregmae</i> ++++ |
| 2. <i>Ageratum conyzoides</i> (Asteraceae) | <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | <i>P. serratus</i> +++ | <i>B. indicus</i> +++ |
| 3. <i>Cajanus cajan</i> (Fabaceae) | <i>C. sexmaculata</i> +++ <i>C. septempunctata</i> ++ | <i>E. balteatus</i> ++ <i>P. serratus</i> +++ | <i>A. gossypii</i> ++ <i>B. indicus</i> ++++ |
| 4. <i>Capsicum frutescens</i> (Solanaceae) | <i>C. sexmaculata</i> ++ <i>C. septempunctata</i> ++ <i>S. pyrocheilus</i> +++ | - | <i>A. gossypii</i> + + + <i>B. indicus</i> + + + <i>L. oregmae</i> +++ |
| 5. <i>Catheranthus rosesus</i> (Aponogetonaceae) | <i>C. sexmaculata</i> ++ <i>S. pyrocheilus</i> ++ | - | <i>A. gossypii</i> + + |
| 6. <i>Citrus limon</i> (Rutaceae) | - | - | <i>B. indicus</i> ++ |
| 7. <i>Clerodendrum infortunatum</i> (Verbanaceae) | - | - | <i>B. indicus</i> + + + <i>L. oregmae</i> ++ |
| 8. <i>Coccinia indica</i> (Cucurbitaceae) | <i>C. transversalis</i> ++ | <i>I. scutellaris</i> +++ | <i>B. indicus</i> ++ <i>L. oregmae</i> ++++ |
| 9. <i>Colocasia</i> sp. (Araceae) | <i>S. pyrocheilus</i> + | - | <i>Aphelius</i> sp. + + <i>L. oregmae</i> +++ |
| 10. <i>Croton</i> sp. (Euphorbiaceae) | <i>S. pyrocheilus</i> ++ | <i>I. scutellaris</i> + | |
| 11. <i>Cucurbita hispida</i> (Cucurbitaceae) | - | - | <i>B. indicus</i> + + + |
| 12. <i>Foeniculum vulgare</i> | <i>C. sexmaculata</i> ++ | - | - |
| 13. <i>Helictis isora</i> | <i>S. pyrocheilus</i> ++ | - | - |

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| 14. <i>Hibiscus rosasinensis</i> (Malvaceae) | <i>C. sexmaculata</i> ++++ <i>S. pyrocheilus</i> +++ | <i>I. scutellaris</i> +++ <i>P.serratus</i> ++ | <i>B. indicus</i> + <i>L. oregmae</i> + |
| 15. <i>Hibiscus sabdariffa</i> (Malvaceae) | - | - | <i>B. indicus</i> ++ |
| 16. <i>Hordeum vulgare</i> (Poaceae) | - | - | <i>B. indicus</i> + |
| 17. <i>Impatiens balsamina</i> (Balsaminaceae) | - | - | <i>Aphelinus</i> sp.++ |
| 18. <i>Lablab purpureus</i> (Fabaceae) | - | - | <i>A. gossypii</i> ++ <i>B. indicus</i> ++ + |
| 19. <i>Lagenaria siceraria</i> (Cucurbitaceae) | <i>C. sexmaculata</i> ++++ <i>S. pyrocheilus</i> ++ | <i>A. javana</i> +++ <i>A. ericetorum</i> +++ <i>I. scutellaris</i> ++++ <i>P.serratus</i> +++ | <i>A. gossypii</i> ++ <i>B. indicus</i> ++ ++ <i>L. oregmae</i> ++ |
| 20. <i>Lawsonia inermis</i> | <i>S. pyrocheilus</i> + | - | <i>B. indicus</i> ++ <i>L. oregmae</i> ++ |
| 21. <i>Luffa acutangula</i> (Cucurbitaceae) | | | <i>A. gossypii</i> +++ |
| 22. <i>Luffa cylindrical</i> (Cucurbitaceae) | <i>C. sexmaculata</i> ++++ <i>I. scutellaris</i> ++++ | | <i>A. gossypii</i> +++ <i>B. indicus</i> ++++ <i>L. oregmae</i> ++ |
| 23. <i>Lycopersicon esculantum</i> (Solanaceae) | <i>C. septempunctata</i> ++ <i>S. pyrocheilus</i> ++ | - | <i>B. indicus</i> ++ |
| 24. <i>Momordica charantia</i> (Cucurbitaceae) | <i>C. sexmaculata</i> +++ <i>C. septempunctata</i> + <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | <i>I. scutellaris</i> ++ | <i>A. gossypii</i> ++ ++ <i>B. indicus</i> ++ <i>L. oregmae</i> +++ |
| 25. <i>Ocimum sanctum</i> | <i>S. pyrocheilus</i> + + | - | <i>A. gossypii</i> + <i>B. indicus</i> ++ ++ <i>L. oregmae</i> + |
| 26. <i>Psidium guajava</i> (Myrtaceae) | <i>C. septempunctata</i> + <i>P. circum flexa</i> ++ <i>S. pyrocheilus</i> +++ | - | <i>B. indicus</i> ++ <i>L. oregmae</i> + |
| 27. <i>Rosa</i> sp. (Rosaceae) | <i>S. pyrocheilus</i> + | - | <i>B. indicus</i> ++ + <i>L. oregmae</i> + |
| 28. <i>Solanum melongena</i> (Solanaceae) | <i>C. sexmaculata</i> +++ <i>S. pyrocheilus</i> ++ | - | <i>A. albipodus</i> + <i>B. indicus</i> ++ ++ <i>L. oregmae</i> ++++ |
| 29. <i>Solanum tuberosum</i> (Solanaceae) | - | - | <i>B. indicus</i> ++ + |

