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BIOLOICAL ASPECTS AND LIFE TABLE PARAMETERS OF THE COTTON LEAF–WORM, SPODOPTERA LITTORALIS (BOISD.), ON DIFFERENT VEGETABLE HOST PLANTS.

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ABSTRACT

The various aspects of the biology of the cotton leaf –worm ,Spodoptera littoralis (Boisd.) ((Lepidoptera: Noctuidae)where it fed on four different vegetable plants okra , squash,cabbage and green beans to study the effect of these host plants on the developmental stages, fecundity and life table parameters under laboratory conditions of (25±1°C) and 75±5%R.H.Obtanied results and statistical analysis cleared that the developmental stages, fecundity and life table parameters affected by different hosts whereas the life cycle(39.6±1.46±2.3, 34±2.07 and35.8±4.08) ,oviposition period (5.4±1.1, 9.2 ±1.3, 9.4±1.14&9.6±1.5) and an averages numbers of eggs (660,448,860&391)green beans, okra, cabbage and squash respectively. okra and squash provide the shortest generation time (G) and longevity as well as greatest fecundity (F)which increased (exp_{rm})t_o. okra and squash was the most suitable tested host, and cabbage was the least suitable one green beans was of intermediate suitability.

INTRODUCTION

In Egypt, the cotton leaf –worm Spodoptera littoralis (Boisd.) (Lepidoptera: Noctuidae), is a serious economic pest. Though polyphagous on a wide variety of plants ,S. littoralis mainly attacks cotton in summer and Egyptian clover between plant to another, the pest frequently attacks vegetable plantations as temporary alternant hosts, and may cause severe damage to them Younis(1992)and Naglaa (2001). Field observations refer that the susceptibility of the alternate vegetable plants to infestation varies according to their suitability for the pest Abdel-Alim (2005) ; Tuca et al. (2012) and Douan et al. (2013). The present work aims, therefore, to determine the relative suitability of four vegetable plants, namely okra, and squash, cabbage. and green beans for the various aspects of the biology of S. littoralis. Such knowledge may help better planning for the integrated pest management of the pest on both main and alternate host plants.

MATERIALS AND METHODS

Present investigations on the various aspects of the biology of S. littoralis were carried out under laboratory conditions of (25±1°C) and (75±5%R.H.) insect material was obtained from a stock–culture,leaves under laboratory conditions of 25±1°C. and (75±5% R.H.), following the technique described by Abd El–whab (1990).considered host plants were leaves of

okra, Hipiscus escalentus L., squash Tucrubit spp., cabbage Brasica oleracae L. and green beans, pisum sativum L.
A group of 100 newly –hatched larvae was initially devoted for each tested host plant. Every larvae was individually introduced into a Petri –dish, containing 2-3 fresh leaflets of the specific host. Dishes were examined daily, and larval food renewed, until pupation. Upon adult emergence, pair of moths (one female and one male) was introduced into oviposition cages. Cages examined daily until moths died. Data were collected daily, and compared statistically according to the analysis of variance. life table parameters were calculated according to Bitch (1984) using the BASTC computer program of Abou Setta *et al* (1986).

RESULTS

Data arranged in Table (1) showed the various aspects of the biology of S. littoralis on four different vegetable host plants at constant laboratory conditions of 25±1°C and 75±5% R.H. Incubation period extended for 4-5days, with nearly equal means 4.2days on green beans,4.2 days on cabbage,4.4days on okra and 4.2days on squash, with insignificant. differences between incubation period on different host plants.

The hatchability percentage were was the highest on okra (99.3%) followed by on green beans(93.9%); on cabbage (93.5%), and on squash (91.7%), thus emphasizing no influence of host plant on hatchability.

As shown in Table(1) the larval duration were the shortest 20.4±0.4 on okra followed by 23.41.±1.1, 24.6±1.5, and 22.6±1.5days on squash ,green beans and cabbage respectively.

Statistically analysis revealed that a significantly difference between the difference, between the different host plant, were recorded.

As cleared in Table(1) pupae period ranged from 9-17 days ,with means of (17.2±0.83,12.2±1.4,9.4±1.14 and 9.2±0.8days)on cabbage, green beans, squash and okra leaves respectively. pupae durations on squash and okra leaves were insignificantly different from each other ,but significantly different from that of cabbage and green beans.

