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Studies on Variation of Abiotic Factors in Different Grainage Houses of Tasar Silkworm (*Antheraea Mylitta* D.) at Bilaspur

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***Abstract*—The tropical tasar silk moth, Antheraea mylitta D., is largely cultivated by the tribal in the forest on natural hosts plants such as Terminalia arjuna and T. tomentosa. During grainage conditions, abiotic factors alter reproductive behavior. Both, temperature and relative humidity play major role in the regulation of moth emergence, reproduction and disease free layings (DFLs) production. The present study was conducted to know the temperature and RH variation in three types of grainage houses. The temperature and RH under natural conditions increased from 25.90 °C to 32.26°C and 42.21% to 44.52% during February to April, respectively. During February, the temperature was highest in both tubular structure and natural conditions and lowest in pucca grainage structure and green shade net structure. But, RH was more in both pucca grainage structure and green shade net structure and lowest in tubular structure. The similar changes were also observed in the March and April period. The fluctuation of mid-day temperature and RH revealed that the temperature under all the grainage system was similar to natural conditions. Whereas, RH under pucca grainage house and green shade net structure was similar to natural conditions, in which RH equal or higher than the temperature with lowest fluctuation rate. Further, it is indicated that the shade net grainage house followed by pucca grainage house are the best in terms of maintenance of optimum temperature and relative humidity under grainage house which is suitable for tasar silkworm cocoons.**

***Index Terms*— *Terminalia arjuna*, *T. tomentosa*, grainage house, tasar silkworm and cocoons**

I. Introduction

The tropical tasar silk moth, *Antheraea mylitta* D., is largely cultivated by the tribal in the forest on natural hosts *plants such as Terminalia arjuna (L.)* and *Terminalia tomentosa* Roxb (ex DC) Wight & Arn (Combretaceae) (Jolly et al., 1976). The poorest among the poor depends on tasar as a supplementary source of income. Tasar practice provides a unique opportunity to create an inclusive value chain for poor communities with far reaching impact on their livelihoods. About 145000 tribal families are involved in tasar rearing as a supplementary source of livelihood. In addition, about 120000 poor families are engaged in reeling, spinning and weaving. Tropical tasar comes under the category of wild silk as its rearing is carried out outdoor, in the tropical deciduous forest of Jharkhand, Bihar, West Bengal, Odisha, Chhattisgarh, Madhya Pradesh, Maharashtra, Andhra Pradesh and Telangana. Jharkhand and Chhattisgarh are the leading producer of tasar raw silk. The overall demand for tasar silk far exceeds its supply from within India. India therefore imports nearly 1200 to 1500 MT of tasar silk to meet its extra demand (Pastakia et al., 2015).

The tasar silkworm completes its life-cycle in two to three generations and accordingly is named as Bivoltine and trivoltine, respectively. Tasar raw silk production is mainly depending on quality cocoons. But, cocoon production is mainly pretentious by abiotic factors. Tasar silkworm is being reared on host plants under natural conditions. But, during egg production cocoons are preserved and process in grainage house which alters the natural behavior of the moth reproduction due abiotic factors. Both, temperature and relative humidity play major role in the regulation of moth emergence and reproduction (Denlinger, 1986). In the present study, efforts were made to study the difference in the temperature and relative humidity in three types of grainage house in comparison with natural conditions.

II. Materials and Methods

The Eco-race, Daba of tropical tasar silkworm was reared on the host plant of *Terminalia arjuna* during October 2017 at two places of Bilaspur region. Diapause cocoons produced at each place were collected and preserved in three different types of grainage houses for the seed/egg production during subsequent year by following the standard preservation technique (Jolly et al., 1974).

The size of pucca grainage house was 35 feet length and 20 feet breadth with 30” thick walls and 144” height. Direct diffused sunrays and light was avoided by having its face to south. The inner and outer wall is plastered and whitewashed. It has a verandah of 8 feet from all sides. Green shade net house was erected without veranda. In tubular structure, the size: 60’X 20’X15’with 5’ Varandah.

The seed cocoons preserved under pucca grainage, green shade net and tubular grainage structure were provided with the instruments for recording temperature and relative humidity. A

