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Availability of naturally grown host plants of golden Muga silkworms in Uttarakhand and their utilization under Muga silk production

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Abstract

The state of Uttarakhand has been endowed with natural resources which need to be exploited in an efficient manner. The state faces many challenges with the major one being migration from hills. The naturally available host plants found in the district of Bageshwar provides an immense opportunity for the proliferation of the Muga silkworms in the region. The present paper deals with the cultivation practices for Muga silkworms, prospects, constraints and strategies for cultivation of Muga silkworms in the district of Bageshwar.

Keywords: Muga, host plant, rearing, livelihood, Uttarakhand

1. Introduction

Muga silk is termed as the “Golden silk” with India being the only region producing all four varieties i.e. Mulberry, Eri, Muga and Oak Tasar silk in the entire world. India is also the second largest consumer and producer of silk in the world. Muga is produced by *Anthrea assamensis* and feeds on certain primary and secondary host plants. The Indian golden silkworm belongs to order Lepidoptera and family Saturniidae and muga culture of Assam is an old Assamese culture and contribution of Tai-Ahoms to culture of Assam.

According to (Nässig *et al.*, 1996), the 1200–1500 species in the family Saturniidae occur throughout the world. (Arora & Gupta, 1979) ^[1] Reported that there are as many as 40 species of silk moths in India, while (Jolly *et al.*, 1975) ^[4] reported about 80 species in Asia and Africa that are used to produce silk commercially. Although Muga culture has its roots in the North East region of India, trials in areas of Bageshwar and Nainital in the state of Uttarakhand have been successful. Muga has a rich tradition and heritage behind it which needs to be exploited in the best possible way. Uttarakhand being a Himalayan state also faces critical issues of migration where villages are turning into ghost villages, unemployment, lack of livelihood means in the hills and rampant climate change causing alterations in agriculture practices which is a primary source of income for rural masses in hill. The practice of sericulture is not new in the region but somehow the industry has not become competent enough in the region. The reasons could be attributed to low production of mulberry and seed production etc. In this direction cultivation practice of Muga silkworm in the district of Bageshwar emerges as a major source of livelihood to the farmers and women in the region. The climatic conditions of the district could be tremendously useful for such culture. In the Kumaon of Uttarakhand District Bageshwar is located at 29°51'N latitude and 79°46'E longitude with an elevation of at 800 AMSL with varied topography at an altitude ranging from 800 to 6000 m. The area covers all weather conditions like tropical, sub-tropical, sub-temperate and temperate. Due to vast flora and fauna of the region many varieties of silkworm are found here. The naturally growing host plant evidence has been found in the entire belt of this region with a new species of *Actias Selene* Hubner reported in the region. Although Muga culture has a rich tradition and heritage, it is increasingly being threatened for its very survival due to the rampant and irrational exploitations (Tikader *et al.*, 2011a) ^[9] in the northeast region of the country. It calls for locating its other potential areas where it could proliferate.

2. Muga silkworm host plant

Muga silk is produced by the silkworm *Antheraea assamensis* Helfer, a polyphagous insect feeding on a wide range of plants viz., som (*Persea bombycina*) and soalu (*Litsea monopetala*) being the primary host plants, and dighloti (*Litsea salicifolia*) and mejankori (*Litsea citrata*) as

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The secondary host plants (Bhattacharya *et al.*, 1993; Tikader and Rajan, 2012) [2, 10]. A few other minor host plants viz., *Cinnamomum glaucescens*, *Actinodaphne obovata*, *Michaela champa*, *Zizyphus jujuba*, *Xanthoxylum rehsta*, *Celastrus monosperma* are also available and are considered tertiary in

nature (Neog *et al.*, 2005) [7]. The natural host plants are available in the clusters of Bageshwar area of Uttarakhand i.e.

