## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1-7</td>
</tr>
<tr>
<td>REVIEW OF LITERATURE</td>
<td>8 - 34</td>
</tr>
<tr>
<td>CHAPTER. I BIOLOGICAL STUDIES</td>
<td>35 - 52</td>
</tr>
<tr>
<td>1.1. Introduction</td>
<td></td>
</tr>
<tr>
<td>1.2. Materials and methods</td>
<td></td>
</tr>
<tr>
<td>1.3. Results</td>
<td></td>
</tr>
<tr>
<td>1.3.1. Biology of the tukra mealy bug, <em>Maconellicoccus hirsutus</em></td>
<td></td>
</tr>
<tr>
<td>1.3.2. Morphological studies of <em>M. hirsutus</em> in scan electron microscope</td>
<td></td>
</tr>
<tr>
<td>1.3.3. Biology of the entomophages, <em>Cryptolaemus montrouzieri</em> and <em>Scymnus coccivora</em> on <em>M. hirsutus</em></td>
<td></td>
</tr>
<tr>
<td>1.3.4. Biology of the parasitoid, <em>Anagyrus kamali</em> on <em>M. hirsutus</em></td>
<td></td>
</tr>
<tr>
<td>1.3.5. Feeding potential of <em>C. montrouzieri</em> and <em>S. coccivora</em></td>
<td></td>
</tr>
<tr>
<td>1.3.6. Parasitization potential of <em>A. kamali</em></td>
<td></td>
</tr>
<tr>
<td>1.4. Discussion</td>
<td></td>
</tr>
<tr>
<td>CHAPTER. II MEALY BUG FEEDING, SYMPTOMS AND ITS DAMAGES</td>
<td>53 - 79</td>
</tr>
<tr>
<td>2.1. Introduction</td>
<td></td>
</tr>
<tr>
<td>2.2. Materials and methods</td>
<td></td>
</tr>
</tbody>
</table>
2.2.1. Microscopical examination of mouthparts
2.2.2. Infestation of mealybug on alternate hosts and symptoms
2.2.3. Infestation of mealybug on mulberry and symptoms
2.2.4. Biochemical analysis of healthy and infested mulberry leaves
2.2.5. SDS polyacrylamide gel electrophoresis of healthy and infested mulberry leaves

2.3. Experimental results

2.3.1. Mouth parts of mealy bug and its feeding
2.3.2. Infestation of mealy bug in different host plants and symptoms
2.3.3. Infestation of mealy bug in mulberry and symptoms
2.3.4. Moisture content in tender, medium and coarse leaves of five different mulberry varieties
2.3.5. Biochemical content in tender, medium and coarse leaves of mulberry plant
2.3.6. Biochemical changes in healthy and mealy bug infested mulberry leaves
2.3.7. Protein profile by SDS polyacrylamide gel electrophoresis

2.4. Discussion

CHAPTER III. TRITROPHIC RELATIONS ON DIFFERENT HOSTS OF M. HIRSUTUS AND ON POPULAR MULBERRY VARIETIES

3.1. Introduction

3.2. Materials and methods

3.2.1. Field studies on different host plants
3.2.2. Pot culture experiments with different host plants
3.2.3. Different mulberry varieties selected for the study
3.2.4. Screening methodologies
3.2.5. Field studies

3.2.6. Biochemical analysis of leaves of different mulberry varieties in different days of crop growth

3.2.7. Trichome density in different mulberry varieties

3.2.8. Observations of *M. hirsutus* infestation on the surrounding plants and trees

3.2.9. Statistical analysis

3.3. Experimental results

3.3.1. *M. hirsutus* infestation on six different host plants in four seasons

3.3.2. Population of *M. hirsutus* on six different host plants in four seasons.

3.3.3. Population of entomophages on the *M. hirsutus* infested branches in six different host plants in four different seasons.

