

Effect of Semi-synthetic Diets on Adult Longevity Sex-ratio, Oviposition Period and Fecundity of *Heliothis armigera* (Hbn)

By

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ABSTRACT

There was a gradual build up of female population of *H. armigera* on semi-synthetic diets and male population on natural hosts. There was an increase of oviposition period to the extent of 12.6 per cent from first to second generation in all the diets. The adults lived longer upto 14.5 days when the larvae had fed on diet—A, while it was only 12 days in all the other diets. The increase in fecundity from first to second generation was marked in diet—A, from 661 to 918 eggs per adult and this diet resulted in the maximum fecundity as compared to the other semi-synthetic diet (diet—B) as well as lab-lab and tomato.

INTRODUCTION

Enhanced fecundity on semi-synthetic medium has been reported in the case of pink bollworm, *Pectinophora gossypiella* (Saunders) and Spruce budworm, *Choristoneura fumiferana* Clem. by Adkisson *et al.* (1960) and Mc Morran (1965) respectively. Another factor, adult longevity, has been found to be enhanced on semi-synthetic diets as observed with the cotton boll weevil *Anthonomus grandis* Boh. (Vanderzan and Richardson, 1963) and with Pea aphid, *Macrosiphum (Acyrtosiphon) pisum* Harris. (Auclair, 1965). The present paper reported the results of the

studies on adult longevity, sex-ratio, oviposition period and fecundity of the adults of *Heliothis armigera* (Hbn.) bred on two improvised semi-synthetic diets to evaluate their influence on the reproductive potential of the insect.

MATERIALS AND METHODS

The insect was fed throughout the larval stage on two semi-synthetic diets A and B (C Nachappan and Subramaniam, 1972) besides lab-lab and Tomato as natural hosts. On pupation they were retained in large containers till emergence. The adults that emerged were sexed and single pairs confined to cages of different dimensions

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of 18×15×17 cm, 16 × 15 × 18 cm, 17×9×30 cm and 25×10 cm. Each of them was provided with a tender shoot of lab-lab plant kept in water in a specimen tube so as to keep the plant fresh enough to enable oviposition and subsequent collection of eggs. Cotton dipped in sucrose solution was also kept inside for feeding the moths. Eggs were laid either on the muslin cloth covering the top of the cage or on the lab-lab shoot. Data on emergence of moths, sex-ratio, pre-oviposition, oviposition periods, adult longevity and fecundity were gathered. The rearing was continued in the second generation in a similar manner.

RESULTS AND DISCUSSION:

(i) *Sex-ratio*: More males were found to emerge when the larvae had been cultured on tomato and lab-lab in both the generations. But, there was a gradual increase of females from first to second generation with diet-A. The male:female ratio of 74:26 in the first generation changed to 58:42 in the second generation in diet-A, while the ratio was kept up in balance in tomato viz., 67:33 and 65:35 in first and second generations respectively (Table 1).

(ii) *Pre-oviposition period*: The newly emerged moths were found to mate freely either on the first or second day. Small variations in the pre-oviposition period of the insect were observed on the different diets in all replications. The period was minimum in lab-lab (3.3 days) and maximum in diet B (3.8 days). In general, the pre-oviposition period was found to be

TABLE 1. Influence of diets on the sex-ratio of *Heliothis armigera*

Diet	Generation I	Generation II
	Male : Female	Male : Female
Diet - A	74 : 26	58 : 42
Diet - B	75 : 25	60 : 40
Tomato	67 : 33	65 : 35
Lab - lab	60 : 40	64 : 36

shorter by 20 per cent in the second generation (Table 2).

TABLE 2. Effect of diets on the pre-oviposition period of *Heliothis armigera* in two generations

Diet	I Generation	II Generation
	(Days)	(Days)
Diet - A	3.50	3.25
Diet - B	4.33	3.25
Tomato	4.20	3.00
Lab-lab	3.67	3.00

(iii) *Oviposition period*: An interesting trend in oviposition period to the extent of 12.6 per cent in the second generation as compared to the first generation, when reared on the semi-synthetic diets was observed, while it remained almost unchanged in their natural hosts viz., tomato and lab-lab (Table 3).

TABLE 3. Effect on the oviposition period of *Heliothis armigera* in two generations

Diet	I Generation (Days)	II Generation (Days)
Diet - A	7.75	9.63
Diet - B	5.33	9.13
Tomato	13.20	11.43
Lab-lab	10.00	10.63

(iv) *Adult longevity*: The adult moths of *Heliothis armigera* lived up to 14.5 days and 12.0 days in diets A and B respectively against only 11.6 days on lab-lab (Table 4). The diet-A was found to be better than the diet of

TABLE 4. Effect of diets on the adult longevity of *Heliothis armigera* in two generations

Diets	I Generation (Days)	II Generation (Days)
Diet - A	12.04	16.88
Diet - B	9.88	14.04
Tomato	10.12	14.24
Lab-lab	10.76	12.40

Shorey and Hale (1965) developed for the same species as the latter recorded only 10.8 days of adult longevity. In the present study also diet-A was better

than the other diets. Similar reports of increased adult longevity on semi-synthetic diets have been made by Vanderzant and Richardson (1963) in The boll weevil, *Anthonomus grandis*. The pea aphid, *Macrosiphum pisum* also was found to survive for two months more on artificial diets than the aphid fed on its natural host (Auclair, 1965).

(v) *Fecundity*: Insects reared on diet-A laid a mean of 790 eggs in two generations, while it was only 558 in diet-B and 610 and 663 eggs were laid respectively in tomato and lab-lab. diet-A was found to be more suitable. The diet-A may be very similar in effect to the diet evolved by Shorey and Hale (1965) using dry beans medium, since they also observed a high fecundity rate of 773 eggs per mated female of *Heliothis armigera*. Similar increases in fecundity in the case of pink boll worm *Pectinophora gossypiella*, Spruce bud worm, *Choristoneura fumiferana* and

TABLE 5. Effect of diets on the fecundity of *Heliothis armigera* in two generations

Diet	I Generation (eggs laid)	II Generation (eggs laid)
Diet - A	661	918
Diet - B	507	608
Tomato	601	618
Lab-lab	648	676

Gypsy moth, *Porthetria dispar* L. when cultured on semi-synthetic diets, in comparison with natural hosts, were recorded by Adkisson *et al.* (1960), Mc Morran (1965) and Leonard and Donae (1966) respectively. Patel *et al.* (1968) also recorded maximum egg laying capacity in the adults, when the larvae of *Heliothis* were reared on semi-synthetic diets than on their natural hosts.

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