BIOLOGICAL AND ECOLOGICAL STUDIES OF THE COTTON LEAFWORM, *SPODOPTERA LITTORALIS* (BOISD.) AND EXTENT OF ITS DAMAGE ON SOME VEGETABLE CROPS

A THESIS PRESENTED FOR THE

Ph.D. DEGREE

By

SAFWAT AZMI DOSS

B.Sc., M.Sc.

Entomologist - Institute of Plant Protection Research,

Agricultural Research Centre

Ministry of Agriculture

Department of Entomology

Faculty of Science

Ain-Shams University

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THESIS EXAMINATION COMMITTEE

NAME	TITLE	SIGNATURE
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.....	.....	.....
.....	.....	.....

BIOGRAPHY

Date and Place of Birth	:	13-11-1936, Assiut.
Date of Graduation	:	June, 1961.
Degrees Awarded	:	B.Sc. - 1961 (Entomology-Biochemistry)
		M.Sc. - 1968 (Entomology)
Occupation	:	Entomologist-Institute of Plant Protection Research, Agricultural Research Centre, Ministry of Agriculture.
Date of Registration For Ph.D. Degree	:	February, 1969.

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INTRODUCTION

Cotton and vegetables are economically considered the most important crops, with which about half of the A.R.E. area is annually cultivated. Various vegetable varieties are planted in Egypt due to the suitable weather prevailing all the year round. Vegetable crops are produced as food for local consumption as well as for exportation. Many crops in A.R.E. especially cotton and vegetables are severely attacked by the cotton leafworm, Spodoptera littoralis (Boisd.). In spite of the great extent of damage this pest causes to vegetable crops, little attention was given to its biology, behaviour as well as to the extent of damage it causes to vegetable crops.

Data on the quantitative study of the consumption index, coefficient of digestibility and the extent of damage on some vegetable crops for S. littoralis are fragmentary. Correlations between these information and the effect of host plants on some biological aspects of this pest seem to be incomplete.

For this reason, the present work was mainly devoted to study the effect of food plants on some biological

aspects of the cotton leafworm. Special reference was made to the consumption index and utilization of the food plants by this insect. Chemical detailed study was carried out on the fat, protein, carbohydrate and ash contents of sixth instar larvae and pupae of S. littoralis. Chemical analysis of green leaves of the tested plants was also conducted. Moreover the extent of damage caused by this insect to some vegetable crops was estimated.

AIM OF PRESENT STUDY

The present study aims at investigating the following points:

(1) The effect of some food plants on some biological aspects of S. littoralis.

(2) Effect of host plants on the consumption index and coefficient of digestibility of different instar larvae.

(3) Effect of type of food plants on chemical constituents of S. littoralis.

(4) The relationship between the chemical constituents of the tested host plants and S. littoralis stages.

(5) Estimation of the extent of damage caused by S. littoralis to some vegetable crops under field conditions.

II. LITERATURE REVIEW

Spodoptera littoralis (Boisd.), previously known as Prodenia litura F., has attracted the attention of many workers in Egypt, due to its major economic importance as a pest of various field and vegetable crops. The species found in Asia, previously known also as Prodenia litura F. is now called Spodoptera litura (F.). The latter species is not found in Egypt (Hafez and Hassan, 1969).

(1) Effect of different host plants on some biological aspects:

Several authors have dealt with this subject in Egypt and gave valuable information.

Larval duration: Moussa et al. (1960) found that the shortest period of larval stage (about 12.8 days) was obtained when the larvae were fed upon leaves of castor oil plant and berseem. On the other hand, the longest period for larval development (16.8 days) resulted when larvae were offered cotton leaves.

Khalil (1965) mentioned that the shortest larval period occurred in the lots reared on cowpea and sweet potato,

while the longest period was obtained when the larval diet was cotton and grape vine leaves.

Nasr and Ibrahim (1965) found that feeding on cotton flowers shortened the life cycle, while the duration was much prolonged when larvae were offered leaves of the same plant.

Badr (1967) recorded the shortest larval period when the diet was sweet potato and castor oil, while the longest was in case of grape vine leaves.

El Rafi (1970) mentioned that the longest larval stage was obtained when the larvae were fed upon leaves of Jew's mallow. The shortest period was exhibited in case of sugar-beet. Intermediate means, however, were obtained with Menoufi and Ashmouni cotton, sweet potato and castor oil.

Salama et al. (1971) recorded the shortest larval duration in case of castor oil followed by those reared on sesban and pepper. The longest larval duration was obtained in case of sweet potato.

Pupal duration: Moussa et al. (1960) found that the shortest pupal duration (6.7 days) occurred when the larvae were fed on okra. In case of larvae reared on cotton and

cowpea the pupal duration reached 7.2 and 7.7 days, respectively.

Khalil (1965) mentioned that the shortest pupal period was obtained when the larval diet was alfalfa, followed by grape vine, cotton, sweet potato and cowpea leaves.

Badr (1967) recorded the shortest duration for pupae raised from sweet potato, followed by cotton and grape vine.

El Rafi (1970) mentioned that the pupal period occupied 6-7 days when the larvae were reared on Jew's mallow, sugar-beet, cotton, sweet potato and castor oil leaves.

Salama et al. (1971) found no significant difference as regards the pupal duration when the larvae were fed on several host plants.

Pupal weight: Moussa et al. (1960) found that larvae fed on okra produced the heaviest pupae, while those reared on cowpea, cotton and castor oil gave lighter ones.

Khalil (1965) mentioned that the maximum weight was obtained when larvae were raised on cotton leaves and the lowest when larvae were fed on grape vine leaves.

Nasr and Ibrahim (1965) recorded the heaviest pupal

weight when the larval diet was cotton flowers, and the lightest weight when larvae were fed on cotton leaves.

Salem (1966) mentioned that larvae fed on castor oil leaves produced the heaviest pupae followed by those fed on cotton, cowpea and clover.

Badr (1967) found that larvae feeding on cotton and castor oil leaves gave the heaviest pupae, compared to those reared on cotton seedlings, sweet potato, grape vine, tomato, citrus, corn leaves and pepper fruits.

El Rafi (1970) obtained the maximum pupal weight when the larval diet was castor oil and the minimum in case of sweet potato.

Salama et al. (1971) mentioned that castor oil leaves produced the heaviest pupae, while the lightest ones were obtained when the larvae were raised on sweet potato and pepper.

Longevity of moths: Moussa et al. (1960) found that moths raised from larvae fed on okra and castor oil leaves showed the longest life span. Moths of shortest longevity were those produced from cotton and clover.

Khalil (1965) recorded the highest value of moth longevity in those raised from cotton followed by alfalfa, grape vine, cowpea and sweet potato.

Badr (1967) mentioned that tomato leaves showed the greatest adult longevity, being highly significantly different from both cotton and castor oil leaves, and significantly different from cotton seedlings and sweet potato. Castor oil leaves resulted in the shortest adult longevity.

El Rafi (1970) found that adults produced from larvae fed on castor oil or cotton lived longer than those fed on sweet potato, soyabean, sugar-beet and Jew's mallow.

Fecundity: Moths produced from larvae fed on okra laid the highest number of eggs, which differed significantly from those raised on cotton, castor oil and clover (Moussa et al., 1960).

Khalil (1965) found that larvae fed on cotton, cowpea and alfalfa produced moths of the highest fecundity. The lewest being from those fed on grape vine.

Nasr and Ibrahim (1965) mentioned that the highest