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SEX RATIO AND FREQUENCY DISTRIBUTION OF COCOON WEIGHT IN WILD AND REARED VARIETY OF *ANTHERAEA MYLITTA*

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ABSTRACT

Antheraea mylitta is a well known sericigenous insect of India of economic importance. Unsynchronized and prolonged emergence of adult moth in the diapausing population of this insect affects the commercial egg production in grainages to a great extent. The sex ratio (F: M) was found to be 1:1.4 in both wild and semi-domesticated populations. The frequency distribution of cocoon weight revealed 92.62% of male population were confined to the cocoon weight range of 8.1 to 12.5 g and 83.66% of female lied between 11.1 to 15.5 g in reared variety while, 78.2% male population ranged between 11.1 to 15.5 g and 87.3% of female population ranged between 15.1 to 19.0 g in wild variety. The mean cocoon weight of male was found to be 10.3 g and 13.5 g, whereas that in female was 14.1 g and 16.1 g in reared and wild variety respectively. Wild variety was found to be superior over reared variety in important cocoon characters, pupa weight and shell weight. The average shell weight per gram of pupal tissue formed was about 0.200g.

Key words: Sex ratio, frequency distribution, *Antheraea mylitta.*

INTRODUCTION

Tropical tasar silk insect *Antheraea mylitta* is and extremely versatile species of polyphagous nature that spins one of the largest cocoon rich in silk. It is a wild sericigenous species found in the subtropical India, and known to encounter a wide range of geo-climatic conditions. Foraging of the silkworm on a variety of food plants together with all abiotic factors (*i.e.,* annual precipitation, temperature and day length) of the habitat leads to a marked difference in their life cycle activities, and also expresses wide variations in behavioural, phenotypical and physiological traits for their survival and perpetuation. It did not lose its wild behaviour although man has handled and exploited it since long. The population size is well under control of the nature. In captivity it poses many difficulties due to unsynchronized emergence and mating behaviour (Rath *et al*., 1998). Even emergence pattern and voltinism are greatly influenced by the geographical area (Nayak *et al*., 1993; Rath *et al.,* 2004). Earlier studies revealed that there was no relationship between pupa weight and pupa l period with emergence (Rath *et al.,* 2004). The sex ratio (F: M) of emerged population in a given time varies greatly from 1:0.48 to 2.17 (Rath *et al.*, 2002). The cocoon weight, length, breadth, volume etc. differ greatly in reared and wild variety. The cocoons obtained from wild are quite superior over reared

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variety in respect of important characters. The sex composition of population and their frequency distribution are important aspects required to be studied particularly when emergence is long and unsynchronized to maximize the reproduction and ultimately the silk production. The present study was intended to find out the above facts. Simultaneously, it was intended to find out the relationship between the commercial and reproductive characters in two divergent populations.

MATERIALS AND METHODS

Antheraea mylitta Drury (eco-race Daba bi-voltine; Lepidoptera: Saturniidae) was reared on *Terminalia tomentosa* to raise the diapausing population. From the harvested cocoons 3 replications were made each having 3500 randomly selected cocoons irrespective of their size and weight. In all, 10500 cocoons thus selected formed the experimental material of the reared variety. Replication wise all the cocoons were serially numbered and their weight, length, breadth, peduncle length and volume were recorded. Sexing of the pupa were made and recorded individually by cutting the cocoons. Pupa weight and shell weights of all were also measured.

A total number of 10500 cocoons of the eco-race were collected from the natural forest of Hatgamharia of Jharkhand to constitute the experimental material of the wild population. Observations on weight-wise frequency distribution and various cocoon characters were also recorded for the wild population in the same way as done in reared variety.

Frequency distribution of cocoon weight were examined by grouping the cocoons on weight basis at an interval of 0.5 g starting from 6.1 g in male and 8.6 g in female in reared population, and 9.1 g in male and 12.1 g in female in the wild population.

Correlation between pupa weight and shell weight were studied to evaluate the trend of change of commercial character with reproductive one. Simultaneously shell content produced per unit of pupal tissue was calculated. Cocoon characters of wild and reared variety were compared and the difference between them was analysed using student's t-test for significance.

