STUDIES INTO INCREASING THE PRODUCTION AND EFFICIENCY OF SPODOPTERA LITTORALIS NUCLEAR POLYHEDROSIS VIRUS USED AS A BIOLOGICAL CONTROL AGENT

BY

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CONTENTS

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CONTENTS : Cont'd.

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CONTENTS : Cont'd.

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1. INTRODUCTION

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Cotton in Egypt is cultivated in 1,100,000 fed. and is the most important export crop. In spite of intensive cultivation the number of conventional insecticides applications during the season rarely exceed four or five and emphasis is being given to the use of selective control agents as a means of conserving the beneficial insect.

The two major cotton pests in Egypt are the Egyptian cotton leafworm Spodoptera littoralis (Boisd.), and the pink bollworm Pectinophora gossypiella (Saund.).

Control of S. littoralis is achieved by the hand collection of egg masses every 3 days during the early part of the cotton season. Alternative control techniques currently being investigated include the use of microbial pesticides and insects growth regulators.

The experimental use of pathogens including virus materials is becoming increasingly common, and a few are already in commercial use. Use of these pathogens has become so widespreaded that new legislation has been prepared in U.S.A. and in Europe to regulate their use and much attention has been given to the definition of appropriate safety testing methods. Viruses could have a major role to play in the integrated control of insect pests especially as they are non-polluting agents and do not appear to induce resistance.

Insect viruses can be classified into a number of groups using structural features alone. Of these groups the occluded viruses in which the virus particles are occluded in protein crystal having a variety of forms are most different from viruses pathogenic to man and plants and animals.

Nuclear polyhedrosis viruses are a group of baculoviruses in which the majority are highly host specific and that have received more attention than other groups of insect viruses. Although viruses differ in the exact shape or size of inclusion body, identification by shape and size is generally unreliable, as many viruses with quite different host ranges are identical in appearance.

As a result of using such bioformulations and selective control methods for beneficial insect populations might remained at high levels throughout the season and acceptable levels of infestation could be achieved associated with relatively few applications of chemical pesticides.

2. REVIEW OF LITERATURE

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Historical Development of Insect Virology :

The study of insect virus diseases began many years ago with the investigation of a disease infecting silk worms called "jaundice". It was named so because of the yellow spots which develop on the abdomen of infected larvae. It is now a virus classified as one of the group of "nuclear polyhedroses", a characteristic of which is the presence of huge numbers of many sided crystals or polyhedra in the tissues.

Bolle (1894) was the first to establish the protein nature of the polyhedra. Bolle (1898) observed further that polyhedra dissolved in weak alkaline solutions but remained insoluble in water and did not decompose by ordinary purification processes.

Von Prowazek (1907) showed that materials from diseased silkworms was infectious after the polyhedra had all been removed by filtration through many layers of filter paper. He examined this clear filtrate under the microscope and saw that all the polyhedra were removed. However, the clear fluid was still infectious, a fact that led this researcher to an erronous conclusion, that the polyhedra were not the carriers of the virus.

It was later suggested by Komarek and Breindl (1924) that the causative agent of the disease might be contained within the polyhedra, since these were dissolved in weak alkaline minute objects showing Brownian movement that could be observed with the optical microscope using dark field illumination.

This was later confirmed by Bergold (1947) who demonstrated the presence of the virus in the polyhedra by means of an electron microscope.

Use of Insect Viruses For the Control of Certain Insect Pests of Cotton in Egypt :

Cotton is considered one of the most important economic crops not only in Egypt but in many countries. Therefore, protection from, and control of, cotton pests is of vital importance.

Willcocks and Bahgat (1937) described the symptoms of a definite virus disease of which they did not know the causative agent at that time and which was attacking the cotton leafworm in breeding cages. They mentioned that the diseased rotten bodies of the cotton leafworm were so very numerous that the air was polluted and the stench was nauseating.

Abul-Nasr (1956) described the symptoms of the viral disease in the cotton leafworm and said that it is greatly influenced by the increase of temperature and relative humidity. He added that healthy larvae can be infected in the laboratory by consuming contaminated food that is dipped in a suspension containing polyhedral bodies. A concentration of 5-10 millions polyhedral per milliliter of suspension is enough to cause complete infection among grown larvae. First and second instar larvae need more concentrated suspension to cause considerable infection.

Hafez (1958) noted that more than half of the mortalities among the larvae in laboratory colonies were due to the polyhedrosis virus. He studied the effect of polyhedrosis virus on different larval instars of the Egyptian cotton leafworm, Prodenia litura F., under laboratory conditions. His results indicated that all larval instars of the cotton leafworm are equally affected by the virus. Few larvae among those infected with the virus at the late larval instar reach the pupal stage. Under laboratory conditions of an average temperature of 24°C, the period from infection to the final death of the larva was about 6 to 7 days.

Abul-Nasr (1959) made further tests using the polyhedrosis virus for the control of the Egyptian cotton