

CONTENTS

	Page
I. INTRODUCTION	1
II. REVIEW OF LITERATURE	3
II.1- Ecological studies	3
A. Survey and population dynamics of phytophagous and predaceous mites on citrus trees	3
B. Relationship between predaceous and phytophagous mites scale insects on citrus trees	8
II.2- Biological studies	11
A. The predatory behaviour and feeding habitats of predaceous mites	11
B. Effect of different kinds of food on some biological aspects of predaceous mites	15
A.1. Sub-order Prostigmata (Fam.: Eupalopsellidae & Fam. Stigmaeidae)	21
A.2- Sub-order Mesostigmata (Fam.: Phytoseiidae)	26
II.3- Effect of temperatures on some biological aspects of predaceous mites	39
III. MATERIALS AND METHODS	49
1. Ecological studies	49
1.a. Population dynamics of phytophagous, scale insects and predaceous mites	49
1.b. Survey of predaceous mites	50
2. Laboratory culture of predaceous mites	50
3. Biological studies	51

	Page
3.a. Effect of different foods	51
3.b. Effect of different constant temperatures on incubation period, ovipositional periods adult longevity, fecundity and feeding capacity.....	52
IV. RESULTS AND DISCUSSION	53
IV.1- Ecological studies	53
1.a- Population dynamics of phytophagous, predaceous mites and scale insects on Navel orange trees during the two successive years at Qalubia Governorate	53
1.a.1- Population dynamics of phytophagous mites on Navel orange leaves	53
a- Seasonal abundance of Citrus flat mite, <i>Brevipalpus californicus</i> (Banks) Fam. Tenuipalpidae on leaves of Navel orange variety	53
b- Seasonal abundance of Citrus rust mite, <i>Phyllocoptruta oleivora</i> Ashmed (Fam. Eriophyidae) on leaves of Navel orange variety	54
c- Seasonal abundance of Citrus brown mite, <i>Eutetranychus orientalis</i> (Klein) (Fam. Tetranychidae) on leaves of Navel orange variety	58
1.a.2- Population dynamics of some scale insects on leaves of navel orange variety	59
1.a.3- Population dynamics of predaceous mites on leaves of Navel orange variety	63

	Page
1- Seasonal abundance of <i>Typhlodromus athiasae</i> Porath & Swirski (Fam. Phytoseiidae) on Navel orange variety	63
2- Seasonal abundance of <i>Cheletogenes ornatus</i> (C. and F.) (Fam. Chyletidae) on Navel orange leaves	64
3- Seasonal abundance of <i>Agistemus exsertus</i> Gonzalez (Fam. Stigmaeidae) on leaves of Navel orange variety	65
4- Seasonal abundance of <i>Saniosulus nudus</i> Summers (Fam. Eupalopselliidae) on Navel orange variety	66
1.b- Relationship between predaceous mites and Phytophagous mites and scale insects	68
1.c. Distribution of different mite species and scale insects during the four season of each year	73
IV.2- Biological aspects and feeding capacity of some predaceous mites	79
2.a- <i>Agistemus exsertus</i> (Fam. Stigmaeidae)	79
2.a.1. Duration of immature stages	79
1- Incubation period	79
2- The total larval and nymphal period	80
3- Total developmental period.....	86
2.a.2. Adult's longevity	88
2.a.3. Adult's life span	89

	Page
2.a.4. Ovipositional periods	90
Pre-oviposition period	90
Oviposition period	91
Post-oviposition period	91
2.a.5. Fecundity (number of deposited eggs / female)	91
Sex ratio	93
2.a.6. Feeding capacity of the predaceous mite, <i>A. exsertus</i> on different preys	94
Total consumption throughout the immature stages	94
Adult stage	95
3-a. <i>Saniosulus nudus</i> Summers	99
3-a.1. Durations of immature stages	99
1- Egg stage (Incubation period)	99
2- The larval and nymphal periods	99
3- The total development period	105
3-a.2. Adult's longevity	106
3-a.3. Adult's life span	107
3-a.4. Ovipositional periods	107
Pre-oviposition period	107
Oviposition period	108
Post-oviposition period	108
3.a.5. Fecundity	109
Sex ratio	109

