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STUDIES ON THE MAIN INSECT PESTES INFESTING CERTAIN SOLANACEOUS VEGETABLE CROPS

BY

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Thesis

Submitted in partial fulfillment of the requirements for the

Degree of

Doctor of Philosophy

In

Agricultural Sciences

(Economic Entomology)

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2019

Contents

Content	Page
1- INTRODUCTION.....	1
2 -REVEIEW OF LITERATURE	3
2.1- The main insect pests of Solanaceous vegetable crops.....	3
2. 1-1. The cotton aphid, <i>Aphis gossypii</i> Glov.....	3
2. 1-2. The whitefly, <i>Bemisia tabaci</i> Gennady.....	6
2. 1-3. The cotton thrips, <i>Thrips tabaci</i> L.....	9
2. 1-4. The leaf hoppers, <i>Empoasca decipiens</i> (Paoli).....	12
2. 1-5. The leaf miner, <i>Liriomyza trifolii</i> Burg.....	14
2. 1-6. The green bug, <i>Nezara viridula</i> L.....	16
2. 1-7. The tomato leaf Mainer, <i>Tuta absoluta</i> (Meyrick).....	18
2. 1-8. The Egyptian cotton leaf worm, <i>Spodoptera littoralis</i> Bosid.....	20
2. 1-9. The cotton bollworm, <i>Heliothis armigra</i> Hubn.....	22
2.2- The main associated predators.....	24
2.2.1. The Eleven-spot lady bird <i>Coccinella undecimpunctata</i> L.....	24
2.2.2. The green lacewing <i>Chrysoperla carnea</i> Steph.....	26
2.2.3. The hoverflies <i>Metasyrphus corollae</i> Fabir.....	28
2.2.4. The predatory <i>Macrolophus pygmaeus</i> Rambu.....	29
2.2.5. The rove beetle <i>Peaderus alfieri</i> Burm.....	30
2.2.6. The predaceous earwing <i>Labidura riparia</i> Palla.....	31
2.3. Studies of the tomato bug <i>Nesidiocoris tenuis</i> (Reuter).....	32
2.3.1. Field studies.....	32
2.3.2. Laboratory studies.....	34

Content	Page
3- MATERIALS AND METHODS.....	37
3.1. 1.Effect of different solanaceous host plants on the main insect pests and the natural enemies on February and May plantation.....	37
3-1.2. Effect of host plant on insect populations.....	38
3.1.3. Relationships between the main insect pests and associated predators.	38
3-2. Effect of host type on biology of <i>Nesidiocoris tenuis</i> (Reuter).....	38
4- RESULTS AND DISCUSSION.....	40
4.1. Effect of Solanaceous vegetable crops as host plants on the main insect pests and their predatory insects.....	40
4.1.1.1. On tomato plants.....	40
4.1.1. 2. On eggplant plants	42
4.1.1.3. On pepper plants	45
4.1.2. The population abundance of the main insect pest of different solanaceous crops	47
4.1.2.1. The cotton aphid, <i>Aphis gossypii</i> Glov.....	47
4.1.2.2: The cotton whitefly, <i>Bemisia tabaci</i> Gennadius.....	51
4.1.2.3 The cotton thrips, <i>Thrips tabaci</i> L.....	55
4.1.2.4. The leaf miner, <i>Liriomyza trifolii</i> Burg.....	59
4.1.2.5. The green bug <i>Nezara viridula</i> L.....	63
4.1.2.6. The leafhoppers <i>Empoasca decipiens</i> Peoli.....	67
4.1.2.7. The cotton worm <i>Spodoptera littoralis</i> Bosid.....	70
4.1.2.8. The tomato leafminer <i>Tuta absoluta</i> Meyrick	74
4.1.2.9. The tomato fruit worm <i>Heliothis armigera</i> Hubn.....	77
4.1.3. The main associated predators on different solanaceous host plants.....	82

Content	Page
4.1.4. The seasonal activity of the main predators on different solanaceous host plants.....	88
4.1.4.1. The eleven-spotted lady bird <i>Coccinella undecimpunctata</i> L.....	88
4.1.4.2. The green lacewing, <i>Chrysoperla carnea</i> Steph.....	92
4.1.4.3. The Metasyrphus corrella flies, <i>Metasyrphus corrella</i> Fabir.....-- -----,	95
4.1.4.4. The predatory bug, <i>Macrolophus pygmaeus</i> Rambu.....	98
4.1.4.5. The predatory, <i>Peaderus alfieri</i> Burm.....	101
4.1.4.6. The common earwing, <i>Labidura riparia</i> Palla.....	103
4.1.5. The relationship between the insect pests and predators associated in solanaceous crops in February and May plantations.	104
4.1.5.1. The predator - prey ratio (P: P ratio)	104
4.1.5.1.2. Simple correlation coefficient	107
4.2.: Studies on the tomato bug <i>Nesidiocoris tenuis</i> (Reuter).....	114
4.2.1: Filed studies.....	114
4.2.2: Laboratory studies on the tomato bug <i>Nesidiocoris tenuis</i> (Reuter).....	124
4.2.2.1. Effect of different host plants on the duration and survival rate of the nymphal instar of <i>N. tenuis</i> as phytophagy insect.....	124
4.2.2.2: Effect of different prey on the duration and survival rate of the nymphal instar of <i>N. tenuis</i> as zoophagy insect.....	126
4.3.2.3: Effect of different host plant and prey on the duration and survival rate of the nymphal instar of <i>N. tenuis</i> as zoophytophagy insect.	127
5- CONCLUSION.....	130
6-SUMMARY	131
7-REFERANCES.....	132

