

PRELIMINARY REARING TECHNIQUE FOR *ATTACUS ATLAS* (LEPIDOPTERA: SATURNIIDAE) A WILD SILK WORM OF INDIA

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ABSTRACT

Sericulture is agro based industry. India is the only country where all four kinds of silks viz. Mulberry, Muga, Tasar and Eri are commercially exploited. *Attacus atlas*, Linnaeus (Lepidoptera: Saturniidae) is wild silk worm of India. Its conservation and exploitation in silk production is essential component of wild silk technology development in India. Therefore, rearing technique of *A. atlas* has been given in the paper. Cocoons were formed within 35-43 days. Cocoon weight, shell weight, shell length, shell width and shell thickness were 9.4 g, 1.82 g, 4.4 cm, 1.4 cm and 0.21 mm respectively, while shell ratio calculated was 19.32%. The rearing success of *A. atlas* was 15% on Angeer *Ficus carica*. The mated females laid 147 eggs and produced 22 offspring's with an average sex ratio (m: f) 1: 0.75.

Key words: Rearing technique, *Attacus atlas*, wild silkworm, India.

INTRODUCTION

India is second largest producer of wild silk in the world (Shankar Rao, 2004). The wild Indian silks like Tasar *Antheraea mylitta*, Muga *Antheraea assamensis*, Eri *Philosamia ricini* are well known in the world as far as rearing technology is concern. However, rearing technology has not developed for *Attacus atlas* in India and elsewhere although it produces durable and brownish silk. The worms of *A. atlas* are scattered in environment of forest and Western Ghats of Maharashtra (Kavane & Sathe, 2011). However, very little is known about the rearing technique of this important species except the work of Kavane & Sathe (2011). Tasar silk moths and rearing techniques for other wild silkworms have been attempted by several workers (Hampson, 1892; Watson 1911; Lefroy & Ghosh, 1912; Pottar, 1941; Jolly, 1972; Jolly

et al. 1977; Barlow, 1982; Nassiget *al.*, 1984; Cotes, 1989; Islam, 1990; Mohanthy, 1991; Thomgavelluet *al.* 1991; Akai, 1998; Rajadurai & Thamgavellu, 1998; Saikia & Handiaue, 1998; Sathe & Jadhav, 2001; Chaoba Singh & Suryanarayana, 2005; Sathe, 2007; Shamitha, 2007; Kavane & Sathe 2008, 1991; Jadhav *et al.* 2014; Nayakawadi, 2014; Sathe & Kavane, 2014; etc.).

MATERIALS AND METHODS

For rearing of wild silkworm *A. atlas* the basic plan of methodology adopted is the same as given by Kavane & Sathe (2011). Other details of rearing of *A. atlas* silk moths are given in table 1 & 2.

Cocoon Characterization:

Table 1 : Cocoon characterization of *A. atlas* silkworm

Sr. No.	Cocoon wt. (g)	Shell wt. (g)	Length of Shell (cm)	Width of Shell (cm)	Shell thickness (mm)	Shell ratio (per cent)
1	9.42	0.82	4.4	1.4	0.21	19.32

Following characters were taken into account for assessment of rearing potential of wild silkworm species.

i) Single cocoon weight

The average cocoon weight in grams of 10 cocoons were taken at random from each replicate on sixth day of spinning was considered as the cocoon weight.

ii) Single cocoon shell weight:

The cocoon shell weight of 10 cocoons was used for calculating the average shell weight, which was expressed in grams.

iii) Determination of the size of the cocoon:

Length and width of the cocoon shell was determined with vernier calipers. The width of the cocoon was measured in different areas such as head, middle and tail regions and calculated by using formula :

Total length / width = main scale reading + vernier coincidence x least count.

iv) Determination of the thickness of the cocoon shell:

The thickness of the cocoon shell was determined with the help of the screw gauge. The cocoon was cut into small pieces in different regions like head, tail, side-1 (right side) and side - 2 (left side) to measure its thickness and calculations were made by using the following formula :

Thickness of cocoon = pitch scale reading + head scale reading x least count.

v) Shell ratio:

Shell ratio is calculated by the following formula:

$$\text{Wt. of shell} / \text{Wt. of cocoon} \times 100$$

RESULTS

The results tabulated in Table 1 and 2 indicate that the cocoon formation took place within 35 to 43 days (average 40 days) cocoon weight, shell weight, length of shell, width of shell and shell thickness were 9.42g, 1.82g, 4.4cm, 1.4cm and 0.21mm respectively while, shell ratio was 19.32 per cent. The rearing success of *A. atlas* silkworms on Anjeer (*Ficus carica*) leaves was 22 per cent. On an average a single mated female laid 147.0 eggs and produced 22 offspring's with an average sex ratio (m:f) 1:0.75. The longevity of adult moths averaged 4 days in males and 6 days in females.

The silkworms gave good response to other host plants such as Mango *Mangifera indica* L. custard apple *Annona squamosa* L. and castor *Ricinus communis* L.

DISCUSSION

According to Islam (1990) *A. atlas* was found feeding on an unusual variety of food plant, the sole heather plant *Moynalaxi flora*, family Rubiaceae in the forests. The cocoon produced by this silkworm was somewhat similar to Eri cocoon in nature and useful for commercial silk production.

