

Kafr El-Sheikh University

Faculty of Agriculture

Economic Entomology Department



Ecological and biological studies on aphids attacking faba bean and cowpea plants at Kafr El-Sheikh

BY

Amina soubhy mohamed sharabash

THESIS

Submitted in partial fulfillment

Of the requirement for the Degree of

Master of Science (M.Sc.)

In

Economic Entomology

Department of Economic Entomology

Faculty of Agriculture

Kafr El-Sheikh University

2020

CONTENTS	Page
1. INTRODUCTION.....	1
2. REVIEW OF LITERATURE.....	3
1. Faba bean, <i>Vicia faba</i> .L.....	
1.1. Survey and seasonal abundance of aphid species on the plants.....	
1.2. Population fluctuation of predators associated with aphid species	11
3.1. Effect of certain weather parameters and the common natural enemies on the aphid population.....	18
1.4. Relative susceptibility of certain faba bean varieties to infestation with aphid under fields conditions.....	22
Biological studies: Certain of biological aspects of the cowpea aphid, <i>Aphis ceaccivora</i> Kock reread on faba bean plants.....	28
2- Cowpea, <i>Vigna unguiculata</i> (L).Walp.:	32
2.1. Survey and seasonal abundance of aphid species infesting cowpea fields.....	
2.2. Population fluctuation of associated predators with aphid species in cowpea fields.....	37
2.3. Effect of certain weather factors and the common predators on the aphid population	39

2.4. Relative susceptibility of certain cowpea varieties to infestation with aphids under field conditions....	44
3. MATERIALS AND METHODS.....	51
1. Faba bean, <i>Vicia faba</i>, (L.):-	51
1.1. Survey of aphid species and the common predators in faba bean fields.....	
1.2. Dominance percentages of the species occurred	52
1.3. Effect of certain weather factors and the common predators on the population of aphids	52
1.4. Relative susceptibility of certain faba bean varieties to infestation with aphids under field conditions.....	55
1.5. Some biological aspects of cowpea aphid, <i>A. craccivora</i> reared on faba bean plants.....	56
2. Cowpea, <i>Vigna unguiculata</i> (L.)Walp.	57
2.1. Survey of aphid species and the common predators in cowpea fields	
2.2-Dominance percentages of the species occurred	58
2.3. Effect of certain weather factors and the common predators on the population of aphids.....	58
2.4- Relativ susceptibility of certain cowpea varieties to infestation with aphids under field conditions.....	60
4. RESULTS AND DISCUSSION.....	61
Ecological studies	61
1- Faba bean, <i>Vicia faba</i> L	
1.1. Survey of aphid species and the common associated predators in faba bean fields.....	
1.2. Seasonal abundance of aphid species in faba bean fields...	64
1.3. Seasonal abundance of the common natural enemies associated with aphid species in faba	70

bean fields.....	
1.4. Effect of the predators and the prevailing weather factors on aphid species population in faba bean fields	76
1.5. Relative susceptibility of certain faba bean varieties to infestation with aphid species under field conditions	79
2- Cowpea, <i>Vigna unguiculata</i> (L.)Walp.	84
1.2.1. Survey of aphid species and the common predators in cowpea fields	
1.2.2. Population fluctuation of the common aphid species in cowpea fields	86
1.2.3. Population fluctuation of the common predators with aphid species in cowpea fields	91
1.2.4 - Effect of the predators and the prevailing weather factors on aphid species population in cowpea fields	96
1.2.5. Relative susceptibility of certain cowpea varieties to the infestation with aphid species under field conditions	98
2. Biological studies:-	103
2.1. Some biological aspects of cowpea aphid, <i>Aphis craccivora</i> Koch. reared on faba bean plants	
5-SUMMARY	108
1. Faba bean <i>Vicia faba</i> L.:	
1.1-Survey of the aphid species and the common associated predators in faba bean fields Summary	
1.2. - Seasonal abundance of aphid species in faba bean fields	109
1.3- Seasonal abundance of the common natural enemies associated with aphid species in faba bean fields	110