RESULTS AND DISCUSSION

Frequency distribution of cocoon weight in *A. mylitta* and sex ratio are presented in Fig. 1 (a, b). Cocoon weight showed a symmetrical distribution pattern in both sexes, while the distribution was not quite symmetrical in wild variety. The cocoon weight distribution in *A. pernyi*, *A. yamamai*, their hybrids and reciprocal hybrids was reported asymmetrical (Kobayashi *et al.,* 1993). In the present study the peaks were observed between 10.1 to 10.5 g and 13.6 to 14.0 g in reared and wild male populations, whereas, in female it was observed between 13.1 to 14.0 g and 17.1 to 17.5 g in reared and wild population respectively. In general the female cocoon weight was heavier than male and was distributed more widely (8.6 to 20.0 g) as compared to male (6.1 to 15.0 g) in the reared population whereas, in the wild population both male and female cocoon weight were distributed widely (male cocoon weight ranged from 9.1 to 18.0 g and that of female from 12.1 to 20.0 g). The mean cocoon weight for male was recorded 10.3 g and 13.5 g and that of female it was 14.1 g and 16.1 g in reared

Table 1. Cocoon characters in reared and wild variety of *Antheraea mylitta* (average value)

Sex	Source	Cocoon weight (g)	Pupa weight (g)	Shell weight (g)	Cocoon length (cm)	Cocoon breadth (cm)	Cocoon volume (cc)	Peduncle length (cm)	Shell content /g pupa formed
Male	Reared	10.356 ± 2.398	8.750 ± 2.092	1.606 ± 0.311	4.100 ± 0.276	2.875 ± 0.334	33.730 ± 3.414	4.602 ± 1.352	0.183 ± 0.014
	P	< 0.01	< 0.01	< 0.001	< 0.001	< 0.02	NS	< 0.01	NS
	Wild	13.507 ± 2.535	11.500 ± 2.236	2.101 ± 0.296	4.904 ± 0.169	3.058 ± 0.129	36.117 ± 3.407	7.006 ± 2.871	0.183 ± 0.015
Female	Reared	14.158 ± 3.330	12.000 ± 2.814	2.146 ± 0.525	4.831 ± 0.336	3.075 ± 0.316	38.600 ± 3.188	5.982 ± 1.782	0.179 ± 0.013
	P	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NS	< 0.001
	Wild	16.065 ± 2.624	13.250 ± 2.092	2.822 ± 0.529	5.459 ± 0.367	3.386 ± 0.147	49.887 ± 7.304	6.293 ± 1.624	0.213 ± 0.021

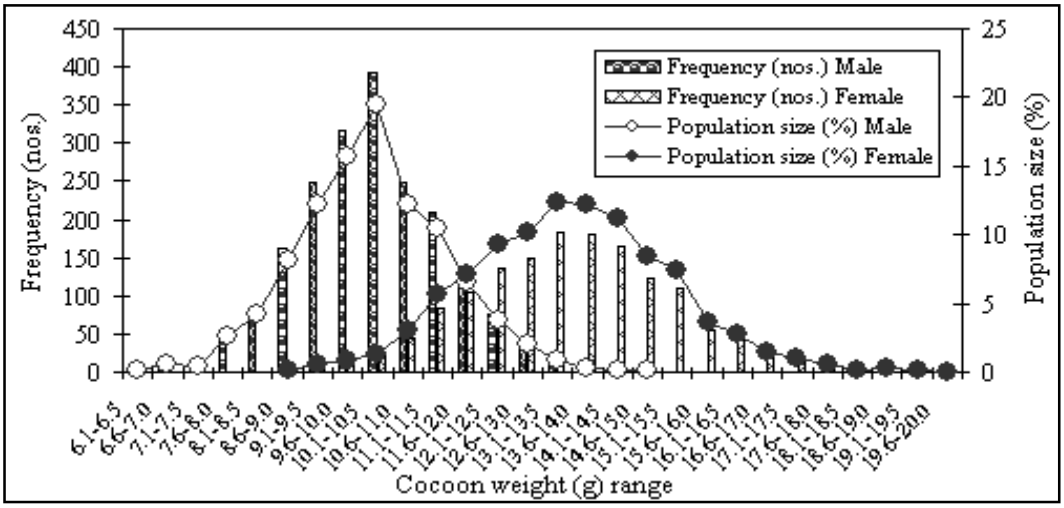

Fig. 1 a. Sex-wise frequency distribution of cocoon weight rang in reared populations of *Antheraea mylitta*.

