

CONTENTS

Item	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	4
2.1. Survey and seasonal abundance of aphid species infesting potato plants	4
2.2. Seasonal abundance of green peach aphid <i>Myzus persicae</i> (Sulzer) on pepper and other vegetable crops	9
2.3. Seasonal abundance of aphidophagous insect predators associated with aphids infesting potato and pepper plants.....	11
2.4. Biological studies	17
2.5. Efficacy of bio-rational insecticides on aphids infesting vegetable crops	22
2.6. Impact of biorational insecticides on aphidophagous predators	23
3. MATERIALS AND METHODS	26
3.1. Experimental site and planting seasons	26
3.2. Survey and seasonal abundance of aphids and aphidophagous insect predators associated with potato and pepper plants	26
3.3. Biological aspects and predation efficiency of <i>Coccinella undecimpunctata</i> on green peach aphid <i>Myzus persicae</i>	27
3.3.1. Rearing of <i>Coccinella undecimpunctata</i>	27
3.3.2. Predation efficacy of larval stage of <i>C. undecimpunctata</i> on aphids	27
3.3.3. Predation efficacy of adult stage of <i>C. undecimpunctata</i> on aphids	28
3.4. Efficacy of certain bio-rational insecticides on <i>Myzus persicae</i> infested potato and pepper plants	28

3.4.1. Bio-rational insecticides used	28
3.4.2. Bioassay experimental design	29
3.4.3. Application rates and inspection intervals	30
3.5. Impact of certain biorational insecticides on the aphidophagous predators (<i>Coccinella undecimpunctata</i> L. and <i>Chrysopa carnae</i>)	30
3.5.1. Predators	30
3.5.2. Insecticides	31
3.6. Statistical analysis	31
4. RESULTS AND DISCUSSION	32
4.1. Survey of aphid species and aphidophagous insect predators associated with potato and pepper plants	32
4.1.1. Survey of aphid species infesting potato plants	32
4.1.2. Survey of aphid species infesting pepper plants	32
4.1.3. Survey of aphidophagous insect predators associated with aphid infestation on potato plants	33
4.1.4. Survey of aphidophagous insect predators associated with aphid infestation on pepper plants	33
4.2. Seasonal abundance of aphids and their associated aphidophagous insect predators on potato and pepper plants.	41
4.2.1. Population fluctuation of aphids on potato plants	41
4.2.2. Population fluctuation of aphidophagous predators associated with aphid infestation on potato plants.....	45
4.2.2.1. Coleopterous insect predators	48
4.2.2.1.1. Coccinellids; The eleven-spot ladybird, <i>Coccinella undecimpunctata</i> L.	48
4.2.2.1.2. The dusky ladybirds, (<i>Scymnus interruptus</i> and <i>S. syriacus</i>)	51

4.2.2.1.3. Staphylylinid: The rove-beetle, <i>Paederus alferii</i> Koch.	55
4.2.2.2. Neuropterous insect predators	58
4.2.2.2.1. Chrysopids; The green lacewing, <i>Chrysoperla carnea</i> (Steph.)	58
4.2.2.3. Dipterous insect predators	62
4.2.2.3.1. Syrphids; The hover fly, <i>Syrphus</i> (= <i>Metasyrphus</i>) <i>corollae</i> Fab.....	62
4.2.3. Overall activity patterns of aphidophagous predators in relation to the seasonality incidence of aphid infestation on potato fields	66
4.2.4. Population fluctuation of aphids on pepper plants	72
4.2.5. Population fluctuation of aphidophagous predators associated with aphid complex on pepper plants	75
4.2.5.1. Hemipterous aphidophagous insect predators	79
4.2.5.1.1. Anthocorids; The pirate bug, <i>Orius</i> spp. (<i>O. albidepennis</i> and <i>O. leavigatus</i>)	79
4.2.5.2. Neuropterous aphidophagous insect predators	82
4.2.5.2.1. Chrysopids; The green lacewing, <i>Chrysoperla carnea</i> (Steph.).....	82
4.2.5.3. Coleopterous aphidophagous insect predators	85
4.2.5.3.1. The eleven-spot ladybird, <i>Coccinella undecimpunctata</i> L.	85
4.2.5.3.2. The seven-spot ladybird, <i>Coccinella septempunctata</i> L.	88
4.2.5.4. Dipterous aphidophagous insect predators	91
4.2.5.4.1. <i>Syrphus corollae</i> F.	91

