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Research Article

Studies on the influence of Environmental factors on post cocoon parameters of Tasar Silkworm, *Antheraea mylitta* Drury

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ABSTRACT

Tasar silk is a natural, sustainable, and biodegradable fibre produced by *Antheraea mylitta* Drury, a wild, semi-domesticated silkworm belonging to the family Saturniidae. It is reared in the tropical forests of India and feeds on several host plants, including *Terminalia arjuna*, *T. tomentosa*, and *Shorea robusta*. Environmental factors such as temperature, relative humidity, seasonal variations, and host plant quality can influence silkworm performance and cocoon characteristics. The present study evaluated the post-cocoon parameters of *A. mylitta* in relation to environmental conditions at three locations in Telangana: Kakatiya University, Mahadevpur, and Chennur. Silkworms reared on *T. arjuna* at Kakatiya University were compared with cocoons collected from the natural forest areas of Mahadevpur and Chennur. The results revealed variations in cocoon characteristics among the study locations, with cocoons from Kakatiya University exhibiting higher cocoon weight and filament length. These differences may be associated with variations in environmental conditions, host plant quality, and seasonal factors. The findings highlight the importance of suitable rearing conditions and host plant management in improving cocoon quality and supporting the livelihoods of forest-dependent communities engaged in Tasar sericulture.

Keywords: *Antheraea mylitta*, Tasar silk, environmental factors, post-cocoon parameters, cocoon quality

1. Introduction

Antheraea mylitta is an economically important wild silkworm species that contributes significantly to Tasar silk production. Tasar sericulture supports the livelihoods of rural and forest-dependent communities by providing income and preserving traditional practices. Understanding the factors affecting cocoon quality, particularly seasonal and environmental variations, is essential for improving silk production and its socioeconomic benefits (Tikader & Vijayan, 1997).

Environmental factors such as temperature, relative humidity, rainfall, and photoperiod play important roles in regulating the growth, physiology, and silk-producing capacity of *A. mylitta*. As an outdoor-reared species, it is particularly susceptible to climatic variations across seasons and geographical regions. Changes in environmental conditions can influence larval feeding, metabolism, moulting, and cocoon formation (Barsagade *et al*., 2023).

Variations in local climatic conditions may affect Tasar silkworm performance and cocoon quality across different rearing locations. Favourable microclimatic conditions can support larval development and improve cocoon characteristics, shell ratio, and silk yield (Khatoon *et al*., 2018; Rahman *et al*., 2018). Therefore, evaluating environmental differences between locations is important for understanding variations in Tasar silk production.

The present study investigated the relationship between environmental conditions, particularly temperature and relative humidity, and the post-cocoon characteristics of *Antheraea mylitta* Drury at Mahadevpur (Karimnagar district) and Chennur (Mancherial district), Telangana, India. Cocoons collected from these locations were assessed to compare their post-cocoon characteristics and examine the association between local environmental variations and silk quality.



(A) **(B)**

Figure-1 A. Tasar silkworm; B. Harvested cocoons arranged into garlands

2. Materials and Methods

2.1 Rearing of Tasar Silkworm, *Antheraea mylitta* D

Tasar silkworms were reared under hygienic conditions to minimize disease outbreaks and predation. Proper host plant selection, brushing of larvae, regular removal of dead and diseased larvae, and careful monitoring of larval development were ensured. Protective nets were used to reduce pest and predator attacks, while excessive handling of larvae was avoided to prevent injury and contamination. Temperature and relative humidity were monitored throughout the rearing period. After completion of all larval instars, cocoons were harvested, evaluated for post-cocoon parameters, and arranged into garlands for further processing and storage (Fig. 1).