- a. Primary host plant
- b. Secondary host plant

Host plants	Scientific name	Distribution
Primary food plants	1. <i>Litsea monopetala</i> 2. <i>Persea bombycina</i>	1. Northeastern India, Western Himalayan region 2. Northeastern India, Nepal
Secondary food plants	1. <i>Cinnamomum camphora</i> 2. <i>Cinnamomum tamala</i> 3. <i>Litsea citrata</i> 4. <i>Litsea salicifolia</i>	1. Northeastern India 2. Northeastern India 3. Northeastern India 4. Northeastern India, Nepal
Tertiary food plants	1. <i>Actinodaphne augustifolia</i> 2. <i>Actinodaphne obovata</i> 3. <i>Celastrus monosperma</i> 4. <i>Cinnamomum cecicodaphne</i> 5. <i>Cinnamomum glanduliferum</i> 6. <i>Cinnamomum obtusifoli</i> 7. <i>Gmelina arborea</i> 8. <i>Litsea nitida</i> 9. <i>Litsea salicifolia</i> 10. <i>Machilus odoritissima</i> 11. <i>Magnolia pterocarpa</i> 12. <i>Michelia champaca</i> 13. <i>Michelia oblonga</i> 14. <i>Symplocas grandiflora</i> 15. <i>Symplocas paniculata</i> 16. <i>Symplocas ramosissima</i>	1. Northeastern India, Bangladesh 2. Northeastern India 3. Northeastern India 4. Northeastern India 5. Northeastern India 6. Northeastern India 7. Northeastern India 8. Northeastern India, Nepal 9. Northeastern India 10. Northeastern India 11. Northeastern India 12. Northeastern India, Nepal, Bangladesh, Myanmar 13. Northeastern India 14. Northeastern India 15. Northeastern India 16. Northeastern India

(Tikader *et al.*, 2013) [11]

3. Lifecycle of muga silkworms and crop pattern in Uttarakhand

Table 1: Various stages of Muga silkworm

Stages of silkworm	Time required in summer season	Time required in winter season
Egg	7	15
Larvae	24	70
Cocoon	3	7
Pupa	14	55
Moth	2	3

Table 2: Crop cycle stage in state of Uttarakhand

Crop season	Crop duration	Crop season		Humidity (%)	Crop stage
		Minimum	Maximum		
Spring	March-April	16-19	30.83-32.21	70.93-76.05	Seed/Commercial
Summer	May-June	24.58-26.26	33.29-34.63	71.56-80.14	Seed
Pre-Autumn	June- July	24.93-26.26	34.63-35.9	80.14-82.41	Seed
Autumn	August-September	25.61-25.7	33.75-35.68	82.21-83.74	Seed/Commercial

4. Constraints in muga production of silk

The genetics of the host plant needs to be studied in the region of Bageshwar. Infestation of the disease in the foliage of the trees makes them unfit for feeding purposes and ultimately hamper cocoon yield production.

Agronomic, biochemical and morphological traits of these plants have not been studied well to formulate strategies necessary to improve the leaf productivity.

Lack of ecological research related to the insect and host plant could be a major bottleneck.

5. Prospects of muga in bageshwar district of uttarakhand

In insects, DNA markers are used to provide information based on which estimates of genetic diversity and gene flow between populations can be obtained, and migration and colonization history can be analyzed [3, 12, 8, 5]. A genetic and molecular study for the region could be initiated in this

direction.

Abundance of naturally available host plants including *Litsea monopetala*, *Persea bombycina*

Congenial climatic conditions

Availability of workforce in the villages

Employment to the rural community in the village

The study related to it needs to be carried out at agronomical, molecular and breeding level to exploit the available resources in the best possible manner.

A boost to the production of Muga silk in the region can also help in bringing the yarn rates down that currently stand at 16,000-18000 making the region to emerge as a major market for silk production.

6. Strategy for development

The available host plants need to be studied and then be utilized to develop superior cultivars.

More such natural spots for host plants need to be explored and then cluster level development of the areas can be initiated. Development of a major station for conducting trials with host plants and bioassay studies should be done.

The post cocoon operations need to be mechanized and subsidy scheme developed by the government to generate more employment in the area.

Improvement of disease management practices.

Extensive surveys to locate other such hotspots of host plants for muga. Rigorous planned mapping should then be followed.

7. Attempts will help: conclude

The sericulture industry had always been present in the region of Uttarakhand but it needs to be revived and made as a catalyst for the revival of the industry in the region. The presence of muga plants in the forest region of the hills of Uttarakhand provides a door of opportunity for exploration of presence of more diversity of such plants in various other regions. The development of hybrids for Uttarakhand region similar to ones done in the northeastern region could be initiated. There is an urgent requirement for the study of host plants at molecular and ecological level to determine the possible potential and challenge for expansion of variety in the region. A bioassay study for survival of the species in the region is also a necessity. It should be followed by extensive survey with advanced training and an expansion of the extension services of the sericulture department.

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