

## ORIGINAL ARTICLE

## STORY OF SPLENDID MUGA

Sagarika Chaudhuri

*Department of Zoology, Sree Chaitanya College, Habra, West Bengal. India.**Email: sagarikaChaudhuri@yahoo.com*

**Abstract:** Muga is one of the most important cottage industries of India that flourished on it from time immemorial. For the extension of this sector, potential areas are always in the survey. While understanding the uniqueness of this Vanya silk's nature, an assessment of biodiversity of muga host plants and muga silkworms in selected areas particularly the Cooch Behar district of West Bengal was carried out. Farm and non-farm activities of muga were surveyed. The role of women in the reeling and weaving of muga was appraised.

**Key Words:** Vanya silk, host plants, silkworms, farm and non-farm activities, potential areas.

Communicated: 12.07.2021

Revised: 24.10.2021

Accepted: 18.11.2021

## 1. INTRODUCTION

Muga silk, the queen of all fabrics, is the most precious natural silk fiber on earth. It is well known for its fine texture, durability, high tensile strength and lustrous golden yellow color. Unlike other textiles, the golden yellow color, and shine of Muga silk increase with every wash.

This silk is secreted by a semi-domesticated insect species, *Antheraea assama* (= *Antheraea assamensis* Helfer 1837), and this wild or Vanya silk is a unique gift of God to the North-Eastern part of India where Muga culture has become a part of their culture [1-3]. The name Muga is also an Assamese word that means golden yellow color. Commercial production of muga silk through muga silkworm rearing along with other related activities is muga silk culture. Being an agro-industry, it is divided into (i) Farm Sector and (ii) Non-farm or Industry Sector. The Farm sector comprises the activities like growing silkworm food plants, rearing silkworms, and producing silkworm eggs. On the other hand, non-farm or industry sector involves activities like reeling, twisting, weaving, dyeing, printing, and finishing the silk.

Muga silk has been granted the protection of geographical indication (GI) as the 38<sup>th</sup> item, in 2007, and was conferred a GI logo for trademark purposes in 2014 [4]. The logo has been registered with the Assam Science Technology and Environment Council. This would help in the commercialization and export of various forms of this pride possession of India.

## 2. METHODOLOGY

Extensive surveys were carried out as a part of the project (UGC, MRP 2015-2017), for the collection of data regarding muga culture. Biodiversity of muga host plants and muga silkworms in selected areas

particularly the Cooch Behar district were assessed. Women involved in various activities of muga reeling in various parts particularly the Dinhat block of Cooch Behar were communicated. An attempt was made to appraise the role of women in reeling and weaving and other related works in muga silk industry.

### 3. RESULT AND DISCUSSION

Muga silkworm, *Antheraea assama* is indigenous to the North-Eastern region of India and is not available anywhere in the world [5]. Muga culture is mostly concentrated throughout the Brahmaputra valley in the hilly districts. Among the North-Eastern states of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Mizoram, Manipur, and Tripura, muga production is confined mainly to the state of Assam. Assam is the only state for the production of reeling cocoons. Other North-Eastern states produce a major quantity of seed cocoons for commercial multiplication. Assam produces 95 percent of the total muga raw silk fiber followed by Meghalaya. The most important muga cocoon rearing districts are Lakhimpur, Sibsagar, Jorhat, and Dibrugarh in upper Assam. These districts produce 90 percent of total muga raw silk. Most of the cocoons are purchased for weaving by the traders of Sualkuchi, the place located in the Kamrup district of Lower Assam. It has also been extended to Uttarakhand and Chinatapalli in Andhra Pradesh. The Eastern Goalpara and the South-Western part of the Kamrup districts in lower Assam had been the major seed cocoon areas. In recent years muga culture has been extended to West Bengal in Cooch Behar and Jalpaiguri districts successfully [6,7,8].