| | | | |
|--|--|--------------------------|---|
| 30. <i>Tagetes</i> sp. (Asteraceae) | <i>S. pyrocheilus</i> ++ | - | <i>A. gossypii</i> + <i>B. indicus</i> ++ + |
| 6. APHIS NASTURTII | | | |
| 1. <i>Ageratum conyzoides</i> (Asteraceae) | <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | | |
| 2. <i>Capsicum frutescens</i> (Solanaceae) | <i>P. circumflexa</i> ++++ <i>S. pyrocheilus</i> +++ | - | <i>B. indicus</i> ++ ++ <i>L. oregmae</i> +++ |
| 3. <i>Chrysanthemum indicum</i> (Asteraceae) | - | - | <i>Aphidius</i> sp. ++ <i>L. oregmae</i> +++ |
| 4. <i>Cucurbita hispida</i> (Cucurbitaceae) | - | - | <i>B. indicus</i> ++ <i>L. oregmae</i> +++ |
| 5. <i>Ficus religiosa</i> (Moraceae) | - | - | <i>B. indicus</i> ++ + <i>L. oregmae</i> ++ |
| 6. <i>Hibiscus sabdariffa</i> (Malvaceae) | - | - | <i>L. oregmae</i> ++ |
| 7. <i>Lagenaria siceraria</i> (Cucurbitaceae) | <i>S. pyrocheilus</i> ++ | <i>A. ericetorum</i> +++ | <i>B. indicus</i> ++ + <i>L. oregmae</i> +++ |
| 8. <i>Luffa cylindrical</i> (Cucurbitaceae) | - | - | <i>B. indicus</i> ++ <i>L. oregmae</i> +++ |
| 9. <i>Lycopersicon esculentum</i> (Solanaceae) | - | - | <i>B. indicus</i> ++ <i>L. oregmae</i> ++++ |
| 10. <i>Psidium guajava</i> (Myrtaceae) | - | - | <i>B. indicus</i> ++++ |
| 11. <i>Solanum melongena</i> (Solanaceae) | <i>C. sexmaculata</i> ++ <i>S. pyrocheilus</i> +++ | - | <i>B. indicus</i> ++ ++ <i>L. oregmae</i> ++++ |
| 12. <i>Solanum tuberosum</i> (Solanaceae) | - | - | <i>B. indicus</i> ++ |
| 13. <i>Tectona grandis</i> | - | - | <i>L. oregmae</i> +++ |
| 7. APHIS NERII | | | |
| 1. <i>Calotropis gigantea</i> | <i>C. sexmaculata</i> +++ <i>C. septempunctata</i> ++ <i>S. pyrocheilus</i> ++ | - | <i>B. indicus</i> ++ ++ <i>L. oregmae</i> ++ |
| 2. <i>Coccinia indica</i> (Cucurbitaceae) | - | - | <i>B. indicus</i> ++ + <i>L. oregmae</i> +++ |
| 3. <i>Nerium indicum</i> | <i>C. septempunctata</i> ++ | <i>P. serratus</i> +++ | <i>B. indicus</i> ++ <i>L. oregmae</i> ++++ |
| 8. APHIS PUNICAE | | | |
| 1. <i>Colocasia</i> sp. (Araceae) | - | - | |

