HOST PREFERENCE AND LIFE-TABLE PARAMETERS OF BLACK CUTWORM, *AGROTIS IPSILON* (HUFN) [LEPIDOPTERA: NOCTUIDAE]

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ABSTRACT

Population growth statistics and age-specific life table parameters were estimated for the black cutworm, BCW, *Agrotis ipsilon* (Hufn), on nine host plants,(four of tested host plants are field crops and five are weeds). These are as follows: 1) Maize, *Zea mays*, 2) Faba beans, *Vicia faba*, 3) Cotton, *Gossypium barbadense,* 4) Egyptian clover, *Ttifolium alexandrinum,* 5) Castor-oil beans, *Ricinus communis* , 6) Bindweed, *Convolvulus arvensisi*, 7) Gargir, *Sativa mill* , 8) Cheeseweed, *Malva parviflora,* and 9) Greater ammi, *Ammi majus.* Results indicated that the host preference to BCW could be arranged as follows: field bindweed, clover, cotton, castor-oil beans, maize, gargir, greater ammi, cheeseweed, and faba beans.

INTRODUCTION

The black cutworm, BCW, *Agrotis ipsilon* (Hufn), is a major but sporadic pest of seedlings many host plants. it is considered as one of the most important insect pests of corn, *Zea mays* (L.) in the United States Midwest and in lower region in Egypt. Larvae are leaf feeders until they become half grown (ca. fourth instar), then they cause serious injury by serving young corn seedlings. Corn is generally most susceptible to cutting from the time it emerges from soil until it reaches the four-leaf growth stage (Archer and Musick 1977). In southeastern United States, BCW occurs in cotton and causes severe damage when planting cotton after legume cover crops or into heavy weed infestations, damaging populations can occur (Oliver & Chapin 1981, Pfadt 1985). In these case legumes or weeds serve as oviposition sites before planting, and larvae then move onto emergent cotton plants (Gaylor et al. 1984). Host plant's preferences are still very important guide in integrated pest management programs (IPM). Many investigators studied the effect of different host plants on biological aspects of BCW (Ragab, 1967, Salem et al. 1982, Abdel-Monsef, 1984).

Careful studies of population growth parameters, host sequence, and population dynamics may reveal a link to exploit as methods of population suppression. Calculating life table is a most common method for measuring parameters in terms of intrinsic attributes of species under non limiting conditions (Birch 1948, and Southwood 1966). Age-specific life tables are used extensively to study the changes in population.

In this study age-specific life table were constructed for BCW reared on nine different host plants; maize, faba beans, clover, cotton, castor-oil beans, bindweed, gargir, cheeseweed, and greater ammi, to estimate the effect of host plants on population growth of BCW, and hence to use it in IPM programs.

MATERIALS AND METHODS

To study the effect of larval dieton different stages of BCW, nine different host plants were used. Five of tested host plants are field crops and the other four are weeds. Field crops are as follows:1) Maize, *Zea mays*, 2) Faba beans, *Vicia faba*, 3) Cotton, *Gossypium barbadense,* 4) Egyptian clover, *Ttifolium alexandrinum,* and 5) Castor-oil beans, *Ricinus communis* , wherease weeds are 6) Bindweed, *Convolvulus arvensisi*, 7) Gargir,*Sativa mill* , 8) Cheeseweed, *Malva parviflora,* and 9) Greater ammi, *Ammi majus.* Under controlled conditions (27 ± 1 °C and 65 ± 5 % R. H.), one hundred newly hatched larvae of BCW were confined individually in plastic tubes (7 X 3.5 cm) with punctured plastic covers. Larvae were provided daily with the required food. Ten pairs of newly emerged moths for each host plant were coupled and fed on 20 % sucrose solution under the above-mentioned constant conditions. One hundred newly deposited eggs from each host were taken to collect data from it. Egg hatchability percentage, and incubation periods were recorded. The newly hatched larvae were reared individually in plastic tubes (7 X 3.5 cm) with punctured plastic covers. The larvae were provided daily with the required food. Larval and pupal duration as well as mortality percentage was recorded daily. One-day old pupae of each host plant were sexed and the sex ratio was determined. The newly emerged moths for each host plant were coupled and fed on 20 % sucrose solution. Females longevity, preoviposition period, oviposition period, and no. of eggs deposited daily per female were recorded daily. Age-specific life table, described by Birch (1948), were derived from the obtained data; net reproductive rate (R_0), finite rate of natural increase (λ), generation time, (T) and intrinsic rate of natural increase (r_m) for BCW fed on each host plant were constructed.