2.2 Field Visits and Cocoon Collection from Mahadevpur and Chennur

Field visits were conducted to Mahadevpur and Chennur, important Tasar sericulture regions along the Godavari riverine belt, characterized by natural vegetation including the host plants *Terminalia arjuna* and *Terminalia tomentosa*. Ten cocoons were examined from each of the three study locations: Kakatiya University (control), Chennur, and Mahadevpur. Post-cocoon parameters were recorded and compared among the locations to evaluate variations in cocoon characteristics. The prevailing environmental conditions, host plant availability, and traditional rearing practices were observed, with interactions with local Tasar rearers to understand seasonal rearing practices and associated challenges. Cocoons were collected from both locations for post-cocoon analysis to examine variations in cocoon characteristics in relation to local environmental conditions.

2.3 Temperature and Relative Humidity

Temperature and relative humidity were recorded daily at three study sites: Kakatiya University, Chennur, and Mahadevpur using a thermo-hygrometer. The average values for each location were calculated and used to compare the prevailing environmental conditions. These average values were considered alongside the post-cocoon parameters of *Antheraea mylitta* to examine the association between environmental variations and cocoon characteristics across the study locations.

2.4 Comparative Analysis of Post-Cocoon Characteristics of *Antheraea mylitta* Reared at Three Different Sites

Post-cocoon parameters, including cocoon weight, weight of shell, and weight of silk reeled. were recorded using a Citizen electronic balance with measurements expressed in grams. The present study involved a comparative evaluation of physical and morphological characters of cocoons from different rearing sites are Kakatiya University, Chennur and Mahadevpur. Kakatiya University rearing site taken as control. Cocoon length, width and peduncle length were recorded using Vernier callipers, while shell thickness was determined with the aid of a screw gauge.

Post-cocoon parameters of *Antheraea mylitta* were assessed to evaluate cocoon quality and silk characteristics. Reelability was calculated as the percentage ratio of the weight of silk reeled to the total cocoon weight. Denier, which indicates silk filament thickness, was calculated by multiplying the weight of reeled silk (g) by 9000 and dividing it by the filament length (m). Shell ratio was determined by expressing the cocoon shell weight as a percentage of the total cocoon weight. Reelability, denier and shell raio formulas as follows:

Reelability

The reelability of cocoons, defined as the ability of cocoons to provide silk filament efficiently during reeling, was computed using the formula below:

Reelability = Weight of the silk reeled / Weight of the cocoon × 100

Denier

In Tasar cocoons, differences in bave thickness are minimal and gradual, leaving the quality of the ultimate silk unchanged. Denier was computed using the following formula.

Denier = Weight of the silk reeled / Length of the silk reeled × 9000

Shell ratio

The following formula was used to calculate the shell ratio:
Shell ratio= Shell Weight / Cocoon Weight × 100

2.5. Statistical Analysis:

Data were expressed as mean ± SD and analysed using a two-tailed Student's *t*-test in Microsoft Excel.

3. Results

3.1 Temperature and Relative Humidity

Temperature and relative humidity were recorded at three study sites: Kakatiya University (Control), Chennur, and Mahadevpur (Table 1). Environmental conditions were monitored using a thermo-hygrometer, and the recorded values were used to compare the climatic conditions among the sites. The observations were then considered alongside the post-cocoon parameters of *Antheraea mylitta* to examine the relationship between environmental variations and cocoon characteristics. The recorded temperature varied from 33°C at the control site to 35°C at Chennur and 36°C at Mahadevpur. Relative humidity was 78% at the control site, 75% at Chennur, and 87% at Mahadevpur. Thus, Mahadevpur experienced the highest temperature and relative humidity, whereas Chennur showed comparatively lower humidity. The altitude also varied considerably among the three locations, with the control site having the highest recorded altitude (1200 m), followed by Mahadevpur (170 m) and Chennur (123 m).

Table 1 Average Temperature and Humidity of three different rearing sites are Control, Chennur, Mahadevpur

S. No	Parameters	Control	Chennur	Mahadevpur
1	Temperature	33°C	35°C	36°C
2	Humidity	78%	75%	87%
3	Altitude	1200mts	123 mts	170mts

3.2 Study of Post-Cocoon Characteristics of Tasar Silkworm (*Antheraea mylitta*)

Comparative analysis revealed variations in cocoon and post-cocoon characteristics among the three locations. Kakatiya University (Control) showed the highest cocoon weight (13.12 g) and filament length (1000 m), followed by Chennur, whereas Mahadevpur recorded the lowest values. Reelability was also higher in the Control (20.43%) than in Chennur (9.09%) and Mahadevpur (7.72%) (Fig. 2; Table 2). The lower values at Mahadevpur may partly reflect the use of cocoons from the previous year. Overall, the findings highlight variations in cocoon quality among locations, potentially associated with environmental and seasonal differences.