| | | | |
|--|---|------------------------|---|
| 2. <i>Punica granatum</i> (Punicaceae) | - | - | |
| 9. APHIS SPIRAECOLA | | | |
| 1. <i>Ageratum conyzoides</i> (Asteraceae) | <i>C. transversalis</i> ++ <i>S. pyrocheilus</i> ++ | <i>P. serratus</i> ++ | <i>A. gossypii</i> + <i>B. indicus</i> ++ ++ <i>L. oregmae</i> ++++ |
| 2. <i>Cajanus cajan</i> (Fabaceae) | - | - | <i>B. indicus</i> ++ |
| 3. <i>Cestrum nocturnum</i> (Solanaceae) | - | - | <i>B. indicus</i> ++ |
| 4. <i>Chrysanthemum indicum</i> | <i>S. pyrocheilus</i> ++ | - | <i>A. gossypii</i> + <i>Aphidius</i> sp. + |
| 5. <i>Coriandrum sativum</i> | <i>C. sexmaculata</i> +++ | - | <i>A. gossypii</i> +++ <i>B. indicus</i> +++ <i>L. oregmae</i> + |
| 6. <i>Cosmos</i> sp. | <i>C. sexmaculata</i> ++ | - | |
| 7. <i>Dahlia</i> sp. | - | - | <i>A. gossypii</i> ++ |
| 8. <i>Hibiscus sabdariffa</i> (Malvaceae) | - | - | <i>B. indicus</i> ++ + |
| 9. <i>Lagenaria siceraria</i> (Cucurbitaceae) | <i>C. septempunctata</i> ++ <i>S. pyrocheilus</i> ++ | <i>P. serratus</i> +++ | - |
| 10. <i>Solanum melongena</i> (Solanaceae) | <i>C. sexmaculata</i> ++ | - | - |
| 11. <i>Sonchus</i> sp. | - | - | <i>B. indicus</i> + |
| 12. <i>Tagetes</i> sp. (Asteraceae) | - | | <i>A. gossypii</i> + +++ <i>B. indicus</i> ++ + <i>L. oregmae</i> +++ |

Intensity of parasitisation/predation

+ = low ++ = Moderate +++ = High ++++ = Very High

Six species of predators (*C. sexmaculata*, *C. septempunctata*, *C. transversalis*, *E. balteatus*, *I. scutellaris* and *P. serratus*) and three species of the parasitoids (*A. gossypii*, *B. indicus* and *L. oregmae*) were found abundantly on *Aphis* spp.(Fig.-2) in the target area and may be utilised in the biological control programme after further study.

1. APHIS AFFINIS DEL GUERCIO

It is small dark grey-green aphid to almost black in colour. It was recorded in only one place in the locality.

Host plants : **It forms colony on tender upper leaves of *Mentha spicata* of family Labiateae in the target area and moderate intensity of infestation was**

observed.

Seasonal abundance: It was recorded only in one locality during April.

Parasitoid : Not recorded.

Predator : Not recorded.

2. *APHIS CRACCIVORA* KOCH

Adult *A. craccivora* are shiny black in colour and immatures are light brown and lightly dusted with wax. It is commonly called cowpea aphid. It was recorded in all localities of the target area.

