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SOME BIOECOLOGICAL OBSERVATIONS OF *SPILOSTETHUS HOSPES* (FABRICIUS) (LYGAEIDAE : HETEROPTERA : INSECTA) ON A NEW HOST PLANT , *SOLANUM KHASIANUM* CLARKE

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INTRODUCTION

Spilostethus hospes (Fabricius) is known to use *Calotropis* spp., *Vernonia cinerea, Sesbania* sp., *Solanum nigrum, S. melongena* (Thangavelu, 1978); *Sorghum vulgare, Gossypium* spp. (Nayar, Ananthakrishnan, and David, 1976); *Antirrhinum* sp. (Mukhopadhyay,1987) as its host plants. Its newly recorded association with *Solanum khasianum* in the North Bengal region of North eastern India is of significance, since this lygaeid bug has from time to time assumed minor pest status. The weed has a wide distribution from Assam hills to Western Ghats and is of medicinal importance as a rich source of the steroid, solasodine from its berries (Santapau and Henry, 1973). Its medicinal value as contraceptive specially for village folks perhaps saves the weed from total deweeding programmes in the tea growing regions, thus giving a scope of wider distribution to this lygaeid bug associated with its new host, which is otherwise reported principally from *Calotropis* spp. in West Bengal (Mukhopadhyay,1983).

The importance of the present study is to investigate the extent to which the new host plant is being successfully exploited by the lygaeid bug and also to draw a comparison of its life stages when reared simultaneously on the new and the already known host plant, *Calotropis*. The work is also meant for better understanding of the reproductive dependence of this milk-weed bug on the fruits and seed of the new host, as has been found, for its congener, *S. pandurus* on seeds of milk weed (Mukhopadhayay,1985).

MATERIALS AND METHODS

The bioecological study was carried out during the warmer months July to September, when the temperature varied between 23° C-36° C and humidity between 71% and 100%.For comparison rearing was done simultaneously on the seeds of two of the local host plants, *Calotropis* sp. and *S. khasianum* at the same room temperature and humidity and other laboratory conditions. The fecundity of the bug was observed for females with ten repetitions in constant company of males and dried pulp with seeds of the new host as food The stadia and the total post embryonic development period was noted with ten repetitions by rearing the nymphs in glass vials (10 cm x 3 cm) with cotton plugs and water siphons. Observations on the incubation period, hatchability and hatching success were made on ten batches of eggs, each batch constituting randomly collected eggs from the same day of laying.

OBSERVATIONS AND RESULTS

During the course of two year observation (1984 - 1986) in the University campus and surrounding areas *S. hospes* was found to use *Calotropis* sp. as the principal host plant during its flowering and fruiting time but with the dehiscence and withering of the follicles the bugs change over to the damaged and putrefied berries of *S. khasianum* weed, that was aboundantly found in the hills and plains of North Bengal. Both adults and nymphs fed mostly on the seeds and stayed inside the hollow fruits. All instars were found associated with the berries, where possibly the adults also laid eggs. Such dependence on a second host plant was usually recorded from late May to late October in the area of study, however, a few early instars of the bug could be seen till most berries withered by early December.

The fecundity of the bug on the new host plant was recorded on an average to be quite high, 172. 77 eggs per female (Table 1) with an exception of 786 eggs laid in an isolated case. Laying could continue for hours, punctuated with an interval of 2 min. 30 sec. to 3min. between two consecutive deposition of eggs. The oviposition rhythm, observed for a month, although showed variability in bursts and breaks amongst the laying individuals (Fig. 1A) yet showed a periodic rhythm with peaks at about every 6th day when plotted as mean eggs per female (Fig. 1B).

Incubation period varied greatly in the same batch of egg but on an average they hatched within 6.7 days. In batches of eggs where hatching continued for 3 to 4 days, the maximum hatching precentage was observed more on the second day than the first. The percentage then gradually diminished on the third and the fourth day. The percentage of successful hatching although showed a wide range for different batches but on an average showed 56.9% success (Table 1). The freshly hatched 1st instar nymphs often sucked up some of the unhatched eggs of the same batch.

