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Ecological Life Table of *Spodoptera litura* Fabricius on Groundnut

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***Abstract* – The life table and key mortality factors of *Spodoptera litura* Fabricius revealed that the mortality in the younger group larvae was 1.56 per cent due to bacterial infection and unknown reasons. Mortality in the older group larvae was 19.8 per cent due to diseases like NPV, *N. rileyi, B. bassiana* and parasites like *Cotesia spp*., and tachinid maggot. Mortality in the pupal stage was 7.98 per cent due to NPV and Unknown reasons. Generation survival (SG) was worked out and it was 0.70. Value of trend index (I) was calculated to the tune of 0.018.**

***Keywords* – Ecological Life Table, *Spodoptera litura,* Key Mortality Factors, Groundnut.**

I. INTRODUCTION

Groundnut (*Arachis hypogaea* Linnaeus) is a leguminous oilseed crop, grown as monoculture in Saurashtra region of Gujarat and contributes around 88% of total production of groundnut in Gujarat State. Among the various insect pests attacking this crop, leaf eating caterpillar, *S. litura* (Fab.) commonly known as tobacco caterpillar, causes extensive damage and it is found to be serious on groundnut crop. Life tables are one of the most important tools in pest management as they reveal the most opportune periods and vulnerable stages of the insect species (Harcourt, 1969 and Singh et al., 1977). Thus life table studies enable us to devise an intelligent and practical manipulation of control factors for sound pest management strategy.

II. MATERIALS & METHODS

A non-replicated field experiment on life tables and key mortality factors of *S. litura* on groundnut were conducted at Instructional Farm at College of Agriculture, Junagadh during *kharif* 2011-12. The variety GG-20 was sown at the spacing of 60 x 10 cm. The experiment comprised of 20 quadrates which is of 1 m x 1 m maintained under pesticide free conditions. On germination of crop, frequent visits were made to record the first incidence of *S. litura* , the known number of eggs as a start of first generation of *S. litura* were collected along with the plant material. Since the generations were overlapping and the pest also surviving in the other crops, the eggs could not be collected in the field. The tiny larvae collected from the field were reared in the laboratory in small plastic boxes till the cessation of pest population in the field. This laboratory culture was used as a check culture for deciding the no of regular generations of pest in the field conditions.

The sampling of early and late instar larvae was done on the basis of development of pests in the laboratory reared culture. At each observation five quadrates were carefully observed twice in the week for the number of larvae of *S. litura.* The field collected larvae were brought to the laboratory and reared on respective groundnut leaves. This was referred as field culture. The food was changed as and when required. The culture was reared till the adult emergence. The observations were made on diseases, parasitism and unknown reasons in the larval and pupal stages.

The column headings used in the life table of the present study are similar to those used by Morris and Miller (1954) and Harcourt (1969) are as under.

x = The age interval, egg, larva, pupa or adult
lx = The number surviving at the beginning of stage noted in the 'x' column
dx = The number dying within age interval stated in the 'x' column
dxf = The mortality factor responsible for 'dx'
100qx = Per cent mortality
sx = Survival rate within the age mentioned in the 'x' column

III. RESULTS & DISCUSSION

Field life table was constructed to understand the role of various mortality factors of *S. litura*. Life table and budget were also worked out to find out the key mortality factors that influence the population of this pest.

The data for life table of *S. litura* on groundnut were given in the (Table. 1 and Fig. 1), which showed natural and sequential mortality in the field population during the crop season. Per cent mortality in the eggs contributed around 10 % respectively. The mortality in the egg stage was mainly due to egg sterility. Larval mortality was recorded by grouping the larvae into two groups, younger larval group (I and II instar) and older larval group (III to VI instar). The results revealed that there were 1.56 and 19.8 per cent mortality in the younger and older larval groups, respectively. The results further revealed that the mortality in the younger group larvae was mainly due to bacterial infection and unknown reasons. The larval population of older group declined by 19.83 per cent owing to different diseases *viz*., NPV, *N. rileyi*, *B. bassiana,* parasites like *Cotesia* spp. and tachinid maggot. During pupal stage, NPV and unknown factors were the major mortality factors operating under field conditions. The mortality in pupal stage was mainly due to NPV, contributed around 6.18 and unknown reasons contributed around 2.25 per cent mortality. Generation survival (SG) was worked out and it was found 0.70. Value of trend index (I) was calculated to the tune of 0.018. The positive value of the trend index indicated that the mortality factors operating during this period were not effective in suppressing the pest population in succeeding generations.

