

Investigations on the Biodiversity of Tropical Tasar silk moth (*Antheraea Mylitta*) in Uttar Pradesh

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Abstract:

The Non-mulberry silk sector involves tropical and temperate Tasar silk. India is home to five types silk mulberry and non-mulberry silks viz. the tropical Tasar (*Antheraea mylitta* Drury), and temperate Tasar (*Antheraea proylei* J), Muga (*Antheraea assamensis* Ww.) and Eri (*Philosamia ricini* Hutt.). All the five silks are produced by silk moths belong to family Saturniidae (order Lepidoptera). Tasar silkworms have stalled itself in several forms of environmental populations normally called as (ecoraces) in various geographical places of the country according to host plants and micro-environmental circumstances. In India Tasar species exists in the form of about 44 ecoraces. The present study, revealed that the diversity of profitable populations of *Antheraea mylitta* Drury in selected sites of Uttar Pradesh is dependent upon climatic conditions, physical geographics, and their cocoon characteristics vary accordingly.

Keywords: *Antheraea mylitta*, biodiversity, tropical tasar silkworm, Sericulture, Tasar silk.

Introduction:

There are two sectors of sericulture Mulberry and Non-Mulberry. Mulberry *Bombyx mori* is a monophagous domesticated insect that feeds upon the leaves of mulberry and reared under indoor circumstances. The non- mulberry sericulture involves tropical Tasar and temperate Silk moths, the tropical Tasar is obtained from *Antheraea mylitta* Drury, and temperate Tasar is obtain from *Antheraea proylei* J. The other non- mulberry silk moths are Muga *Antheraea assamensis* Ww. and Eri *Philosamia ricini* Hutt, belonging to family Saturniidae order: Lepidoptera. India is a unique country in the world producing five types of silk. The silkworms and their host plants compose an important factor of forest - based flora and fauna, (Allam *et al.*, 2018). The non-mulberry silk moth is main role in the protection and utilization of biodiversity as described by Frankel (1982); Peigler (1993) and Kioka (1998). Inter as well intra inhabitants, interaction exists between and within the several populations of *Antheraea mylitta* (Sinha *et al.*, 1994). Tasar silkworm is a blessing to the forest resident tribals as they earn a source of revenue with the gathering and sale of forest grown wild Tasar cocoons (Nayak *et al.*, 2000; Hansda *et al.*, 2008). The range distribution of *Antheraea mylitta* is almost between 12–31°N latitude 72–96°E longitude (Renuka & Shamitha 2015). This widespread range of difference in its genotype, additional inter- breeding amongst diverse ecoraces in nature over periods has led to high grade of heterozygosity in usual population of *Antheraea mylitta* Drury (Sinha and Prashad, 2011). This species is widespread and circulated in diverse geographical areas of India in the form of different environmental races (Mahendran *et al.*, 2006). It shows variation in phenotypic traits such as fertility, voltinism, cocoon weight, and also in its degree of performance on different food plants (Sinha *et al.*, 1994). Tropical tasar silkworm is used in country for profitable silk production and better-quality varieties of these silkworms can be evolved by engaging various breeding techniques (Sinha & Prasad, 2011). Tasar silkworm has stalled itself in several forms of environmental conditions normally called as ecoraces. In various geographical places of the country depending upon host plants and micro-environmental circumstances presented. In India 44 ecoraces of Tasar species are found (Singh and Srivastava, 1997, Srivastava, 2002). The present study revealed that the diversity of profitable populations of *Antheraea mylitta* Drury in selected sites of Uttar Pradesh is based upon climatic conditions and physical geographics, and its cocoon characteristics vary accordingly (Renuka & Shamitha, 2015).

Materials and Methods:

In this study biodiversity of Tasar silkworm (*Antheraea mylitta*) were investigated. Field surveys were conducted in different seasons of four districts viz. Hardoi, Shravasti, Sonbhadra, and Mirzapur during the year of 2017 to 2019 in the Uttar Pradesh (India). Wild silk moths along with their host plants were studied during the rearing and non-rearing periods. In this study various ecological aspects were observed. The *Antheraea mylitta* Drury, explored in its natural habitats in four districts of Tasar silkworm, and the geographical parameters were recorded (Renuka & Shamitha, 2015). The primary and secondary food plants of Tasar silk worm (*Antheraea mylitta*) have been observed. Temperature and relative humidity were recorded by digital hygro meter. The collection of the eggs, moths, cocoons, and different larval stages was done by hand picking method and adult moths were collected by nylon net. During the field survey photographs of the moths,

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cocoons, pupa, and different stages of larvae and their host plants were taken by Canon camera and Samsung Max Pro cell phone. We used GPS co-ordinates recorded by mobile apps for each site every year (Shangpliang & Hajong, 2015).

