

LIST OF CONTENTS

Contents	Page
CHAPTER I	
1. Introduction	1
CHAPTER II	
2. Review of literature	
2.1. Toxicity of insect growth regulators on cotton leafworm <i>S. littoralis</i>	3
2.2. Biochemical effects of insect growth regulators on cotton leafworm <i>S. littoralis</i>	14
2.3. Histopathological impacts of insect growth regulators on cotton leafworm <i>S. littoralis</i>	25
CHAPTER III	
3. Materials and methods	
3.1. Rearing of the Egyptian cotton leafworm <i>S. littoralis</i> (Boisd.)	29
3.2. Tested insecticides	
3.3. Bioassay test	
3.4. Biochemical studies	30
3.4.1. Preparation of samples for biochemical assay	
3.4. 2. Determination of total soluble protein	31
3.4.3. Determination of total carbohydrates	
3.4.4. Determination of total lipids	
3.4.5. Determination of enzyme activities	32
3.4.5.1. Determination of aspartate transaminase (AST) and alanine transaminase (ALT)activities	
3.4.5.2. Determination of non-specific esterase activities	33
3.4.5.3. Determination of phosphatase activities	
3.4.5.4. Determination of chitinase activities	34

3.4.5.5. Determination of phenol oxidase activities	35
3.5. Histopathological studies	36
3.6. Statistical analysis	
CHAPTER IV	
4. Results	37
4.1. Toxicity of Chitin Synthesis Inhibitors against 2 nd & 4 th instar larvae of <i>S. littoralis</i>	
4.1.1. Susceptibility of the 2 nd instar larvae to the tested compounds	
4.1.2. Susceptibility of the 4 th instar larvae to the tested compounds	
4. 2. The biochemical effects of the three Chitin Synthesis Inhibitors on <i>S. littoralis</i> larvae	40
4.2.1. The total soluble protein	
4.2.2. The total carbohydrates	
4.2.3. The total lipids	
4.2.4. Transaminase enzymes	42
4.2.4.1. Aspartate transaminase (AST)	
4.2.4.2. Alanine transaminase (ALT)	
4.2.5. Non- specific esterases	44
4.2.5.1. Alpha esterase (α -esterase)	
4.2.5.2. Beta esterase (β -esterase)	
4.2.6. Phosphatase activities	46
4.2.6.1. Alkaline phosphatase	
4.2.6.2. Acid phosphatase	
4.2.7. Chitinase activity	48
4.2.8. Phenoloxidase activity	

4.3. Histopathological effects of 4 th instar larvae of <i>S. littoralis</i> treated with tested Chitin Synthesis Inhibitors:	50
4.3.1 . Histopathological effects on the integument	
4.3.2. Histopathological effects on the fat body	53
4.3.3. Histological effects on the midgut	55
CHAPTER V	
5- Discussion	59
CHAPTER VI	
6. Summary	73
CHAPTER VII	
7. References	77
Arabic summary	95

LIST OF TABLES

No.	Table title	Page
1	Susceptibility of 2 nd instar larvae of cotton leafworm, <i>S. littoralis</i> (Boisd.) to tested CSIs after 96 hrs. from treatment.	38
2	Susceptibility of 4 th instar larvae of cotton leafworm, <i>S. littoralis</i> (Boisd.) to tested CSIs after 96 hrs. from treatment.	
3	Determination of total proteins , carbohydrates and lipids in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> (Boisd.) after treatment with LC ₅₀ of each tested insecticide .	41
4	Determination of AST & ALT activity in haemolymph of the 4 th instar larvae <i>S. littoralis</i> (Boisd.) after treatment with LC ₅₀ of each insecticides.	42
5	Alpha and Beta esterases activity in haemolymph of the 4 th instar larvae <i>S. littoralis</i> (Boisd .) after treatment with LC ₅₀ of each tested compound.	45
6	Alkaline phosphatase and acid phosphatase activity in haemolymph of the 4 th instar larvae <i>Spodoptera littoralis</i> (Boisd.) after treatment with L C ₅₀ of each tested compound .	46
7	Chitinase and phenol oxidase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> (Boisd.) after treatment with LC ₅₀ of each tested insecticide.	48