LIST OF TABLES

Table No.	Title	Page
1	Total number and relative abundance of the main insect pests infesting tomato plants in February plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	40
2	Total number and relative abundance of the main insect pests infesting tomato plants in May plantation at Kafr El Sheikh Region during two successive years 2015 and 2016.	41
3	Total number and relative abundance of the main insect pests infesting eggplant plants in February plantation at Kafr El Sheikh Region during two successive years 2015 and 2016.	42
4	Total number and relative abundance of the main insect pests infesting eggplant plants in May plantation at Kafr El Sheikh Region during two successive years 2015 and 2016.	43
5	Total number and relative abundance of the main insect pests infesting pepper plants in February plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	44
6	Total number and relative abundance of the main insect pests infesting pepper plants in May plantation at Kafr El Sheikh Region during two successive years 2015 and 2016.	45
7	The average number of the cotton aphid <i>A. gossypii</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	50
8	The average number of the cotton whitefly <i>B. tabaci</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh Region.	54

LIST OF TABLES

Table No.	Title	Page
9	The average number of the cotton thrips <i>T. tabaci</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	58
10	The average number of the leaf minor, <i>L. trifolii</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	62
11	The average number of the green bug, <i>N. viridula</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	66
12	The average number of the leafhoppers <i>E. decipiens</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	70
13	The average number of the cotton worm <i>S. littoralis</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	74
14	The average number of the tomato leafminer <i>T. absoluta</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	78
15	The average number of the tomato fruit worm <i>H. armigera</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	81
16	Total number and relative abundance of the main associated predators on tomato plants in February plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	82
17	Total number and relative abundance of the main associated predators on tomato plants in May plantation at Kafr El Sheikh Region during two successive years 2015 and 2016.	83
18	Total number and relative abundance of the main associated predators on eggplant plants in February plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	84

LIST OF TABLES

Table No.	Title	Page
19	Total number and relative abundance of the main associated predators on eggplant plants in May plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	85
20	Total number and relative abundance of the main associated predators on pepper plants in February plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	86
21	Total number and relative abundance of the main associated predators on pepper plants in May plantation at Kafr El Sheikh region during two successive years 2015 and 2016.	87
22	The average number of the lady bird, <i>C. undecimpunctata</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	91
23	The average number of the aphid lion, <i>Chrysoperla carnea</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	94
24	The average number of <i>M. corrella</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	97
25	The average number of the predatory bug, <i>M. pygmaeus</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	100
26	The average number of the predatory <i>P. alfieri</i> in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	102
27	The total insect Pests, total predators and prey-predator (P: P Ratio) on tomato plants in February plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region.	104
28	The total insect Pests, total predators and prey-predator (P: P Ratio) on tomato plants in May plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region	105

LIST OF TABLES

Table No.	Title	Page
29	The predator -prey (P: P Ratio) on tomato plants in February plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region.	106
30	The prey-predator (P: P Ratio) on eggplant plants in May plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region	107
31	Simple correlation coefficients between the main tomato insect pests and associated predators in February and during (2015 and 2016).	108
32	The simple correlation coefficients between the main pepper insect pests and associated predators in February plantation during (2015 and 2016).	109
33	The total insect Pests, total predators and prey-predator (P: P Ratio) on pepper plants in May plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region.	110
34	The simple correlation coefficients between the main tomato insect pests and associated predators in May plantation during years (2015 and 2016).	111
35	The simple correlation coefficients between the main eggplant insect pests and associated predators in February plantation during year 2015 and 2016.	112
36	The simple correlation coefficients between the main pepper insect pests and associated predators in February plantation during 2015 and 2016.	113
37	The average numbers of the tomato bug <i>N. tenuis</i> on different solanaceous crops in February and May plantations during the two successive years 2015 and 2016 in Kafr El Sheikh region.	117
38	The weekly total numbers of insect pests, the weekly numbers of <i>N. tenuis</i> , prey–predator ratio (PP Ratio) and simple correlations on different solanaceous crops in February plantation during year 2015.	118
39	The weekly total numbers of insect pests, the weekly numbers of <i>N. tenuis</i> , prey–predator ratio (PP Ratio) and simple correlations on different solanaceous crops in February plantation during year 2016.	119
40	The weekly total numbers of insect pests, the weekly numbers of <i>N. tenuis</i> , prey–predator ratio (PP Ratio) and simple correlations on different solanaceous crops in May plantation during year 2015.	120