1.4. Effect of the predators and the prevailing weather factors on aphid species population in faba bean fields	110
1.5. Relative susceptibility of certain faba bean varieties to infestation with aphid species under field condition	111
2. Cowpea, <i>Vigna unguiculata</i> (L.) Walp.	111
2.1. Survey aphid species and the common predators in cowpea fields	
2.2. Population fluctuation of the aphid species in cowpea fields	112
2.3. Population fluctuation of the common predators associated with aphid species in cowpea fields	112
2.4. Effect of the predators and the prevailing weather factors on aphid species population in cowpea fields	113
2.5. Relative susceptibility of certain cowpea varieties to the infestation with aphid species under field condition	113
Biological studies:-	114
1. Some biological aspects of cowpea aphid, <i>Aphis craccivora</i> Kock. reared on faba bean plants	
6-REFERENCE	115

LIST OF TABLES

Table No.	Titles	Page No.
Table 1	Weekly means of prevailing weather factors during the inspection period of two seasons on faba bean plants at Kafr El-Sheikh Governorate	54
Table 2	Weekly means of prevailing weather factors during the inspection period of two seasons on cowpea plants at Kafr El-Sheikh Governorate	59
Table 3	Aphid species and the common associated predators on faba bean plants during 2016/17 and 2017/18 seasons at Sakha, Kafr El - Sheikh Governorate	62
Table 4	Dominance percentages of aphid species and the common predators in faba bean fields during 2016/17 and 2017/18 seasons at Kafr El - Sheikh Governorate	63
Table 5	Population fluctuations of aphid species in faba bean fields during 2016/17 season at Kafr El-Sheikh Governorate.....	65
Table 6	Population fluctuation of aphid species in faba bean fields during 2017/18 season at Kafr El- Sheikh Governorate	67
Table 7	Statistical seasonal differences between four aphid species in faba bean fields during two successive seasons 2016 /17 and 2017/18 at Kafr El –Sheikh Governorate	69
Table 8	Population fluctuations of common natural enemies in faba bean fields during 2016/17 season at Kafr El-Sheikh Governorate	71
Table 9	Population fluctuations of common predators in faba bean fields during 2017/18 season at Kafr El-Sheikh Governorate	72
Table 10	Statistical seasonal differences between common predators in faba bean fields during two successive season 2016/17 and 2017/18 at Kafr El-Sheikh Governorate	75
Table 11	Statistical parameters for four aphid species population in relation to prevailing weather factors and predatory arthropods in faba bean fields during 2016/17 and 2017/18 seasons at Kafr El-Sheikh Governorate	78
Table 12	Population density of aphid species / 15 branches of five faba bean varieties during 2016/17 and 2017/18 seasons at Kafe El -Shiekh Governorate	80
Table 13	Seasonal mean of aphid species and resistance status of certain faba bean varieties during 2016/17 and 2017/18 seasons at Kafr El-	81

	Sheikh Governorate	
Table 14	Aphid species and the common predators associated with cowpea plants during 2017 and 2018 seasons at Sakha, Kafr El - Sheikh Governorate	85
Table 15	Dominance percentages of aphid species and the common predators in cowpea fields during 2017 and 2018 seasons at Kafr El - Sheikh Governorate	86
Table 16	Population fluctuation of aphid species on cowpea plants during 2017 season at Kafr El-Sheikh Governorate	88
Table 17	Population fluctuation of aphid species on cowpea plants during 2018 season at Kafr El-Sheikh Governorate	89
Table 18	Statistical differences between seasons for two aphid species in cowpea fields during two successive seasons; 2017 and 2018 at Kafr El –Sheikh Governorate	90
Table 19	Seasonal abundance of the common predators in cowpea fields during 2017 season at Kafr El-Sheikh Governorate	92
Table 20	Seasonal abundance of the common predators in cowpea fields during 2018 season at Kafr El-Sheikh Governorate	93
Table 21	Statistical differences between seasons for common predators occurred in cowpea fields during two successive seasons; 2017 and 2018 at Kafr El-Sheikh Governorate	94
Table 22	Statistical parameters for two aphid species population in relation to prevailing weather factors and predatory arthropods in cowpea fields during 2017 and 2018 seasons at Kafr El-Sheikh Governorate	97
Table 23	Mean weekly numbers of aphids / 15 cm shoot tip infesting certain cowpea varieties during two successive seasons 2017 and 2018 at Kafr El-Sheikh Governorate	100
Table 24	Mean numbers of aphid species and resistance status of certain cowpea varieties during 2017 and 2018 seasons at Kafr El- Sheikh Governorate	102
Table 25	Nymphal durations, longevity and life span of <i>A. craccivora</i> reared on faba bean plants under laboratory conditions expressed as mean±stander error	105

LIST OF FIG.

