





Studies on insect pests infesting soybean plants in Qalyoubia Governorate and their control

By

Esmat Salem AbdAllah Mohamed zaghlol

B.SC. Agric. Sci. (Plant protection), Faculty of Agric. Moshtohor Benha University (2009)

M.Sc. Agric. Sci. (Economic Entomology), Faculty of Agric. Moshtohor Benha University (2013)

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of DOCTOR OF PHILOSPHY In

Economic Entomology

Plant Protection Department
Faculty of Agriculture, Moshtohor
Benha University

2019

ABSTRACT

Field experiment was carried out at the experimental farm of the Faculty of Agriculture, Benha University, Qalubiya governorate during two successive seasons, 2015 and 2016 to study the susceptibility of five soybean varieties (Giza 21, Giza 22, Giza 35, Giza111 and Crawford) under natural infestation with cotton leaf warm Spodoptera littoralis (Boisd) and sucking pests mainly (Bemisia tabaci (Genn.). Aphis spp., and Tetranychus urtica Koch). As well as the relationship between this pests and some climatic factors, plant height, chlorophyll content and leaflets characteristic. Results showed that, Crawford variety was highly infested with the four pests of study in both seasons. In the case of S. littoralis Giza 21 variety recorded the lowest number of larvae/100 plants and rate of leaflets soybean feeding damage .On the other hand, Giza 35 variety was more resistant to aphids and T.urticae while the lowest infestation with B.tabace nymphs/100 leaflets was Giza 22 during the two successive seasons. Regarding the addition of potassium fertilization at the rate of 50 kg/fed. caused the lowest infestation by the four pests in both seasons. The using of pesticides (Abantin, 1.8% E.C) recorded the lowest infestation by twospider mite, T. urticae and cotton leaf worm, S. littoralis followed by Truegold in the two successive seasons.

List of Contents

Subject	Page No.
I. INTRODUCTION	1
II. REVIEW OF LITERATURE	4
1-Survey studies.	4
2- Susceptibility of different soybean varieties to infestation by some pests.	
2-1-Effect of climatic factors on soybean.	17
2-2-The relationship between phytochemical components of leaves of soybean varieties and infestation rates with pests were studied.	19
2-3- The relationship between anatomical characters of soybean leaves and infestation with pests.	20
3-Effect of potassium (K) fertilizer.	22
4-Pesticides.	24
5-Yields.	26
III. MATERIALS AND METHODS	
1-Survey of insects associated with soybean plants in the field	28
1-1. Sweeping net.	28
1-2. Plant examination.	27
2-Sampling techniques.	27

2-1- The cotton leaf worm, Spodoptera littoralis	29
2-2- Whitefly, Bemisia tabaci	30
2-3-Aphis spp.	31
2-4- Two-spotted spider mite, <i>Tetranychus urticae</i> Koch.	31
3- Study the susceptibility of different soybean varieties to infestation by some pests.	31
3.1- Growth characters	31
3.2- Phytochemical components in leaflets of different soybean varieties and infestation of some insect pests.	32
3. 3-Study the anatomical characteristic of different soybean varieties leaflets.	32
4. Fertilization	33
5. Insecticides.	33
6-yield assessment.	35
7- Statistical analysis.	35
IIII. RESULTS AND DISCUSSION	36
1-Survey of insects associated with Soybean plants in the field.	
2-Susceptibility of different soybean to infestation by some insect pests.	42
2-1- Cotton leaf warm <i>Spodoptera littoralis</i> .	42
2-1-1 The relationship between climatic factors and population density of <i>S. littoralis</i> on five varieties during 2015 and 2016 season.	45

2-1-2- The relationship between height plants and population density of <i>S. littoralis</i> on five varieties during2015 and 2016 seasons.	54
2-1-3- The relationship between leaf chlorophyll content and population density of <i>S. littoralis</i> on five varieties during 2015 and 2016 seasons.	55
2.1.4-The relationship values between phytochemical components in five soybean varieties and mean infestation rate of <i>S. littoralis</i> during 2016 seasons.	57
2.1.5- The relationship between anatomical characters in five soybean varieties and mean infestation rate of <i>S. littoralis</i> during 2016 seasons.	59
2-2. Whitefly <i>Bemisia tabaci</i>	
2.2.1- The relationship between climatic factors and population density of <i>B. tabaci</i> on five varieties during2015 and 2016 season.	67
2-2-2- The relationship between height plants and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 seasons.	67
2-2-3- The relationship between chlorophyll content and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	69
2-2-4- The relationship between phytochemical components and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	70