	Page
3-a.6. Feeding capacity of the predaceous mite, <i>Saniosulus nudus</i> on different preys	111
4-a. <i>Typhlodromus athiasae</i>	115
4.a.1. Duration of immature stages	115
1- Egg stage (Incubation period)	115
2- The larval and nymphal period	115
3- The total developmental period	116
4.a.2. Adult's longevity	122
4.a.3. Adult's life span	122
4.a.4. Oviposition periods	123
Pre-oviposition period	123
Oviposition period	123
Post-oviposition period	124
4.a.5. Fecundity	124
Sex ratio	126
4.a.6. Feeding capacity	127
V. SUMMARY	131
VI. REFERENCES	136
VII. ARABIC SUMMARY	--

LIST OF TABLES

Table No.	Title	Page
(1)	Population dynamics of different phytophagous, scale insects and predaceous mites on Navel orange leaves during the first year (Dec. 2000-Nov.2001) at (Degwa village) Benha region – Qalubia.....	55
(2)	Population dynamics of different phytophagous and predaceous mites and scale insects on Navel orange leaves during the first year (Dec. 2000-Nov.2001) at (Moshtohor village) Tukh region – Qalubia.	56
(3)	Population dynamics of different phytophagous and predaceous mites and scale insects on Navel orange leaves during the second year (Dec. 2001-Nov.2002) at (Degwa village) Benha region - Qalubia.....	60
(4)	Population dynamics of different phytophagous, predaceous mites and scale insects on Navel orange leaves during the second year (Dec. 2001-Nov.2002) at (Moshtohor village) Tukh region – Qalubia.....	61
(5)	Coefficient values of simple correlation between phytophagous, scale insects and their predaceous mites; and both temperature and relative humidity during the two years of investigation	67
(6)	Monthly numbers of predaceous mites and phytophagous pests (mites and scale insects) during the two years on Navel orange trees	69
(7)	Distribution of different mite species and scale insects during the two seasons on Navel orange trees at Qalubia Governorate.	75

Table No.	Title	Page
(8)	Average temperatures and relative humidity during the period extended from December to November during the two years of investigation at Qalubia Governorate	78
(9)	Durations of development at stages of the predator, <i>Agistemus exsertus</i> Gonzalez reared on different diets at $16 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	81
(10)	Durations of development at stages of the predator, <i>Agistemus exsertus</i> Gonzalez reared on different diets at $24 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	82
(11)	Durations of development at stages of the predator, <i>Agistemus exsertus</i> Gonzalez reared on different diets at $28 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	83
(12)	Durations of developmental stages of the predator, <i>Agistemus exsertus</i> Gonzalez reared on different diets at $30 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	84
(13)	Durations of developmental stages of the predator, <i>Agistemus exsertus</i> Gonzalez reared on different diets at $32 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.....	85
(14)	Effect of various diets on ovipositional periods, longevity and number of eggs per mated female of <i>Agistemus exsertus</i> Gonzalez at different constant temperatures and $70 \pm 5\%$ R.H.	92
(15)	Rate of consumed prey / female of <i>Agistemus exsertus</i> Gonzalez fed on different preys at 28°C and $70 \pm 5\%$ R.H.....	97
(16)	Rate of consumed prey / male of <i>Agistemus exsertus</i> Gonzalez fed on different preys at 28°C and $70 \pm 5\%$ R.H.....	98