As shown in Table(1)adult longevity ranged from12-17days, longevity means were(13.6±2.07,12±2.3,16.8±2.28 and 17.4±1.6days)for adult moths emerged from larvae reared on green beans, cabbage, okra and sqush respectively. Statically analysis indicated that the longevity of adult moths reared as larvae, on green beans was insignificantly different from that reared on cabbage, but significantly different from that reared on okra and squash .Also the longevity of adult moths reared as larvae, on okra and squash had insignificantly differehces.

Table (1):Effect of different vegetable host plants on the developmental stages and number of deposited eggs of S. littoralis under laboratory conditions at 25 ±1 °C and 70±5 %R.H:

Temperature	Developmental stage (days)										No. Egg	Hatching%
	Incubation period	Larvae	Pupal	Life cycle	Pre Ovi.	Generation	Ovi.	Post Ovi.	Longevity	Life span		
green beans, Pisum sativum	4.0±0.83b	23.4±1.14a	12.2±0.48b	39.6±1.34b	6±0.58a	45.6±1.64a	5.4±0.14b	2.2±0.44ab	13.6±2.07b	53.2±2.16b	660±13.6b	93.9
okra, Hipiscusescalentus	4.4±1.14b	20.4±0.4b	9.2±0.83b	34±2.07c	4.4±0.54b	38.4±2.07b	9.2±0.30a	3.2±0.30a	16.8±2.28ab	50.8±3.60c	443±12.4c	99.3
Cabbage,	4.2±0.83b	24.6±0.51a	17.2±0.83a	46±2.38a	3.2±0.83c	49.2±2.38a	6.4±0.14b	2.4±0.14a	12±2.34b	58±3.53a	860±9.35a	93.5
squash, Tucurbita spp.	3.8±0.83b	22.6±0.51ab	9.4±0.14b	35.8±4.08c	5.4±0.14ab	41.2±4.09b	9.6±0.51a	2.4±0.14ab	17.4±1.62a	53.2±5.07b	391.2±13.5c	91.7
L.S.D at 0.05	1.03	.1.9	3.05	4.55	3.42	5.02	3.25	1.56	1.89	3.94	47.59	1.35

As shown in Table(1) the pos-oviposition period, 2.3-3.2 days, the means were 2.2±0.44,2.4±1.14, 2.4±1.14 and 3.2±1.3days on green beans, cabbage, squash and okra.such means indicated that the pre-oviposition period was longer for females reared on green beans and squash, but shortest for female reared on cabbage and okra. the longest ovi-position period occurred for moths reared on squash and okra, while the female moths reared on green beans and cabbage has the shortest oviposition period; post-oviposition period means were similar for moths reared on green beans, cabbage and squash, but about one day shorter than the corresponding mean for moths reared on okra.

As shown in Table(1)egg-laying capacity ranged from 390-860eggs/female, with means of 660±13.6,860±9.3,443±12.4 and391±13.5 eggs/female for the moths emerged from larvae on green beans, cabbage, okra and squash, respectively. Results of the present study indicated that rearing the larvae of S. littoralis on the leaves of squash and okra reduced the egg laying capacity of resulting female moths , as compared to those reared on green beans and cabbage. Statistically speaking, egg- laying capacity means on the four tested vegetable host plants were significantly different from each other.

The life span of S. littoralis was significantly differed according to the host plant , Table (1) and Also, the same Tables showed that the highest recorded life span period was noticed when the female individuals was reared on cabbage (58.2±3.53 days.) The followed by 50.8±3.6, 53.2±2.2 and 52.2±5.07day on okra, squash, and green beans leaves respectively. Statistically analysis revealed that a significantly difference between the difference, between the different host plant, were recorded.

Our results are in agreement with those of Goh *et al* (1991); Younis(1992); Mairy et al. (1999) added that the developmental duration of all developmental stages was equal as temperature degrees.

Effect of some different vegetable plant leaves on life table parameters of the cotton leaf worm Spodoptera littoralis (Boisd) at 25±1°C and 70% R.H.

Data in Table (2) indicated that the net reproduction rate (R_0) was 47.65, 38.79, 24.50 and 20.51 with a single generation on leaves of cabbage, green beans, okra and squash respectively at 25±1°C. The duration of one generation of cotton leaf worm as shown in the same table lasted about 54.98, 52.35, 46.30 and 50.35 days on leaves of cabbage, green beans, okra and squash respectively at 25°C.