2-2-5- The relationship between anatomical characters and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	72
2-3- Aphis spp.	73
2.3.1- The relationship between climatic factors and population density of <i>Aphis</i> on five varieties during2015 and 2016 season.	78
2-3-2- The relationship between height plants and population density of <i>Aphis</i> on five varieties during 2015 and 2016 seasons.	79
2-3-3- The relationship between chlorophyll content and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	79
2-3-4- The relationship between phytochemical components and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	82
2-3-5- The relationship between anatomical characters and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	83
2-4 -Two-spotted spider mite, <i>Tetranychus urticae</i> Koch.	85
2-4-1- The relationship between climatic factors and population density of <i>T. urticae</i> on five varieties during2015 and 2016 season.	90
2-4-2- The relationship between height plants and population density of <i>T. urticae</i> on five varieties during 2015 and	92

2016 seasons.	
2010 seasons.	
2-4-3- The relationship between chlorophyll content and population density of <i>T. urticae</i> on five varieties during 2015 and 2016 season.	93
2-4-4- The relationship between phytochemical components and population density of <i>T. urticae</i> on five varieties during 2015 and 2016 season.	94
2-4-5- The relationship The relationship between anatomical characters and population density of <i>T. urticae</i> on five varieties during 2015 and 2016 season.	94
3- Effect of Fertilization on the infestation by some pests attacking soybean plants.	97
3-1. Cotton leaf worm, <i>Spodoptera littoralis</i> .	97
3-2. Whitefly, Bemisia tabaci.	97
3-3. Aphis spp.	104
3-4Two-spider mite, <i>Tetranychus urticae</i> .	107
4- The yield	110
4-1- Effect of varieties on yield of soybean plants during 2015 and 2016 seasons.	110
4.2- Effect of potassium fertilization on yield of soybean plants during 2015 and 2016 seasons.	113
5- Pesticides.	116
5.1- Efficacy of some insecticides against cotton leaf worm, Spodoptera littoralis on soybean plants under field condition during 2015 and 2016 seasons.	116

5.2- Efficacy of some insecticides against two spider mite, <i>Tetranyhus urticae</i> on soybean plants under field condition during 2015 and 2016 seasons.	121	
V. SUMMARY		
VI. REFERENCES		
VII. ARABIC SUMMARY	-	

List of Tables

No.	Title	Page
1	The available literature on field survey of Soybean insects summarized during 2015 and 2016 seasons.	4
2	Tested insecticides, dosages, common name, trade name and chemical structure during 2015 and 2016 season.	34
3	A list of insect and mite species and associated predator collected from soybean plant cultivations in Moshtohor, Qaliobia Governorate during 2015 and 2016 seasons.	38
4	Numbers of insect and mite species, their families and orders surveyed in soybean field at Moshtohor, Qaliobia Governorate During 2015and 2016 seasons.	40
5	Effect of certain soybean Varieties on population density of <i>S. littoralis</i> /100 plants at Moshtohor region, Qaliopia Governorate during 2015 season.	44
6	Rate of leaflets soybean feeding damage in different varieties with <i>S. littoralis</i> at Moshtohor region, Qaliopia Governorate during 2015 season.	46
7	Effect of certain soybean Varieties on population density of <i>S. littoralis</i> /100 plants at Moshtohor region, Qaliopia Governorate during 2016 season.	49
8	Rate of leaflets soybean feeding damage in different varieties with <i>S. littoralis</i> at Moshtohor region, Qaliopia Governorate, during 2016 season.	51

