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EFFECT OF NUMBER OF FEEDING ON DISEASE INCIDENCE IN TASR SILKWORM, *ANTHERAEA MYLITTA* D.

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ABSTRACT

Tasar silkworm *Antheraea mylitta* D. is a polyphagous insect and is reared out door on the food plant like as *Terminalia arjuna, Terminalia tomentosa, Shorea robusta*. Productivity of cocoon in out door rearing is poor due to attack of number of pests, predators and diseases besides natural vagaries such as, wide fluctuating temperature, heavy rain and stormy wind etc. Attempts were made in the past to increase the cocoon production by adopting various methods of indoor rearing particularly for early instar worms and also by improving the rearing conditions. In the present study, indoor rearing was conducted in wooden tray supported with wooden rearing frames specially designed for young age and late age silkworms. Trials were taken up to determine optimum number of feeds per day for indoor rearing of tasar silkworm and there effects on disease incidence. Three feed per day resulted significantly lower mortality of worms due to diseases and other factors (65% and 70% during I and II crop respectively). Larval period was also recorded less under three feeding condition. Significant increase in commercial characters (cocoon weight and shell weight) was observed under three feedings condition than other feeding treatments.

Key words: *Antheraea mylitta*, indoor rearing, wooden rearing frame.

INTRODUCTION

Larval feeding in non-feeding adult insect is an active and dynamic process, and the amount, rate and quality of food consumed directly affects the growth, development, final weight, survival and reproductive potential as well (Slansky and Scriber, 1985). The tropical tasar silkworm, *Antheraea mylitta* D is polyphagous insect. It is commercially reared out doors on its primary food plants, *Terminalia arjuna*, *Terminalia tomentosa*, and *Shorea robusta.* Traditional rearing method of tasar silkworm on nature grown forest plantations has many disadvantages like erratic climatic conditions, lack of watch and ward and free access to parasites, pathogens and predators lead to extremely low returns. There is heavy population loss to the tune of 50-55% in early instars due to pests and predators attack when reared out door but in indoor rearing this loss during early instars can be reduced (Jolly *et al.,* 1974, 1979, Mathur *et al.,* 1999). It is pertinent to ensure higher recovery which is possible only in rearing the silkworm under controlled condition. Domestication of silkworm *i.e.* the indoor rearing at the Institute level has been tried by many scientists to study the nutritional ecology (Rath *et al.,* 1999; Ojha *et al*., 2000; Sinha *et al*., 2000). But works are still required to standardize the indoor rearing technique for higher survivability. Insects attain their functional optima through intake and growth

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target (Raubenheimer and Simpson, 1999) and any change in intake and growth targets will lead to physiological disturbance affecting at its performance level. Keeping in view, the present study was carried with an object to find out optimum number of feeds/day to meet the consumption level for better growth, development, survival, cocoon production, and disease incidence of tasar silkworm in indoor condition.

MATERIALS AND METHOD

The experiment was conducted at Central Tasar Research and Training Institute, Nagri, Ranchi, Jharkhand during July to October.

a. The rearing tray

Specially designed wooden trays (90cmLX60cm.W X 10cmH), with wire meshed bottom were used for early and late instar rearing. Wooden rearing frame of smaller size (30 cm L X 30cmW X 8cmH) was provided for young age (upto II instar) rearing, while rearing frame of bigger size (75cmL X 45cmW X 10cmH) was provided for late age rearing (III instar onwards). News papers were used on the bottom of the tray for absorbing the litter moisture. Trays were arranged on the bamboo racks inside the rearing room. Temperature (25-28°C) and relative humidity (75-85 %) were maintained inside the rearing room.

b. Rearing technique

Antheraea mylitta (Lepidoptera: Saturniidae; Daba bi-voltine eco-race) larvae (fresh and healthy) hatched during the first week of July (I Crop) and first week of September, 2006 (II crop) were taken for the experiments.

