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INFLUENCE OF SEED DIET ON FECUNDITY AND POST EMBRYONIC DEVELOPMENT OF *SPILOSTETHUS PANDURUS MILITARIS* (FABRICIUS) (HEMIPTERA : LYGAEIDAE)

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ABSTRACT

In southern part of West Bengal *Spilostethus pandurus militaris* (Fabricius) is found for major part of the year to use *Calotropis gigantea* as its principal host-plant. The role of *Calotropis* plant sap or its mature seed or any seed other than *Calotropis* (viz., sunflower seed) in the fecundity and post embroyonic development is investigated. It has come to light that rate of fecundity and development of egg enhances considerably when the bugs are kept on a combination of diet of *Calotropis* seed and its sap (from floral or vegetative parts) ; a diet with a combination of sunflower seed and water (supplied by siphon) seldom instigates egg laying but maintains steady nymphal development, whereas a diet made up purely of *Calotropis* sap precludes fecundity as well as development of latter instars ; the result indicates an obligatory association of this phytophagous-bug with *Calotropis* seed in this region.

INTRODUCTION

Majority of lygaeid bugs are seed feeders. Fecundity and post embryonic development of these bugs are affected by a number of factors *viz.* temperature, humidity, parental age and the nature of laying or moulting substrate etc., but nutrition, especially the seed of the host-plant seems to be an important controlling factor.

Kehat and Wyndham (1972) demonstrated that the availability of the nature of food has a profound effect on longevity, fecundity, and post embryonic development of *Nysius vinitor* Berg. Eyles (1964) besides indicating the host specificity among rhyparochromines demonstrated that only seeds, not leaves or stems of host-plant, supported growth and oviposition in *Scolopostethus*, *Stygnocoris* and *Drymus*. Isman (1977) showed the dietary influence of cardinolides on larval growth and development of milk-weed bug, *Oncopeltus fasciatus* (Dallas). Frings, Frings and Little (1957) showed that a substitute food for seeds reduced the fecundity of *O. fasciatus*. An investigation has, therefore, been undertaken to find out the importance of the milk-weed seeds (*Calotropis gigantea*) in controlling the post embryonic development and fecundity of the common milk-weed bug, *Spilostethus pandurus militaris* (Fabricius).

MATERIALS AND METHODS

For estimating the post embryonic development periods each specimen was reared separately in large vial (10×3 cm). Three kinds of food combinations were provided i. e.

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A. *Calotropis* sap + *Calotropis* seed

B. Sunflower seed + water (in siphon)

C. *Calotropis* sap (from floral and vegetative parts)

Developmental periods of six nymphs were observed on each such combination of food.

For observing fecundity freshly emerged pairs (♂ and ♀) were kept in small jars (10 × 7 cm.) on the above three different diet combinations i. e. A, B and C. Five pairs of bugs were kept on each such diet combination.

The experiments were conducted during the months of June to August under similar conditions of temperature and humidity.

Observations

Post embryonic development with successful moulting and finally metamorphosis was complete for all the specimens reared on A and B diet combinations, However, the mean developmental period of the bugs was shorter when reared on combination-A than on B. Specimens reared on combination-C never successfully moulted to 5th instar and therefore never reached adult stage ; most of these nymphs died after prolonged stadia at 3rd or 4th instar.

Mating in the pairs of the bugs kept on all the above three combinations A, B and C took place within 3 to 4 days. However, regular egg laying was found, after about a preoviposition period of ten days, in only those pairs kept on a diet combination A *Calotropis* (Seed + sap). For these pairs the oviposition period lasted for 6 to 15 days and total number of eggs laid ranged between 282 to 540. Pairs when kept on combination-B (Sunflower seed + water) rarely laid eggs, however in one such exceptional case after a preoviposition period of 38 days a female laid 30 and 12 fertile eggs on two subsequent days. Pairs kept on diet combination-C (Calotropis sap) never laid eggs despite their 26 to 32 days of longevity (Table 2).

TABLE 1 Post embryonic development of the nymphs of *S. pandurus militaris* kept on three different diet combinations (Based on six observations). (Fig. I).