Table No.	Title	Page
41	The weekly total numbers of insect pests, the weekly numbers of <i>N. tenuis</i> , prey–predator ratio (PP Ratio) and simple correlations on different solanaceous crops in May plantation during year 2016.	121
42	The simple correlation coefficients between the main tomato insect pests and <i>N. tenuis</i> in February and May plantation during two years 2015 and 2016.	122
43	The simple correlation coefficients between the main eggplant insect pests and <i>N. tenuis</i> in February and May plantation during two years 2015 and 2016.	123
44	Effect of host plants on duration of the nymphal instar of <i>N. tenuis</i> and their survival rates as phytophagy insect.	125
45	Effect of different prey on the duration and survival rate of the nymphal instar of <i>N. tenuis</i> as zoophagy insect.	127
46	Effect of different host plant and prey on the duration and survival rate of the nymphal instar of <i>N. tenuis</i> as zoophytophagy insect.	128

LIST OF FIGURES

Figure No.	Title	Page
1	Population abundance of the cotton aphid <i>A. gossypii</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	47
2	Population abundance of the cotton aphid <i>A. gossypii</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	48
3	Population abundance of the cotton whitefly <i>B. tabaci</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	51
4	Population abundance of the cotton whitefly <i>B. tabaci</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	52
5	Population abundance of the cotton thrips <i>T. tabaci</i> on different solanaceous crops in February plantation during the two successive years 2015 (A) and 2016(B) in Kafr El Sheikh region.	55
6	Population abundance of the cotton thrips <i>T. tabaci</i> on different solanaceous crops in May plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region.	56
7	Population abundance of the leafminer <i>L. trifolii</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and (B)2016 in Kafr El Sheikh region.	59
8	Population abundance of the leafminer <i>L. trifolii</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	60
9	Population abundance of the green bug <i>N. viridula</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	63
10	Population abundance of the green bug <i>N. viridula</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	64
11	Population abundance of leafhoppers <i>E. decipiens</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	67

LIST OF FIGURES

Figure No.	Title	Page
12	Population abundance of leafhoppers <i>E. decipiens</i> on different solanaceous crops in May plantation during the two successive years 2015 and 2016 in Kafr El Sheikh region.	68
13	Population abundance of cotton worm <i>S. littoralis</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	71
14	Population abundance of cotton worm <i>S. littoralis</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016 (B)in Kafr El Sheikh region.	72
15	Population abundance of tomato leafminer <i>T. absoluta</i> on different solanaceous crops in February plantation during the two successive years 2015 (A) and 2016(B) in Kafr El Sheikh region.	75
16	Population abundance of tomato leafminer <i>T. absoluta</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	76
17	Population abundance of tomato fruit worm <i>H. armigera</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	79
18	Population abundance of the lady bird, <i>C. undecimpunctata</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	87
19	Population abundance of the lady bird, <i>C. undecimpunctata</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	88
20	Population abundance of the aphid lion, <i>Chrysoperla carnea</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	90
21	Population abundance of the aphid lion, <i>Chrysoperla carnea</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	91
22	Population abundance of the Metasyrphus corrella flies, <i>M. corrella</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	93

LIST OF FIGURES

Figure No.	Title	Page
23	Population abundance of <i>M. corrella</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	94
24	Population abundance of the predatory bug, <i>M. pygmaeus</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016 (B) in Kafr El Sheikh region.	96
25	Population abundance of the predatory bug, <i>M. pygmaeus</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	97
26	Population abundance of the predatory <i>Peaderus alfieri</i> on different solanaceous crops in May plantation during the two successive years 2015 (A) and 2016(B) in Kafr El Sheikh region.	99
27	Population abundance of the predatory common earwing, <i>Labidura riparia</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region	101
28	Population abundance of the tomato bug <i>N. tenuis</i> on different solanaceous crops in February plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	117
29	Population abundance of the tomato bug <i>N. tenuis</i> on different solanaceous crops in May plantation during the two successive years 2015(A) and 2016(B) in Kafr El Sheikh region.	118

6- SUMMARY

The present studies were carried out during the two successive years, 2015/16 and 2016/17 at Experimental farm belong to Agricultural Research center in Kaf El Sheikh on Three different solanaceous host plant tomato, eggplant and pepper during two plantations dates.

The obtained results could be summarized as following:

6.1. Effect of Solanaceous vegetable crops as host plants on the main insect pests and their predatory insects.

6.1.1. On the main insect pests:

6.1.1.1. On tomato:-

The cotton whitefly *B.tabaci* Came in the first category in February plantation during the first year 2015 followed by the green bug *N.viridula* and represented by 677 and 645 individual, respectively. Meanwhile during the year 2016 the green bug *N.viridula* came in the first category followed by the cotton whitefly and represented by 665 and 554 individual, respectively. On May plantation during the two year the cotton whitefly *B.tabaci*, ranked the first category and represented by 2129 and 2035 individuals, respectively. On the other hand the tomato leafminer *T.absoluta* came in the second ranking and recorded 1765 and 1797 individuals, respectively. Moreover, the total numbers of the main insect pests, on tomato plants was the highest in May plantation during the two years and represented by 5259 and 5249 individuals, respectively. While in February plantation was the lowest and represented by 2919 and 2880 individuals, respectively.

