

Original Research Article

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Comparative Biology of *Spodoptera litura* on Vegetable and Grain Soybean [*Glycine max* (L.) Merrill]

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ABSTRACT

The studies on the comparative biology of *S. litura* were carried out in laboratory on vegetable and grain soybean. The duration of egg, larva, prepupa and pupal period lasted for 3.13, 16.36, 1.30 and 8.48 days respectively on vegetable soybean. Where has different stages viz., the egg, larva, pre pupa and pupal period was lasted in 2.04, 14.39, 0.91 and 7.95 days respectively o grain soybean. The fecundity was 279.50 in on vegetable soybean. The mean longevity of adult with food (10% honey solution) was ranged between 9.16 to 9.16 to 9.23 and 5.20 to 5.40 days in female and male moth. The mean longevity of female and male moth without food was ranged between 5.10 to 5.50 and 3.90 to 3.98 days respectively on vegetable soybean during June to November 2012. Mean total life cycle lasted between 29.88 and 32.12 days on vegetable soybean, it was 27.10 and 30.14 days on grain soybean respectively during June to November 2012.

Keywords

Biology, *S. litura*,
Vegetable and
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Introduction

India is one of the major oilseeds producing country in the world and these are the second largest agricultural commodity in India after cereals occupying 13-14% of gross cropped area (Sreekanth *et al.*, 2013). Soybean (*Glycine max* (L.) Merrill) is an oil seed crop contains about 40-42 per cent protein (Netam *et al.*, 2013).

Spodoptera litura (Fab.) (Lepidoptera: Noctuidae) is polyphagous pest damaging numerous crops in India and many other countries (Shivayogeshwara *et al.*, 1991). *S. litura* is also known as tobacco cutworm, or cluster or tobacco caterpillar. It has reached a major status of insect an important pest on

soybean [*Glycine max* (L.) Merrill] and major defoliator vegetable soybean. It infests soybean from mid-August to October in *kharif*. Incidence of *S. litura* was observed in all the soybean growing parts of northern Karnataka during *kharif*. During the vegetative stage of the crop it feeds on leaves and on young parts at reproductive stage it feeds on pods (Anonymous, 2007). *S. litura* was reported to cause 30 to 50 per cent crop loss in Dharwad and Belgaum districts of Karnataka (Patil, 2002). Study of the host plants on the biology of insects is important in understanding host suitability of plant infesting insect species. There have been a number of studies on the biological

parameters of *S. litura* on different host plants under different environmental conditions, particularly in India (Patel *et al.*, 1986, 1987). In view of several health benefits of soybean, there is growing demand for vegetable soybean in affluent urban population in the country. The vegetable soybean is characteristically rich in sucrose content besides many food grade characters. These characters are bound to influence insect life-cycle, but there is no systematic study on this part. Keeping all these points in view the present investigation on biology of *S. litura* on vegetable and grain soybean was undertaken.

Materials and Methods

The biology of the *S. litura* on vegetable and grain soybean was studied under laboratory at room temperature and relative humidity at the Zonal Agricultural Research Station, Gandhi Krishi Vigyana Kendra, University of Agricultural Sciences, Bengaluru during June to November 2012.

Mass rearing of *S. litura*

The larvae of *S. litura* was collected from the vegetable soybean field and mass reared in the laboratory on vegetable soybean plants. A pair of newly emerged male and female moths obtained from the nucleus culture was introduced in to a wooden cage (35x 25x 40 cm) vegetable soybean plants egg laying. The root portion of the plant was immersed in a container containing water for maintaining the turgidity and freshness of the plant. Cotton swab was dipped in ten per cent honey solution which served as food for the moths. Oviposition period and fecundity was studied by enclosing ten pairs of newly emerged male and female moths in the wooden rearing cages (35 cm × 25 cm × 40 cm), with wire mesh on three sides and wooden front door at the rate of one pair per cage for egg laying. The open end of the jar was covered with muslin cloth

fastened with rubber band. The egg mass deposited every day was collected till the death of female moth. For studies on incubation period, freshly laid eggs were kept in petri dishes provided with wet blotting paper at the bottom which protect the eggs from desiccation.