RESULTS AND DISCUSSION

Biological aspects: Data obtained under constant temperature and relative humidity in Table (1) concluded the main aspects of the biology of BCW. Host plants can be arranged according to the percentages of eggs hatchability as follows: faba beans, castor-oil beans, cheeseweed, greater ammi, cotton, clover, maize, and field bindweed. Statistical analysis showed that there are not any significant differences in the incubation period where it ranged from 4.3 (the highest) for faba beans and 3.6 (the lowest) for castor-oil beans. the highest larval duration occurred in faba beans (30.63 days) while the lowest one was detected in clover (23.86 days). The lowest larval mortality happened when larvae fed on maize leaves (12.6%) while it reached to 63.85 % when larvae fed on field bindweed. The highly percentage of pupation was happened one clover (46.67%), while the lowest was in maize (24%). Larvae fed on cotton and castor-oil leaves gave female moths laying an average of 1314.6 and 1156.6 respectively.

Life table parameters: Data in Table (2) reveled the age-specific life table, described by Birch (1948), derived from the obtained data; net reproductive rate (R_0), finite rate of natural increase (λ), generation time, (T) and intrinsic rate of natural increase (r_m) for the uninterested host plants. Careful examination of these

data arranged suitability of host plants to the feeding of BCW according to the R_0 values as follows: clover, cotton, field bindweed, castor-oil beans, maize, gargir, greater ammi, cheeseweed, and faba beans. Age-specific survival and fecundity (lx & mx) for BCW fed tested host plants plotted in (Fig. 1). The differences in the intrinsic rate of increase (r_m) and consequently finite rate of natural increase (λ), generation time (T), among the cohort studied of BCW are due to the differences in host plants effects. The present study revealed that, of BCW, the host preference could be arranged as follows: clover, cotton, field bindweed, castor-oil beans, maize, gargir, greater ammi, cheeseweed, and faba beans. Similar observantions have been recorded by Hutchion and Hogg (1984) on pea aphid population. These results are also in agreement with earlier studies with spotted bollworm on cotton and okra (Ambegaonkar and Bilapate, 1984) and Nanthagopal and Uthamasamy (1989). The implication of this results about the succession of crops should be considered in the development of future IPM programs for BCW in Egypt.

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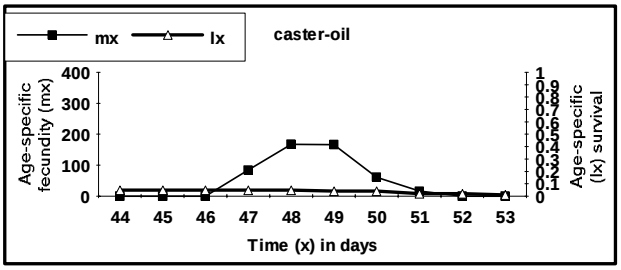
Table (1): Effect of host plants on the biological aspects of BCW

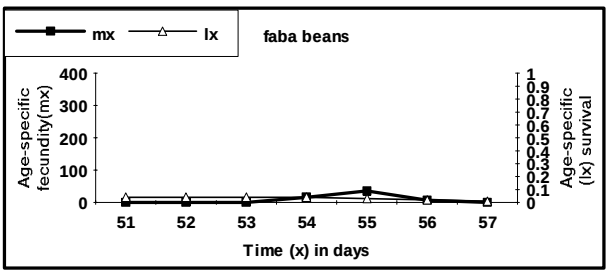
Host	% hatc-abilit y	incuba-tion period (days)	larval duration (days)	pupal duration (days)	% pup ation	female longevity (days)	No. o eggs/ femal
Maize	63	4.1	28.2	12	24	11	162
Faba beans	86	4.3	30.63	13.6	25.8	6.35	236
Cotton	77	3.49	24.45	10.3	33.3	15.95	1314.
Clover	71	3.8	23.86	12.75	46.6	11.95	515.2
Castor oil beans	81	3.06	27.37	11.26	36.6	14.65	1156.
Field bind-	60	4.21	27.75	11.73	32.3	7.5	167

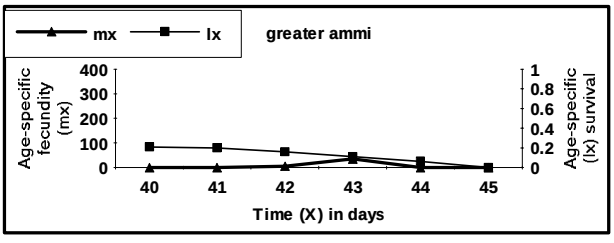
weed							
Gargir	75	3.45	26.04	11.76	37.7	6	168
Cheese weed	80	3.6	24.8	10.08	36.5	7.15	268
Greater ammi	77	3.53	26	8.9	43.5	6.9	101