6.1.1. 2. On eggplant:-

The cotton aphid *A. gossypii* Came in the first category, in February plantation during the two years, and represented by 910 and 921 individual, respectively. The cotton whitefly ranked the second category during the two years and represented by 605 and 479 individual, respectively. On May plantation during the two year the cotton whitefly *B.tabaci*, ranked the first category and represented by 597 and 522 individuals, respectively. On the other hand the plant hopper *E.decipiens* came in the second ranking and recorded 413 and 436 individuals, respectively. Moreover, the total numbers of the main insect pests, on eggplant plants was the highest in February plantation during the two years and represented by 2367 and 2224 individuals, respectively. While in May plantation was the lowest and represented by 1858 and 1820 individuals, respectively.

6.1.1.3. On pepper:-

The cotton aphid *A. gossypii* Came in the first category in February plantation during the two years, and represented by 620 and 506 individual, respectively. The cotton whitefly ranked the second category during the two years and represented by 469 and 453 individual, respectively. On May plantation during the two year the cotton whitefly *B.tabaci*, ranked the first category and represented by 752 and 442 individuals, respectively. On the other hand the plant hopper *E.decipiens* came in the second ranking and recorded 299 and 360 individuals, respectively. Moreover, the total numbers of the main insect pests, on pepper plants was the highest in February plantation during the two years and represented by 1810 and 1602 individuals, respectively. While in May plantation was the lowest and represented by 1652 and 1498 individuals, respectively.

6.1.2. The population abundance of the main insect pest of different solanaceous crops.

6.1.2.1. The cotton aphid, *Aphis gossypii*

The highest peak of cotton aphid *A.gossypii* in the two plantations during the two years recorded in February plantation which occurred on eggplant represented by (116 and 122 individuals) followed by pepper and tomato and represented by (75and 52) and (40and 42 individuals), respectively .The highest average number of *A.gossypii* during two plantation in two years recoded in eggplant during the February plantation represented by (56.8 ± 9.9 in first year and 57.5 ± 9.6 in the second year) followed by pepper represented by(38.7 ± 5.2 in first year and 31.6 ± 6.0 in the second year) .Meanwhile the highest average number in May plantation recorded in Pepper represented by (13.7 ± 2.4 in first year and 16.0 ± 1.7 in the second year), respectively. Statistical analysis represented a significant difference in the number of the cotton aphid *A.gossypii* in the same type of solanaceous crop with different plantation date (February and may).Also there is a significant difference between solanaceous crops during February plantation and May plantation.

6.1.2.2: The cotton whitefly, *Bemisia tabaci*

The highest peak of cotton whitefly *B.tabaci* in the two plantations during the two years recorded in May plantation which occurred on tomato represented by (253 and 247 individuals) followed by eggplant and pepper and represented by (60and 48) and (48and 46 individuals), respectively .The highest average number of *B.tabaci* during two plantation in two years recoded in tomato during the May plantation represented by (133.0 ± 19.2 in first year and 127.1 ± 17.0 in the second year) followed by eggplant represented by(37.3 ± 4.7 in first year and 32.6 ± 3.19 in the second year) .Meanwhile the highest average number in February plantation recorded in tomato represented by (42.3 ± 3.8 in first year and 34.6 ± 2.6 in the second

year) followed by eggplant and pepper represented by $(37.8 \pm 3.8$ and 29.9 ± 2.9) and $(29.3 \pm 3.11$ and $28.3 \pm 2.5)$, respectively. Statistical analysis represented a significant difference in the number of the cotton whitefly *B.tabaci* in only tomato crops and no differences in eggplant and pepper plantation in the same type of solanaceous crop with different plantation date (February and may). Also there is a significant difference in number of *B.tabaci* between tomato and pepper solanaceous crops during February plantation and May plantation.

6.1.2.3 The cotton thrips, *Thrips tabaci*

The highest peak of cotton thrips *T.tabaci* in the two plantations were during the February plantation and record the highest peak which occurred on tomato represented by 46 and 50 individuals followed by eggplant and pepper and represented by 41, 39 and 43, 36 individuals, respectively. The highest average number of *T.tabaci* during two plantation in two years recoded in tomato during the February plantation represented by $(21.8 \pm 3.8$ in first year and 25.6 ± 3.8 in the second year) followed by eggplant represented by $(21.5 \pm 3.1$ in first year and 20.6 ± 3.1 in the second year). Meanwhile the highest average number in May plantation recorded in eggplant represented by $(9.0 \pm 2.2$ in first year and 7.25 ± 1.7 in the second year) followed by tomato and pepper represented by $(7.8 \pm 1.1$ and $4.43 \pm 1.4)$ and $(5.8 \pm 0.9$ and $4.8 \pm 0.9)$, respectively. Statistical analysis represented a significant difference in the number of the cotton thrips *T.tabaci* to each solanaceous crops in the same type of solanaceous crop with different plantation date (February and may). Also there is no significant difference in number of *T.tabaci* between tomato, pepper and eggplant in February or May plantation period.

