

## COMPARATIVE STUDY FOR SOME BIOLOGICAL ASPECTS OF THE EGYPTIAN COTTON LEAFWORM *Spodoptera littoralis*(BOISD) REARED ON CASTOR BEAN LEAVES AND ARTIFICIAL DIETS.

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### ABSTRACT

Laboratory mass rearing of *Spodoptera littoralis* (Boisd) on two artificial diets (Kidney beans diet and broad beans diet) was carried out for five successive generations in order to compare some of their biological aspects with those reared on fresh castor bean leaves.

Results indicated that, The mean weight of the last larval instars, the percentages of larvae pupation, the mean weight of pupae, the percentages of adult emergence and the number of eggs laid by a female moth were higher for the insects reared on artificial diets than those reared on fresh castor leaves. These difference in the biological aspects were more pronounced at the 5<sup>th</sup> generation. for the two artificial diets examined, broad bean diet proved to be the preferable diet for rearing *S. littoralis*.

### INTRODUCTION

The cotton leafworm *Spodoptera littoralis* (Boisd) is a serious pest on cotton and on a wide variety of several other economic plants laboratory rearing of this insect on an artificial diet seems necessary for the establishment of standard laboratory strains laboratory reared *S.littoralis* on synthetic diets is particularly useful for toxicological investigations, since insects of uniform size and age may be produced in relatively great numbers under controlled conditions. some modifications of a diet described by have (Shorey and Hale 1965; Dimetry 1970; Howell 1970; EL-Menshawy and Zeid 1973; Isa and Khadr 1973; Loutfy 1973; Isa and Khadr 1974; EL-Gundy *et al* 1979; Abdin 1979; Burton et al 1984; Kumara and Ballal 1991; EL-Metwally *et. al.* 1997; and Abdalla, 2001) have been used to rear the cotton leaf worm in the laboratory.

The purpose of the present work is to study the possibility of rearing the cotton leafworm on two different artificial diets in order to compare some of their biological aspects with those reared on fresh castor bean leaves.

### MATERIALS AND METHODS

*Spodoptera Littoralis* egg masses were collected from cotton fields at Kafr El-Sheikh Governorate during the growing season 2003. The strain was reared on castor bean leaves under constant temperature of 27C and 65±5% R.H. The experimental insects were divided into two groups. The first group was fed on castor bean leaves, while the second was reared on artificial diet.

Couples of male and female moth emerging from insects reared on different artificial diets were put each in 1 lb glass jar provided with *Nerium oleander* leaves as oviposition site and pieces of cotton wetted with 10% sugar solution for feeding. Egg masses obtained were left until hatching. the diet was modified from that described by Shorey and Hale(1965) as shown in Table (1)Two artificial diets were used in the present study, diet K based on kidney beans and diet B based on broad beans.

**Table (1): Composition of artificial diets used for rearing *S. littoralis*.**

Contents (gm)	Diet K	Diet B
Agar	30g	30g
Yeast	15g	13g
Kidney bean	500 g	-
Broad bean	-	500g
Ascorbic acid	4.5g	4.5g
M.paraben	15g	15g
Sorbic acid	6g	5g
Water for dissolving agar	1L	1L
Formaldehyde ( 40 % )	6cm <sup>3</sup>	10cm <sup>3</sup>
Water for blending	3 L	3 L

Preparation of diet was made according to Isa and Khadr (1974). Bacto agars were dissolved by boiling in a water bath for 10 to 20 minutes. Weighed amounts of all dry ingredients were added and the mixture was stirred with an electric stirrer for five minutes. The antibiotic solutions were pipetted into the mixture with stirring .The diet media was then allowed to cool for 3 to 5 hours.

Larvae were reared individually in glass vials 1×3 inches. About 5gm of diet were put in each vial as food and shelter for the entire larval life. In one experiment groups of larvae of different numbers were reared in 1lb.glass jar and were then transferred individually into glass vials on fresh media. Amounts of diet put in each jar differed according to the number of insects to be reared and about 2 gm of diet were assigned for each larva. Newly hatched larvae were introduced into rearing vials or jars using a soft brush. Vials were then plugged with cotton to prevent drought of the diet.

Rearing was done in complete darkness and at a constant temperature of 27C. A group of larvae was reared individually in glass vials on castor bean leaves for comparison. Pupae obtained were placed in glass vials plugged with pieces of moist cotton until moth emergence.

Biological data were recorded on larval weight, percent pupation, pupal weight, The percentage of adult emergence, average number of eggs /female.

Analysis of variance was performed on the data obtained to determine whether significant differences had resulted from different treatments.DUNCANS multiple range test was used to determine which means differed significantly from others. In order to prevent contradictions between this multiple range test and the F-test, the multiple range test was used only when the F-test was significant.

## RESULTS AND DISCUSSION

The Egyptian cotton leafworm was reared on diet K and diet B for five generations results were compared with those resulting from rearing on castor bean leaves for the some number of generations.

The effect of artificial diets on some biological aspects of *S. littoralis*. is presented in Table (2). The results show that the mean weight of the last larval instar reared on the artificial diet was significantly higher than that obtained on castor bean leaves. for example the mean weights were 176, 180, 188, 192 and 195 mg on diet K, and 101, 156, 201, 251 and 303mg on diet B compared 106, 115, 125, 137 and 141mg on castor bean leaves. This difference in larval weight, was statistically significant .