The larval instars were noted by transferring freshly hatched neonate larvae into specimen tubes individually. Fresh vegetable soybean/grain soybean leaves were provided as food. The food was changed after every 24 h.

The first instar larvae of *S. litura* were reared on both vegetable and grain soybean host plants. Fifty larvae were used in batches. The food was changed daily. The incubation period, larval period, per cent pupation, fresh pupal weight within 24 h of pupation, pupal duration, total developmental period, per cent adult emergence and mean number of eggs laid by female were recorded on each host. The experiment was conducted from June to November, 2012 and data was generated for five generations.

Results and Discussion

The observations on biology of *S. litura* on vegetable and grain soybean during June to November (2012) under laboratory are presented in (Table 1). The, egg, larva, pre-pupa and pupal period was lasted for 3.13, 16.34, 1.30 and 8.48 days respectively, on vegetable soybean. Whereas, the egg, larva, pre-pupa and pupal period was completed in 2.84, 14.39, 0.91 and 7.95 days respectively, on grain soybean. The present findings are similar to the observations made by Kulkarni (1989) on the biology of *S. litura* on ground nut. The *S. litura* deposited eggs in batches on tender leaves and covered with the abdominal scales, the larvae moulted for five times and completed six instars. Pupation occurred at six to eight cm depth in soil.

Table.1 Biology of *S. litura* on vegetable soybean and grain soybean under laboratory (June - November 2012)

Month	Host	Incubation period (days)		Larval period (days)		Pre-pupal period (days)		Pupal period (days)		Total life cycle (days)	
		Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
June - July	Vegetable soybean	2.45 - 3.62	3.13	13.13 - 17.44	16.34	0.65 - 1.76	1.30	7.36 - 9.17	8.48	26.84 - 31.67	30.10
	Grain soybean	2.32 - 3.50	2.89	13.10 - 16.12	14.39	0.54 - 1.22	0.91	6.22 - 8.12	7.95	24.68 - 30.13	28.13
July - August	Vegetable soybean	2.45 - 3.52	3.12	13.20 - 17.40	16.32	0.65 - 1.74	1.29	7.36 - 9.16	8.46	24.66 - 30.56	29.90
	Grain soybean	2.20 - 3.43	2.84	13.12 - 15.14	13.22	0.52 - 1.14	0.88	6.20 - 8.10	7.90	23.90 - 29.13	27.10
August - September	Vegetable soybean	2.35 - 3.52	3.11	13.20 - 17.40	16.36	0.65 - 1.74	1.28	7.36 - 9.17	8.44	26.66 - 32.5	32.12
	Grain soybean	2.23 - 3.46	2.89	12.90 - 16.22	14.36	0.54 - 1.25	0.91	7.32 - 8.0	7.94	24.32 - 31.10	30.14
September - October	Vegetable soybean	2.45- 3.60	3.18	13.10 - 17.20	14.20	0.65 - 1.76	1.28	7.34 - 9.14	8.42	26.80 - 32.0	30.12
	Grain soybean	2.10 - 3.39	2.86	13.00 - 16.15	13.44	0.53 - 1.21	0.90	7.28 - 8.23	7.92	24.54 - 29.34	28.2
October - November	Vegetable soybean	2.45 -3. 62	3.19	13.10 - 17.20	15.26	0.65 - 1.76	1.30	7.34 - 9.14	8.40	26.78 - 31.60	29.88
	Grain soybean	2.14 - 3.40	2.84	13.10 - 16.12	13.32	0.54 - 1.19	0.89	7.22 - 8.10	7.90	24.32 - 29.12	28.12

Table.2 Adult longevity (days) of *S. litura* on vegetable soybean under laboratory (June – November- 2012)

Period of study	Longevity with food (Male)		Longevity without food (Male)		Longevity with food (Female)		Longevity without food (Female)	
	Range	Mean	Range	Mean	Range	Mean	Range	Mean
June - July	4.16-6.26	5.37	3.10-4.56	3.96	9.02-9.56	9.21	3.20-5.22	5.10
July - August	4.12-6.22	5.20	3.08-4.52	3.92	9.02-9.54	9.20	3.22-5.24	5.00
August - September	4.18-6.28	5.40	3.12-4.58	3.98	9.05-9.58	9.23	3.25-5.25	5.13
September - October	4.16-6.24	5.22	3.10-4.54	3.92	9.03-9.52	9.18	3.24-5.22	5.50
October - November	4.14-6.22	4.20	3.12-4.54	3.90	9.04-9.51	9.16	3.22-5.20	5.40