6.1.2.4. The leafminer, *Liriomyza trifolii*

The highest peak of leafminer *L.trifolii* in the two plantations during the two years 2015 and 2016 recorded in February plantations, which occurred on tomato represented by 55, 48 individuals, followed by eggplant and pepper and represented by 53, 48 and 41, 45 individuals, respectively. The highest average number of *L.trifolii* during two plantation in two years recorded in tomato during the February plantation represented by (3.4 ± 0.5 in first year and 3.0 ± 0.4 in the second year) followed by eggplant and pepper and represented by (3.3 ± 0.4 in first year, 3.0 ± 0.3 in the second year) and (2.5 ± 0.5 in the first year and 2.8 ± 0.4 in the second year), respectively. Meanwhile the highest average number in May plantation recorded in pepper represented by (2.8 ± 1.0 in first year, 2.8 ± 0.8 in the second year) followed by tomato and eggplant represented by (2.0 ± 0.6 in first year, 2.6 ± 0.8 in second year) and (2.0 ± 0.5 in first year and 2.1 ± 0.4 in second year), respectively. Statistical analysis represented no significant difference in the number of the leafminer *L.trifolii* to each solanaceous crops in the same type of solanaceous crop with different plantation date (February and May). Also there is no significant difference in number of *L.trifolii* between tomato, pepper and eggplant in February or May plantation period.

6.1.2.5. The green bug *Nezara viridula*

The highest peak of green bug *N.viridula* in the two plantations during the two years 2015 and 2016 recorded in February plantations, which occurred on tomato and represented by 146 and 159 individuals, followed by pepper and eggplant and represented by 22, 18 and 17, 13 individuals, respectively. The highest average number of *N.viridula* during two plantation in two years recorded in tomato during the February plantation represented by (40.3 ± 11.0 in first year and 41.5 ± 11.4 in the second year) followed by pepper represented by (7.0 ± 1.5 in first year, 6.0 ± 0.0 in the second year) and eggplant represented by (4.7 ± 1.2 in first year and 4.0 ± 1.0 in second

year), respectively. Meanwhile the highest average number in May plantation recorded in tomato represented by (11.6 ± 1.8 in first year and 12.2 ± 0.6 in the second year) followed by pepper and eggplant represented by (6.6 ± 0.0 in first year, 9.9 ± 0.55 in second year) and (7.1 ± 1.1 in first year and 9.9 ± 0.55 in second year), respectively. Statistical analysis represented a significant difference in the number of the green bug *N.viridula* to each solanaceous crops in the same type of solanaceous crop with different plantation date (February and may). Also there is a significant difference in number of *N.viridula* between tomato and pepper and eggplant in February or May plantation period .

6.1.2.6. The leafhoppers *Empoasca decipiens*

The highest peak of the leafhoppers *E.decipiens* in the two plantations during the two years 2015 and 2016 recorded in May plantation , which occurred on tomato and represented by 81, 75 individuals, followed by eggplant and pepper and represented by 37, 49 and 33 and 39 individuals, respectively . The highest average number of *E.decipiens* during two plantation in two years recoded in tomato during the May plantation represented by (30.6 ± 4.8 in first year , 35.0 ± 4.2 in the second year) followed by eggplant represented by (25.8 ± 2.8 in first year , 27.2 ± 2.3 in the second year) and pepper represented by (18.6 ± 1.4 in first year and 22.5 ± 1.9 in second year), respectively . Meanwhile the highest average number in February plantation recorded in tomato represented by (18.2 ± 1.9 in first year, 16.5 ± 1.7 in the second year) followed by eggplant and represented by (14.3 ± 1.9 in first year, 14.75 ± 1.9 in second year) and pepper represented by (13.1 ± 1.8 in first year and 11.5 ± 1.9 in second year) , respectively. Statistical analysis represented a significant difference in the number of the leafhoppers *E.decipiens* between February and May plantation in the same type of solanaceous crop with different plantation date (February and may). Also there is no significant difference in number of *E.decipiens* between

tomato and pepper and eggplant in February, while found in May plantation period .

