

## **EFFECT OF FEED CUT IN FIFTH INSTAR ON SEED CROP REARING AND ITS EFFECT ON REPRODUCTIVE TRAITS OF SILKWORM *BOMBYX MORI* L.**

**M.T. HIMANTHARAJ AND G. SREERAMA REDDY\***

RESEARCH EXTENSION CENTRE, MARAGHATTA-577 520, INDIA.

DEPARTMENT OF SERICULTURE,

UNIVERSITY OF MYSORE, MYSORE, INDIA\*.

(e-mail : himantharaj@gmail.com)

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It is known that 20 percent feed cut during the fifth instar increases the reproductive efficiency in pure races without sacrificing the other characters, it has not been tested on Indian races reared under tropical conditions. Hence, the study was undertaken to study the effect of feed cut in fifth instar on reproductive traits of two pure races viz. NB4D2 and KA. The results revealed that 20% feed cut during fifth instar had positive effect on some of the character studied. The marginal improvement was observed in pupation rate, fecundity and egg recovery in both the races.

**Key words :** Feed cut, fifth instar, reproductive traits, *Bombyx mori* L.

### **INTRODUCTION**

The silkworm *Bombyx mori* L. is a commercially important insect, around which the sericulture industry is built for the production of silk. Having been reared under human care since several thousands of years, it has lost its capacity to adopt itself to the natural environment and has changed from those of other wild insects of the same species. It has become very sensitive and delicate and needs continuous care and attention for its survival and is easily amenable to various environmental factors, such as temperature, relative humidity, light, air current as well as the quality and quantity of food, the mulberry leaf which is the only source. Therefore, the silkworm requires optimum environmental conditions as well as good quality mulberry leaves for its normal growth and development (Himantharaj, 1994).

Unlike the hybrid silkworms which are reared commercially, the rearing of pure races requires special skill and attention as they are less buffered against slight fluctuations in the ambient environmental conditions and nutritional requirements. Therefore, it is necessary to develop rearing technology suitable for commercial rearing for the production of reeling cocoons and seed cocoons for the reproductive purpose. It is apparent that the silkworm reproduction is influenced by both internal and external factors reflecting on the egg laying capacity. Nutritional factors have been shown to affect the total egg output apart from the environmental factors such as light, temperature and relative humidity during different developmental stages as well as during mating and egg laying (Himantharaj, 1994). Continuous attempts made by several investigators (Krishnaswamy, 1978; Ullal & Narasimhanna, 1987; Jolly, 1987; Datta, 1992) on the type and quality of mulberry leaves, the amount of leaf to be fed at a time and the number of feeds in a day have yielded fruitful results to develop rearing technology for successful rearing of silkworm crops. However, most of the studies on the aspect are related to rearing of commercial hybrids. The appetite of pure silkworm races is poor and growth and development is rather slow compared to hybrids. Overfeeding, under feeding as well as the quality of leaf play a critical role in the metabolism during the growth and development resulting in physiological imbalance leading to the formation of pupa with

increased or decreased fat content affecting the egg laying capacity of the moths. Eventhough, it is known that 20 percent feed cut during the fifth instar increases the reproductive efficiency in pure races without sacrificing the other characters. This is known as "Shimegai rearing" in Japan (Anonymous, 1972). But, it has not been tested in Indian races, rearing under tropical conditions. Hence, this study was undertaken to study the effect of feed cut in fifth instar on reproductive traits in seed crop rearing.

### MATERIALS AND METHODS

Two bivoltine races NB4D2 and KA form the material for the study. Mass rearing was conducted upto fourth moult. 3600 larvae were selected for each one of the races, after fourth moult the larvae were divided into four groups of 900 larvae, in three replications for each one of the groups. 2700 larvae were subjected to three different treatments in three replications of 300 larvae by manipulating the quantum of feed by feed cut method by calculating the daily requirement of mulberry leaves for 300 larvae on the basis of recommended quantity of 800 Kg and 880 Kg for NB4D2 and KA respectively for 40, 000 larvae in fifth instar (Anonymous, 1986-87).

- a) First three days normal feed and last three days with 20% feed cut (T1)
- b) First three days 20% feed cut and last three days with normal feed (T2)
- c) 20% feed cut throughout the fifth instar (T3)
- d) Remaining 900 larvae in 3 replications were kept as control with standard quantum of feed (control).
- e) The ripened worms were mounted in plastic collapsible mountages. The cocoons were harvested on the 7<sup>th</sup> day after mounting. All the batches were tested by shaking the cocoons gently to find out the number of live pupae and the percentage of pupation is calculated based on the number of cocoons harvested. 100 cocoons of uniform shape and size were retained and processed for grainage operations. The grainage parameters such as egg recovery, fecundity and hatching percentage were assessed by following standard grainage practices (Krishnaswami *et al*, 1973; Jolly, 1983). The silkworm eggs prepared were acid treated and incubated at  $25 \pm 1^{\circ}\text{C}$  temperature with  $75 \pm 5\%$  relative humidity until hatching to record hatching percentage. The experiment was repeated thrice. The generated data were subjected to statistical analysis and data were presented in Tables (I-III ; Fig. 1).