The values of intrinsic rate of increase (r_m) were higher on okra followed by that on squash, green beans and cabbage respectively. These values indicated that the okra leaves is the best host for S. littoralis at 25±°C. On the other hand, when the values of (r_m) were converted to finite rate of increase (λ) by the procedure outlined, it is clear that the population of S. littoralis had a capacity to multiply about 1.32, 1.33, 1.37 and 1.33 times per female on cabbage, green beans, okra and squash leaves respectively at 25°C. Similar conclusion was recorded by El-Saadany et al. (2000), that feeding larvae on tomato fruits markedly increased the larval longevity in comparison with those fed on potato leaves.

Age-specific fecundity life table results obviously indicated that the highest age-specific fecundity was obtained when cotton leaf-worm larvae fed on okra and squash leaves. The highest intrinsic rate of increase (r_m) and the finite rate of increase were recorded. These rates were reduced when the larvae fed on green beans leaves and cabbage. Similar results were obtained by Srinivasaperumal *et al* (1992), Sood *et al* (1995) Sekhar *et al* (1995), El-Saadany et al. (2000),Lin *et al* (2007) and Lanzoni *et al* (2012).The lowest reproductive rate (R_0) and intrinsic rate of increase (r_m) were recorded on cabbage Similar conclusion was recorded by Sekhar *et al* (1995) and Mourad (2003) demonstrated that high rearing temperature caused male sterility. As a conclusion, the calculated biological parameters (R_0, GT, r_m and λ) indicate that, hosts of okra and squash leaves seem to be more favorable host for development and multiplication of the cotton leaf- worm, meanwhile, green beans and cabbage seem to be the least of favorable hosts. In this study, the calculated biological parameters indicate that okra leaves seem to be the favorable host for the development and reproduction of this pest.

Table (2): Effect of some different vegetable plant leaves on life table parameters of the cotton leaf worm Spodoptera littoralis (Boisd.) at 25±1 °C and 70 % R.H.

Parameters	Hosts			
	cabbage	green beans	okra	squash
Net reproduction rate (R_o)	47.65	38.79	24.50	20.51
Mean -generation time (T)	54.98	52.35	46.30	50.35
Intrinsic rate of increase(r_m)	0.27	0.28	0.317	0.28
Finite rate of increase (exp r_m)	1.32	1.33	1.37	1.33
Fraction of eggs reaching maturity	93.5	95.9	92.4	93.7

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الخصائص البيولوجية و قياس جداول الحياة لدودة ورق القطن Spodoptera littoralis (Boisd.)(Lepidoptera:Noctuidae) على نباتات خضر مختلفة.

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أجريت دراسات بيولوجية لدودة ورق القطن S. littoralis التابعة لعائلة Noctuidae من رتبة حرشيفية الاحنحة على أربع محاصيل خضر مختلفة هى الباميا،الكوسة ،الكرنب والبسلة تحت ظروف معملية ثابتة مقدارها ٢٥ م

أوضحت الدراسات البيولوجية أن التطور والخصوبة لدودة ورق القطن i تأثرت بالأنواع المختلفة من الخضر ودرجة الحرارة مقدارها ٢٥ م.

حيث استغرق الطور اليرقى (٢٣.٤، ٢٠.٢ ، ٢٤.٦ و ٢٢.٦ يوم عند التغذية على البسلة، الكوسة ،الكرنب و الباميا على الترتيب. كما أن فترة وضع البيض استغرقت (٥.٤) و (٩.٢) و (٦.٤)(٩.٦) يوما عند ٢٥ °م على التغذية سابق الذكر وكان متوسط عدد البيض للأنثى على التغذية سابق الذكر (٦٦٠) و (٤٤٣) و (٨٦٠) و(٣٩١.٢)على نفس النمط ، حيث أوضحت النتائج الباميا هي أفضل غذاء لدودة ورق القطن لقصر مراحل التطور و أفضل ارتفاع معدل الخصوبة الكرنب، وأوضحت الدراسة أن أفضل أنواع الغذاء لتطور دودة ورق القطن هى الباميا و البسلة بالمقارنة عند التغذية على الكرنب و الكوسة.