

Consequence of *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae) Morphometrics Reared on Different Cotton Varieties

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Abstract

Morphometric characteristics of cotton armyworm *Spodoptera litura* were studied on cotton varieties CB9, CB10 and SR05. The morphometric parameters of the insect showed that the cotton variety SR05 revealed significantly the highest diameter of egg mass (7.4 ± 0.4 mm). The cotton varieties showed significant effect on the length of different larval instars but the breadth of 3rd and 4th instar were statistically different. The studied cotton varieties as food sources did not affect pupal length and also the length and breadth of adults, but pupal breadth showed significant variation. The highest breadth (6.5 ± 0.6 mm) of pupa was found when the insects were reared on SR05 variety.

Key words: Cotton, morphometrics, *Spodoptera litura*

Introduction

There are 162 insect species cause damage to cotton of which a large group of Lepidopteron insects are major pest (Abou-Elhagag, 1998). Among the Lepidopteron insects, cotton armyworm *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae) is an economically serious pest of cotton, and reported to attack 120 species of host plants (Chari and Patel, 1983; Zhang, 1994; Pogue, 2003). For proper management of any pest, it is utmost necessary to know its biology and morphological characteristics. Host plant characteristics greatly influence on the feeding, life history and morphometrics of herbivores which have been documented in many cases (McIntyre and Gooding, 2000; Agrawal, 2001). In many insects maternal diet influences egg size, offspring quality

and adult size (Rossiter *et al.*, 1993; Jann and Ward, 1999).

Some cotton varieties contain significant levels of tannins that disrupt feeding and growth of chewing insects. The optimal growth of plant feeding insects depends on their ability to acquire essential amino acids from dietary protein (Mattson, 1980; Bernays and Chapman, 1994). Tikkanen *et al.* (2000) reported that insects are able to grow and develop on a variety of host plant species which characteristic effect on larval growth and survival, pupal development, adult emergence, adult size and weight. Cotton plants contain trichomes which are epidermal appendages such as non glandular hairs, scales, or pelts hairs. Trichomes affect the insect behavior by

providing a barrier that prevents landing on the plant surface and prevent movement and feeding (Goertzen and Small, 1993). For example, trichome effect on the feeding behavior of Colorado potato beetle, *Leptinotarsa decemlineata* (Yencho and Tingey, 1994). Therefore, the aim of this study is to know the effect of three cotton varieties as food type on the development of *S. litura* in an attempt to determine which of the cotton variety is the most favorable diet for developing this species and the efficiency of the diet was assessed by evaluating the diameter of egg mass, larval, pupal and adult size.

Materials and methods

This study was conducted in the Entomology Laboratory, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh from September 2008 to February 2009. Adult male and female moths of *S. litura* were collected from the cotton field and they were reared in the laboratory at $25\pm 2^{\circ}\text{C}$, $60\pm 5\%$ humidity and 12:12 light: dark condition providing with fresh cotton flower of CB9, CB10 and SR05 variety as diet. The cotton varieties were cultivated without insecticide treatment. The moths were kept in different petridishes (9.0×1.5 cm) for mating. After completion of mating, the male moths were removed from the petridishes and the females were kept in jars (26.5×13.5 cm) for oviposition. Cotton leaves and flowers were supplied into the jars. Every morning the petridishes were cleaned and monitored to observe the egg mass. After hatching, fresh cotton leaves were supplied into the jars for food of the young larvae till pupation. Newly emerged adult male and females were further reared for this study. The morphometric parameters viz. the length

and breadth of larvae, pupae and adults were measured with the help of ordinary millimeter scale and the diameter of egg mass were taken by using stereomicroscope. Data were analyzed by analysis of variance and the mean values were separated by Duncan's Multiple Range Test (DMRT).