Fig. No.	Title	Page No.
Fig. 1	Mean weekly abundance of four aphid species occurred in faba bean fields during the season of 2016/2017	66
Fig. 2	Mean weekly abundance of four aphid species occurred in faba bean fields during the season of 2017/2018	68
Fig. 3	Population fluctuations of the common predators in faba bean fields during 2016/17 season at Kafr El – Shiekh Governorate	73
Fig. 4	Population fluctuations of the common predators in faba bean fields during 2017/18 season at Kafr El – Shiekh Governorate	73
Fig. 5	General mean of aphids on faba bean varieties during 2016/17 and 2017/18 seasons at Kafr El-Sheikh Governorate	81
Fig. 6	Mean weekly abundance of two aphid species occurred in cowpea fields during season of 2017 at Kafr El-Sheikh	89
Fig. 7	Mean weekly abundance of two aphid species occurred in cowpea fields during season of 2018 at Kafr El-Sheikh	90
Fig. 8	Mean weekly abundance of predatory arthropod species occurred in cowpea fields during season of 2017 at Kafr El-Sheikh	95
Fig. 9	Mean weekly abundance of predatory arthropod species occurred in cowpea fields during season of 2018 at Kafr El-Sheikh	95
Fig. 10	General mean of aphids on cowpea varieties during two seasons 2017 and 2018 at Kafr El-Sheikh Governorate	103

Abstract

Faba bean, *Vicia faba* L. and cowpea, *Vigna unguiculata* (L.) Walp. are of the most important legume crops all over the world. They are attacked by several insects in the field, among of them are aphid insects. Therefore, the aim of this work was to survey and seasonal abundance of aphid species and the common associated natural enemies on the two crops in relation to the prevailing weather factors in addition to susceptibility of some varieties to aphid infestation at Sakha Agric. Res. Station Farm during season of 2016/17 and 2017/18 for faba bean and of 2017 and 2018 for cowpea. Also, this work involved some biological aspects of cowpea aphid, *Aphis craccivora* Koch. reared on faba bean plants under laboratory conditions.

The obtained results showed four aphid species: *Aphis craccivora* Koch., *Aphis gossypii* (Glov.), *Myzus persicae* (Sulz.) and *Acyrtosiphon pisum* (Harris) on faba bean, while only the first and second species were found on cowpea. *A. craccivora* was the most dominant species, while *A. gossypii* was the least on the two crops. Aphid species recorded two and one peak of abundance on faba bean in the first season and the second one, respectively, while it recorded one peak on cowpea in the two seasons. The observed predatory insects were *Chrysperla carnea* (Steph.), *Scymnus* spp., *Coccinella undecimpunctata* L., *Paederus alfieri* Koch. and *Orius* sp. in addition to unidentified true spiders on the two crops with exception of *P. alfieri* that did not found on cowpea. *Ch.carnea* was the most dominant predators, while *P. alfieri* and *C. undecimpunctata* were the least ones on faba bean and cowpea, respectively. The aphid parasitism was observed on faba bean during January. In season of 2016/17, the temperature, relative humidity, wind speed and rainfall as well as the predators had an insignificant effect on aphid species on faba bean except wind speed effect on *A. gossypii* which it was significant. During season of 2017/18, only relative humidity induced positive and significant effect on aphid species. On cowpea, only the true spiders had a positive and significant effect on the aphid species in the second season. According to the susceptibility degree to aphids, faba bean varieties Misr1 and Giza 843 appeared as susceptible, while Sakha 3, 4 and Giza 40 showed low resistance. Cowpea varieties, Kream 7 and Kafr El-Sheikh 1 were susceptible, Kaha 1 and Dokki 331 appeared medium resistance, while Tiba was low resistant. The nymphal duration of *A. craccivora* was 8.04 ± 0.62 and 8.49 ± 0.63 days for the first and second generation, respectively. Also, adult longevity was 10.59 ± 1.37 and 11.94 ± 1.89 days, while life span was 18.62 ± 1.96 and 20.43 ± 2.52 days for the two successive generations, respectively. The generation time lasted $8.71 \pm$ and $9.35 \pm$ days for the two generations.

Thus, the obtained results are very an important and useful in the development of an integrated management program for aphid insects in faba bean and cowpea fields to minimize the bad effects of insecticides for control these insects.