Days	1st Instar	2nd Instar	3rd Instar	4th Instar	5th Instar	Total Period
			A-Calotropis (Sap + Seed)			
Mean	3.66	2.5	2.66	3.0	6.16	18.0
Range	(3-4)	(2-3)	(2-3)	(—)	(6-7)	(17-19)
±S. D.	±0.516	±0.541	±0.516	±0.000	±0.408	±0.632
			B-Sunflower seed + water			
Mean	4.33	2.66	2.5	3.66	7.0	20.16
Range	(3-7)	(2-4)	(2-3)	(3-7)	(6-9)	(18-24)
±S. D.	±1.366	±0.816	±0.547	±1.632	±1.264	±2.714
			C-*Calotropis* sap			
Mean	3.83	4.66	8.66	17.0	—	—
Range	(3-5)	(3-6)	(3-11)	(16-19)		
±S. D.	±0.752	±1.366	±3.141	±1.414		

TABLE 2 Fecundity of five pairs of *S. pandurus militaris* on three different diet combinations.

DIET COMBINATION	PAIR NUMBER 1	2	3	4	5	MEAN (RANGE) ± S. D. OF EGGS LAID	
A-*Calotropis* (Sap+Seed)	274	521	409	282	540	405.2 (274-540) ±	126.47
B-Sunflower Seed+Water	—	—	42	—	—	8.4 (–)	—
C-*Calotropis* Sap	—	—	—	—	—	—	—

Discussion

The above experiments decisively show that some chemical components present in the seeds directly or indirectly control post embryonic development as well as fecundity of the milk-weed bugs, *Spilostethus pandurus militaris*. The factors seem to be more predominent in the seeds of the host-plant (*Caiotropis gigantea*) so that when included in diet it instigated faster development of nymphs and maximum egg laying within a short period. It has been demonstrated by Sweet (1964) that the seed feeding rhyparochromines when kept on lettuce and other green material produced fewer eggs in contrast to heavy production when fed on sunflower and other seeds. Johansson (1954, '58) has conclusively shown that in *Oncopeltus fasciatus* the corpora allata hormone production was controlled by seed feeding, for starving or placing the insect on diet without seeds, cuts off egg production.

As seed feeding in the present context is found to influence both oviposition as well as moulting and metamorphosis of latter stages, implication of insect hormones obtained from nonneural endocrine glands and their involvement for the onward successful post embryonic development may be ascribed. The activity of corpora allata