Table.3 Mean comparative of biology of *S. litura* on vegetable soybean and grain soybean

Month	Host	Pre-oviposition period (days)	Ovi-position period (days)	No. of eggs per female	Incu-bation period (days)	Larval period (days)	Pre - pupal period (days)	Per cent pupation	Length of pupa (mm)	Weight of pupa (mg)	Pupal period (days)	Total develop-mental period (days)	Per cent adult emergence
June - July	Vegetable soybean	2.06	3.59	278.50	3.13	16.34	1.30	82.20	18.05	380.40	8.48	30.10	75.06
	Grain soybean	2.04	3.54	191.0	2.89	14.39	0.91	80.00	17.07	372.20	7.95	28.13	72.02
July- August	Vegetable soybean	2.08	3.56	274.0	3.12	16.32	1.29	80.00	18.04	380.00	8.46	29.90	74.02
	Grain soybean	2.02	3.52	188.0	2.84	13.22	0.88	78.00	17.03	370.00	7.90	27.10	71.04
August- September	Vegetable soybean	2.08	3.58	252.0	3.11	16.36	1.28	86.30	18.05	382.20	8.44	32.12	75.00
	Grain soybean	2.04	3.54	185.0	2.89	14.36	0.91	84.00	17.06	373.00	7.94	30.14	70.10
September - October	Vegetable soybean	2.06	3.56	307.0	3.18	14.20	1.28	82.60	18.02	378.00	8.42	30.12	72.12
	Grain soybean	2.06	3.52	182.0	2.86	13.44	0.90	80.00	17.02	363.00	7.92	28.20	68.40
October - November	Vegetable soybean	2.06	3.56	286.0	3.19	15.26	1.30	80.00	17.98	380.00	8.40	29.88	74.22
	Grain soybean	2.04	3.52	190.0	2.84	13.32	0.89	78.00	17.00	372.00	7.90	28.12	68.00

Table.4 Mean Fecundity of *S. litura* on vegetable soybean under laboratory (June - November 2012)

Sl. No.	Days after emergence									Total
	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	
1	-	31	36	40	110	70	-	-	-	287
2	-	-	30	60	115	65	-	-	-	270
3	-	-	40	68	108	40	20	-	-	276
4	-	15	45	62	112	38	-	-	-	272
5	-	16	47	55	114	32	-	-	-	264
6	-	18	30	66	106	20	-	-	-	240
7	-	-	45	70	120	38	21	-	-	294
8	-	24	46	68	130	32	20	--	-	320
9	-	22	40	56	128	40	28	-	-	314
10	-	20	32	58	110	38	-	-	-	258
Total	-	146	391	603	1153	413	89	-	-	2795
Average	-	14.6	39.1	60.3	115.3	41.3	8.9	-	-	279.5

The mean longevity of adult with food (10 % honey solution) was between 9.16 and 9.23 and 5.20 to 5.40 days in female and male moth respectively, and mean longevity of female and male moth without food ranged between 5.10 and 5.50 and 3.90 to 3.98 days respectively, on vegetable soybean during June to November (Table 2). The present observations are in comparison with the studies made by Patel *et al.*, (1987). Pre-oviposition and oviposition period lasted for 2.06 to 2.08 and 3.56 to 3.59 days on vegetable soybean. However, it was 2.02 to 2.06 and 3.52 to 3.54 days on grain soybean during June to November (Table 3). The fecundity ranged from 240 to 320 eggs with an average of 279.50 eggs per female on vegetable soybean (Table 4). The mean total life cycle was ranged between 29.88 and 32.12 days during June to November. The similar developmental period was reported by Thippeswamy (1983) and Kulkarni (1989) on groundnut and soybean.

The study indicated that, comparative biology of *S. litura* on soybean I the preferentiality of host by the insect. *S. litura* preferred vegetable soybean host than grain soybean

host. The biotic potentiality of the pest was high on vegetable soybean compared to grain soybean.

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