Results:

In the District of Sonbhadra (Parasi Pandey), Tasar silkworm species (*Antheraea mylitta*) was found as shown in table No- 2. In this region, the two crops of Tasar silkworm were found namely Ampatiya (July- August) & Daba ecoraces (September- October). Total 15 Tasar silk farm were found in Sonbhadra. The cocoon colour of first crop was white grey, cocoon colour of second crop was creamy grey. The cocoon of male moth was small in size and average weight 11.60 g and the female moth of large in size and average weight 12.90 g. The colour of male moth was dark brown whereas female moth was yellow in colour.

Daba ecoraces better crop than Ampatiya. The several primary and secondary host plants such as *Terminalia arjuna*, *Terminalia tomentosa*, *Ziziphus mauritiana*, *Syzygium cumini*, and *Shorea robusta* were found in shonbhadra district. The annual average temperature was 25.5°C, average annual rainfall 1115.00 mm and relative humidity 45- 90% was observed. In Mirzapur, tasar silkworm rearing of two crops were observed: the first crop in July–August and the second crop in September–October. Only one species of *Antheraea mylitta*, was found in the whole district which fed on *Terminalia arjuna*. But this species was observed in several other host plants of the Tasar silk worm were found, such as *Terminalia tomentosa*, *Ziziphus mauritiana*, *Syzygium cumini* and *Shorea robusta*, due to the presence of red loamy soil and tropical dry deciduous forest. Eri silkworm rearing was also found in this region. The average annual rainfall was 1100 mm, the average annual temperature was 25.9°C, and the relative humidity was observed 45.85%.

In Shravasti district, the forest dominates as tropical semi-evergreen and fine loamy soil was found. There many other food plants were available for the Tasar silkworm viz. *Terminalia arjuna*, *Ziziphus mauritiana*, and *Syzygium cumini*. Only the rearing of mulberry silkworm was found Instead of the rearing of Tasar. The cocoon of mulberry silkworm was found in two colours: white- grey, and yellow. The annual average temperature was (24.5°C), the relative humidity was (68.25%), the average annual rainfall was observed 1196.00 mm.

In Hardoi district, at Rara Tasar silk farm, where the Tasar silkworm (*Antheraea mylitta*) was reared. Tasar silkworm rearing was found in the months of September and October. Only one species of *Antheraea mylitta* reared on *Terminalia arjuna* food plant. The richness and availability of primary and secondary food plants such as *Ziziphus mauritiana* and *Syzygium cumini* were found because of loamy sandy soil and tropical dry deciduous forest were found in this region. The cocoon of male moths was small in size and average weight (9.4 g) and cocoons of female moth were large in size and average weight (10.5 g) has been observed. The cocoon colour of *Antheraea mylitta* was found in dark grey. Colour of the mature larvae of *Antheraea mylitta* was pale yellow-green. The annual average temperature 25.30 °C and relative humidity 54% were observed. The average annual rainfall was 981.00 mm as shown in (table -1).

Table no (1): Natural habitats and their ecological parameters in Uttar Pradesh

Area of Habitats	Geographical ordinates		Forest type	Soil type	Maximum average temp. (°C)	Minimum aver. Temp. (°C)	Annual rainfall (mm)
	North East						
Parasi Panday (Sonbhadra)	24.704	83.019	Tropical dry deciduous	Red loamy	32.2	18.9	1115.00 mm
Barkacha (Mirzapur)	25.133	82.564	Tropical dry Deciduous	Red loamy	30.57	18.5	1100.00 mm
Rara (Hardoi)	27.430	80.170	Tropical dry deciduous	Loamy sandy soil	32.33	22.08	981.00 mm
Chandrakha bujurg (Shravasti)	27.655	81.699	Tropical semi evergreen	fine loamy soil	30	17	1196.00 mm

Table no (2) Distribution of Tasar silkworm *Antheraea mylitta* Drury In Uttar Pradesh

Species	Sites name	Host plants
<i>Antheraea mylitta</i>	Parai Panday (Sonbhadra)	<i>Terminalia arjuna</i> , <i>Terminalia tomentosa</i> , <i>Ziziphus mauritiana</i> , <i>Syzygium cumini</i> and <i>Terminalia catappa</i> .
	Barkacha (Mirzapur)	<i>Terminalia arjuna</i> , <i>Terminalia tomentosa</i> , <i>Tyzygium cumini</i> .
	Rara (Hardoi)	<i>Terminalia arjuna</i> , <i>syzygium cumini</i> and <i>Ziziphus mauritiana</i> .
<i>Bombyx mori</i>	Shravasti (Chandrakha bujurg)	<i>Morus alba</i> , <i>Terminalia arjuna</i> , <i>syzygium cumini</i> and <i>Ziziphus mauritiana</i>

