EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
ENTOMOLOGY

A

ISSN
1687-8809

WWW.EAJBS.EG.NET

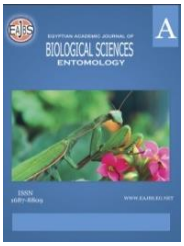
Vol. 14 No. 2 (2021)

Citation: *Egypt. Acad. J. Biolog. Sci. (A. Entomology) Vol. 14(2) pp.191-194 (2021)*
DOI: 10.21608/EAJBSA.2021.191036

Egypt. Acad. J. Biolog. Sci., 14(2):191-194(2021)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
http://eajbsa.journals.ekb.eg/



The Life Cycle of Armyworm, *Spodoptera litura* (Noctuidae: Lepidoptera) Destructive Pest of Cabbage

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ARTICLE INFO

Article History
Received:4/4/2021
Accepted:7/6/2021
Keywords:
Cabbage, *Spodoptera litura*, Lepidoptera, Biology, Morphology.

ABSTRACT

Armyworm, *Spodoptera litura* is a destructive pest of several agricultural and horticultural crops all over the world including Pakistan. The life cycle of *S. litura* was checked on cage leaves under laboratory conditions during 2019. The incubation period was completed in 2-4 days with an average of 3.12 + 0.39 days. The colour of neonate larvae, second, third, fourth, fifth and sixth instar was pale green, dark green, dark blue-green, dark blackish-brown and blackish brown, respectively. The average life period of 1st, 2nd, 3rd, 4th, 5th and 6th larval instar was 3.34 + 0.32, 2.57 + 0.45, 3.49 + 0.45, 3.11 + 0.67, 3.33 + 0.87 and 2.98 ± 0.33 days, respectively. The pre-pupal and pupal periods was lasted 2-3 and 6-11 days, respectively. The female was long-lived than male. The longevity of males was 6-10 days while the female was 9-12 days. The ovipositional, pre-ovipositional and post ovipositional period was lasted 7.67 + 1.40, 1.74 + 0.51 and 1.78 + 0.45 days, respectively. The study showed that cabbage is a suitable host for pest growth and development and larvae feed vigorously to cabbage leaves.

INTRODUCTION

Armyworm, *Spodoptera litura* belongs to order lepidoptera and family noctuidae is a destructive pest of several agricultural and horticultural crops all over the world (Shankara *et al.*, 2006). It is the most destructive pest of crops grown especially in tropical and subtropical areas of the globe like Pakistan. Due to high migrating power and reproductive potential, pest attack on various hosts including cotton, maize, cabbage, berseem and okra, etc. (Saleem *et al.*, 2008; Saleem *et al.*, 2016; Ahmad and Arif, 2010). The larvae of pests can attack the vegetative and reproductive parts of more than 150 host species. The severe attack of larvae can reduce crop productivity which ultimately becomes the cause of economic losses (Ramzan *et al.*, 2019). According to Prashant *et al.* (2015),

26-100 percent yield losses of crops are caused due to this pest.

The crop losses can be minimized with a decrease in pest population which can be done by the application of pest management strategies (Integrated pest management, IPM) such as cultural, physical, mechanical, biopesticides, botanical and chemical. The basic information like biology, morphology and life cycle of the target pest is very important before application of any strategy.

MATERIALS AND METHODS

The egg batches and different instar larvae were collected from cabbage fields of farmers at Multan. Every stage of *S. litura* was kept separate from each other. Collected larvae were brought to the laboratory and transferred individually into petri dishes to avoid cannibalism. The larvae were provided cabbage leaves for feeding on a daily basis. The pupae were kept in plastic containers (1 L) for adult emergence. One pair of emerged adults was transferred into an adult rearing cage for mating and egg-laying. The tissue paper was hanged inside the cage for egg-laying. The eggs were collected and placed 20 eggs individually into a petri dish for hatching and further studies. All insect parameters were noted and recorded during the whole study period. Data were arranged on an MS Excel page or sheet and their mean and range were calculated statistically.

RESULTS AND DISCUSSION

Armyworm is widely distributed in all tropical and subtropical regions of the world including Pakistan. It has a wide range of host plants and high migrating power. Due to these characters, *S. litura* has been widely distributed.

The life cycle of this pest was recorded on cabbage leaves under controlled conditions. The results of biology revealed that the total life cycle from egg to adult was 30-40 days with an average of 31.98 ± 4.75 days. Eggs were laid on cabbage leaves and tissue paper in masses. The spherical shape and yellowish colour eggs were also laid on each other in 2-3 layers. The incubation period was 2-4 days with an average of 3.12 + 0.39 days. Similar findings have been observed and noted by early scientists (Cardona *et al.*, 2007; Kandagal and Khetagoudar, 2013; Ramzan *et al.*, 2020).

The average life period of first, second, third, fourth, fifth and sixth larval instar was 3.34 + 0.32, 2.57 + 0.45, 3.49 + 0.45, 3.11 + 0.67, 3.33 + 0.87 and 2.98 ± 0.33 days, respectively as shown in Table 1. The colour of neonate larvae, second, third, fourth, fifth and sixth instar was pale green, dark green, dark blue-green, dark blackish-brown and blackish brown, respectively. Kaur *et al.* (2012) had reported similar findings of the total period of larvae. They reported total life period of the first to fifth larval instar was 18-28 days while in the current study sixth larval instar were recorded and the total life period was 13-21 days on cabbage. According to Shukla (2000) and Murtaza *et al.*, 2019 and 2020, the average length and width of sixth larvae on cabbage leaves were 34.26 ± 1.45 mm and 4.09 ± 0.17 mm, respectively.

During the pre-pupal stage, the feeding and movement of larvae were reduced. Larvae entered into the soil for pupation. The colour of the newly developed obtect pupa was light yellowish green which after 20-24 hours of pupation changed to light brown and later changed to dark brown. The pre-pupal and pupal periods was lasted 2-3 and 6-11 days, respectively. The pupal period was 8-10 days as reported by Shukla (2000) while Baloliya (2001) reported 9-10 days on cabbage. Our findings are in line with these studies.

The female longevity was more than male. The longevity of males was 6-10 days while the female was 9-12 days. The ovipositional, pre-ovipositional and post ovipositional

period was lasted 7.67 + 1.40, 1.74 + 0.51 and 1.78 + 0.45 days, respectively. Eggs were laid on and underside the cabbage leaves. The fecundity was 1767-2387 per female. The capacity of egg lying can vary with location and climatic conditions.

Table 1. Development of different stages of *S. litura*

Stages	Duration (days)	
	Mean + SD	**Range**
Eggs	3.12 + 0.39	2-4
Larva		
1st	3.34 + 0.32	2-3
2nd	2.57 + 0.45	2-3
3rd	3.49 + 0.45	3-4
4th	3.11 + 0.67	3-4
5th	3.33 + 0.87	3-5
6th	2.98 ± 0.33	3-5
Total larval period	17.23 + 1.35	13-21
Pupa		
Pre-pupa	1.34 + 0.23	2-3
Pupa	7.67 + 0.34	6-11
Adult longevity		
Male longevity	6.98 + 1.33	6-10
Female longevity	9.96 + 1.47	9-12
Ovipositional period		
Pre-oviposition	1.74 + 0.51	1-3
Oviposition	7.67 + 1.40	5-9
Post oviposition	1.78 + 0.45	2-4
Fecundity	2035.00 ± 1123.43	1767-2387
Total life cycle	31.98 ± 4.75	30-40

Conflict of Interest:

The authors declare no conflict of interest.

Author Contribution:

All authors have equal contributions.

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