#### Muga Episode

Muga silk is produced by the muga silkworm or the larva, a stage in the life cycle of the insect. Muga silkworm is a holometabolous insect i.e., undergoes complete metamorphosis. The stages of the life cycle like the egg, larva, pupa, cocoon, and adult moth (Figure 1A- 1D) were observed in the study area during the survey at muga farms of Coochbehar district, West Bengal. The egg is ovoid in shape and brownish in color. The larva is with brown colored head and a yellowish body which later changes to green color. After being hatched the tiny muga silkworm larva starts to feed on food plant leaves and grow. These silkworms cast off their skin four times to reach their full size. After the larva completes its growth, it stops feeding and spins a protective covering around it, called the cocoon. The larva then changes into the pupa, which lies quietly and appears lifeless. But inside the pupal skin, there will be rapid activity in which the larval structures are broken down largely into a liquid which reforms into adult organs. After the changes are complete, the adult moth crawls out by piercing through the cocoon. In muga the cocoon is single-shelled, golden brown or glossy white in color, oblong, closed, reelable, and slightly flossy with a weak peduncle. The pupa inside is copper brown. The final stage in the life cycle of the muga silkworm is the adult stage which is a moth. The moth is characterized by the presence of wings, prominent antennae, and sucking but redundant mouthparts. There is a marked difference between males and females, thus there is sexual dimorphism.

Silk is produced and secreted from the silk secreting gland present in the head of the silkworm. The silk glands are the most conspicuous part of the larval anatomy. Silk comes from the silkworm cocoon that the ripe silkworm spins around itself. The purpose of the cocoon is to provide a protective casting to the delicate silkworm during the most critical period of its life viz., the pupal stage. The silk fiber is made up of two proteins, these are fibroin, constituting the core of the fiber, and sericin, a waxy substance that encases the fibroin. Initially, very loose and irregular silk is spun on cocoons and the outermost surface layers are called floss of cocoons. After the formation of the outer floss, the silkworm larva then starts S spinning shape and changes into alpha shape. It regularly changes location and gradually forms silk layers one by one. At the final stage of larval, spinning the cocooning is complete.

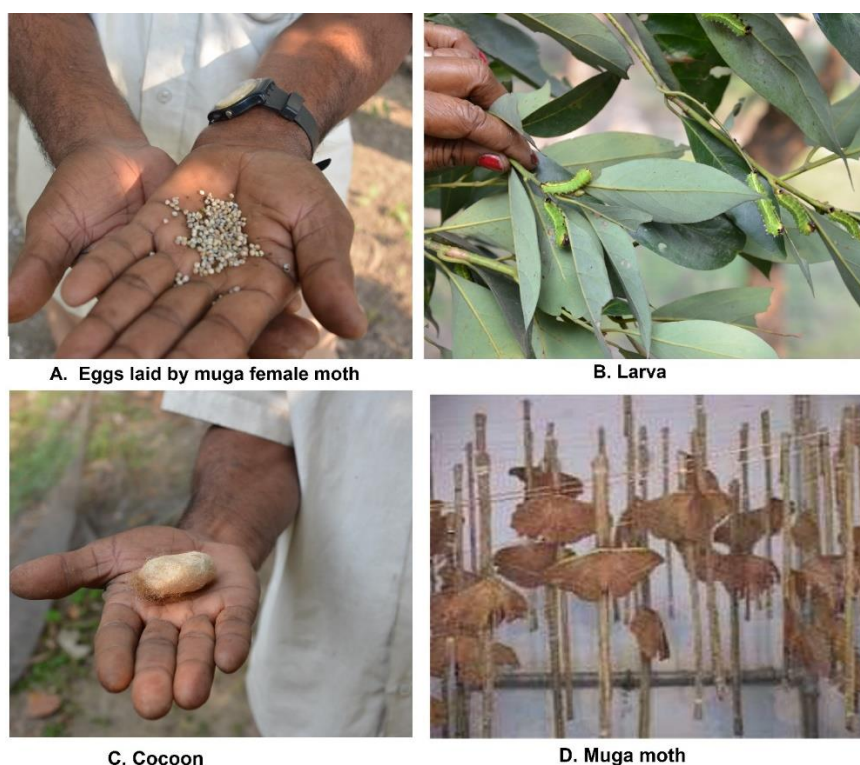


Figure 1. Different stages of the life cycle of muga moth observed in the study area. Contributor of golden silk

### **Voltinism clock of the silkworm and the crop cycle**

The number of times the repetition from egg to egg occurs one year in the insect is called voltinism. The voltinism that has evolved in response to photoperiod and other seasonal factors works with clock-like precision. The larvae in the final instar pick up the signals from the environmental factors triggering voltinism, for pupal diapause. Muga silkworm is multivoltine and it completes six cycles in a year (Table 2). The muga silkworms are reared according to these cycles and given local names according to the rearing months. Kotia and Jethua are large-scale crops for the production of reeling cocoons and production of fibers. The remaining crops are used only for stock maintenance and seed purpose.

