ECOLOGICAL STUDIES ON THE COTTON LEAFWORM, SPODOPTERA LITTORALIS (BOISD.)

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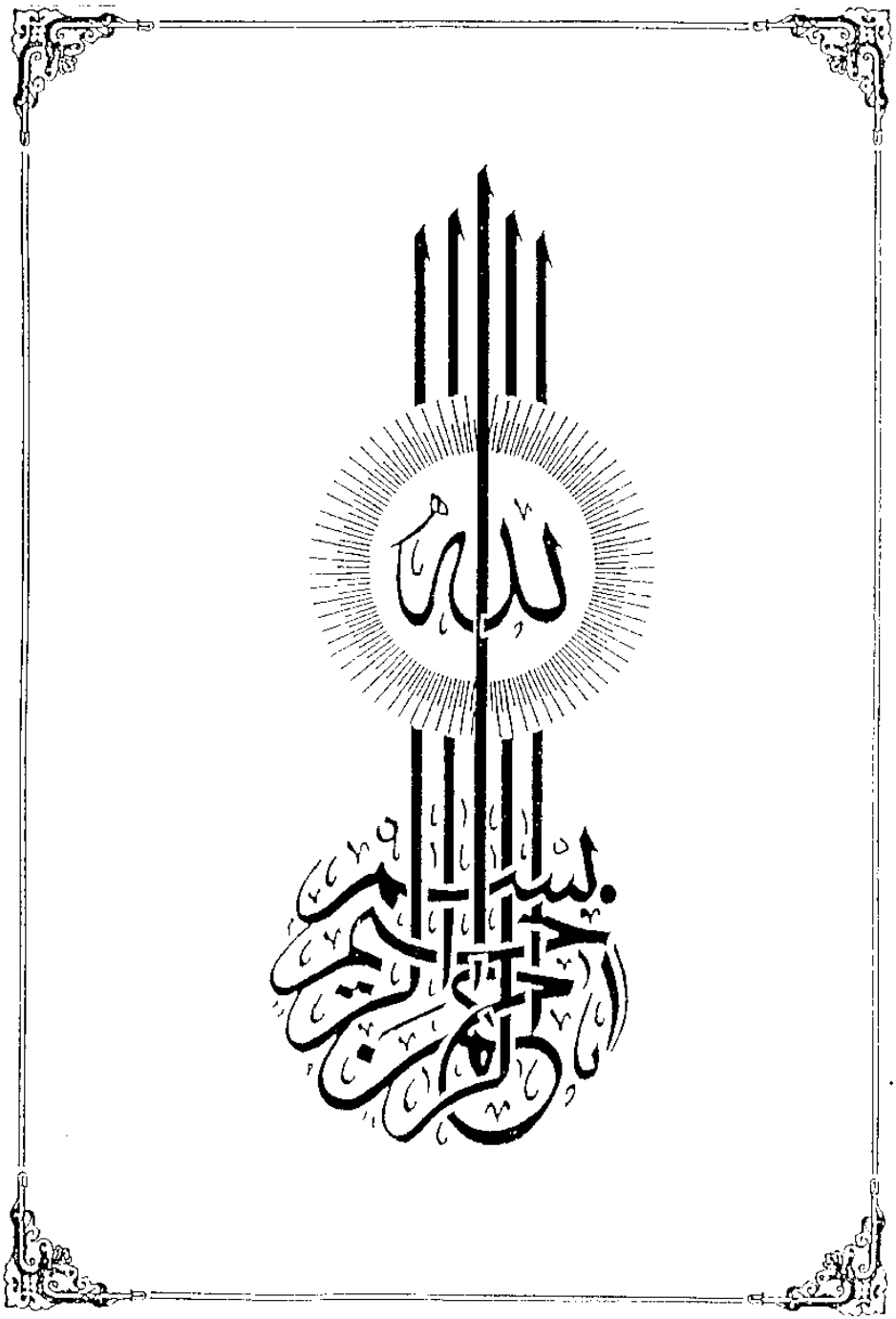