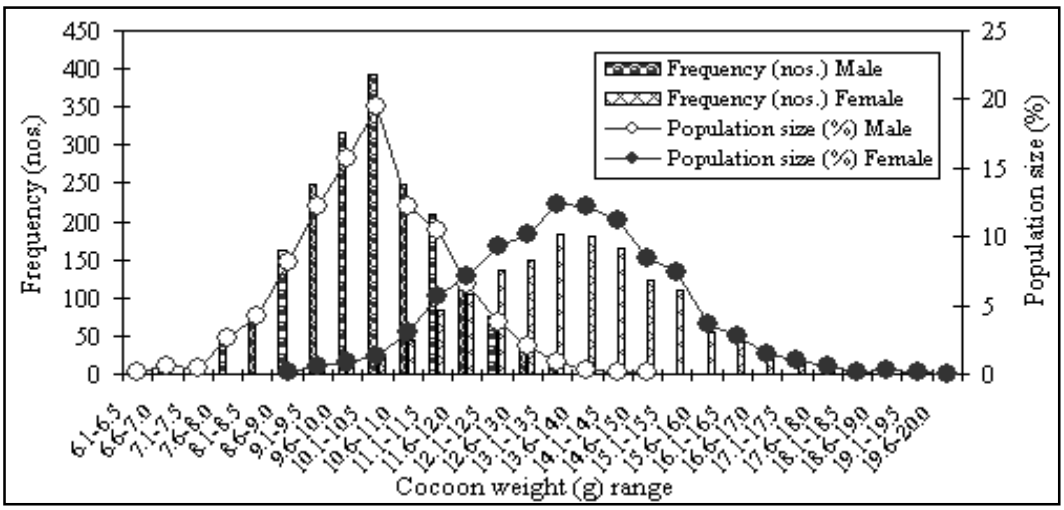

Fig. 1 b. Sex-wise frequency distribution of cocoon weight rang in wild populations of *Antheraea mylitta*.

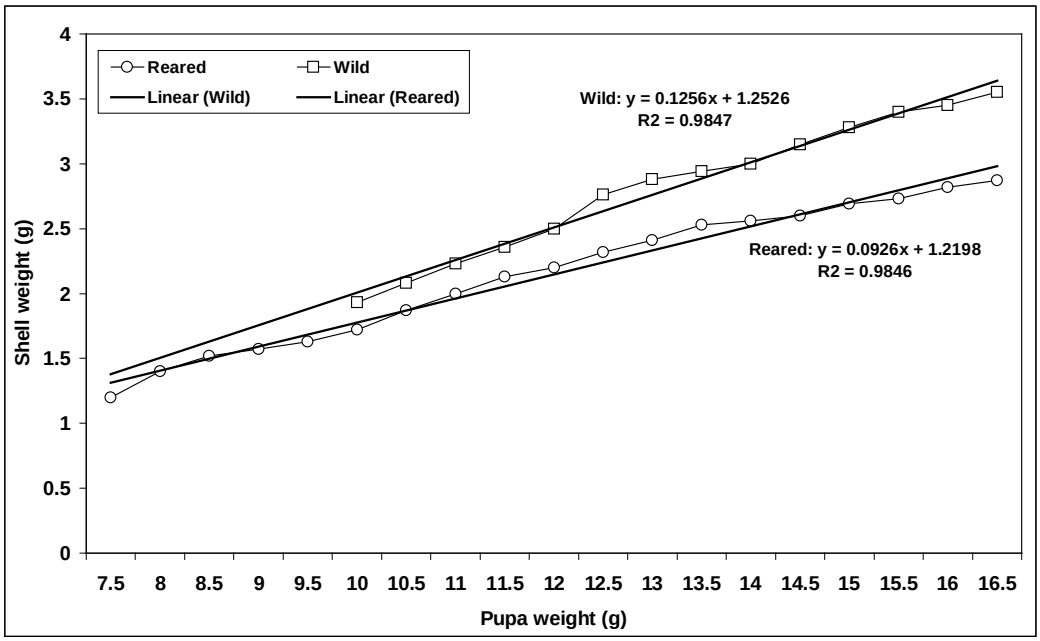

Fig. 2 a. Relationship between pupa weight and shell weight in reared and wild variety of *Antheraea mylitta* (male).