The longevity of the laying females on an average exceeded that of males (Table 2). Exceptionally an individual female lived as long as 59 days. The nymphs on an average showed a shorter post-embryonic development period (21 .1 days) when reared on *Calotropis* than on *S. khasianum* (25 .1 days) (Table 3). The average stadia and the patterns of changes at individual instar level (Fig . 2) showed that development proceeds more efficiently on *Calotropis* than *S. khasianum*, nevertheless all the instars could exploit the latter without any mortality.

TABLE 1. Fecundity, incubation, and hatching of the eggs of *S. hospes* when reared on *S. khasianum.*

	Eggs/ Female	Incubation Period	Hatchability(% on day) 1st	2nd	3rd	4th	Hatching success %
Mean	172.77	6.7	32.89	44.63	19.81	18.42	56.9
Range	(52-244)*	(5-9)	(3.5 -	(2.3 -	(2.7 -	(2.1 -	(26.3-
	83.3)	90.9)	69.1)	80.0)	98.0)		
S. D±	72.02	0.53	26.01	29.02	24.65	34.42	22.05

* Exception 786 eggs in an individual case.

TABLE 2. Longevity of male and female *S. hospes* on *S. khasianum* with break up of pre-, post-, and oviposition periods (in days).

	Pre-Oviposition	Oviposition	Post-Oviposition	Longevity (Female)	Longevity (Male)
Mean	12.6	12.0	1.5	26.1	24.66
Range	(4-23)	(3-23)	(0.0-6)	(12-35)*	(5-47)
S. D. ±	6.11	7.24	2.32	6.53	12.97

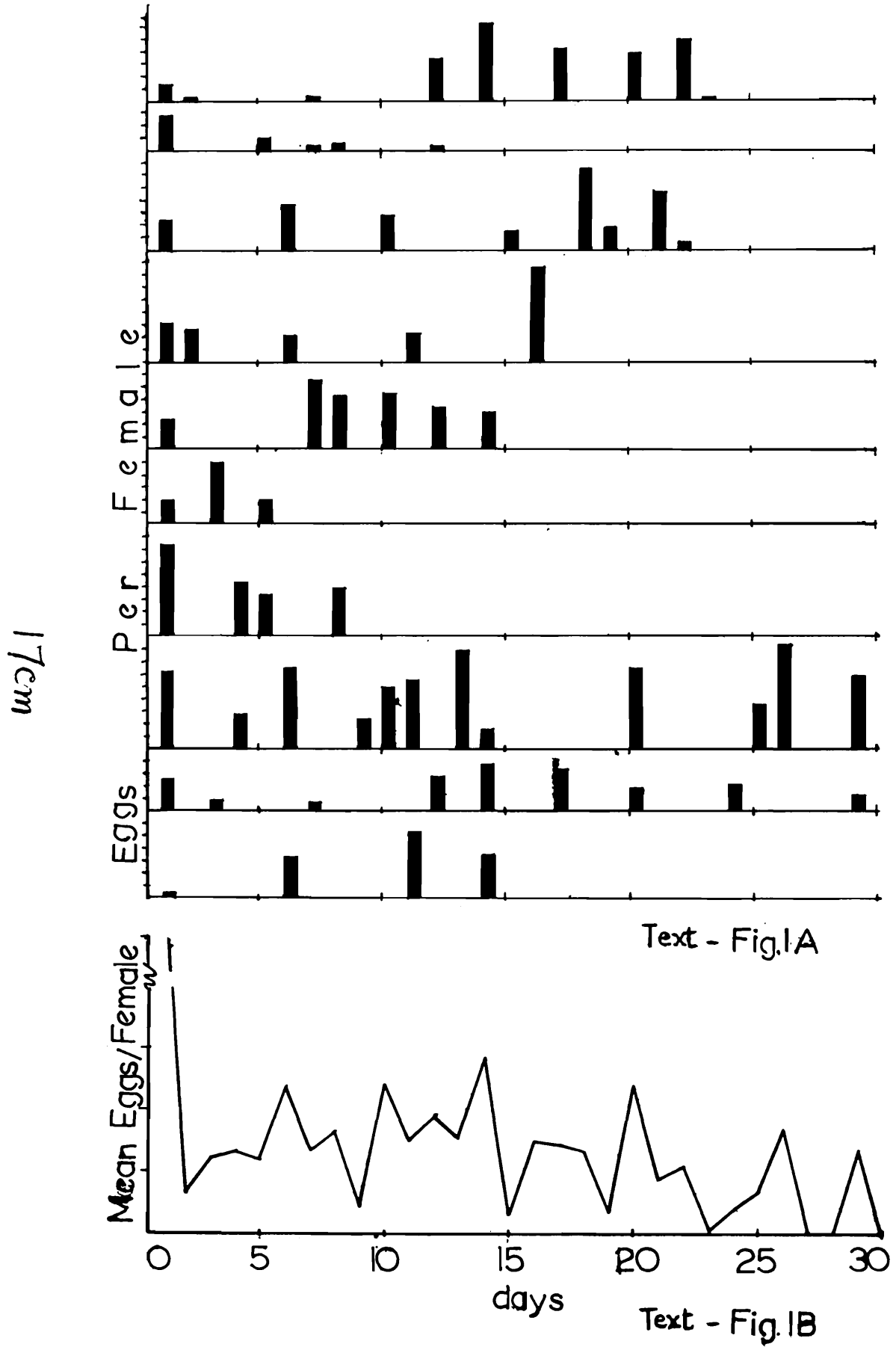
* Exception 59 days in an individual case.