Page

PART IV

THE EFFICIENCY OF HAND-PICKING EGG-MASSES OF THE COTTON LEAFWORM, SPODOPTERA LITTORALIS IN RELATION TO RATE OF INFESTATION AND TO PLANT GROWTH

METHODS AND TECHNIQUE... 67

1) Experimental locations 67

2) The normal process of hand-picking.. 67

3) The experimental procedure 70

RESULTS AND DISCUSSION.. 71

a) The relation between the efficiency of hand-picking the egg-masses and plant length.. ... 78

b) Relationship between the number of collected and left-over egg-masses.. 78

c) Relationship between the number of egg-masses collected and the efficiency of collecting ... 80

d) The estimated efficiency of hand-picking the egg-masses at two stages of plant growth. ... 81

PART V

SUMMARY.. 94

REFERENCES 101

ARABIC SUMMARY

PART I

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INTRODUCTION

Egypt is one of the most important cotton producing countries in the world. Its importance is not due so much to the amount of cotton it produces but to the good qualities of its lint. The annual cotton production of Egypt is small in comparison with that of the United States of America or, for, that of India, yet most of the long-staple cotton the world consumes is produced in Egypt. However, the yield, in this country is annually threatened by certain insect pests of major economic importance.

The cotton leafworm, Spodoptera littoralis (Boisd.) is still one of the most important cotton pests in Egypt. It ranks first among the polyphagous insect pests in Egypt. It attacks more than 70 cultivated crops as well as weeds and other wild plants. Cotton, clover, vegetables, fruit trees and ornamental plants are favourable host plants. Its damage to these host plants ranges between slight in some years to complete ruin in others. The variation in the extent of damage is related to the population density of the insect prevailing at the time of infestation. This differs from one locality to another and from season to season.

Efforts of controlling this insect or suppressing its damage to cotton usually involve all possible cultural, mechanical and biological methods as well as chemical pesticides. Nevertheless, many gaps in the basic ecological information about this insect still exist. The present investigation was planned to cover some of these gaps and to provide information regarding the following:

1- Population studies:

a) Annual broods of moths.

b) The effect of accumulated heat on the length of the broods.

c) An evaluation of light-traps as means of reducing moth population.

2- The nocturnal activity of the adult stage in relation to the prevailing temperature and relative humidity.

3- The efficiency of hand-picking egg-masses with regard to the following relationships:

a) The efficiency of hand-picking the egg-masses and plant length.

b) The numbers of collected and of left-over egg-masses.

c) The number of collected egg-masses and the size of population (infestation).

To study these points, field experiments were conducted in several parts of the country (mainly in Sakha, Kafr-El-Sheikh Governorate) during the years (1974-79) along with certain studies in the Cotton Leafworm Research Division Laboratories, at Dokki.

II- REVIEW OF LITERATURE

The literature pertaining to the present study on the cotton leafworm, Spodoptera littoralis is so voluminous that it would be more convenient to classify it under separate headings:

Population dynamics of the cotton leafworm, Spodoptera littoralis (Boisd.) using light traps.

Various studies were carried out by several workers to determine the interrelationships between S. littoralis populations and the environmental conditions.

Williams (1923) stated that the cotton leafworm occurred throughout Egypt, the maximum attack being from 15th June to 7th of July and lasting until the end of August. Although no appreciable damage was done at that time, the insect was considered as a menace to the cotton crop.

Bishara (1928) recorded 7 broods of P. litura (= S. littoralis) moths per year, the most important of which being the 3rd and 4th. According to this author, the maximum flight during these broods took place about the 20th of June and the 20th of July. He added that the spread of this insect in Upper Egypt was limited by

the intense summer heat, while in lower Egypt the severity of attack varied from year to year in different localities.

The cotton leafworm annual generations in Egypt were determined by Bishara (1934), using Andres-Maire's bait traps at Giza for catching moths. He concluded that under natural field conditions there were more or less seven distinct broods a year, four of which occurred on berseem, with the maximum flights about October 10th, November 20th, March 5th, and May 5th. After these four broods, comes the June brood, which is, by far, the biggest and most important one. The maximum flight of moths during this brood was about the 3rd week of June. The next brood overlapped a little with the former, but the maximum number of moths occurred about the third or the fourth week of July. The seventh brood of late August and September was usually small.