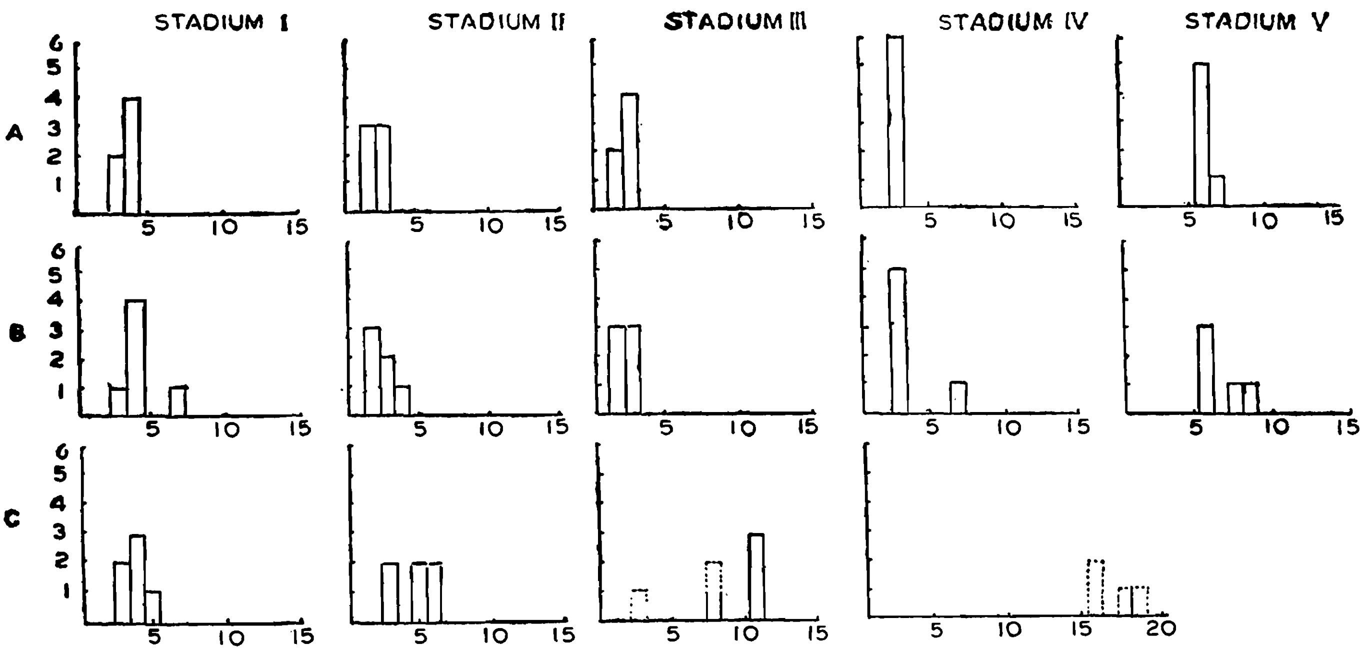

FIG. I. Frequency distribution of duration of instars on three diet combinations (A, B, C) of S. pandurus militaris. Ordinates, number of observations; Abscissae, time in days. Dotted rectangles indicate nymphal mortality.

and maturation of oocytes are closely related with nutrition. In *Rhodnius* it has been shown that the 'Juvenile hormone' of the young larva and 'yolk forming hormone' of adult appear to be interchangable and probably identical substances (Wigglesworth, 1964). It is further demonstrated that on decapitation of a 4th instar nymph of *Rhodnius* (before critical period) no growth occurred and the nymph did not moult-although such nymph remained alive for many months (Wigglesworth, 1970).

In view of the above facts it may be presumed that seed deprivation has engendered elemination of active principle which necessarily implicate the successful completion of post embryonic development. Nevertheless, the plant sap appears to be instrumental for initiating the development but can not maintain the latter stages. Furthermore, the importance of the brain to elaborate respective trophic hormones in proper sequence and concentration may well be envisaged for elaboration of respective hormones in event of successful moulting and maturation of oocytes in adults.

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References

Eyles, A. C. 1964. Feeding habits of some Rhyparochrominae (Het. : Lyg.) with particular reference to the value of natural foods. *Trans. R. ent. Soc. Lond.*, **116** (5) : 89-114.

Frings, H., Frings, M., and Little, F. 1957. Peanuts as substitute food for large milk-weed bug. *J. econ. Ent.*, **50** : 363-364.

Isman, M. B. 1977. Dietary influence of cardinolides on larval growth and development of the milk-weed bug *Oncopeltus fasciatus* (Het. : Lyg.). *J. Insect. Physiol.*, **23** : 1183-1187.

Johansson, A. S. 1954. Corpus allatum and egg production in starved milk-weed bugs. *Nature Lond.*, **174** : 89.

Johansson, A. S. 1958. Relation of nutrition to endocrine reproductive functions in milk-weed bug *Oncopeltus fasciatus* (Dallas) (Het. : Lyg.). *Nytt. Mag. Zool.*, **7** : 1-132.

Kehat, M. and Wyndham, M. 1972. The effect of food and water on development, longevity and fecundity in the Rutherglen bug, *Nysius vinitor* (Hem. : Lyg.), *Aust. J. Zool.*, **20** : 119-130.

Sweet, M. H. 1964. The biology and ecology of Rhyparochrominae of Few England (Het. : Lyg.). *Entomologica am.* **43** : 60.

Wigglesworth, V. B. 1964. Hormone Control of growth and reproduction in Insects : review *Adv. Insect physiol.* **2** : 247-336.

Wigglesworth, V. B. 1970. Insect Hormones. University reviews in Biology. Oliver and Boyd, Edinburgh.