LIST OF FIGURES

NO	Figure title	Page
1	Toxicity index of the three CSIs, flufenoxuron , chlorfluazuron and triflumuron for the 2 nd instar larvae of <i>S. littoralis</i> .	39
2	Toxicity index of the three CSIs, flufenoxuron, chlorfluazuron and triflumuron for the 4 th instar larvae of <i>S. littoralis</i> .	
3	Determination of total lipids, total carbohydrates and total proteins in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each tested insecticide.	41
4	AST (GOT) activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each tested insecticide.	43
5	ALT(GPT) activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each tested insecticide.	
6	Alpha & beta esterase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ with each tested insecticide.	45
7	Alkaline-phosphatase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each insecticide.	47
8	Acid-phosphatase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each insecticide.	
9	Chitinase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each tested insecticide.	49
10	Phenol oxidase activity in haemolymph of the 4 th instar larvae of <i>S. littoralis</i> after treatment with LC ₅₀ of each tested insecticide.	
11	Cross section in the cuticle of untreated 4 th instar larvae (control) of <i>S. littoralis</i> (HE 200X) showing normal fiber layer and cellular layer.	51
12	Cross section in the cuticle of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of flufenoxuron (HE 200X) showing necrosis of epidermal cells and separated from the cuticle.	

13	Cross section in the cuticle of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of chlorfluazuron (HE 400X) showing weak epicuticle, necrosis of epidermal cells and separated of the cuticle.	52
14	Cross section in the cuticle of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of triflumuron (HE 200X) showing necrosis of epidermal cells and separated from the cuticle.	
15	Cross section in the fat body of untreated 4 th instar larvae (control) of <i>Spodoptera littoralis</i> (HE 200X) showing normal cells.	53
16	Cross section in the fat body of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of flufenoxuron (HE 400X) showing severe necrosis and dissolved cells.	54
17	Cross section in the fat body of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of chlorfluazuron (HE 400X) showing necrosis of most cells & increased no. fat cells.	
18	Cross section in the fat body of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of triflumuron (HE 200X) showing necrobiotic change with increased no. of cells.	55
19	Cross section in the mid gut of untreated 4 th instar larvae (control) of <i>S. littoralis</i> (HE 200X) showing normal layer with brush border , regenerative cells and goblet cells.	56
20	Cross section in the mid gut of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of flufenoxuron (HE 200X) showing ruptured columnar cells with pyknotic nuclei and destroyed basement membrane.	57
21	Cross section in the midgut of the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of chlorfluazuron (HE 400X) showing distruction of columnar cells with loss of brush border and increased no. of goblet cells.	
22	Cross section in the 4 th instar larvae of <i>S. littoralis</i> treated with LC ₅₀ of triflumuron(HE 200X) showing the midgut with vacuoles in the columnar cells, cells are separated from the basement membrane, necrosis of muscles cells & distroyed peritrophic matrix.	58

List of abbreviations

No.	abbreviation	name
1	IGR	Insect Growth Regulator
2	CSI	Chitin Synthesis Inhibitor
3	GOT	Glutamic Oxaloacetic Transaminase
4	GPT	Glutamic Pyruvic Transaminase
5	AST	Aspartate Transaminase
6	ALT	Alanine Transaminase
7	Al- P	Alkaline- phosphatase
8	Ac- P	Acid - phosphatase
9	α-E	Alpha - esterase
10	β-E	Beta- esterase

College: Science	Department: Zoology	Cal No.:
Author: Rasha Ibrahim Ibrahim Said	Degree: Master	Date: / / 2018
Dissertation Title		
Histopathological and Biochemical Studies of the Effect of Some Insecticides on the Cotton Leafworm <i>Spodoptera littoralis</i>		
Dissertation Abstract (One page A4) □		
<p>This study aimed to evaluate the efficacy of some insect growth regulators against cotton leafworm <i>Spodoptera littoralis</i>. So; LC_{50s} of flufenoxuron, chlorfluazuron and triflumuron were estimated for both 2nd and 4th larval instars.</p> <p>Biochemical analysis for 4th larval instars was estimated to observe enzymatic changes resulting to these treatments.</p> <p>Histopathological studies of 4th instar larvae declared that there was serious changes in some important structures of the insect such as the cuticle, fat bodies and midgut.</p>		
Key Words: (not more than Ten)		