9	The relationship between climatic factors and population density of <i>S. littoralis</i> on five varieties during 2015 and 2016 season.	53
10	The relationship between plant height and population density of <i>S. littoralis</i> on five varieties during2015 and 2016 season	55
11	The relationship between leaf chlorophyll content and population density of <i>S. littoralis</i> on five varieties during 2015 and 2016 season	56
12	The relationship between phytochemical components and population density of <i>S. littoralis</i> on five varieties during 2015 and 2016 season	58
13	The relationship between anatomical characters and population density of <i>S. littoralis</i> on five varieties during2015 and 2016 season	60
14	Effect of certain soybean Varieties on population density of <i>B. tabaci</i> /100 leaflet at Moshtohor region, Qaliopia Governorate, during 2015 season.	63
15	Effect of certain soybean Varieties on population density of <i>B. tabaci</i> /100 leaflet at Moshtohor region, Qaliopia Governorate, during 2016 season.	65
16	The relationship between climatic factors and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	68
17	The relationship between plant height and population density of <i>B. tabaci</i> on five varieties during 2015 and	69

	2016	
	2016 season.	
18	The relationship between chlorophyll content and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	70
19	The relationship between phytochemical components and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	71
20	The relationship between anatomical characters and population density of <i>B. tabaci</i> on five varieties during 2015 and 2016 season.	73
21	Effect of certain soybean Varieties on population density of <i>Aphis spp</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2015 season.	75
22	Effect of certain soybean Varieties on population density of <i>Aphis spp</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2016 season.	77
23	The relationship between climatic factors and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	80
24	The relationship between plant height and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	81
25	The relationship between chlorophyll content and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	82

26	The relationship between phytochemical components and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	84
27	The relationship between anatomical characters and population density of <i>Aphis</i> on five varieties during 2015 and 2016 season.	85
28	Effect of certain soybean Varieties on population density of <i>T.urticae</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2015 season.	87
29	Effect of certain soybean Varieties on population density of <i>T.urticae</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2016 season.	89
30	The relationship between climatic factors and population density of <i>T.urticae</i> on five varieties during 2015 and 2016 season.	91
31	The relationship between plant height and population density of <i>T.urticae</i> on five varieties during 2015 and 2016 season.	92
32	The relationship between chlorophyll content and population density of <i>T.urticae</i> on five varieties during 2015 and 2016 season.	93
33	The relationship between phytochemical components and population density of <i>T.urticae</i> on five varieties during 2015 and 2016 season.	95

34	The relationship between anatomical characters and population density of <i>T.urticae</i> on five varieties during 2015 and 2016 season.	96
35	Effect of potassium fertilization on the infestation by the cotton leaf worm, <i>S. littoralis</i> on soybean plants during 2015 and 2016 seasons.	99
36	Effect of potassium fertilization on the infestation by the whitefly, <i>B. tabaci</i> on soybean plants during 2015 and 2016 seasons	102
37	Effect of potassium fertilization on the infestation by <i>Aphis</i> on soybean plants during 2015 and 2016 seasons	37
38	Effect of potassium fertilization on the infestation by the two spider mite, <i>T. urticae</i> on soybean plants during 2015 and 2016 seasons	108
39	Effect of varieties on yield of soybean plants during 2015 and 2016 seasons.	111
40	Effect of potassium fertilization on yield of soybean plants during 2015 and 2016 seasons.	114
41	Effect of different compounds on cotton leaf worm, <i>S. littoralis</i> /100 plants of Crawford soybean plants during 2015 season.	117
42	Reduction percentages on cotton leaf worm, <i>S. littoralis</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2015 season	117

43	Effect of different compounds on cotton leaf worm, <i>S. littoralis</i> /100 plants of Crawford soybean plants during 2016 season.	119
44	Reduction percentages on cotton leaf worm, <i>S. littoralis</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2016 season	120
45	Effect of different compounds on two spider mite, T.urticae /100 plants of Crawford soybean plants during 2015 season.	122
46	Reduction percentages on two spider mite, <i>T.urticae</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2015 season	123
47	Effect of different compounds on two spider mite, <i>T. urticae</i> /100 plants of Crawford soybean plants during 2016 season.	124
48	Reduction percentages on two spider mite, <i>T. urticae</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2016 season	125