4.2.6. Overall activity patterns of aphidophagous predators in relation to the seasonality incidence of aphid infestation on pepper fields	94
4.3. Laboratory studies.....	100
4.3.1. Biological aspects and predation efficiency of <i>Coccinella undecimpunctata</i> on green peach aphid, <i>Myzus persicae</i>	100
4.3.1.1. Larval stage	100
4.3.1.1.1. Larval durations	100
4.3.1.1.2. Predation efficiency	100
4.3.1.2. Pupal Stage	101
4.3.1.3. Adult Stage	103
4.3.1.3.1. Female	103
4.3.1.3.1.1. Female - Pre-oviposition period	103
4.3.1.3.1.2. Female - Oviposition period	103
4.3.1.3.1.3. Female - Post-oviposition period	104
4.3.1.3.1.4. Female – Longevity	105
4.3.1.3.2. Male – Longevity	105
4.4. Efficacy of some bio-rational insecticides on <i>Myzus persicae</i> infested potato and pepper plants during 2016 season	107
4.4.2. Efficacy of tested compounds on aphids infested pepper plants	110
4.5. Impact of certain bio-rational insecticides used to control aphid infestation on the aphidophagous predators (<i>Coccinella undecimpunctata</i> L. and <i>Chrysoprela carnae</i>) ...	114
5. SUMMARY AND CONCLUSION	120
6. REFERENCES	130
7. ARABIC SUMMARY	

Name of Candidate	Ibrahiem Mohamed El-baz El-sayed
Title	Integrated Management of Green Peach Aphid, <i>Myzus persicae</i> (Sulzer) on Vegetable Crops
Faculty	Agriculture
Department	Plant Protection
Location	Ismailia
Degree	Ph.D. In Agricultural Sciences, Economic Entomology
Date	/ 6 / 2019
Language	English
Supervision Committee	Prof. Dr. Yousry Mohamed Ahmed Prof. Dr. Mohamed Abd El-Naeim Osman Prof. Dr. Mahmoud Farag Mahmoud Prof. Dr. Hassan El-Said Salem
<p style="text-align: center;">ABSTRACT</p> <p>The green peach aphid, <i>Myzus persicae</i> (Sulzer) (Homoptera: Aphididae), is regarded as one of the major and most destructive pest of vegetable crops in Egypt. The current study carried out during three successive seasons (2014, 2015 and 2016) in Fakous district, Sharkia Governorate on potato and pepper fields. The main objectives and results are presented as follows: 1) Survey and seasonal abundance of aphid species infesting potato and pepper plants, and their aphidophagous insect predators. Pepper plants were severely infested with aphids compared to potato plants. Three aphid species of <i>Myzus persicae</i> (Sulzer), <i>Aphis gossypii</i> Glover, and <i>Aphis craccivora</i> (Koch) were found infesting potato plants, while only the first two species were recorded on pepper plants. Aphidophagous insect predators found to be associated with aphids infesting both potato and pepper plants were belonged to three insect orders of Coleoptera, Neuroptera and Diptera. Besides, the predators of order Hemiptera, found only associated with aphid-infested pepper plants. 2) Biological aspects and predation efficiency of the eleven-spotted ladybird beetle, <i>Coccinella undecimpunctata</i> L. (Coleoptera: Coccinellidae) fed on green peach aphid, <i>M. persicae</i> colonized on potato plants under laboratory conditions. The average durations of the 1st, 2nd, 3rd and 4th larval instars of <i>C. undecimpunctata</i> were 3.0, 3.07, 3.1 and 3.4 days, respectively. The mean consumption during larval stage was 254.03 aphids per larva. The 4th and 3rd larval instars of <i>C. undecimpunctata</i> were the most efficient as their respective consumption was 36.50 and 28.32% of the total consumed aphid preys during the whole larval duration. The adult female of <i>C. undecimpunctata</i> consumed about 2.7 times as much as consumed by its larva. 3) Efficacy of four biorational compounds (Skanmite, 73% EC, Spiner 10% SC, Agreflex 18.6% SC and Protecto 9.4% WP) against aphids infesting potato and pepper plants using three ascending application rates (half dose, full recommended dose, 1½ dose) under field conditions. All tested compounds at their different rates caused noticeably reduction in aphid population. Highest reduction was recorded in Agreflex using full dose at 84.18 and 86.29% in potato and pepper plants, respectively. Broctecto at full dose came second at 80.73 and 81.08% reduction on potato and pepper plants, respectively. Skanmite had moderate efficiency even with using half dose at 76.58% reduction in infestation on potato plants. The lowest reduction in aphid infestation was recorded in Spiner treatments. 4) Impact of certain biorational insecticides used to control aphid infestation on the aphidophagous predators (<i>Coccinella undecimpunctata</i> L. and <i>Chrysopa carnae</i>). Based on LC50, the descending order of toxicity was skanmite > agreflex > spiner. Therefore, spiner treatment was relatively safe for larvae and adults of <i>C. undecimpunctata</i> and larvae of <i>Ch. Carnea</i> than skanmite and agreflex.</p>	
Keywords:	<i>Myzus persicae</i> , <i>Coccinella undecimpunctata</i> , biorational insecticides, integrated management, predation efficiency, infestation reduction, toxicity