Table No.	Title	Page
(17)	Durations of the developmental stages of the predator, <i>Saniosulus nudus</i> Summers fed on different diets at $16 \pm 1^{\circ}\text{C}$ and 70 ± 0.5 R.H.....	100
(18)	Duration of developmental stages of the predator, <i>Saniosulus nudus</i> Summers fed on different diets at $24 \pm 1^{\circ}\text{C}$ and 70 ± 0.5 R.H.	101
(19)	Duration of developmental stages of the predator, <i>Saniosulus nudus</i> Summers fed on different diets at $28 \pm 1^{\circ}\text{C}$ and 70 ± 0.5 R.H.	102
(20)	Duration of developmental stages of the predator, <i>Saniosulus nudus</i> Summers fed on different diets at $30 \pm 1^{\circ}\text{C}$ and 70 ± 0.5 R.H.	103
(21)	Duration of developmental stages of the predator, <i>Saniosulus nudus</i> Summers fed on different diets at $32 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	104
(22)	Effect of various diets on ovipositional periods and fecundity of <i>Saniosulus nudus</i> Summers female at different constant temperatures and $70 \pm 5\%$ R.H.....	110
(23)	Rate of consumed prey / female of <i>Saniosulus nudus</i> Summers fed on different preys at 28°C and $70 \pm 5\%$ R.H.....	112
(24)	Rate of consumed prey / male of <i>Saniosulus nudus</i> Summers fed on different preys at 28°C and $70 \pm 0.5\%$ R.H.....	113
(25)	Duration of developmental stages of the predator, <i>Typhlodromus athiasae</i> Porath & Swirski fed on different kinds of food at $16 \pm 1^{\circ}\text{C}$ and $70 \pm 5\%$ R.H.	117

Table No.	Title	Page
(26)	Duration of developmental stages of the predator, <i>Typhlodrmus athiasae</i> Porath & Swirski fed on different kinds of food at 24 ± 1 °C and $70 \pm 5\%$ R.H.....	118
(27)	Duration of developmental stages of the predator, <i>Typhlodrmus athiasae</i> Porath & Swirski fed on different kinds of food at 28 ± 1 °C and $70 \pm 5\%$ R.H.....	119
(28)	Duration of developmental stages of the predator, <i>Typhlodromus athiasae</i> Porath & Swirski fed on different kinds of food at 30 ± 1 °C and $70 \pm 5\%$ R.H.	120
(29)	Duration of developmental stages of the predator, <i>Typhlodromus athiasae</i> Porath & Swirski fed on different kinds of food at 32 ± 1 °C and $70 \pm 5\%$ R.H.	121
(30)	Effect of various diets on ovipositional periods, longevity and fecundity of <i>Typhlodromus athiasae</i> female at different constant temperatures and $70 \pm 5\%$ R.H.	125
(31)	Rate of consumed prey / female of <i>Typhlodromus athiasae</i> Porath & Swirski fed on different preys at 28°C and $70 \pm 5\%$ R.H.	128
(32)	Rate of consumed prey / male of <i>Typhlodromus athiasae</i> Porath & Swirski fed on different preys at 28°C and $70 \pm 5\%$ R.H.	129

LIST OF FIGURES

No.	Figure	Page
1	Population dynamics of phytophagous mites, scale insects and predaceous mites on Navel orange trees throughout the first year of study at Benha and Takh region (Qalubia Governorate)	57
2	Population dynamics of phytophagous mites, scale insects and predaceous mites on Navel orange trees throughout the second year of study at Benha and Takh region (Qalubia governorate).....	62
3	Relationship between the population of predaceous mites and phytophagous pests (mites and scale insects) throughout the first year on Navel orange trees at Benha and Takh, Qalubia Governorate.....	70
4	Relationship between the population of predaceous mites and phytophagous pests (mites and scale insects) throughout the second year on Navel orange trees at Benha and Takh, Qalubia Governorate.....	72
5	Numbers of phytophagous mites, scale insects and predaceous mites on Navel orange trees / 300 leaves during the two seasons at Takh Qalubia Governorate.....	76
6	Numbers of phytophagous mites, scale insects and predaceous mites on Navel orange trees / 300 leaves during the two seasons at Benha Qalubia Governorate.....	77