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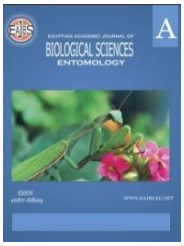

Effects of Host Plant on *Spodoptera litura* under Laboratory Condition

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ABSTRACT

In Asia, the polyphagous pest, *Spodoptera litura* defoliates a variety of agricultural and horticulture crops. The current study was undertaken at ecology laboratory of MNS-University of Agriculture, Multan, Pakistan during 2018-2019 to study the effect of different host plants, alfalfa, sesbania and cabbage on biology of *Spodoptera litura* under laboratory condition. The host plants had an impact on all of the biological variables that were measured in the study. The average mean duration of first, second, third, fourth, fifth and sixth larval instars on sesbania was 3.32±0.16a, 3.45±0.10a, 3.67±0.12a, 4.37±0.11a, 6.55±0.19a, and 5.30±0.20a days, respectively. The development times of *S. litura* larval instars fed on various host plants differed significantly (F = 90.65; df = 3,125; *p* 0.05). Among the tested host plants, sesbania was the most suitable host plant for pest growth and development followed by cabbage, and alfalfa. Alfalfa was the least important host for pest. Sesbania was found to be the most advantageous host for *Spodoptera litura*, followed by cabbage and alfalfa, according to the study.

INTRODUCTION

Spodoptera litura (Lepidoptera: Noctuidae) is a dangerous polyphagous pest that causes massive destruction to field crops like oilseeds, vegetables, pulses, and fruits in the whole world. A wide variety of agricultural, horticultural crops and many ornamental plants have been documented to have suffered considerable harm from this insect. It was discovered to result in a 26–100% decrease of groundnut yield (Favetti *et al.,* 2015; Ashwini *et al.,* 2016; Ramzan *et al.,* 2021).

In evolutionary tactics, a wide host range is thought to be important for a better chance of survival. Due to their higher level of feeding on many plant species and nearly all of these plants, generalist insect pests like *S. litura* may have a wider variety of host plants (Taludker *et al.,* 2018; Ramaiah and Maheshwori, 2018). These plants' primary and secondary metabolites, which aid them in selecting their preferred hosts in response to nutritional change, may be linked to host selection. Larvae consume a large amount of plant leaves before eventually devouring nearly the entire plant. In the Indo-Pak region, the behavior of travelling from one field to another like an army gave rise to the term "armyworm" (Gupta *et al.,* 2015). In terms of crops, *S. litura* might result in economic losses of between 25.8 and 100%. *S. litura* is regarded as the most destructive insect pest

in many countries of the Asia-Pacific region, including China, Japan, India, and Pakistan, where these two species threaten agricultural production, food security, and the livelihoods of farmers due to their high reproductive capacity and associated significant crop losses (Early *et al.*, 2018; Pragya and Das, 2022).

S. litura decreases the number as well as the quality of many crops. *S. litura* creates galleries in the immature corn cobs during the milking period, causing injury (Naz *et al.*, 2003). The same pattern is seen in cabbage flowers, which leads to the formation of fungus and stunting. This bug breeds on sesbania for one to two generations and entirely obliterates the plant's leaves (Yinghua *et al.*, 2017). Different management approaches have used by farmers in their fields to control this noxious pest on different host plants (Li *et al.*, 2022; Mehta *et al.*, 2022; Sharma *et al.*, 2022; Kumar and Bhattacharya, 2019). Before adopting any control measures for pest, it will be best for researchers to determine the suitable host and its effect on the pest. To keep in mind the importance of the study, the current study was conducted.

MATERIALS AND METHODS

Study Area and Collection of Pest Stages:

The current study was conducted in Muhammad Nawaz Shareef University of Agriculture, Multan during 2018-2019 at Ecology Laboratory. To perform this research trail, different stages (egg, and larvae) were collected from different fields of cotton, cabbage and cauliflower planted nearby the University.

Host Plants, Rearing and Mass Culture:

In this investigation, the host plants were sesbania, alfalfa and cabbage. These plants were chosen because they are significant crops in Pakistan. The collection of stages was done in plastic containers and shifted into laboratory for further experiment. After shifting into laboratory, each stage was separated and kept into separate plastic jar for the development. The rearing procedure of early researchers was used to rear the pest (Narvekar *et al.*, 2018; Abdullah *et al.*, 2019).

RESULTS AND DISCUSSION

Understanding a pest's biological and morphological characteristics is essential for effective pest management. The results of the current study showed how *S. litura* morphometric characteristics were affected by three kinds of the host plant. Understanding how different cultivars affect the performance of lepidopteran insects is crucial since the quality of the host plant has a significant impact on how quickly an insect population multiplies. Variation in the characteristics of the host plant has an impact on life characteristics like fertility, longevity, and herbivore survival. Important biochemical barriers for plant resistance to insects are secondary metabolites of plants (Ramzan *et al.*, 2019; Murtaza *et al.*, 2020; Ahmad *et al.*, 2022).

The eggs raised on various host plants in the current study underwent the same amount of incubation time. The average mean duration of first, second, third, fourth, fifth and sixth larval instars on sesbania was 3.32±0.16a, 3.45±0.10a, 3.67±0.12a, 4.37±0.11a, 6.55±0.19a, and 5.30±0.20a days, respectively. The development times of *S. litura* larval instars fed on various host plants differed significantly ($F = 90.65$; $df = 3,125$; p 0.05). Among the tested host plants, sesbania was the most suitable host plant for pest growth and development followed by cabbage, and alfalfa. Alfalfa was the least important host for pest in the current study (Table 1). The similar findings had been reported by many others researchers in the globe (Murtaza *et al.*, 2020; Azidah and Sofian-Azirun, 2006; Mohamed

et al., 2019; Kawre *et al.,* 2017; Hatem *et al.,* 2015; Xue *et al.,* 2010; Ramzan *et al.,* 2020). The pest completes the growth and development faster on sesbania as compared to other host plants in the current study.