The percentages of larval pupation were higher on diet B than on diet K, and castor bean leaves, The larval diet seemed to have conspicuous effect on the percentage of the pupal weight. For example, the percentages of larval pupation were 80, 78, 68,85and 88% in case of larvae developing from diet K, and 90, 88, 88, 97 And 98% in case of larvae fed on diet B, while were 76, 71, 56, 72 and 80% for larvae fed on castor bean leaves. Similar results were obtained by Isa and Khadr (1974).

**Table (2): Effect of diets on some biological aspects of *S. Littoralis* reared for five successive generations at 27°C and 65 ± 5 R.H.**

Generation	Diet	M. weight of Larvae (mg)	% Larvae pupation	M.weight of Pupae (mg)	% Adult emergency	No. of egg/♀
G1	C	106 b	76 a	260 a	73 b	700 b
	K	176 a	80 a	283 a	87 ab	1035 a
	B	101 b	90 a	293 a	93 a	1145 a
F-Value		192.988	2.907	3.150	4.998	6.140
P-Value		0.000 **	0.131 N@	0.166 N	0.053 *	0.035 *
G2	C	115 b	71 b	276	70 b	1000 a
	K	180 a	78 ab	289 ab	85 a	1020 a
	B	156 ab	88 a	317 a	91 a	1140 a
F-Value		7.590	6.157	5.424	8.484	1.731
P-Value		0.023 *	0.035 *	0.045 *	0.018 **	0.254 N
G3	C	125 b	56 c	289 b	62 b	800 b
	K	188 a	68 b	305 b	78 ab	1000 ab
	B	201 a	88 a	348 a	89 a	1120 a
F-Value		88.518	42.056	29.925	7.213	5.212
P-Value		0.000 **	0.000 **	0.001 **	0.025 *	0.049 *
G4	C	137 c	72 b	295 b	87 b	950 b
	K	192 b	85 ab	273 b	80 c	1130 a
	B	251 a	97 a	362 a	100 a	1170 a
F-Value		23.861	8.430	26.386	29.404	10.131
P-Value		0.001 **	0.018 **	0.001 **	0.001 **	0.012**
G5	C	141 c	80 c	281 b	85 b	1000 b
	K	195 b	88 b	274 b	85 a	1025 b
	B	303 a	98 a	364 a	100 a	1250 a
F-Value		108.191	20.333	96.763	7.500	39.460
P-Value		0.000 **	0.002 **	0.000 **	0.023 *	0.000**

\* Significant

\*\* Highly significant

@N non-significant

The mean weights of pupae from larvae reared on natural and artificial diets were 283, 289, 305, 273 and 274 mg for diet K; 293, 317, 348, 362 and 364 mg for diet B and 260, 276, 289, 295 and 281 for castor bean leaves. The mean weight of the last larval instars reared on the artificial diet was significantly higher than that reared on castor bean leaves. This is in agreement with the results obtained by El-Gundy *et al* (1979)

The percentages of adult emergence were higher in diet B than in diet K and castor bean leaves. The percentage of adult emergence were 87, 85, 78, 80, and 85% in case of larvae fed on diet K; 93, 91, 89, 100 and 100% in case of larvae fed on diet B and 73, 70, 62, 87 and 85% for larvae fed on castor bean leaves. These differences in percentage of adult emergence were statistically significant. Similar results were obtained by Dimetry (1970)

The female moths emerging from larvae fed on diet B laid the highest number of eggs, as indicated by 1145, 1140, 1120, 1170 and 1250 egg/female. The lowest egg mean were obtained from moths emerging from larvae fed on castor bean leaves, as revealed by 700, 1000, 800, 950 and 1000 eggs/female. Similar results were obtained by El-Gundy *et al* (1979)

Howell (1970) reported that development on an artificial diet is considered normal if the growth rate, weight of the various stages, longevity and reproductive rate are parallel to those of the insect reared on its natural food. AbdAlla. (2001) reared *S. littoralis*, on broad bean, kidney bean, and corn leaf powder. The broad bean diet was the most suitable for rearing *S. littoralis* followed by corn leaf powder then kidney bean.

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مقارنة بعض الصفات البيولوجية لدودة ورق القطن المرياة على بيئة صناعية و ورق الخروع

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يهدف هذا البحث إلى تربية دودة ورق القطن فى المعمل على اثنان من البيئات الصناعية وكذلك على غذاء طازج من ورق الخروع بغرض إنتاج كميات كبيرة منها وذلك تحت درجة حرارة 27م ورطوبة نسبية 65±0

أمكن تربية هذه الحشرة على البيئة الصناعية لمدة خمسة أجيال متتالية وكانت النتائج كمايلى.

وجد من خلال عملية التربية أن وزن اليرقات فى العمر الأخير يختلف من جيل إلى جيل آخر حيث كانت المعنوية عالية.على اليرقات المغذاة على بيئة الفول ، عكس الفاصوليا والخروع . وكانت النسبة المنوبة للتعدير عالية فى الجيل الأخير لليرقات المراباة على الفول، الفاصوليا،الخروع على التوالي.بينما كانت نسبة خروج الفراشات لليرقات المراباة على الفول عالية عكس بيئة الفاصوليا والخروع . أما متوسط أوزان العذراء فى الجيل الأخير فقد كانت عالية على بيئة الفول مقارنة بيئة الفاصوليا والخروع.ولوحظ أن الفراشات الناتجة من تربية اليرقات على بيئة الفول فى جميع الأجيال كانت طبيعية وأمكنها التزاوج ووضع بيض مخصب.وهذه النتائج تشير إلى أن دودة ورق القطن يفضل تربيتها على بيئة الفول.