THE EFFICIENCY OF SOME BIOLOGICAL AGENTS TO THE DESERT LOCUST

By

RADA WAGEH MOHAMED KAMEL ELATREBY

B.Sc. Agric. Sci (plant pathology), Fac. Agric., Alex Univ., Egypt, 1990

THESIS

Submitted in Partial Fulfillment of the Requirements for the degree of

in

Agricultural Sciences

Microbiology control

Department of Agricultural Sciences, Institute of Environmental Studies and Research, Ain Shams University

2018

APPROVAL SHEET

THE EFFICIENCY OF SOME BIOLOGICAL AGENTS TO THE DESERT LOCUST

M. Sc. Thesis

By

RADA WAGEH MOHAMED KAMEL ELATREBY

B.Sc. Agric. Sci (plant pathology), Fac. Agric., Alex Univ., Egypt,1990

Graduate Diploma in Agricultural Planning and Statistics, Faculty of Agriculture, Alexandria University

Diploma of Environmental Sciences Institute of Environmental Studies and Research Ain Shams University

Approved by:

Dr. Gamal M. M. Abdelatef :……..

Senior Researcher , Plant Protection Research Institute (PPRI) Institute of Agricultural Research.

Professor Dr. Kadri WShahi Mahmoud:……

Professor of Pesticide and Toxin Chemistry, Faculty of Agriculture, Ain Shams University.

Professor DR. Medhat Kamel Ali:……

Professor of Plant Pathology,Faculty of Agriculture , Ain Shams University (Chief Supervisor).

2018

SUPERVISION SHEET

THE EFFICIENCY OF SOME BIOLOGICAL AGENTS TO THE DESERT LOCUST

M. Sc. Thesis

By

RADA WAGEH MOHAMED KAMEL ELATREBY

B.Sc. Agric. Sci (plant pathology), Fac. Agric., Alex Univ., Egypt,1990

Graduate Diploma in Agricultural Planning and Statistics, Faculty of Agriculture, Alexandria University

Diploma of Environmental Sciences Institute of Environmental Studies and Research Ain Shams University

Under Supervision

Dr. Medhat Kamel Ali

Professor in Dept. Of Plant Disease, Faculty of Agriculture, Ain Shams University.

Dr. Mohamed Zakria Sedik

Professor in Dept. Of Plant Microbiology, Faculty of Agriculture, Cairo University.

Dr. Ahmed Kamel Hasan Hosny

Director of Communications and Recommendations in the General Directorate of Locust Control and Agricultural Aviation Ministry of Agriculture.

Dedication

Who taught me that great works are done only "
with patience, determination and diligence. Give
them the fruit of their work

To the spirit of my mother and father, God
.forgave them

With all the love .. to who walked with me
towards the dream ... my husband Atef
Khawanki thanks for your support me.

ACKNOWLEDGEMENT

I thank all those who helped to complete this research and gave assistance and help and provided us with information, especially to **Professor Dr. Medhat Kamel Ali** ·***Dept. Of Plant Disease, Faculty of Agriculture, Ain Shams University.,*** **Professor Dr. Mohamed Zakria Sedik** ***Dept. Of Plant Microbiology, Faculty of Agriculture, Cairo University.,*** **Dr. Ahmed kamel Hasan HOSNY.*General Dept. for Locust and Agro-aviation Affairs, Ministry of agriculture.*** ,I thank **Professor Dr. Kadri WShahi Mahmoud Professor of Pesticide and Toxin Chemistry, Faculty of Agriculture, Ain Shams University**, **Dr. Gamal M. M. Abdelatef** Senior Researcher , Plant Protection Research Institute (PPRI) Institute of Agricultural Research. **AND DR. ALSAYED SULTAN**. **Institute for Prevention and Control of Locusts grateful apprecication is also extended to staff members and to employees, engineers and workers all of them I thank them very much.**

ABSTRACT

Desert locust, *Schistocerca gregaria* is serious agricultural pest that cause considerable damage to all field crops and pasture grasses, particularly during outbreaks.

In this study, laboratory trials and field trials were carried out at different times in some places in Egypt considered as favorable breeding sites to test its efficacy on the target pest under the Egyptian argro-ecosystem to evaluate the performance of three natural products as bio-insecticide , Actinomycetes - bacteria, *Saccharopolyspora Spinosa* (Spinosad, 24%SC), fungus, *Metarhizium anisopliae var. acridium* (Green Muscle), and *Bacillus thuringiensis*-bacteria (Protecto 9.4%WP)**.**

The Results of the laboratory trials revealed that, actinomycetes (Spinosad, 24%SC) was successful as bio-agent to control both locusts and grasshoppers. Also, fungus *M. anisopliae var. acridium* (Green Muscle) is promising for locust and grasshoppers control. While obtained domenstrated that, no significant effects of *B. thuringiensis* (Protecto 9.4%WP) was not effective on the desert locust, *S. gregaria* or the grasshoppers.