Harvey and Palm (1935) stated that light traps were quite helpful in studying the periods and habits of flight in insects, and in determining the effects of weather conditions on the flight.

Frost (1952) reported that the insect light traps are valuable tools for determining the presence of certain

nocturnal insects and for obtaining their population-levels.

Hassanein (1956) mentioned that, in Monoufia Province, cotton leafworm moths were captured in all months of the year and there appeared to be five generations annually. The peak of maximum abundance was during June and July.

Hosny & Khattab (1960), using U V light traps in Giza, determined the insect's 7 annual broods as follows: the 1st between early April and mid-May, the 2nd from early June to early July, the 3rd between mid-July and mid-August, the 4th extended between mid-August and about the 3rd week of September, the 5th from late September to about the end of October, the 6th from early November to early January and the 7th from mid-January to mid-march.

Nasr (1961) studied the seasonal abundance and the fluctuations in the population of the cotton leafworm moths in Egypt. He reported that low populations of larvae and pupae were found in berseem fields from December to May and this coincided with the records of moth catches in a U V light trap during the same period.

Abul-Nasr et al. (1974 b) using moth catches in light traps studied the seasonal fluctuations of moths

throughout three cotton seasons (1964-1966) in Sakha and Sids, and during two seasons (1964-1965) in Giza. In the three regions, moth-fluctuations of variable sizes occurred within each cotton season. Variations existed among the size of the broods of one season, as well as among the corresponding broods of the successive seasons in the different regions. Regardless of the seasonal or regional differences, three moth broods occurred from early May to mid-July, mid-June to mid-August and early August to late September. Peaks of such broods took place around mid-June, late July and early September, respectively. They added that, the moth population was markedly lower in Sids than in Sakha and Giza.

Wissa (1978) using a U V light trap in Matay, stated that the annual numbers of captured moths suggested the existence of 6-7 broods of moths, 1-2 in the spring, three in the summer and two in the autumn and winter. He added that the sixth brood, occurring about October, is predominantly the largest among all six or seven annual broods of moths. This author also revealed that a significantly negative correlation was obtained between the total number of captured moths and each of the mean temperature and the male ratio within the catch. He added

that the daily mean relative humidity had no apparent effect on the male ratio in the catch.

The role of light trapes as means of control for the moths of the cotton leafworm, Spodoptera littoralis (Boisd.)

Several workers have used U V light traps as a tool for determining the seasonal abundance of many insect species. Published information, however, regarding the role of these traps in suppressing the infestation of S. littoralis are rather scarce.

Williams (1939) analysed four-years captures of insects in a light trap. He stated that there is practically no evidence that the trap reduces the population of Lepidoptera.

Khattab (1965) on the other hand, reported that U V light traps were successful in trapping the males as well as virgin and gravid females of Laphygma exigua. The largest group of females attracted by the light traps constituted the virgin and the gravid pre-ovipositing females. He concluded that the ultra-violet light traps are suitable means of reducing Laphygma exigua population, providing they are located at suitable distances (densities) in the field.

Salem and Amin (1976) observed that 26% of the total dissected A. ipsilon female moths were mated but did not lay eggs before being captured in the light traps, whereas 34% were unmated. They concluded that these two types of moths (forming 60% of the total) represented the potential value of light traps as a means of suppressing the infestation of this insect pest.

Khalifa and Salem (1976) concluded that the percentage of mated S. littoralis females which came to the light traps before laying any egg-masses was 28.6% plus 13.4% unmated females. The light traps, therefore, were responsible for 42.0% reduction in the population density of the cotton leafworm.

El-Deeb (1977) showed that 8.6% of the total dissected females of S. littoralis moths captured in the light traps were virgin females, while 23.1% came to the traps without laying eggs. He suggested that light traps could, therefore, help in reducing the population of the insect in the fields by almost one third and, hence, may be considered as a means of control.

According to data incorporated in a 1978 report by the Academy of Scientific Research and Technology,