List of Figures

No.	Title	Page
1	Graphic representations of various levels of soybean leaf defoliation.	30
2	Numbers of insect and mite species, their families and orders surveyed in soybean field at Moshtohor, Qaliobia Governorate during 2015and 2016 seasons	41
3	Percentage of insect and mite species and enemies of soybean and their status during 2015 and 2016 seasons.	41
4	Effect of certain soybean Varieties on population density of <i>S. littoralis</i> /100 plants at Moshtohor region, Qaliopia Governorate during 2015 season.	45
5	Rate of leaflets soybean feeding damage in different varieties with <i>S. littoralis</i> at Moshtohor region, Qaliopia Governorate during 2015 season	47
6	Effect of certain soybean Varieties on population density of <i>S. littoralis</i> /100 plants at Moshtohor region, Qaliopia Governorate during 2016 season.	50
7	Rate of leaflets soybean feeding damage in different varieties with <i>S. littoralis</i> at Moshtohor region, Qaliopia Governorate, during 2016 season.	52
8	Anatomical characters of tested soybean varieties.	61

9	Effect of certain soybean Varieties on population density of <i>B. tabaci</i> /100 leaflet at Moshtohor region, Qaliopia Governorate, during 2015 season	64
10	Effect of certain soybean Varieties on population density of <i>B. tabaci</i> /100 leaflet at Moshtohor region, Qaliopia Governorate, during 2016 season.	66
11	Effect of certain soybean Varieties on population density of <i>Aphis</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2015 season	76
12	Effect of certain soybean Varieties on population density of <i>Aphis</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2016 season.	78
13	Effect of certain soybean Varieties on population density of <i>T.urticae</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2015 season	88
14	Effect of certain soybean Varieties on population density of <i>T.urticae</i> /100 plant at Moshtohor region, Qaliopia Governorate, during 2016 season.	90
15	Effect of potassium fertilization on the infestation by the cotton leaf worm, <i>S. littoralis</i> on soybean plants during 2015 season.	100
16	Effect of potassium fertilization on the infestation by the cotton leaf worm, <i>S. littoralis</i> on soybean plants during 2016 season.	101

17	Effect of potassium fertilization on the infestation by the whitefly, <i>B. tabaci</i> on soybean plants during 2015 season.	103
18	Effect of potassium fertilization on the infestation by the whitefly, <i>B. tabaci</i> on soybean plants during 2016 season.	104
19	Effect of potassium fertilization on the infestation by <i>Aphis</i> on soybean plants during 2015 season.	106
20	Effect of potassium fertilization on the infestation by <i>Aphis</i> on soybean plants during 2016 season.	107
21	Effect of potassium fertilization on the infestation by the two spider mite on soybean plants during 2015 season.	109
22	Effect of potassium fertilization on the infestation by the two spider mite on soybean plants during 2016 season.	109
23	Effect of varieties on yield in soybean plant during 2015 and 2016 seasons.	112
24	Effect of potassium fertilizer on yield of soybean during 2015 and 2016 seasons.	115
25	Reduction percentages on cotton leaf worm, <i>S.littoralis</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2015 season	118

26	Reduction percentages on cotton leaf worm, <i>S. littoralis</i> count /100 plants of Crawford soybean plants after treatment by four different compounds during 2016 season	121
27	Reduction percentages on two spider mite, <i>T.urticae</i> count/10 plants of Crawford soybean plants after treatment by four different compounds during 2015 season.	123
28	Reduction percentages on two spider mite, <i>T. urticae</i> count/10 plants of Crawford soybean plants after treatment by four different compounds during 2016 season.	125







دراسات علي الآفات الحشرية التي تصيب نباتات فول الصويا في محافظة القليوبية ومكافحتها

رسالة مقدمة من

عصمت سالم عبدالله محمد زغلول

بكالوريوس العلوم الزراعية (وقاية النبات) - كلية الزراعة- جامعة بنها 2009 ماجستير العلوم الزراعية (حشرات اقتصادية) - كلية الزراعة – جامعة بنها -2013

للحصول علي درجة الدكتوراه في (الحشرات الاقتصادية) قسم وقاية النبات كلية الزراعة (مشتهر) - جامعة بنها