Kakatiya University Mahadevpur Chennur

Fig. 2 Cocoons of three different rearing sites

4. Discussion

Environmental conditions play an important role in Tasar silkworm performance. In the present study, Kakatiya University (Control) recorded a temperature of 33°C and relative humidity of 78%, while Chennur and Mahadevpur recorded higher temperatures of 35°C and 36°C, respectively. Mahadevpur also exhibited the highest relative humidity (87%). These climatic variations may be associated with differences in cocoon quality and silk production. Previous studies have reported that high temperatures and excessive humidity may adversely affect silkworm development and increase disease risk (Renuka *et al*., 2012; Bhattacharya *et al*., 2008).

Cocoons from Kakatiya University exhibited higher cocoon weight (13.12 g) and filament length (1000 m), compared with Chennur (10.75 g and 985 m) and Mahadevpur (3.62 g and 736 m). Reelability was also higher at Kakatiya University (20.43%) than at Chennur (9.09%) and Mahadevpur (7.72%). These differences indicate variation in silk recovery and reeling characteristics among the study locations. Environmental conditions, host plant quality, and rearing practices may collectively influence these parameters, as discussed by Reddy *et al*. (2012) and Bhatia *et al*. (2014).

The observed variations in post-cocoon characteristics among Kakatiya University, Chennur, and Mahadevpur may reflect differences in environmental conditions, host plant availability, and site-specific rearing or management practices. However, the Mahadevpur cocoons were collected in the previous year, whereas those from Kakatiya University and Chennur were

Table 2 Post cocoon parameters of three different rearing are Control, Chennur, Mahadevpur.

S. No.	Post-cocoon parameters	Control	Chennur	Mahadevpur
1	Cocoon Weight (g)	13.122±0.82	10.75±0.74	3.622±0.36
2	Pupa weight (g)	10.14±0.48	8.88±0.61	2.45±0.43
3	Shell weight (g)	1.7±0.05	1.66±0.11	1.22±0.043
4	Shell Ratio (%)	34.15	22.21	12.87
5	Cocoon width (cm)	1.9	1.68	1.66
6	Cocoon Length (cm)	3.9	3.4	3.8
7	Filament length (m)	1000	985	736
8	Reelability (%)	20.43	9.09	7.72
9	Denier	9.7	9.09	10.8

collected during the same year and season. This difference in collection period represents a potential confounding factor, and seasonal variation and differences in host plant characteristics may also have contributed to the observed variations. Debnath *et al.* (2024) highlighted the importance of microclimatic stability during larval development, while Khatoon *et al.* (2018) and Rahman *et al.* (2018) reported the relevance of environmental conditions to cocoon quality and silk production. As these factors were not independently controlled, the observed differences cannot be attributed solely to environmental conditions. Therefore, the findings should be interpreted as co mparisons among the sampled locations rather than evidence of a direct causal relationship between environmental conditions and cocoon quality.

The findings suggest an association between environmental variation and post-cocoon characteristics of *Antheraea mylitta*. However, since the study also involved differences in cocoon collection periods, further investigations using cocoons collected under comparable seasonal conditions are needed to clarify the contribution of individual environmental factors to cocoon quality and silk yield.

5. Conclusion

The present study revealed variations in the post-cocoon characteristics of *Antheraea mylitta* in association with fluctuations in environmental conditions across the study locations.

Competing interests:

The authors declare that they have no competing interests

Consent for Publication: Not applicable.

Availability of Data and Materials:

The datasets analyzed during the current study are available from the corresponding author upon reasonable request, subject to institutional and ethical regulations.

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