Host plants : *A. craccivora* is a most serious polyphagous pest in the target area. During the extensive survey, it was recorded on 36 species of host plants. Highly infested food plants were *Abelmoschus esculentus*, *Cajanus cajan*, *Lablab purpureus*, *Phaseolus sinensis*, *Solanum xanthocarpum*, *Vicia faba*, *Vigna mungo* var. *mungo* and *Vigna* sp. High to moderate infestation was also observed on several food plants viz., *Cicer arietenum*, *Clerodendrum splendens*, *Hibiscus sabdariffa*, *Lagenaria siceraria*, *Lycopersicon esculentum*, *Mangifera indica*, *Melilotus alba*, *Mirabilis jalapa*, *Nerium oleander*, *Vigna radiata* var. *radiata*, *Solanum tuberosum* and *Trigenella foenumgraecum*. However on rest of food plants, low infestation was observed (*Brassica campestris*, *Brassica oleracea* var. *botrytis*, *Bougainvillea* sp., *Citrus limon*, *Cucumis melo*, *Cyamopsis* sp. *Lathyrus aphaca*, *Lathyrus sativa*, *Pisum sativum*). The most suffered food plants belong to families Fabaceae.

Seasonal abundance : It was recorded

in the month of August to May. Its peak population was observed during September to March. During May to July its population declined due to increase of temperature.

Parasitoids : *A. albipodus*, *A. basilicas*, *A. gossypii*, *B. indicus* and *L. oregmae* were recorded in the target area on this aphid with low to high rate of parasitisation (Table-1)

Predators :

a. Coccinellids: All six species of coccinellid predators viz., *C. sexmaculata*, *C. septempunctata*, *C. transversalis*, *M. discolor*, *P. circumflexa*, *S. pyrocheilus* were recorded on this aphid with moderate to high rate of predation (Table -1).

b. Syrphids : *A. javana*, *A. ericetorum*, *E. balteatus*, *I. scutellaris* and *P. serratus* were recorded in the target area on *A. craccivora* (Table -1).

3. *APHIS FABAE*

A. fabae is commonly known as bean aphid. Young colonies consist of brown aphids were collected on young shoots in only few localities in the target area.

Host plants : In the present survey, it was recorded on 10 food plants viz., *Brachycome* sp., *Brassica oleracea* var. *botrytis*, *Chrysanthemum indicum*, *Cyamopsis tetragonolobus*, *Hibiscus rosasinensis*, *Lagenaria siceraria*, *Luffa cylindrica*, *Lycopersicon esculentum*, *Solanum tuberosum*, *Tagetes* sp. Highly infested plants were *Brachycome* sp., *Chrysanthemum indicum*, *L. siceraria*, and *Tagetes* sp. The most suffered family was

Asteraceae.

Seasonal abundance : *A. fabae* was started to build up its population during December. Its peak population was observed in the month of February (Table-1).

Parasitoids : *B. indicus* and *L. oregmae* were recorded in the target with moderate rate of parasitisation.

Predators :

a. Coccinellids: Only *C. septempunctata* and *Scymnus pyrocheilus* was recorded on this aphid with moderate rate of predation.

b. Syrphids : only *I. scutellaris* was recorded in the target area on *A. fabae*.

4. APHIS GLYCINE

It is commonly called soybean aphid. It was recorded only from two localities of the target area.

Host Plants : This aphid is not common in the target area and were recorded on only two plants *Catheranthus roseus* and *Lycopersicon esculentum* with low intensity of infestation.

Seasonal abundance : It was recorded during September to December.

Parasitoid : Not recorded.

Predator : Not recorded.

5. APHIS GOSSYPHII

It is commonly known as cotton aphid or melon aphid. Individuals of the same colony show a great variation in size. *A. gossypii* was the most common aphid and recorded in all localities of the target area.

Host plants : *A. gossypii* is a most serious pest in the target area and was recorded on more than 46 food plants. The most suffered food plants were *A. esculantus*, *Clerodendrum infortunatum*, *Capsicum frutescens*, *Coccinia indica*, *L. siceraria*, *Lawsonia inermis*, *Momordica charantia*, *Ocimum tenuiflorum*, *Psidium guajava*, *Solanum melongena*, *S. tuberosum* and *Tagetes* sp.

Seasonal abundance: *A. gossypii* is found throughout the year except in June due to high temperature. It started to appear during July. Its high intensity of infestation was observed during October to February on several economically important plants (Table-1).