4.1.2.7. The cotton worm *Spodoptera littoralis*

The highest peak of the cotton worm *S.littoralis* in the two plantations during the two years 2015 and 2016 recorded in May plantation recorded , which occurred on tomato represented by 19, 22 individuals, followed by eggplant and pepper and represented by 16, 20, and 0, 18 individuals), respectively .The highest average number of *S.littoralis* during two plantation in two years recoded in tomato during the May plantation represented by (10.4 ± 1.4 in first year and 11.5 ± 1.9 in the second year) followed by eggplant represented by (7.8 ± 1.3 in first year and 8.2 ± 1.7 in the second year), respectively. Meanwhile the highest average number in February plantation recorded in tomato represented by (1.9 ± 0.7 in first year and 2.8 ± 3.8 in the second year) followed by eggplant and represented by (5.9 ± 1.2 and 6.87 ± 1.5), respectively. Statistical analysis represented a significant difference in the number of the cotton worm *S.littoralis* between February and May plantation in the same type of solanaceous crop with different plantation date (February and may). Also there is a significant difference in number of *S.littoralis* between tomato and pepper and eggplant in February and May plantation period .

6.1.2.8. The tomato leafminer *Tuta absoluta*

The highest peak of the tomato leafminer *T.absoluta* in the two plantations during the two years 2015 and 2016 recorded in May plantations , which occurred on tomato represented by 219 and 240 individuals, followed by eggplant and represented by 13 and 16 individuals, respectively .The highest average number of *T.absoluta* during two plantation in two years recoded in tomato during the May plantation represented by (110.3 ± 17.7 in first year and 112.3 ± 18.1 in the second year) followed by eggplant represented by (10.5 ± 0.5 in first year and 11.3 ± 0.5 in the second year).

Meanwhile the highest average number in February plantation recorded in tomato represented by (31.0 ± 4.8) in first year and 31.5 ± 5.0 in the second year) followed by eggplant and represented by (3.3 ± 1.0) and 2.1 ± 0.7 , respectively. Statistical analysis represented a significant difference in the number of the tomato leafminer *T.absoluta* between February and May plantation in the same type of solanaceous crop with different plantation date (February and may). Also there is a significant difference in number of *T.absoluta* between tomato and eggplant in February and May plantation period. However no appearance of *T.absoluta* in pepper plants during the two plantation time.

6.1.2.9. The cotton bollworm *Heliothis armigera*

The highest peak of the tomato fruit worm *H.armigera* in the two plantations during the two years 2015 and 2016 recorded in May plantation, which occurred on tomato represented by 31, 26 individuals followed by eggplant and represented by 13, 14 individuals and pepper represented by 11 and 10 individuals, respectively. The highest average number of *H.armigera* during two plantation in two years recorded in tomato during the May plantation represented by (10.3 ± 2.8) in first year and 11.1 ± 2.1 in the second year) followed by eggplant represented by (4.5 ± 1.0) in first year and 5.0 ± 1.2 in the second year). Statistical analysis represented a significant difference in the number of the tomato fruit worm *H.armigera* between February and May plantation in the same type of solanaceous crop with different plantation date (February and may). Also there is a significant difference in number of *H.armigera* between tomato and eggplant in May plantation period. However no appearance in February appearance of *H.armigera* in all plants during February plantation period.

6.1.3. The main associated predators on different solanaceous host plants

6.1.3 on Tomato

In February plantation during the two years, *C.undecimpunctata* Came in the first category and represented by 105 and 160individual, respectively. The predator *M.pygmaeus* ranked the second category during the two years and represented by 70and64individuals, respectively. On May plantation during the two *C.undecimpunctata*, ranked the first category and represented by 109 and 96 individuals, respectively. On the other hand the predator *M.corllea* came in the second ranking during the first year 2015 and recorded 96 individuals, respectively. While in the second year 2016 the predator *M.pygmaeus* ranked the second category and presented by 76 individuals, respectively .Moreover, the total numbers of the predators associated on tomato plants was the highest in May plantation during the two years and represented by 416 and 337 individuals, respectively. While in February plantation was the lowest and represented by 272and 320 individuals, respectively.

6.3.2. on eggplant

In February plantation during the two years, *C.undecimpunctata* Came in the first category and represented by 94 and 101individual, respectively. The predator *M.pygmaeus* ranked the second category in the two years and represented by 79 and77 individuals, respectively. On May plantation during the two *C.undecimpunctata*, ranked the first category and represented by 116 and 102individuals, respectively. On the other hand the predator *M.corllea* came in the second ranking during the two years and recorded 74and 60 individuals, respectively. Moreover, the total numbers of the predators associated on eggplant plants was the highest in May plantation during the two years and represented by 325 and 272

individuals, respectively. While in February plantation was the lowest and represented by 234 and 245 individuals, respectively.

6.3.3. on pepper

In February plantation during the two years, *C.undecimpunctata* Came in the first category and represented by 58 and 59 individual, respectively. The predator *C.carnea* ranked the second category in the two years and represented by 46 and 48 individuals, respectively. On May plantation during the two *C.undecimpunctata*, ranked the first category and represented by 71 and 102 individuals, respectively. On the other hand in the first year the predator *C.carnea* ranked the second category and recorded 52, while the predator *M.corllea* came in the second ranking during the second year and recorded 60, individuals, respectively. Moreover, the total numbers of the predators associated on pepper plants was the highest in May plantation during the two years and represented by 203 and 271 individuals, respectively. While in February plantation was the lowest and represented by 147 and 143 individuals, respectively.