Results and discussion

Cotton armyworms laid eggs in masses on the under side of the cotton leaves or on the petridishes. The observed diameter of the egg masses were significantly different and which measured 4.4 ± 0.4 , 5.6 ± 0.4 and 7.4 ± 0.4 mm when the insects were reared on CB9, CB10 and SR05 variety, respectively (Tab. 1). Table 1 showed that larval length varied with sources of food. The length of 1st, 2nd, 3rd, 4th and 5th instar larvae varied from 8.9 ± 0.9 to 10.2 ± 0.8 , 13.5 ± 1.0 to 16.3 ± 1.5 , 20.5 ± 1.9 to 24.5 ± 0.6 , 28.8 ± 1.5 to 32.3 ± 2.8 and 47.5 ± 1.9 to 50.5 ± 1.9 mm, respectively. The breadth of 1st, 2nd, 3rd, 4th and 5th instar larvae were measured 1.3 ± 0.2 to 1.5 ± 0.2 , 2.3 ± 0.5 to 2.5 ± 0.5 , 3.3 ± 0.5 to 4.0 ± 0.8 , 4.8 ± 0.5 to 6.0 ± 0.8 and 7.8 ± 0.5 to 8.3 ± 0.4 mm, respectively (Tab. 1). First, second and fifth instar larvae did not show significant variation in their breadth but the 3rd and 4th instar larval breadth showed significant variation. The 3rd instar larvae showed highest (4.0 ± 0.8 mm) and lowest (3.3 ± 0.5 mm) breadth when they were reared on CB9 and CB10 variety, respectively, whereas the 4th instar larvae attained highest (6.0 ± 0.8 mm) and lowest (4.8 ± 0.5 mm) breadth when they fed SR05 and CB10 variety, respectively.

Table 1 showed that the studied cotton varieties as food sources did not affect the length of *S. litura* pupae, adult males and females. However, the length of

Table 1. Morphometric parameters of *S. litura* feeding on different cotton varieties

Morphometric parameters	Cotton variety		
	CB9	CB10	SR05
Diameter of egg mass (mm)	4.4±0.4	5.6±0.4	7.4±0.4
Length of larval instar (mm)			
1 st instar	10.2±0.8a	8.9±0.9ab	9.1±0.8ab
2 nd instar	16.3±1.5a	14.8±0.5ab	13.5±1.0b
3 rd instar	24.5±0.6a	20.5±1.9b	21.5±1.0b
4 th instar	28.8±1.5b	29.5±1.0b	32.3±2.8a
5 th instar	47.5±1.9b	49.5±2.5a	50.5±1.9a
Breadth of larval instar (mm)			
1 st instar	1.3±0.2a	1.3±0.3a	1.5±0.2a
2 nd instar	2.3±0.5a	2.3±0.5a	2.5±0.5a
3 rd instar	4.0±0.8a	3.3±0.5ab	3.8±0.5a
4 th instar	5.3±0.5ab	4.8±0.5ab	6.0±0.8a
5 th instar	7.8±0.5a	7.8±0.5a	8.3±0.4a
Length of pupae (mm)	20.0±0.8a	19.8±0.9a	19.0±0.8a
Breadth of pupae (mm)	5.9±0.3ab	5.9±0.9ab	6.5±0.6a
Length of adult ♂ (mm)	16.9±0.3a	17.3±0.5a	17.1±0.6a
Length of adult ♀ (mm)	20.2±0.5a	20.5±0.4a	20.3±0.6a
Breadth of adult ♂ (mm)	5.3±0.5a	5.8±0.3a	5.2±0.3a
Breadth of adult ♀ (mm)	7.8±0.5a	7.7±0.8a	8.0±0.3a

Means within a row followed by no common letter(s) are significantly different (DMRT, $p \leq 0.05$). N= 5 for each variety and parameter.

pupae, adult males and females were varied from 19.0±0.8 to 20.0±0.8, 16.9±0.3 to 17.3±0.5 and 20.2±0.5 to 20.5±0.4 mm, respectively. On the contrary, the studied cotton varieties showed significant effect on the breadth of pupae but the breadth of adult males and females were statistically similar. The pupae, adult males and female's breadth ranged from 5.9±0.3 to 6.5±0.6, 5.2±0.3 to 5.8±0.3 and 7.7±0.8 to 8.0±0.3 mm, respectively. The pupae attained highest breadth (6.5±0.6) when the insects were reared on SR05 variety (Tab. 1).

Ou-Yang and Chu (1994) reared *S. litura* on an artificial diet and observed the average body length of male 20.9±1.1 mm and female 20.2±1.0 mm on the day of emergence. In this study, the length of males and females were measured 16.9±0.3 to 17.3±0.5 and 20.2±0.5 to 20.5±0.4 mm,

respectively. Plants have many external structural defenses that discourage insects feeding. Plant morphology has been shown to influence the biology of herbivores through feeding preferences (Legrand and Barbosa, 2000). The early instar stages of insects are particularly sensitive to overall physiological and biochemical functions (Scriber, 1981). The studied cotton varieties are morphologically different which may influence on the amount of food consumption, production of excreta and duration of different life stages of *S. litura* as a result some morphometrics of the insects showed variation.

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