Table 1. Effect of host plants on different stages of *S. litura*.

Parameters	Sesbania	Alfalfa	Cabbage
Eggs			
Incubation period	3.13 ± 0.65a	3.87±0.15a	3.17±0.21a
Larvae			
First instar	3.32±0.16a	3.99±0.17b	3.53±0.09b
Second instar	3.45±0.10a	3.87±0.26ab	3.50±0.11b
Third instar	3.67±0.12a	4.73±0.34 b	4.69±0.14a
Fourth instar	4.37±0.11a	4.74±0.11b	4.32±0.10a
Fifth instar	6.55±0.19a	7.98±0.34c	6.57±0.14b
Sixth instar	5.30±0.20a	6.44±0.09bc	5.33±0.10b
Total larval period	27.23±0.17a	31.33±0.67c	30.54±0.40b
Pupal period	7.09±0.32a	7.21±0.37b	7.11±0.30c
Adult			
Male adult	6.66±0.10a	7.55±0.18a	7.12±0.11a
female adult	6.45±0.11a	7.22±0.31bc	6.56±0.34ab

Table 2. Effect of host plants on length and weight of larvae.

Host plants	Length of larva (cm)	Weight of larva (g)	Period
Alfalfa	3.56±0.21ab	0.63±0.09ab	8.29 days
Sesbania	3.50±0.12ab	0.51±0.03bc	7.51 days
cabbage	3.61±0.16a	0.65±0.03a	8.75 days

The average means larval length on alfalfa, sesbania and cabbage was 3.56±0.21ab, 3.50±0.12ab, and 3.61±0.16a cm, respectively, while weight of larva was 0.63±0.09ab, 0.51±0.03bc, and 0.65±0.03a g, respectively (Table 2). The length and weight of pupa is given in Table 3, while Percentage of larval instar stages on different hosts is shown in Figure 1**.** The findings of Sandhyarani and Rani (2013) and Ahmad *et al.* (2013) are almost similar to our current study findings.

Table 3. Effect of host plant on length and weight of pupae**.**

Host plants	Length of pupa (cm)	Weight of pupa (g)	Period
Alfalfa	1.76±0.06b	0.070±0.05b	11.04 days
Sesbania	1.59±0.08bc	0.062±0.01b	10.98 days
cabbage	1.99±0.09a	0.076±0.04a	9.01 days

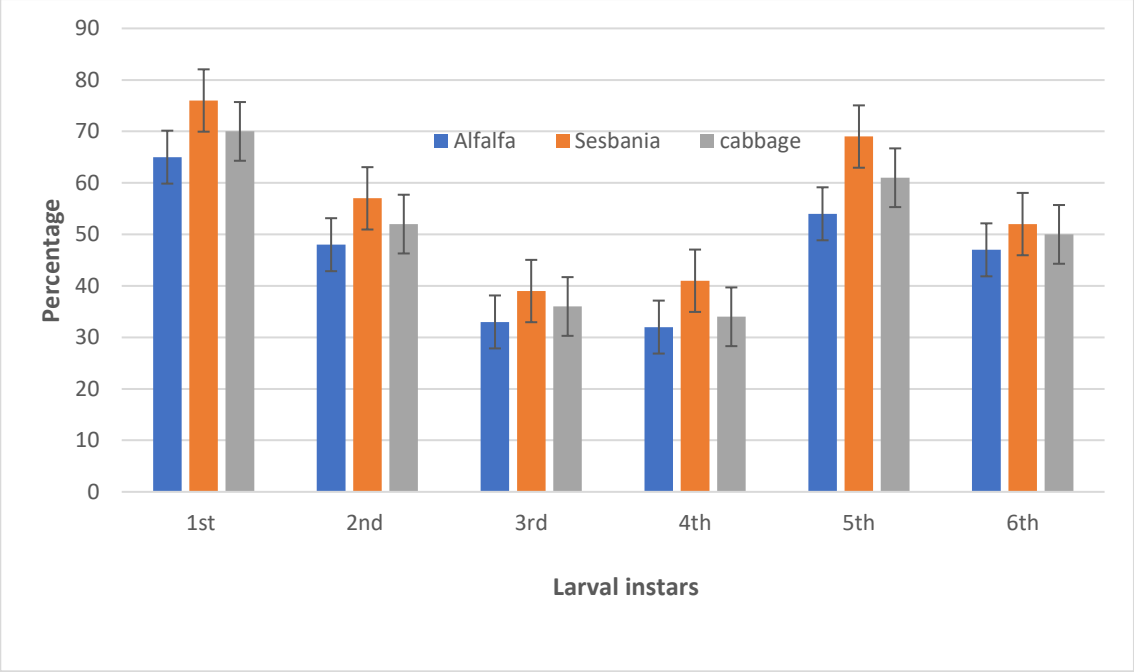

Fig. 1: Percentage of larval instar stages on different hosts.

Conclusion

The study found that accurate information on host plants is required for prompt management of insect pests. *Spodoptera litura* had six larval instars. During the investigation, the cannibalism of the larvae was seen. In Pakistan, for example, the insect pest *Spodoptera litura* affects a number of host plants. The study came to the conclusion that sesbania, rather than cabbage or alfalfa crop, was the preferred host of *Spodoptera litura* among the examined host plants.

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