6.1.4. The seasonal activity of the main predators on different solanaceous host plants.

6.1.4.1. The eleven-spotted lady bird *Coccinella undecimpunctata*

The highest peak of *C. undecimpunctata* was on tomato crops in February plantation and represented by 15 and 18 in first year and second year, following by eggplant and represented by 13 and 17 individuals, respectively. Meanwhile in May plantation the highest peak recorded on eggplant and represented by 13 and 11 individuals, respectively. However, the highest average numbers of *C.undecimpunctata* during February plantation recorded on tomato plants during the two years (6.5 ± 1.6 in the first year and 10.0 ± 2.2 in the second year). Meanwhile in May plantation the highest average recorded on eggplant (7.2 ± 0.9 in the first year and

6.3±2.6 in the second year). Data indicated that no significant differences in numbers of the predator between the solanaceous crops in February plantation, while in May plantation there was a significant differences between tomato and eggplant.

6.1.4.2. The green lacewing, *Chrysoperla carnea*

The highest peak of *C. carnea* was on tomato crops in February plantation and represented by 11 and 11 in first year and second year. Meanwhile in May plantation the highest peak recorded on eggplant and represented by 11 and 11 individuals, respectively. However, the highest average numbers of *C. carnea* during February plantation recorded on tomato plants during the two years (4.0±0.8 in the first year and 3.25±0.85 in the second year). Meanwhile in May plantation the highest average recorded on eggplant (3.75±0.7 in the first year and 3.25±0.7 in the second year). Data indicated that no significant differences in numbers of the predator between the solanaceous crops in February plantation, while in May plantation there was a significant differences between tomato and eggplant.

6.1.4.3. The Syrphus flies, *Metasyrphus corrella*

The highest peak of *M. corollae* was on tomato crops in February plantation and represented by 5 and 11 in first year and second year, following by eggplant and represented by 13 and 17 individuals, respectively. Meanwhile in May plantation the highest peak recorded on tomato and represented by 18 and 18 individuals, respectively. However, the highest average numbers of *M. corollea* during May plantation recorded on tomato plants during the two years (6.0±1.5 in the first year and 6.06±1.1 in the second year). Meanwhile in February plantation the highest average recorded on tomato (1.68±0.47 in the first year and 2.62±0.86 in the second year). Data indicated that no significant differences in numbers of the predator between the

solanaceous crops in February plantation or May plantation, but found between the two plantations on different solanaceous crops

6.1.4.4. The predatory bug, *Macrolophus pygmaeus*

The highest peak of *M. pygmaeus* was on tomato crops in February plantation and represented by 18 and 16 individuals, respectively. Meanwhile in May plantation the highest peak recorded on tomato and represented by 9 and 11 individuals, respectively. However, the highest average numbers of *M. pygmaeus* during May plantation recorded on tomato plants during the two years (5.06 ± 0.6 in the first year and 4.75 ± 0.53 in the second year). Meanwhile in February plantation the highest average recorded on eggplant (4.93 ± 1.28 in the first year and 4.81 ± 1.1 in the second year). Data indicated that no significant differences in numbers of the predator between the solanaceous crops in February plantation or May plantation but found between different solanaceous crops in May plantation.

6.1.4.5. The predatory, *Peaderus alfieri*

The highest peak of *P. alfieri* was on tomato crops in May plantation and represented by 7 and 6 individuals, respectively. Meanwhile in February plantation the appearance of the predator was with low numbers less than 5 in tomato without appearance on eggplant or pepper. However, the highest average numbers of *P. alfieri* during May plantation recorded on tomato plants during the two years (2.25 ± 0.63 in the first year and 1.62 ± 0.52 in the second year). Data indicated that no significant differences in numbers of the predator between the solanaceous crops in February plantation or May plantation but found between plantations in tomato with a significant difference.

6.1.4.6. The common earwing, *Labidura riparia*

The common earwing, *Labidura riparia* showed no appear in February plantation in the first year 2015 and the second year 2016. In May plantation as in Figure (27) the highest peak of abundance recorded in tomato plants followed by eggplant and pepper and presented by 6 ,5and 1 individuals ,respectively in the first year 2015. Meanwhile in the second year 2016 the highest peak of abundance recorded in tomato followed by eggplant and pepper and represented by 4, 4 and 3 individuals, respectively.

6.1.5. The relationship between the insect pests and predators associated in solanaceous crops in February and May plantations.

6.1.5.1. The total Predator: prey Ratio (P: P Ratio) on different solanaceous crops

The narrowed P: P ratio was recorded on February plantation on tomato plants and represented by 1:11 in the first year and 1: 9 in the second year, respectively. However, on eggplant and pepper the narrowed rate recorded on eggplant and pepper were recorded during May plantation on eggplant with (1: 6 in the first year and 1: 7in the second year), and pepper with (1: 8 in the first year and 1: 6 in the second year).