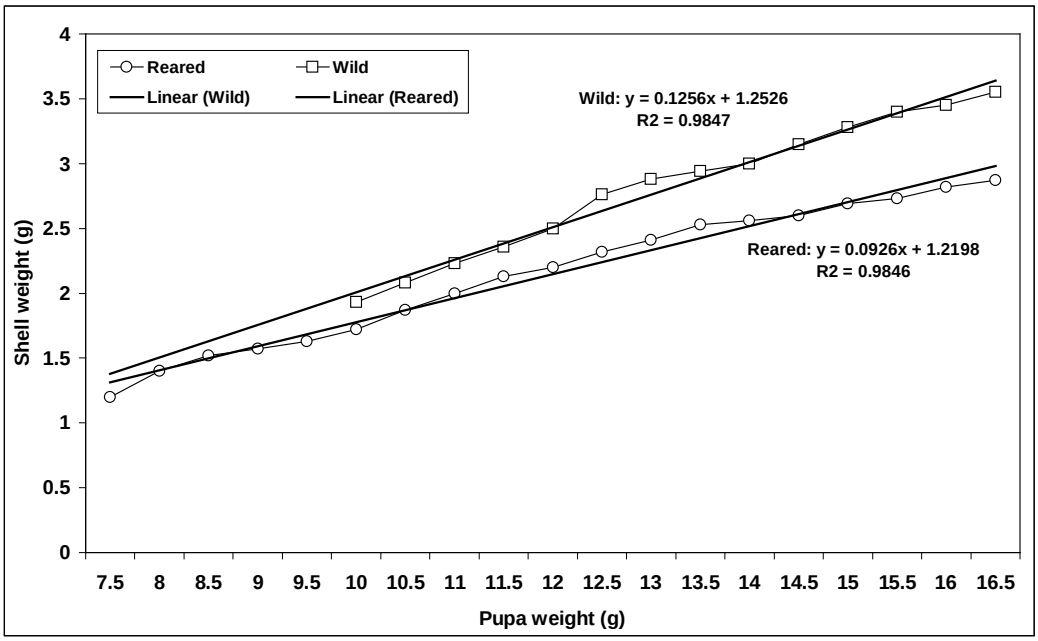

Fig. 2 b. Relationship between pupa weight and shell weight in reared and wild variety of *Antheraea mylitta* (female)

and wild variety respectively.

Earlier attempts was made to find out sex-wise frequency distribution of cocoon weight of reared variety of Daba (Dubey *et al.,* 1995), but their study did not reveal the sex composition of an unknown population. In the present study the sex ratio (F: M) in reared and wild population were found to be 1:1.36 and 1:1.45 respectively, which were very close to the sex ratio (F: M) of *A. assama* (1:1.365) (Srivastava *et al.,* 1996). However, the sex ratio was reported to be 1:2, 1:1.7, 1:1.3 and 1.7 *A. yamamai*, *A. pernyi*, hybrid of *A. yamamai* x *A. pernyi* and hybrid of *A. peinyi* x *A. yamamai* respectively (Kobbayashi *et al.,* 1993). In *B. mori* the sex ratio was found to be 1:1. In *A pernyi* the sex ratio of 1:1 lost its equilibrium in late 5th instar (Kurasawa and Koyama, 1950). Presence of higher percentage of males in both reared and wild populations of *A. mylitta* (1:1.4) observed in the present investigation seems to be an

evolutionary adaptation to obtain the optimum reproduction rate where unsynchronized emergence pattern prevails.

The important cocoon characters revealed that wild variety cocoons were superior over the reared variety (Table 1).The female cocoon weight was heavier than male. Wild male cocoon weight was significantly higher ($P < 0.01$) than the reared variety. Although females of wild population did not have significantly higher mean cocoon weight but other important characters recorded had significantly higher values than the reared variety. Except cocoon volume in male other characters in wild population had significantly higher values. The shell content per gram pupa tissue formed in female of wild variety was found to be significantly ($P < 0.001$) more than that of the reared variety, but this was not true for male. An average of 0.2 g of silk was produced (in terms of cocoon shell) per gram of pupal body weight in both wild and reared population irrespective of sex. Shell weight increased significantly ($P < 0.001$) with increase in pupal weight irrespective of the type of population and sex (Fig. 2 a, b). Similar results were also reported from the earlier studies in other sericigenous species (Kobayashi *et al.*, 1993) confirmed our results.

From the above it can be concluded that the species Antheraea mylitta has a sex ratio (F: M) of 1: 1.4 in both wild and reared population indicating the biological adaptation for higher reproductive value. The distribution of cocoon weight was wider in wild variety, while it was compact in male but wide in female in reared variety. In both the population irrespective of sex each gram of pupal tissue correspond to 0.2 g of silk, which indicates that the species is more concerned about its continuation of generation rather than to put energy for silk production.

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