Parasitoids : Five species of the parasitoids viz., *A. albipodus*, *A. gossypii*, *Aphelinus* sp., *B. indicus* and *L. oregmae* were recorded. *B. indicus* and *L. oregmae* were found abundantly in most of the localities with moderate to high rate of parasitisation in the target area.

Predators :

a. Coccinellids: All six species of coccinellid viz., *C. sexmaculata*, *C. septempunctata*, *C. transversalis*, *M. discolor*, *P. circumflexa*, *S. pyrocheilus* were recorded on this aphid with moderate to high rate of predation (Table -1).

b. Syrphids : *A. javana*, *A. ericetorum*, *E. balteatus*, *I. scutellaris* and *P. serratus* were recorded on this aphid (Table -1).

6. APHIS NASTURTII

Distribution : *A. nasturtii* is also a common aphid observed in almost all localities of the target area.

Host plants : *A. nasturtii* is a polyphagous in nature and recorded on 18 food plants. The intensity of infestation was very low to very high on different plants in different localities. The highly infested plants were *A. esculantus*, *C. frutescens*, *C. infortunatum*, *Ficus religiosa*, *P. guajava* and *S. melongena*. **Seasonal abundance:** It is found mostly in months of last July to May in different localities of target area (Table-1). Its high infestation was observed in month of October to March on different food plants.

Parasitoids : *Apidius* sp., *A. gossypii*, *B. indicus* and *L. oregmae* were recorded in the target area with moderate to high rate of parasitisation on this aphid.

Predators :

a. Coccinellids: *C. sexmaculata*, *P. circumflexa* and *S. pyrocheilus* were recorded on this aphid with moderate to high rate of predation (Table -1).

b. Syrphids : only one species, *A. ericetorum* was recorded on this aphid (Table -1).

7. APHIS NERII

It is commonly known as nerium aphid. The aphid is very easy to identify because of its unique bright yellow-orange colour and dark brown appendages.

Distribution : It was recorded from

several localities in the target area.

Host plants : *A. nerii* was recorded only on 4 food plants of different families (Table-1). The high intensity of infestation was recorded on *Calotropis gigantea* and *Coccinia indica* in different localities of target area (Table-1).

Seasonal abundance: During extensive survey in different localities of target area, it was observed during April to December. Its peak population was observed in November to December (Table-1).

Parasitoids : *B. indicus* and *L. oregmae* were recorded in the target area on this aphid with moderate to high rate of parasitisation.

Predators :

a. Coccinellids : *C. sexmaculata*, *C. septempunctata*, and *S. pyrocheilus* were recorded on this aphid with moderate to high rate of predation (Table -1).

b. Syrphids : only *P. serratus* was recorded in the target area on *A. nerii* (Table -1).

8. APHIS PUNICAE

It is small yellowish green aphid and commonly called Pomegranate aphid.

Distribution : It were recorded only in two localities of the target area.

Host Plants : It is not common aphid in the target area and were recorded on only two plants with low intensity of infestation (*Colocacia* sp. and *Punica granatum*).

Seasonal abundance : It was observed during October to November.

Parasitoid : Not recorded.

Predator : Not recorded.

9. APHIS SPIRAECOLA

It is commonly known as spiraea aphid or apple aphid. It is small, bright greenish yellow or apple green in colour.

Distribution : It is a common aphid, generally found in almost all localities of the target area.

Host plants : It is a common aphid, generally found in all localities of the target area in abundant number and infest more than 18 food plants (Table-1). The most infested host plants were *Brachycorne* sp., *Chrysanthemum indicum*, *Coriandrum sativum*, *F. vulgare* and *Trachyspermum roxburghianum*. The moderate to low intensity of infestation was observed on rest of the plants. The most suffered family was Asteraceae.

Seasonal abundance: *A. spiraecola* was recorded during August to March and found abundantly during December to March.

Parasitoids : *Aphelinus* sp., *A. gossypii*, *B. indicus* and *L. oregmae* were recorded in the target area on this aphid with low to high rate of parasitisation (Table -1)

Predators :

a. Coccinellids : *C. sexmaculata*, *C. septempunctata*, *C. transversalis* and *S. pyrocheilus* were recorded on this aphid with moderate to high rate of predation (Table -1).

b. Syrphids : only *P. serratus* was recorded in the target area on *A. spiraecola* (Table -1).

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