TABLE 3. Comparison of post-embryonic development of the instars of *S. hospes* on two different host plants.

	Nymphal development (in days)					
	1st instar	2nd instar	3rd instar	4th instar	5th instar	Total
	(on *Calotropis)*					
Mean	3.1	3.0	3.0	4.9	7.3	21.3
Range	(3-4)	(2-4)	(2-4)	(4-9)	(6-8)	(20-25)
S. D. ±	0.31	0.47	0.47	1.52	0.82	1.82
	(on *S. khasianum)*					
Mean	3.8	3.4	4.8	5.9	7.2	25.1
Range	(3-4)	(3-4)	(3-6)	(4-8)	(6-10)	(23-28)
S. D. ±	0.42	0.51	0.91	1.52	1.31	1.59

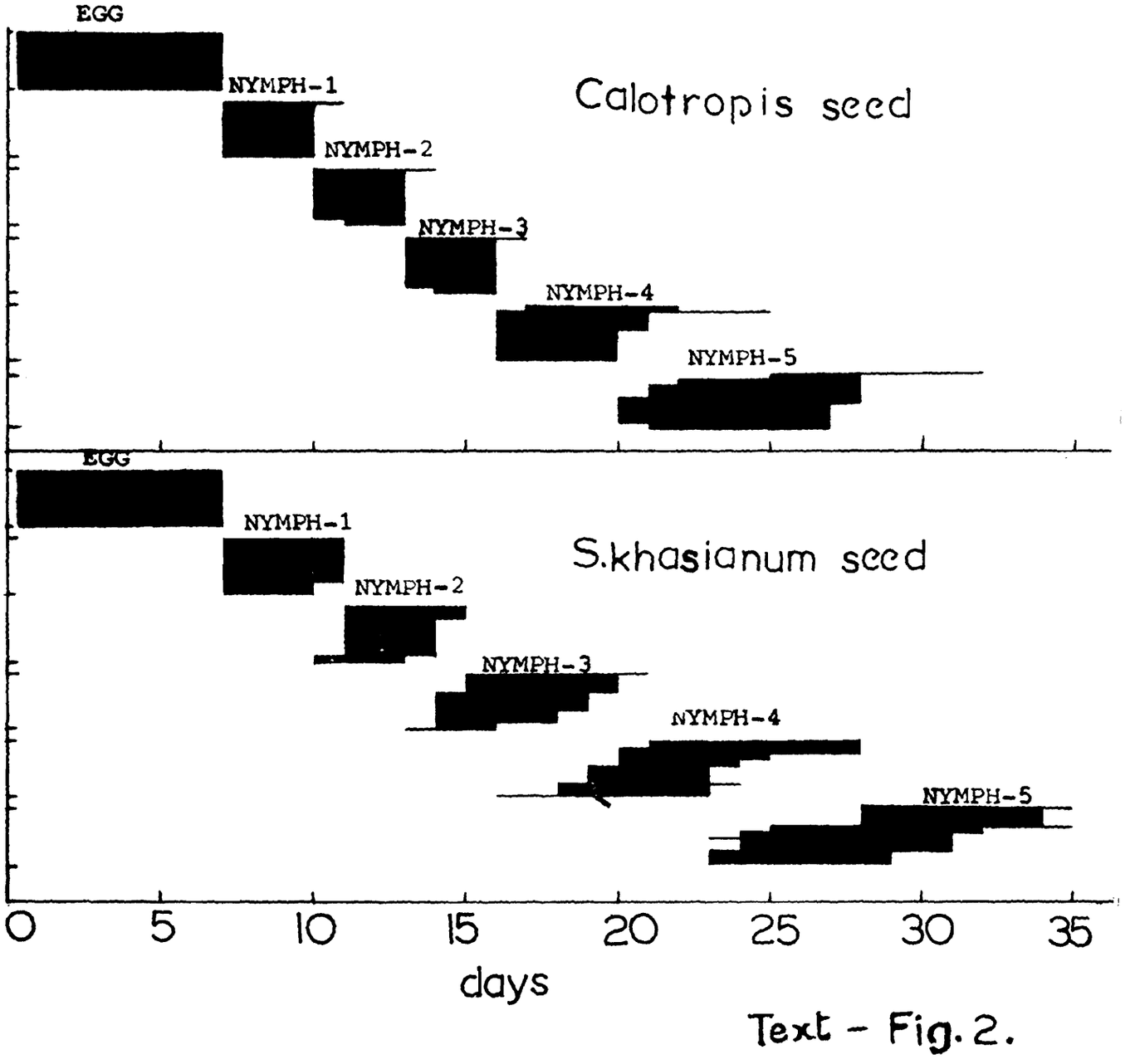
DISCUSSION

The ability to utilize *S. khasianum* as an alternate host plant by *S. hospes* in North Bengal region has a serious implication, as this bug through its new adaptation, gains the capacity to spread along with the new host plant even in the hill regions where *Calotropis* weed is absent. The occurrence of the new host plant, as a reservoir of the pest species in or around cultivated plots seems to have more importance when insect-wed-crop interactions are considered. The prolific and prolonged fruiting period of this weed when compared to a short term fruiting of *Calotropis* in this region surely helps the milk-weed bugs to live actively and multiply for greater part of the year subsisting on the newly available host.



Text-Fig. 1A. Oviposition rhythm for ten individuals expressed through bursts (black rectangles) and breaks (blanks) ; each small marking on the ordinate represents ten eggs.

1B. Oviposition trend; each small marking on the ordinate represents five eggs, abscissae-time in days for a month.



Text-Fig. 2. Comparison of post-embryonic developmental stages (ten nymphs) on two different hosts; ordinate-number of moulting observed, abscissa-time in days.

The steroidal compound, associated with the fruits of the new host appeared in no way to interfere with the egg production of the bug. The high fecundity and female longevity on this new host although indicated on one hand of its capacity to support some vital life processes, yet a longer post-embryonic development period on the other hand contradicted its efficiency. This is evident through an average shorter stadial period of the *S. hospes* nymphs when reared on *Calotropis* seeds than on *S. khasianum* seeds (Table 3). Nevertheless, the latter (new host plant) showed enough life supporting capacity for the bug, like the already established host, Madar *(Calitropis)*. The variation and the difference in the hatching success between batches of eggs were perhaps to some extent affected by the cannibalistic behaviour of the just hatched nymphs that fed on the unhatched eggs of the same batch.

SUMMARY

Spilostethus hospes is recorded to use *Solanum khasianum* as a new host plant in Darjeeling district of North East India. Through this new adaptive switching to the alternate host plant, from the already established host *(Calotropies)*, this minor pest gets an opportunity for a wider distribution in the hill regions. All the biological processes like longevity, fecundity, post-embryonic development, and survival potentiality are found to be well carried out using the berries of the new host as a principal diet. In view of such an association a new dimension in the economic aspect of the insect-weed-crop interaction becomes apparent.

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