### RESULTS

**Pupation rate :** 20% feed cut in the later stage of the fifth age was found to have an effect on the improvement of this trait in NB4D2 (97.33%), while in KA, the trait was observed to increase in the batches imposed with 20% feed cut in the beginning followed by normal feed(97.55%). However, a marginal improvement was observed in both the races (96.11% in NB4D2 and 94.77% in KA) in the experimental batches, imposed with feed cut throughout the fifth age (Table 1).

**Fecundity :** Reduction in the quantum of feed during fifth age was observed to have no effect on this trait except in the batches imposed with 20% feed cut throughout in NB4D2 (483), compared to control (427) and in KA, the batches with 20% feed cut in the beginning (497) compared to control (430) (Fig. 1).

**Table I :** Effect of feed cut on pupation rate (%).

Treatments	NB4D2	KA
Normal : 20% feed cut	97.33	96.89
20% feed cut : Normal	94.55	97.55
20% feed cut : 20% feed cut	96.11	94.77
Normal(control)	94.66	94.55
SE	1.79	
CD @ 5%	5.06	
Test of significance	NS	

NS : Not significant

**Table II :** Effect of feed cut on egg recovery (%).

Treatments	NB4D2	KA
Normal : 20% feed cut	24.00	25.44
20% feed cut : Normal	26.11	25.33
20% feed cut : 20% feed cut	25.00	23.00
Normal(control)	23.89	22.67
SE	0.45	
CD @ 5%	1.26	
Test of significance	*	

\* : Significant @5%

**Table III :** Effect of feed cut on hatching (%).

Treatments	NB4D2	KA
Normal : 20% feed cut	93.48	94.45
20% feed cut : Normal	94.20	96.21
20% feed cut : 20% feed cut	95.86	95.40
Normal(control)	93.81	94.83
SE	1.45	
CD @ 5%	4.10	
Test of significance	NS	

NS : Not significant

**Egg recovery percentage :** It was found to improve significantly in both the races (26.11% in NB4D2 & 25.33% in KA) in the batches imposed with 20% feed cut in the first half of the fifth age, while it was found to increase only in KA, in the batches imposed with feed cut in the later half of the fifth age (25.44%) (Table II).

**Hatching percentage :** Hatching percentage was observed to be on par with the control as evidenced non significant difference between the experimental batches and the control batch (Table III).

## DISCUSSION

The quantum of mulberry leaves to be supplied during the period of rearing particularly in the fifth age is very important as overfeeding/underfeeding leads to nutritional imbalance during the growth and development of larvae resulting in crop loss.

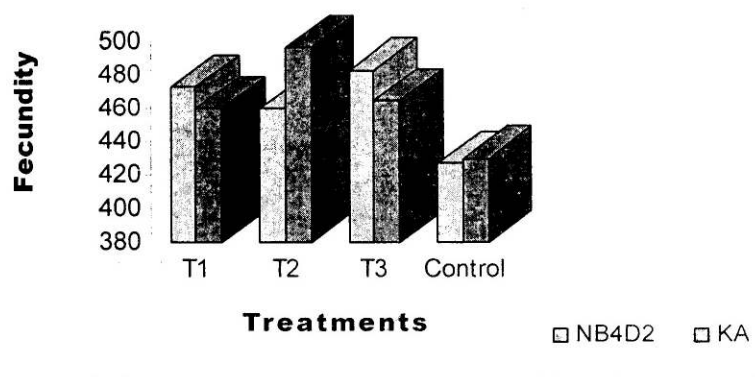


Fig. 1 : Effect of feed cut on fecundity.

determination of quantum of feed assumes special importance for both seed crop and commercial crop rearing. Literature on this aspect reveals a great deal of information on the quantum of feed to be supplied to hybrid silkworms (Krishnaswami, 1978; Ullal & Narasimhanna, 1987; Jolly, 1987; Datta, 1992; Meenal *et al.*, 1999 & 2001) and very little is known about the quantum of feed to be supplied for rearing of pure races for reproductive purpose (Anonymous, 1986-87).

The present investigation on feed cut on two bivoltine races NB4D2 and KA has clearly indicated that the 20% reduction in the quantum of feed either in the beginning or in the later part of the fifth age was observed to improve the pupation rate, fecundity and egg recovery. The positive effect of the reduction of the quantum of feed on most of the reproductive traits can be attributed to the increased efficiency of ingested food and is in agreement with the observation of Radhakrishna & Delvi (1987), who reported the same in the hybrid races with 25% feed cut and also parallel with Shimegai rearing (Anonymous, 1972). Contrary to the observations of Anonymous (1986-87), on the negative effect of 25% feed cut on the reproductive rate of bivoltine race KA, the improvement in the fecundity in both the races NB4D2 and KA imposed with 20% feed cut can be ascribed to the reduced accumulation of fat content in the larval body leading to increased efficiency of the female moths to lay more number of eggs.

Thus, in view of the findings, it is the considered opinion of the author that, regulation of the quantum of feed during the fifth age will help in the production of quality cocoons with robust pupae and healthy moths in seed crop rearing without sacrificing other economic traits.

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