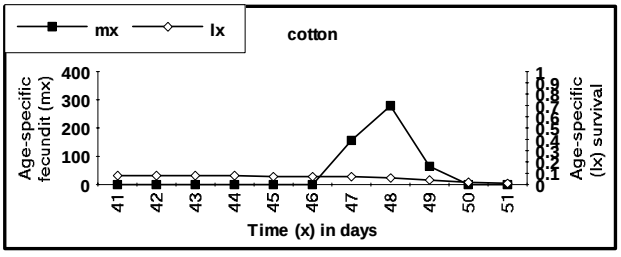
Table (2) Population static's for BCW on different host plants.

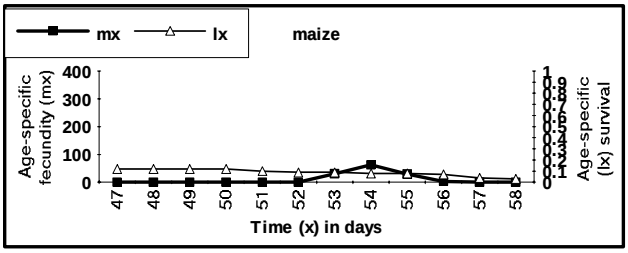
Host plant	R_0	r_m	λ	T
Maize	**10.33**	**0.04828**	**1.045**	**54.49**
Faba beans	**1.857**	**0.01121**	**1.011**	**55.23**
Cotton	**30.229**	**0.0707**	**1.073**	**48.2**
Clover	**31.4**	**0.0706**	**1.073**	**48.77**
Castor-oil	**22.024**	**0.0633**	**1.065**	**48.84**
Field bind weed	**34.25**	**0.06962**	**1.0721**	**50.75**
Gargir	**7.046**	**0.0448**	**1.0458**	**43.55**
Cheese weed	**4.5005**	**0.03638**	**1.0370**	**41.36**
Greater ammi	**5.002**	**0.0371**	**1.0378**	**43.33**

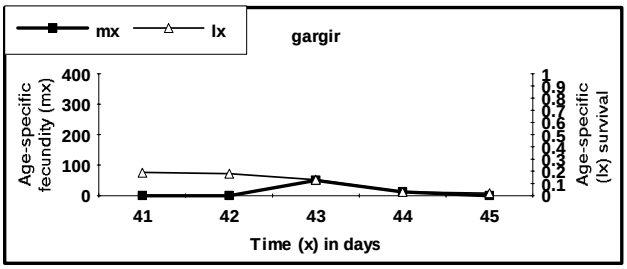


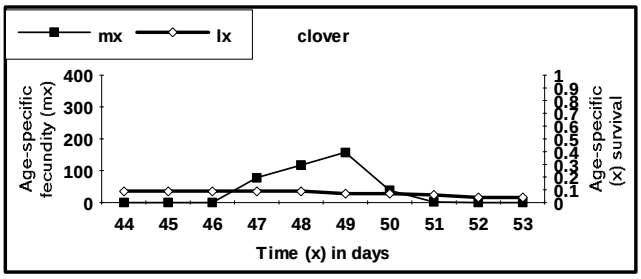


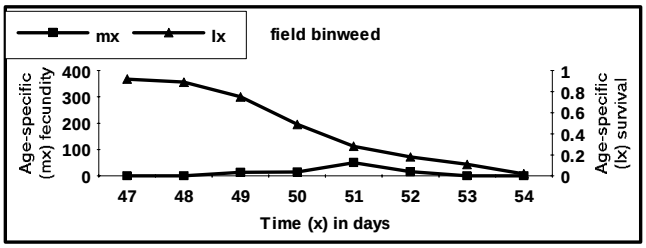












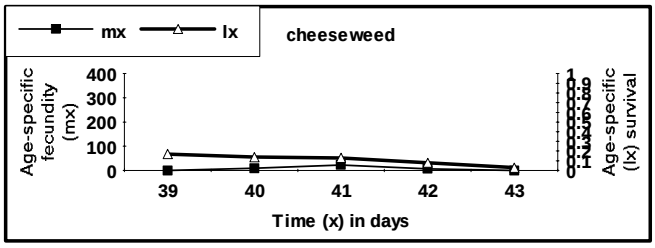


Fig. (1): Age-specific fecundity (mx) and age-specific survival (lx) of BCW on clover, field bindweed, and cheeseweed.