Discussion:

In the present study, four ecoraces were found, which were predominantly found in dry tropical forest area (Sonbhadra, Mirzapur and Shrivasthi and Hardoi). The red loamy sandy soil found in this region with maximum temperature range of (29.15 - 33.56°C) and minimum (15.50 - 22.96 °C), the annual precipitation ranging from (900 - 1196 mm) in moist tropical deciduous forest areas (Suryanarayana & Srivastava, 2005). Orissa was 3rd major Tasar silk producing state of India. Tasar culture was also practised by tribals communities in fourteen districts with woodlands. In Orissa, out of 5.48 million hectares, 0.89 million hectares was found in the Tasar belt.

The over-all forest area under *Terminalia tomentosa* is 0.12 million hectare and under *Shorea robusta* (SAL) was 0.77 million hectares also helps as food plants of Tasar silkworm (Sinha & Prasad, 2011). Although in the present study biodiversity of silkworms in the District of Sonbhadra (Parasi Pandey), the rearing of Tasar silkworm species (*Antheraea mylitta*) was found. In this region, there were two crops of Tasar silkworm, the first crop in July-August and the second crop in September-October. The known first crop name was Ampatiya, and the second crop Daba ecoraces. Primary and secondary host plants of the Tasar silkworm were found in this area, such as *Terminalia arjuna*, *Terminalia tomentosa*, *Ziziphus mauritiana*, *Shorea robusta*, and *Syzygium cumini*.

Mostly cocoon and associated parameters such as; breadth 3.47, (3.42-3.50 cm), cocoon length 5.40, (5.23-5.48 cm), single cocoon weight 15.57, (13.48-18.48 g), cocoon volume 30.03 (29.20-31.10 cc), single shell weight 3.22, (2.90-3.52 g), and silk ratio 20.80, (19.11-21.52%) were observed higher in the comparison than all other ecoraces. Whereas Nalia has lengthiest peduncle at 11.01, (10.07–11.98 cm) comparatively than other ecoraces. Same outcomes were testified by earlier authors although bestowing the evaluations of wild tasar ecoraces in the Simlipal Biosphere Reserve. (Khasru alam *et al.* 2020).

Current study was done in Jhansi district, four chaki resham farms were found, primary and secondary food plants were more available, *Terminalia arjuna*, *Terminalia tomentosa*, *Ziziphus mauritiana*, *Terminalia catappa* L. (Jangli badam), and *Shorea robusta*, because of red loamy soil and tropical dry deciduous forest were found in this region mostly observed in this area. Tasar rearing occurs in this region from July - August for the first crop and second crop September - October. Only one species, *Antheraea mylitta*, was found in the whole district, and it was observed that mostly in this area, Tasar silkworms reared on the food plants of *Terminalia arjuna*. These plants, tropical, grow abundantly at low altitudes (0–600 msl) between 40 north and south latitudes. Mostly Tasar silkworm (*Antheraea mylitta*) preferred host plants of *Terminalia arjuna* and *Terminalia tomentosa*. It was observed that better rearing crop in this area in month of September to October, because of good climatic factors, lack of rainfall, and a different other factor that contribute to good Tasar silk production. In this region's most rearers of Tasar silk worm preferred *Terminalia arjuna* food plants because of them to the richness. Male moth cocoon was found small in size and average weight was 10.5 g whereas female cocoon moth was large in size and average weight was 11.60 g. The colour of mature larvae of *Antheraea mylitta* was pale yellow-green. Annual average temperature of 25.8 °C and a relative humidity of 55% were found. The average annual rainfall 900.00 mm was observed.

The Tasar silkworm ecoraces were possess some changes of economically useful and genetically determined heterozygous (Jolly *et al.*, 1979; Sengupta *et al.*, 1993). So that the ecoraces had been used in the reproduction purpose for reformation of crop and race productivity. In current study in the biodiversity of Shrivasthi district, the forest dominates as tropical semi-evergreen and fine loamy soil were found. There were many other food plants for the Tasar silkworm in this region, viz., *Terminalia arjuna*, *Ziziphus mauritiana*, and *Syzygium cumini*. In this region, Tasar silkworm rearing is not found due to the presence of Tarai land, more humidity, heavy rain falls, and weather fluctuations. Only the mulberry silk worm (*Bombyx mori*) species was found and reared on *Morus alba* food plants.

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