Table 1. The Life cycle of Muga silkworm and the days to complete development in each stage. Source: Wild Silks of India, volume II [9]

Stages in the life cycle	Days required	
	In summer	In winter
Egg	07	15
Larval	24	57
Spinning	03	06
Pupal	14	44
Moth	02	03
Total	50	125

Table 2. Muga rearing schedule. Source: Wild Silks of India, volume II [9]

Crop	Nature of crop	Rearing period	Cocoon quality
Jarua (Winter)	Pre-seed	December- January	Poor cocoon
Chotua (late Winter)	Seed	March- April	Poor cocoon
Jethua (Spring)	Commercial	May- June	Good cocoon
Aherua (Summer)	Pre-seed	July- August	Poor cocoon
Bhodia (late summer)	Seed	August- September	Poor cocoon
Kotia (Autumn)	Commercial	October- November	Best cocoon

### The Farm Part of Muga Culture

During survey in muga farms of Coochbehar district, it was observed that muga silkworm, *Antheraea assama*, from which silk is obtained, is a semi-domesticated insect whose rearing is done outdoors. Muga silkworms feed on the leaves of a variety of food plants. Among them, the most preferred ones are Som and Soalu (Figure 2a-b) plants. Muga silkworms reared on Som plants (*Persea bombycina* King, Family - Lauraceae ) produce very good quality cocoons used for reeling whereas, silkworms reared on Soalu ( *Litsaea polyantha* Juss, Family: Lauraceae) produces cocoons used for producing seeds for propagation. Mejankari, Dighalati, Kathalua, Bogori, and Bhimloti are other food/host plants used for rearing muga silkworms.



a. Som plant at Dinhata muga farm

b. Soalu plant

Figure 2. Preferred foodplants for the muga silkworms, photographed from Dinhata Muga Farm, Coochbehar district, West Bengal.

Muga culture was originally practiced by the tribals of North-Eastern states in natural forest areas, near their dwelling places. With the shrinking forest patches, there is decreasing availability of naturally

grown food plants. The concept of raising economic plantations has come into practice. Growing muga food plants is thus the primary step. Next rearing is done following the rearing schedule and, finally, cocoons are harvested and stored. The word Grainage used in the silk industry refers to an establishment, where disease-free silkworm eggs are produced by scientific methods. The success of this silk industry lies in the production and supply of quality and disease-free muga silkworm eggs or seeds.

### **The Non-Farm Part**

In muga farms of Coochbehar, good quality cocoons are selected for reeling. The main purpose of reeling is to harness the continuity of the silk filaments well, in a most desirable way in time. In muga reeling, unwinding of cocoon filaments take place (Figure 3), from 8-12 cocoons combined to get a yarn suitable for weaving. An appropriate reeling device like charkha is used for efficient reeling. The muga silk filament is of fine denier (5 to 6 d) and 8-10 cocoons are reeled together to produce 40-44 denier silk yarn (Figure 4a). Among other reeling machines, the CSTRI motorized-cum-pedal operated reeling-cum-twisting machine is used widely in the farms. The reeled yarn of muga silk (Figure 4b) is used directly for weaving after winding with or without twisting. Twisting involves introducing spiral turns into raw silk. Certain properties to the silk fabric are imparted by the extent of twist and the direction. Weaving is done on handlooms such as Frame loom, CSTRI improved frame handloom with jacquard (Figure 4b) or, power looms. Finishing the silk fabric helps to enhance the desirable features as desired by the customer. The new technology used in finishing units nowadays involves a wider choice of machines and processes.



Figure 3. Muga reeling at Dinhata muga farm





Figure 4. Yarn of muga silk (a) and CSTRI frame handloom at Khagrabari, Coochbehar.

### Present Status of Muga Silk Industry

The Government of India is giving high priority to improving the quality and the production of muga silks. Central Silk Board, under the Ministry of Textiles, Govt. of India is authorized with the responsibilities of developing muga silk industry. State Sericulture Departments, Institutes, and Universities are involved in the research and development of technologies regarding the promotion and commercial exploitation of muga silk [10] The most expensive of all silks, muga is intrinsically woven into the cultural tradition of India. Sarees and mekhla-chaddars are the traditional items made from muga silks. Fashion designers have initiated the development of new products and designs using muga silk [11].