The results are in conformity with the results reported by Ali (1992) reported that the pathogen like NPV caused some mortality. Paras and Rakesh (1999) reported that failure of older larvae to survive because of NPV. Rojas *et al.* (2000b) reported that *Apanteles* spp. and Tachinid spp. were the most common parasitoids seen during parasitization. Jadav *et al.* (2006) found larval mortality in early instars was due to unknown reasons and unidentified parasitoid and unknown reasons in the later instars. Jagtap *et al.* (2007) reported that green muscardine fungus and unknown reasons caused heavy larval mortality of *S. litura.* Patait *et al.* (2009) found that *Apanteles* spp., green muscardine fungus and an unidentified Tachinid fly were the major mortality factors of *S. litura*. Paresh and Rakesh (1999) and Jadav *et al.* (2006) reported that the pupal mortality was due to unknown causes. Paresh and Rakesh (1999) and Kamble *et al.* (2007) reported that positive trend index was observed in respect to population of *H. armigera*.

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AUTHOR'S PROFILE

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hails from Nandyal, Andhra Pradesh. He completed my B. sc. (Ag.,) from Acharya N G Ranga Agricultural University, Hyderabad. & M. Sc. (Ag.,) in the specialization of Agricultural Entomology from College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat. At present he is working in Bayer Bioscience Pvt Ltd, Jedcherla, and Telanganna. He published an article "Comparative relative toxicity of some modern insecticides against *Spodoptera litura* Fabricius on groundnut" in *International Journal of Plant Protection*.

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Table 1: Key Mortality Factors of *Spodoptera litura* on Groundnut

Age interval **x**	No. alive/ ha **lx**	Factor responsible for dx **dxf**	No. dying during x **dx**	Mortality percent **100 qx**	Survival within x **sx**	Log No./ ha	'k' values
Younger group larvae (N_1)	25,000			4.3979			
1st and 2nd instar larvae		Unknown reasons	166.5	0.67	0.98	4.3950	0.0029
		Bacterial infection	222	0.89		4.3911	0.0039
			388.5	**1.56**			**0.0068**
Older group larvae	24,611.5						
3rd – 6th instar larvae		**Diseases**			0.80	4.3223	0.0688
		NPV	3,274.5	13.3			
		N. rileyi	111	0.45			
		B. bassiana	222	0.90			
		Parasites					
		Cotesia spp.	333	1.35			
		Tachinid maggot	943.5	3.83		4.2950	0.0273
			4884	**19.8**			**0.0961**
Pupae	19,727.5						
		NPV	1,221	6.18	0.91	4.2673	0.0277
		Un known reasons	444	1.80		4.2567	0.0106
			1665	**7.98**			**0.0383**
Moths	18,062.5						
		Deformed adults	388.5	2.15	0.97	4.2473	0.0094
			388.5	**2.15**			**0.0094**
Females x2	17,674	(Reproducing females- 8823.5)				3.9463	0.301
						0.301	
Normal females x 2	17,674				1.00		
Generation total	**7,326**			**31.49**			
Trend index (**I**) (N_2/N_1)			**0.0018**	**-**		K's =	**0.4516**
Generation survival(**SG**) (N_3/N_1)			**0.70**	**-**			

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Healthy Larvae


B. bassiana infected larvae


N. rileyi infected larvae


Larvae liquefied due to NPV


Tachinid maggot


Cotesia spp., Pupa


Cotesia spp., Adult


NPV infected pupa


Deformed adults

Fig.1. Images For Key Mortality Factors Of S. Litura On Groundnut