In the field, (Spinosad, 24%SC) at concentration of 65ml/100L caused 75% mortality among *S. gregaria* nymphs after 24hr., reached its maximum effect (100%mortality) after 48hr. under the Egyptian conditions, while fungus *M. anisopliae var. acridium* (Green Muscle®) was very slow acting as a bio-control agent when applied against *S. gregaria* and some acridid pests, but it was safe to non-target organisms and mammals. 50g/ha dose (diluted in diesel) resulted in an optimal mortality of locusts during 21 days, followed by 50g/ha dose (diluted in vegetable oil), respectively.

Key words: *Acrididae*, Locust, *Schistocerca gregaria***,** Biological Control**.** *Metarhizium anisopliae var. acridium*, Green Muscle, Spinosad, *Bacillus thuringiensis*

CONTENTS

LIST OF TABLES

LIST OF FIGURES

NO **Title** **page**

INTRODUCTION

The insect pests which belong to family "Acrididae" specially the desert locust, *Schistocerca gregaria* (Forsk.) and several species of grasshoppers are consider the most serious pests around the world. Locusts can cause considerable economic problems on affected countries and so on grasshoppers on the regional levels (Bullen 1970). So indicated that, instead of waiting for *Schistocerca gregaria* outbreaks to occur, preventive action against this pest must be taken to prevent its damage (Krall 1995).

The principal aim of preventive strategies for locust controls were designed on: a) reduce the size of the total population of insects, b) prevent of any plagues may forming by controlling of bands and swarms in affected areas (Steedman, 1990).

Numerous pesticides used for locust control during upsurges and plagues causing environmental risks and affected non-target organisms. Due to the environmental and pest-resistance problems associated with chemical pesticides, now there is an increasing interest for the exploitation of biological control agents, available as commercial products or those still under development. Consequently, the environmental pollution by chemical pesticides such as; toxicity to non-target organisms (Tingle, 1996) and humans (Pretty, 1996) has led to new strategies and development of environmental friendly alternatives to control locusts and grasshoppers based on microbial control agents (Johnson and Goettel, 1993)(Lomer et al., 2001 and Lange, 2005).

At last years the quality of the environment has become a major issue. Many chemicals (pesticides) previously accepted for locust control at national and international levels would not survive the rigorous environmental testing required of modern insecticides.

Therefore, the present study is an attempt through laboratory and field trails to evaluate the efficacy of some bio-insecticides such as a *Actinomycetes* bacteria (Spinosad, Tracer 24%SC), fungus, *Metarhizium anisopliae var. acridium*, (Green Muscle) and Bacteria, *Bacillus thuringiensis* (Protecto 9.4%WP) against desert locust, *Schistocerca gregaria* under the Egyptian environment conditions.

REVIEW OF LITRATURE

Economic importance of the desert locust:

Locusts have been the enemies of humans since the early days of agriculture. They are mentioned in ancient sacred books such as the Torah, the Koran, and the Bible. In the latter, they constitute the infamous Eighth plague of Egypt. In the Old Testament of the Bible, there are about 100 references to insects and other arthropods; among them, the 40 references to locusts and grasshoppers far outnumber all other related quotes (Kritsky, 1997). Locust swarms often brought devastation and famine to entire nations. According to the ancient Roman historian Pliny the Elder, in 125 BC, 800,000 people died in the Roman colonies of Cyrenaica and Numidia (territories of contemporary Libya, Algeria, and Tunisia) from famine caused by a locust plague(Uvarov, 1944). In 1958 in Ethiopia, locusts destroyed 167,000 tons of grain, which is enough to feed 1 million people for a year (Steedman, 1988).

The desert locust *S. gregaria* has been considered a major pest since ancient times, as locust swarms holding millions of insects move throughout the Sahel of northern Africa, Middle East and southern Mediterranean countries. Most research has focused on the biology of the species and the development of strategies in locust control, but little is known about the place of locust pulses within food webs in which domestic herbivores and European long-distance migratory birds are also involved.

Eruptions of desert locusts *S. gregaria* Forskal in arid zones of Africa and the Middle East have been so closely intertwined with human agricultural economies that reports of catastrophes are numerous and detailed since the time of the Pharaohs (Nevo, 1996).