Entire rearing operation was conducted in a pre-disinfected rearing room. On the day of hatching, the eggs were transferred from incubator to disinfected rearing tray. The hatched worms were fed with tender leaves (except the two whorls of apical leaves) of *Terminalia arjuna* (Arjun). All the rearing trays were kept on rearing rack separately treatment-wise. Young age rearing was conducted on small size rearing frame and during the late age worms were transferred on to the large size rearing frame. Bed cleaning was carried out every day morning by replacing the news paper along with litters and dead worms. During the whole process of rearing hygiene was maintained.

c. Leaf harvesting

Leaf harvesting was preferred between 5-7 AM and then preserved up to 6 pm in a bamboo box covered with wet gunny cloth to keep the moisture content of the leaves. Leaf quality was maintained as per the need of the worms of a particular instar.

d. Feeding treatments

Four feeding trials were taken up by providing different number of feeds per day as follows:

T1-Only one feeding in a day at 9 AM

T2-Three feeds a day at 6 AM, 1PM, and 6 PM

T3- Four feeds in a day 6 AM, 10 AM, 2 PM and 6 PM

T4- Two feeds a day at 6 AM, and 6 PM (Control)

Each treatment has four replications and each with two hundred worms.

e. Spinning

At the end of the fifth instar the weight and size of the larva reach their peak. Soon the feeding stops and the larva discharges the last excreta (gut purging) and emptying the gut, thus indicates that the larva is ready to spin the cocoon. Here the matured worms were selected and placed in separate tray for smooth spinning. In spinning trays sufficient leaves along with twigs were kept for making hammock and ring. During the process cocooning worms were not disturbed. Cocoons were harvested after 10 days and they were tied in form garland and stored in the cocoon cage.

During the experiment data on effective rate of rearing and commercial characters of the cocoon were recorded and were statistically analysed using analysis of variance (ANOVA).

RESULTS

The results are presented in Table 1-4. Increase frequency of feeding to 3 feeds /day (T2) significantly enhance the ERR % in both crops. The ERR % increased by 16.66 % over control (T4) and 94.4% over T1 (one feeds per day) during I crop of rearing (Table-1). When one feeds per day (T1) was maintained the ERR% was declined by 40% over T4 (control) while four feeds/day (T3) registered a decline of 6.7%. Three feeds per day (T2) has resulted significantly higher ERR % in I and II crop. Based on pooled data the ERR % in different treatment can be arranged in following order T2>T4>T3>T1. The performance of I crop in indoor rearing was always a better one than the II crop (Table 1).

Larval duration was significantly increased to 49 days in one feeds per day (T1) and less (36 days) in T2 than other treatments (Table 2).

In T2 the mortality was significantly low (I crop 65 % and in II crop70 %) in comparison to other treatments (Table 2). Treatment having four feeds per day (T3) has resulted maximum (I crop

Table-1.Effect of frequency of feeding on rearing performance

Treatments	Effective rate of rearing %		Pooled value	Mean	Performance of II crop over I crop
	I Crop	II Crop			
T1(One feeds/day)	18 (-40.0)	12 (-50.0)	30	15.0	-33.3%
T2(Three feeds/day)	35 (+16.6)	30 (+25.0)	65	32.5	-14.3%
T3(Four feeds/day	28 (-6.6)	21 (-12.5)	49	24.5	-.25.0%
T4(Two feeds/day, Control)	30	24	54	27.0	-20.0%
CD% at 5%	4.10	4.85		4.47	-

(Figures in parenthesis indicate change over control)

Table-2. Effect of frequency of feeding on mortality of worms

Treatments	Mortality %		Pooled value	Mean	Larval Period in days
	I Crop	II Crop			
T1(One feed/day)	82	88	170	85.0	49
T2(Three feeds/day)	65	70	135	67.5	36
T3(Four feeds/day)	72	79	151	75.5	40
T4(Two feeds/day Control)	70	7 6	146	73.0	44
CD% at 5%	4.10	3.85	-	4.47	2.56

Table - 3. Effect of frequency of feeding on disease incidence

Treatments	Disease Incidence%								Mortality due to other factors			
	Virosis				Bacteriosis							
	I Crop	II Crop	Pooled Value	Mean	I Crop	II Crop	Pooled Value	Mean	I Crop	II Crop	Pooled Value	Mean
T1 (One feed /day)	21	14	35	17.5	14	26	40	20.0	47	48	95	47.5
T2 (Three feeds/day)	29	35	64	32.0	22	20	42	21.0	14	15	29	14.5
T3 (Four feeds/day)	40	43	83	41.5	26	28	54	27.0	6	8	14	7.0
T4 (Two feeds /day, Control)	36	31	67	33.5	19	23	42	21.0	15	22	37	18.5
C.D. at 5%	3.76	4.85	-	4.32	4.26	4.06	-	4.16	6.98	7.65	-	7.35

Table-4. Effect of frequency of feeding on commercial characters of cocoons.

