Alexandria University
Faculty of Agriculture (Saba-Basha)

Evaluation of some chemical and bio-insecticides against some insect pests infesting potato tubers.

BY
Emad Mostafa El sayed EL-Adawy

A Thesis presented to the Graduate School
Faculty of Agriculture (Saba-Basha), Alexandria University
In Partial Fulfillment of the Requirements governing for the Degree

OF
Doctor of philosophy

AGRICULTURAL SCIENCES
(PESTICIDES)

Department of Plant Protection

From

Alexandria University

2018

CONTENTS

1-INTRODUCTION.....**1**

2. REVIEW OF LITERATURE ……..**5**

2.1. The importance of *Gryllotalpa gryllotalpa* and *Penitodon bispinosus* to assess potato crop losses and profitability. **5**

2.2. Biological aspects of *Gryllotalpa gryllotalpa* and *Penitodon bispinosus* **12**

2.3 Efficacy of chemicals and biopesticides on *G. gryllotalpa* and *P. bispinosus*……16

2.4. . Qualitative losses *G. gryllotalpa* and *P. bispinosus* **36**

3-MATERIALS AND METHODS **39**

3.1. Experimental site and design.....**39**

3.2. Insecticidal treatments **40**

3.3. Insecticides used: **40**

3.3. 1. Organophosphorus Insecticides.....**41**

A) Chloropyrifos methyl (Houky®)…….

B) Fenitrothion(sumithion K Z®)…….

C) Dimethoate(Perfecthion40%®).....

3.3.2. Bio insecticides **43**

A) *Beauveria bassiana* careprotector®……..

B) *Bacillus thuringiensis* (BT) subsp. Kurstaki (Protecto®)……..

C) **Azadirachtin (Nimbecidin®0.03% EC)**…….

3.3.3.Fipronil(Coach®)………… 44

3.4. sampling technique and pest inspection……...45

3.5. Yield loss assessment…….45

3.6. Determination of economic injury levels (EIL)…….45

3.7. Economics of pest control……46

3.8. Determination of certain chemical components in potato tubers……46

3.9. Statistical analys……47

4. RESULTS AND DISCUSSION…….50

4.1. Efficacy of certain treatments against *G. gryllotalba* and *P. bispinosus* infesting tuber potato during seasons, summer 2014 and winter 2015……50

4.2. Impact of the used insecticide baits on potato yields and loss% of tubers in two potato growing seasons, summer 2014 and winter 2015…….. 55

4.2.1 Losses% assessment in potato tubers:…… ……**55**

4.2.2 Quantitative yield (Ton/fed.) ……**58**

4.3. Determination of multiple economic injury levels (EILs) of both *G. gryllotalba* , *P. bispinosus* insect pests……..66

4.3. 1. Summer plantation of 2014…….66

4.3.2. Winter plantation of 2015……**6**9

4.4. Economics and profits of the tested insecticides vs control the *G. gryllotalpa* , *P. bispinosus* ……74

4.5. Effect of the tested insecticide on certain internal components of potato tubers, in the season of 2014…….80

4.5.1. The dry matter content…….80

4.5.2. The specific gravity content……..……..**80**

4.5.3. The total sugar content ……**81**

4.5.4. The reducing sugar content……..…**81**

4.6. Effect of the treatments on certain internal components in potato tubers, season 2015……..86

4.6.1. The dry matter content……86

4.6.2. The specific gravity…….86

4.6.3. The total sugar content ……..86

4.6.4. The reducing sugar content……87

4.7. Future studies opportunities……...91

5- SUMMARY.....92

6- LITERATURE CITED……..101

7- ARABIC SUMMARY……..

LIST OF TABLES

No.	Title	Page
1	**Trade names, common names, formulation and application rate of the tested insecticides.**	40
2	**Efficacy of certain insecticide baits against *G. gryllotalba* and *P. bispinosus* infesting tuber potato during both season summer of 2014 and winter, 2015.**	52
3	**Impact of the used insecticide baits on potato yields and loss% of tubers in two potato growing seasons, summer 2014 and winter 2015.**	61
4	**Summer of the lines regressing formula values for each considered insect pest receiving different insecticidal baits for the summer plantation of 2014.**	67
5	**Winter of the lines regressing formula values for each considered insect pest receiving different insecticidal baits for the winter plantation of 2015.**	69
6	**Determination of the economic injury levels for (EILs) the mole cricket, *G. gryllotalba* and the white grub, *P. bispinosus* in the summer season 2014.**	72
7	**Determination of the economic injury levels for (EILs) the mole cricket, *G. gryllotalba* and the white grub, *P. bispinosus* in the winter season 2015.**	73
8	**Economics and profits of the used compounds compared with the control against *Gryllotalpa gryllotalpa* and *P. bispinosus* in the summer season 2014.**	77
9	**Economics and profits of the used compounds compared with the control against *G. gryllotalpa* and *P bispinosus* in the winter season 2015.**	78
10	**Effect of the used insecticides baits on the internal components in Potato *Solanum tuberosum* (season 2014).**	83
10	**Effect of the used insecticides baits on the internal components in Potato *Solanum tuberosum* (season 2015).**	88

LIST OF FIGURES

No.	Title	Page
1	Efficacy of certain insecticide baits against *G. gryllotalba* infesting tuber potato during summer season of 2014.	53
2	Efficacy of certain insecticide baits against *P. bispinosus* infesting tuber potato during summer season of 2014	53
3	Efficacy of certain insecticide baits against *G. gryllotalba* infesting tuber potato during winter season of 2015	54
4	Efficacy of certain insecticide baits against *P. bispinosus* infesting tuber potato during winter season of 2015.	54
5	Losses percentage due to the mole cricket in the summer season 2014.	62
6	Losses percentage due to the white grub in the summer season 2014.	62
7	The cumulative losses percentage by both insect-pests and yield (Ton/fed.) In the summer season of 2014.	63
8	Losses percentage due to the mole cricket in the winter season 2015.	64
9	Losses percentage due to the white grub in the winter season 2015.	64
10	The cumulative losses percentage by both insect-pests and yield (Ton/fed.) in the winter season of 2015.	65
11	Economics and profits of the used compounds compared with the control against *G. gryllotalpa* and *P. bispinosus* summer season 2014.	79
12	Economics and profits of the used compounds compared with the control against *G. gryllotalpa* and *P. bispinosus* winter season 2015.	79
13	Effect of the tested insecticides on the dry matter content, season 2014.	84
14	Effect of the tested insecticides on the specific gravity content, season 2014.	84
15	Effect of the tested insecticides on the total sugar content, season 2014.	85
16	Effect of the tested insecticides on the reducing sugar content, season 2014.	85

17	Effect of the tested insecticides on the dry matter content, season 2015.	89
18	Effect of the tested insecticides on the specific gravity content season 2015.	89
219	Effect of the tested insecticides on the total sugar content, season 2015.	90
20	Effect of the tested insecticides on the reducing sugar content, season 2015.	90

LIST OF PHOTOS

No.	Title	Page
1	**The revealed symptoms on damaged potato tuber due to infestation by *Penitodon bispinosus*, where: a) the larva; b) Adult insect on infested tuber; c) Larva inside infested tuber; d) infested tubers.**	48
2	**The revealed symptoms on damaged potato tuber due to infestation by *Gryllotalpa gryllotalpa* where: a) Adult of *Gryllotalpa gryllotalpa*; b) tunnels of *Gryllotalpa gryllotalpa*; c&d) infested potato tubers.**	48
3	**Photo (3): Spreading of the prepared baits between rows.**	49