3.3.4. *M. hirsutus* infestation, population and its entomophages in pot culture experiments of six different host plants

3.3.5. Mealy bug infestation on five mulberry varieties

3.3.6. *M. hirsutus* population on five mulberry varieties

3.3.7. Predator population on different mulberry varieties

3.3.8. Parasitization of *M. hirsutus* on different mulberry varieties

3.3.9. *M. hirsutus* infestation, population and its entomophages in pot culture experiment of five mulberry varieties.

3.3.10. Biochemical content in tender mulberry leaves in different stages of crop growth in different varieties.

3.3.11. Trichome density in the mulberry leaves of five mulberry varieties

3.3.12. Olfactometry studies

3.3.13. Incidence of *M. hirsutus* on the surrounding plants.
3.4. Discussion

3.4.1. Preference of *M. hirsutus* to different host plants

3.4.2. Preference of predator and parasitoid to different host plants

3.4.3. Tritrophic relations in five mulberry varieties

3.4.3.1. Tukra incidence and *M. hirsutus* population on different mulberry varieties

3.4.3.2. Entomophages population in different mulberry varieties

3.4.4.1. Biochemical content of tender mulberry leaves in different stages of crop growth in different varieties

3.4.4.2. Correlation between amino acid content of leaf and tritrophic relations.

3.4.4.3. Correlation between total soluble sugars and tritrophic relations

3.4.4.4. Correlation between protein content of the leaves and tritrophic relations

3.4.4.5. Correlation between chlorophyll content of the leaves and tritrophic relations

3.4.4.6. Correlation between phenol content of the leaves and tritrophic relations

3.4.5. Comparison of trichome density in different mulberry varieties and pest population

3.4.6. Olfactometry studies

3.4.7. Integrated management of *M. hirsutus*
CHAPTER - IV. DIVERSITY OF INSECTS IN THE MULBERRY ECOSYSTEM INFLUENCING TRITROPHIC RELATIONS.

4.1. Introduction

4.2. Materials and Methods

4.2.1. Mulberry garden
4.2.2. Insect assessment
4.2.3. Taxonomic diversity
4.2.4. Biodiversity indices

4.3. Results

4.3.1. Characteristics of study garden
4.3.2. Soil type
4.3.3. Ecological profile of the garden
4.3.4. Diversity of insects
4.3.5. Insect orders observed in the mulberry ecosystem
4.3.6. Species richness
4.3.7. Insect diversity indices
4.3.8. Influence of ant population on the tritrophic relations

4.4. Discussion

4.4.1. Diversity of insects
4.4.2. Taxonomic diversity
4.4.3. Trophic diversity
4.4.4. Species richness index
4.4.5. Relative abundance of species
4.4.6. Proportional abundance of insects
4.4.7. Diversity indices
4.4.7. Abundance of pests and natural enemies
4.4.8. Interaction between the mealy bug and ants
CHAPTER -V  
INFLUENCE OF BIOTIC AND ABIOTIC FACTORS  
ON TRITROPHIC RELATIONS OF MULBERRY,  
MEALY BUG AND ITS ENTOMOPHAGES  
144 - 161

5.1. Introduction

5.2. Materials and methods

5.3. Results

5.3.1. Mealy bug infestation in mulberry in different months
5.3.2. Population dynamics of the mealy bug
5.3.4. Population dynamics of entomophages
5.3.5. Weather parameters
5.3.5.1. Impact of temperature on mealy bug infestation
5.3.5.2. Impact of relative humidity on mealy bug infestation
5.3.5.3. Impact of rain fall on mealy bug infestation
5.3.5.4. Impact of rainy days on mealy bug infestation
5.3.5.5. Multiple regression equations
5.3.6. Correlation between mealy bug infestation in plants and branches
5.3.7. Correlation of mealy bug infestation, mealy bug population and entomophages.
5.3.8. Correlation of entomophages population with abiotic factors

5.4. Discussions

6. SUMMARY  
161 - 169

7. REFERENCES  
170 - 202