Treatments	Cocoon weight(g)			Shell weight(g)			Silk ratio (%)		
	I Crop	II Crop	Mean	I Crop	II Crop	Mean	I Crop	II Crop	Mean
T1	8.96	8.78	8.87	0.92	0.89	0.90	10.26	10.13	10.19
T2	10.97	10.85	10.91	1.57	1.61	1.59	14.31	14.83	14.57
T3	10.12	10.14	10.13	1.22	1.23	1.22	12.05	12.13	12.09
T4	10.62	10.73	10.67	1.34	1.28	1.31	12.61	11.92	12.26
C.D. at 5%	0.32	0.11	0.21	0.17	0.26	0.22	NS	NS	NS

40 % and in II crop 43 %) disease incidence of virosis which was significantly higher than other treatments so also mortality due to bacteriosis (26% and 28% during I and II crop respectively). Interestingly mortality recorded for virosis and bacteriosis in T1 were lowest than all but the larvae in the same treatment were reported dead due to other factors (Table 3). Above all the mortality recorded were in the order of T1>T3>T4>T2.

Significant differences in cocoon weight and shell weight were observed among treatment groups. The pooled data revealed minimum single cocoon weight (8.87gram) and single shell weight (0.92gram) for T1 while in T2 the cocoon weight higher single cocoon weight were 10.91 and 1.59 respectively. Based on pooled data of commercial

characters the feeding trials can be arranged in the order T2> T3> T4> T2 (Table-4).

Thus, the overall result revealed that T2 is better than others.

DISCUSSION

The success obtained in the present attempt at indoor rearing up to cocooning was due to the introduction of wooden rearing frame. Such special type support was not used in earlier attempts for rearing of *A. mylitta* (Jollly *et al.,* 1972, 1974, 1979; Thangavelu and Sahu, 1983; Tikoo and Singh, 1990; Thangavelu *et al.,* 1993; Ojha *et al.,* 1994). Rearing till cocoon formation was conducted in wooden tray having specially designed frames to facilitate cocooning and restrict the worm inside the tray (Negi *et al.* 2004 and Prasad *et al.* 2005). Higher rate of nutrition results in higher survivability of *Antheraea mylitta* (Rath, 2005) corroborates our findings that three feed per day (T2) resulted significantly higher ERR during I and II crop, as against minimum ERR recorded under one feeding (T1). The ERR increased by 94.4% in T2 over T1. Mortality was significantly less in both crops in T2. This is due to optimum frequency of feeding and optimum handling of worms. One feeds in a day (T1) has resulted maximum mortality due over drying of leaves which causes starvation to the worms. Four feeds per day has resulted lower single cocoon weight and lower single shell weight due to over handling of worms which reduces net food consumption and also make larvae more prone to infectious diseases like as virosis and bacteriosis.

The survivability of worms has increased following fresh food three times a day. In this method of indoor rearing it was observed that newly hatched larvae were remain on leaves feeding it voraciously since the frame is raised from bottom surface of the tray. The frame prevents the leaves touching the bottom and sides walls of the tray, resulting restriction migration of worms out of the tray.

Late age worms (from 3rd instar onwards) were reared on the bigger rearing frame because they required larger spaces for their movements and have many advantages. It is provided with 4" height stand at four corners raising it above the tray bottom and silkworm can not touch the tray bottom and sides owing to is size. Bigger frame supports comparatively large quantity of leaves and thus facilitates the bigger larva to feed.

Silkworms passing last excreta were picked up and put in a separate tray over matured leaves kept on late age rearing frame for cocoon spinning. Late age rearing frames was also found very helpful during cocoon formation. The bigger rearing frame provides optimum space is for hammock, ring and peduncle formation.

The present study indicates the feasibility of indoor rearing of tasar silkworm *Antheraea mylitta* in wooden tray along with wooden rearing frame up to spinning stage by adopting 3 feed per day. This method can be adopted for better cocoon production and for conducting various experiments and maintenance of precious germplasm.

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