## 4. CONCLUSION

The weather and environmental conditions of Cooch Behar and Jalpaiguri districts are very much similar to Assam. Hence since 1985, in the Dinhatata area of Cooch Behar district, muga rearing was possible.

Presently in Dinhatata, in 800acre lands, 2200 farmers are involved. All the reeling cocoons are converted into twisted muga yarn in the district itself which in turn is disposed to traders from Assam and West Bengal @ Rs. 8000/- to Rs. 8300/- per kg. Considering its demand in the market muga silk has been introduced in Cooch Behar on a smaller scale. Women are involved in various activities of muga culture. Financial assistance and technical help are provided by State and Central Government. There are Women Self Help Groups in areas like Atiabari, Khagrabari, Tufhanganj, Ghughumari, and Mathabhanga. The total number of groups is 340 and the number of reeling machines is 30. There is an effort to the overall development of this wild silk, elevate the economic status of people involved in culture, and empowering women engaged in various activities for the production of the lustrous golden silk.

The demand for this exquisite golden natural fiber is growing extensively in the domestic and international markets. In appreciation of its bright future, the scope of youth and women employment, chance of rural economic improvement, and huge export potentiality, the need for further and overall scientific and technological developments of the Muga silk industry is never-ending.

## 5. ACKNOWLEDGEMENTS

UGC is thankfully acknowledged for granting the MRP on muga culture in India (F.No. PSW-183/14-15(ERO), dated. 03.02.2015). Dr. Sibendu Chaudhuri (retired professor, Jadavpur University), my husband, helped me, by arranging fieldwork and by taking most of the photographs of the project. I appreciate Dr. Soma Bandyopadhyay, Principal, Narasinha Dutt College and Dr. Pampa Chakraborty, Associate Professor of Botany, of Narasinha Dutt College, for their encouragement.

## 6. REFERENCES

1. *Wild Silks of India. Vol. I. An introduction of Vanya silks. Central Silk Board, Bangalore. 2006: 1-195.*
2. A. Tikader, A.K. Gogoi, and L. Pachua, "Muga culture: the rich tradition of Assam. *Indian Silk*", vol. 2, (2011), pp 18-20.
3. J.P. Baruah, "Muga Silkworm *Antheraea assamensis* Helfer (Lepidoptera: Saturniidae)-an overview of distribution, life cycle, disease, and control measure", *Munis Entomology and Zoology Journal*, vol 16(1), (2021), pp 214-220.
4. *GI Registry India. Statewise Registration Details of GI Applications. Intellectual property India. <https://web.archive.org/web/20130826183844/http://ipindia.nic.in/girindia/> (Retrieved 12<sup>th</sup> September, 2021).*
5. D. P. Paliwal, R. K. Khatri, I. P. Tonk, K. K.Sharma and B.K. Negi, "Muga culture a pride of the North-Eastern Region", In: *Silk in the new millennium. Swarup Book Publishers Pvt. Ltd., New Delhi. 2009, 18: 205-212.*
6. P. K Das., A. Bhattacharya, B. Choudhury and B.K. Singh, "Biodiversity of Muga and Eri silkworms and its Economic Significance in North-East India", In: *Indian Sericulture Alfa Publications, New Delhi. 2009, 6: 123-136.*
7. K.K. Das, T.N. Roy, and B. Das, "Diversification of Agriculture in Eastern India". *Springer Link. 2014. 225-236.*
8. *coochbehar.gov.in Homepage, MUGA (Non-mulberry) cultivation in Cooch Behar ([http://coochbehar.nic.in/htmlfiles/cob\\_seri\\_muga.html](http://coochbehar.nic.in/htmlfiles/cob_seri_muga.html)) retrieved on 12<sup>th</sup> September, 2021.*
9. *Wild Silks of India. Vol. II. "Profiles of Farm Activities", Central Silk Board, Bangalore. 2010: 1-220.*
10. S. Chaudhuri, "Economic Zoology", *New Central Book Agency (P) Ltd. 2017. 1-693.*
11. R.K. Sinha, "New areas of research for value addition to sericulture", *Indian Silk*, vo. 5(6), (2015), pp 18-20.