Saikia and Handique (1998) studied the life cycle of *A. atlas* by providing main food plant *M. flora* under which the incubation period of eggs was 10 days, the larval period was 28 days and the pupal duration was 28 days. The adult male survived for 2-3 days and female 4-6 days. Jolly *et. al.* (1977) reported grayish brown colour of the cocoon of *A. atlas* insect. While, Hampson (1892) reported tubercular arrangement in the larvae of *A. atlas*. Peigler (1989) reported over 100 plant species belonging to 90 genera in 48 families as host plants for *Attacus* spp.

Table 2: Requirements for rearing one DFL for *A. atlas* silk worms*

Instar of worm	Duration (Days)	Feeding time per day	Feeding time total	Feeding dose total (kg)	Leaf proportion (g)	Leaf number of food plant twig	Leaf size	No. of Boxes	No. of trays	Box/ Tray cleaning time	Duration of shading cuticle(hr)	Humidity %	Temp. °C	Bed Size Sq.ft
1 st	5	1	5	1-1.5	40-50	2-3 (Top)	Whole	1	-	2	24	75	28-30	1
2 nd	4.5	2	9	2-2.5	50-60	3-4 (Top)	Whole	1	-	2	48	75	28-30	3
3 rd	4	2	8	3-4	50-60	Medium/ June	Whole	-	1	3	72	80	28-30	6
4 th	6	2	12	4.5-5	65-75	Medium/ June	Whole	-	1	Once every morning	72	80	28-30	10
5 th	7	2	18	4.5-5	75-85	Medium/ June	Whole	-	1	Once every morning	-	80	28-30	16

***One DFL contain 50 eggs of *A. atlas*, food plant- Anjeer (*F. carica*).**

Villiard (1969) was of the opinion that greater success on the rearing of *Attacus* larvae particularly the later instars could be achieved by feeding them on a mixed diet of above said plants. Murphy (1990) was the first to mention the present of *Attacus* in mangrove habits, stating that *A. atlas* occurred once on *Avicennia alba* Bl. (Avicenniaceae) and simultaneously with many other trees. However, it occurred at low levels on *Bruguiera gymnorhiza* (L.) Lamk (Rhizophoraceae). The biology of *A. atlas* was recently reported by Kavane & Sathe (2011) completing its life cycle from egg to adult within 64.5 days on Anjeer *F. carica* under laboratory conditions $30\pm1^{\circ}\text{C}$, 80% R.H. & 12 hr. photo period. In the present study attempts have been made to establish rearing technique for *A. atlas* on *F. carica* host plant. However, *A. atlas* found feeding on the leaves of *M. indica*, *A. squamosa* and *R. communis* from the environment of forests of Western Ghats.

Rajadurai *et al.* (1998) studied the life cycle of *Actias selene* and reported that *A. selene* was distributed widely all along the mixed forests plants such *Terminalia arjuna*, *T. tomentosa* and *Ziziphus mauritiana*. The incubation period of egg was 9 days, the larval period was 31 days and the pupal duration was 18 days. The adult males survived for 3-4 days and females 4-6 days. The total period for completion of life cycle was 58 days. While, in the present form *A. atlas*, the life cycle from egg to adult was completed within 64.5 days which is considerably longer than *A. selene*.

Lefroy and Ghosh (1912) reported the commercial importance of Saturniids, the diversified wild silk moths as silk producing individuals of the World. He reported that the wild saturniid Moon moth *A. selene* was geographically distributed in tropical and deciduous forests. Cotes (1889) recorded *A. selene* from Missorie and Sikkim parts of India. Kavane and Sathe (2008) indicated that the rearing success of *A. mylitta* on *T. catappa* under laboratory conditions ($24\pm1^{\circ}\text{C}$, 65-70% R.H. & 14 hr. photo period) was 45% and also recorded the good sign of adaptation of silk worms for indoor rearing by not forming peduncle. Similarly, attempts have been made to standardize the rearing technique of tasar silkworm *A. mylitta* by several workers (Jolly 1972; Sathe & Jadhav, 2001; Shamitha, 2007; etc).

Very recently, Jadhav *et al.* (2014) studied the performance of tasar silkworm *A. mylitta* on different food plants from Kolhapur district of Maharashtra. They reported that *A. mylitta* produced best quality and quantity cocoons when their larvae were fed with leaves of *T. tomentosa* in autumn season as compared to other host plants. The performance of rearing of *A. mylitta* was better on the leaves of *T. arjuna* than *T. catappa* and *Ziziphus jububa*. The life cycle of *A. mylitta* was lengthy in autumn and best compared to rest of the seasons.

Nayakawadi (2014) studied the rearing performance of Eri silkworm *P. ricini* on girija castor variety grown in Krishna river basin of

Sangli district of Maharashtra. Nayakawadi (2014) observed that the weight of matured larva was 4.859 gm and total incubation duration was 16.32 days; and larval and pupal periods were 21.20 days and 18-21 days respectively. The survival rate of the worms was 97.42%. Next to the mulberry silkworm *Bombyx mori* L., the highest rearing success was recorded in *P. ricini* on castor plant and the technique can be easily performed by the farmers.

In the present study, rearing technique for *A. atlas* have been tried for the first time with 15% success indicating that there is scope to improve the rearing technique for *A. atlas* in future.

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