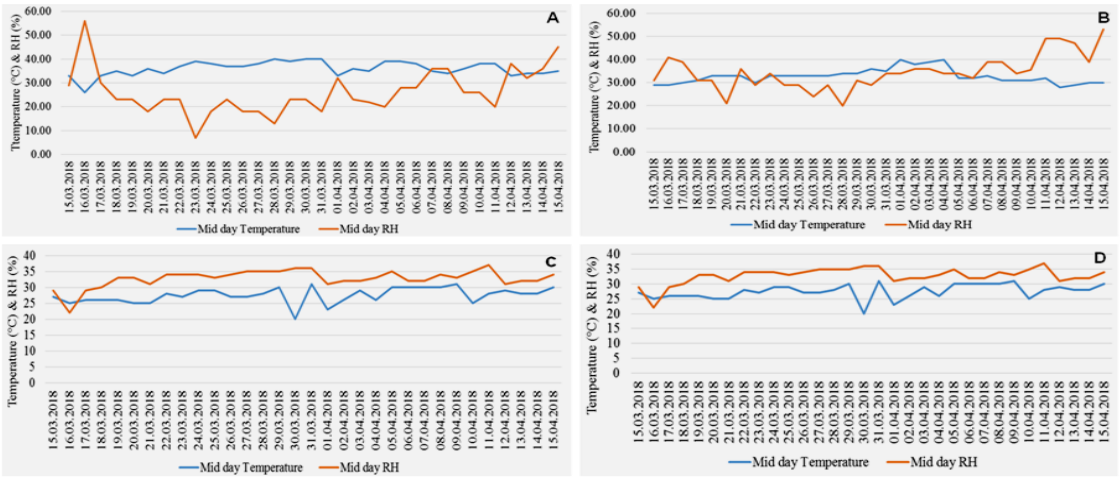

Fig. 2. Temperature and RH fluctuation over period of time under different grainage house [tubular grainage house-A; Pucca grainage house - B and green shade net structure - C] and Natural condition (D)

separate set of instruments were also installed in the natural conditions near to the grainage house for recording the actual temperature and relative humidity. The data was compiled and analyzed using Microsoft-excel.

III. Results and Discussion

The temperature and RH under natural conditions increased from 25.90 °C to 32.26°C and 42.21% to 44.52% during February to April, respectively. February was last part of winter and April was early part of summer. During February, the temperature was highest in both tubular structure and natural conditions and lowest in pucca grainage structure. But, RH was more in both pucca grainage structure and green shade net structure and lowest in tubular structure. During March, temperature was more in natural condition compared to all the grainage structures and lowest in pucca grainage structure. The relative humidity was more in tubular structure and lowest in natural conditions. During April, the temperature under all the grainage structures was comparatively lower than the natural conditions and RH was more under pucca grainage structure and natural conditions (Fig.1). From the overall observations it is inferred that the optimal temperature and RH was maintained under pucca grainage structure and green shade net house.

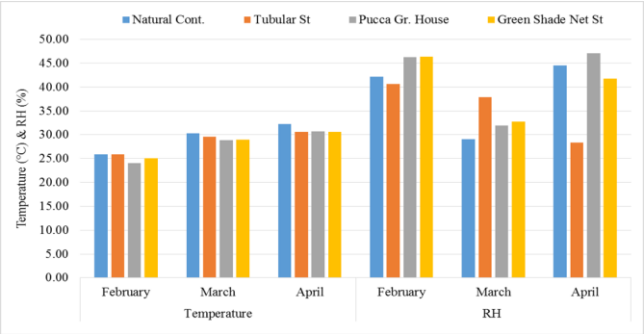

Fig. 1. Average temperature and RH of natural, tubular, pucca and green shade net grainage structure during February to April, 2018

The fluctuation of mid-day temperature and RH was observed for all the grainage houses including natural conditions from 15 March to 15 April, 2018. The results revealed that the temperature under all the grainage system was similar to natural conditions. Whereas, RH under pucca grainage house and green shade net structure was similar to natural conditions, in which RH was equal or higher than the natural temperature and less fluctuated. But, under tubular structure the RH fluctuated greatly and was lower than the actual temperature values of the day for throughout the month. RH was fluctuated to an extent of 10 to 55 % during day time under tubular structure, but, under natural, green shade net structure and pucca grainage system the RH was 22-36%, 22-36% and 21-55%, respectively (Fig.2).

Lowest pupal mortality under preserved conditions, synchronized male and female moths emergence, recovery of maximum coupled moths should be the criteria for the ideal grainage performance. To achieve these parameters, requires optimum abiotic factor like temperature (25±5 ºC) and RH (70-80 %). Substantial variation in the temperature and RH in different grainage systems have been observed during February to April. Fluctuation in temperature was recorded under green shade net similar to natural condition. But, under pucca grainage house and tubular structure, the temperature fluctuations were not similar to the natural conditions. Green shade net structure, due to perforation in the green shade net, might have allowed natural air to pass inside and exit, thereby, regulated the temperature and RH under the structure. The temperature among the different grainage structures was low under pucca grainage structure compared to shade net structure, tubular structure and natural conditions. Under the pucca grainage concert structure, the heat inside is reduced through air infiltration (Mumovic and Santamouris, 2009) and ventilation by exhaust fan. The RH was more in both pucca grainage structure and green shade net structure and lowest in tubular structure. Under pucca graiange house the RH was maintained

Fig. 3. Different grainage structure for tasar silkworm seed production. A) Green shade net structure, B) Pucca grainage house and C) Tubular grainage structure

by wet gunny bag. But, green shade nets, the mechanism of resistance to solar radiation and weathering as well as trapping and maintenance of humidity (Behera et al., 2016) helped in the maintenance of RH. It was found that the optimum temperature and RH was ideal under agro shade net grainage house (Kumar et al., 2012).

From the foregoing observations it is inferred that the shade net grainage house followed by pucca grainage house are the best for tropical tasar grainage in terms of maintenance of optimum temperature and relative humidity.

IV. Conclusion

As per the above data it is inferred that, the green shade net grainage house structure is ideal system for tropical tasar grainage. The system provides ideal conditions as prevailing under natural system for emergence, pairing and disease control, it also improves grainage performance and leads to high fecundity.

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