6.1.5.1.2. The predator - prey ratio (P: P ratio) of each predator on different solanaceous crops during February and May plantation.

the narrowed P: P ratio between the insect pest and the associated predators on different solanaceous crops were recorded in February plantation on the three crops tomato, eggplant and pepper. The predators' *C. undecimpunctata* and *C. carnea* recorded the narrowed ratio on February and May plantation. Meanwhile the predator *M. correlae* showed a narrowed ratio in May plantation during the two

seasons. The predator *M. pygmaeus* recorded similar ratio in May plantation on all crops.

6.1.5.2. Simple correlation coefficients

The simple- correlations coefficient between the main solanaceous insect pests and associated predators during May plantation in two years 2015 and 2016, indicated that there was a highly positive significant effect among predators with *E. decipiens*, *T. absoluta* and *H. armigera*. Highly correlations found between the predator *M. pygmaeus* with *T. absoluta*, *S. littoralis* and *H. armigera*, on tomato. While, in eggplant a high positive significant effect was recorded among predators, *C. undecimpunctata* and *C. carnea* and *B. tabaci*, *T. absoluta* and *H. armigera*. High correlations found between the predator *M. pygmaeus*, *P. alfieri* and *L. riparia* with *A. gossypii*, *B. tabaci*, *T. absoluta*, *E. decipiens* and *H. armigera*. On pepper, a high positive significant effect among predators *C. undecimpunctata* and *C. carnea* with *B. tabaci* and *H. armigera*.

6.2.: Studies on the tomato bug *Nesidiocoris tenuis* (Reuter)

6.2.1: Filed studies:

6.2.1.1: The population abundance of tomato bug on different solanaceous crops.

The highest peak of abundance of the tomato bug *N.tenuis* recorded in May plantation in tomato plant in the first year 2015 and the second year 2016 and represented by 198 and 177 individuals respectively. In the other hand there was a significant difference between February plantation and May plantation on the population densities of tomato bug. Eggplant and pepper showed no significant differences.

6.2.1.2: The relationship between the main insect pests and *N.tenius* as a Prey-Predator Ratio and simple correlations on different solanaceous crops in February and May plantation.

The highest populations of total insect pests and *N.tenius* recorded in May plantation in tomato plant and represented by 5259 and 1151 in the first year 2015 and 5249 and 1050 in the second year 2016. Meanwhile in February plantation the highest population abundance of total insect pests and *N.tenius* recorded also on tomato plants and recorded 2919 and 274 for the first year 2015 and 2880 and 286 individuals in the second year 2016, respectively.

The population abundance of *N.tenius* increased with the weekly increasing of insect pest's populations which gives a strong typical predator response to prey availability. On other hand P: P ratio showed a very narrowed range for the tomato bug and main insect pests in tomato plants during February and May plantation and ranged about 1:11 and 1:10 in February plantation and 1:5 in May plantation during the two years .

6.2.1.3: simple correlation coefficients between the main solanaceous crops and the tomato bug *N.tenius*.

Results indicated that a strong positive correlation found between the tomato bug and *A. gossypii*, *Bemisia tabaci*, *Thrips tabaci*, *Empoasca decipiens*, *Tuta absoluta* and *Heliothis armigera*.

6.2.2: Laboratory studies on the tomato bug *Nesidiocoris tenuis* (Reuter)

6.2.2.1. Effect of different host plants on the duration and survival rate of the nymphal instar of *N. tenuis* as phytophagy insect.

The total immature stage was the shortest when the insect *N. tenuis* reared on pepper (7.3 ± 0.33 days) followed by eggplant (8.3 ± 0.33 days) and tomato came in the

third category and represented by 8.8 ± 0.33 days with significantly differences. On the other hand, the survival rates were the highest when the insect reared on tomato plants followed by eggplant and pepper plants and represented by 42.5, 21.7 and 10.0% respectively.

4.2.2.2: Effect of different prey on the duration and survival rate of the nymphal instar of *N. tenuis* as zoophagy insect.

The total immature stage was the shortest when the insect *N. tenuis* reared on cotton gassed and tomato borer (6.0 ± 0.00 days) followed by cotton worm and whitefly (7.0 ± 0.58 days) with significantly differences. On the other hand, the survival rates were the highest when the insect reared on tomato borer 80.8% followed by whitefly, cotton gassed and cotton worms and represented by 72.5, 71.5 and 63.3% respectively.

4.3.2.3: Effect of different host plant and prey on the duration and survival rate of the nymphal instar of *N. tenuis* as zoophytophagy insect.

The total immature stage was the shortest when the insect *N. tenuis* reared on whitefly and tomato borer with tomato plants (6.0 ± 0.00 days) followed by cotton worm and whitefly (6.33 ± 0.33 days) with significantly differences. On the other hand, the survival rates were the highest when the insect reared on tomato borer whitefly with tomato plants 95.8% followed by tomato borer, cotton worms and cotton gassed and represented by 92.9, 90.8 and 89.2% respectively.