JUST AGRICULTURE
multidisciplinary e-Newsletter

Recent Advances and Innovations in Muga Silk Industry

Shilpa Saikia[1], Nanita Bora[2] and Monimala Saikia[3]

[1]Sericulture facilitator, North East Region Textile Promotion Scheme,
Directorate of Sericulture, Govt. of Assam, Guwahati, Assam

[2]Young Professional II, College of Sericulture, Titabor,
Assam Agricultural University, Jorhat, Assam

[3]Assistant Professor, Department of Sericulture,
Assam Agricultural University,
Jorhat, Assam

ARTICLE ID: 006

Introduction:

Muga, the source of precious 'Golden Silk' and being the monopoly of Assam has high in demand since time immemorial. Because of unique golden hue it occupies a significant place in global silk trade and soon will emerge as the biggest market for the thread. It is apparently now evident how the muga silk industry is potentially strong in shaping and sustaining the rural economy of Assam as well as in earning a bunch of foreign exchange. Despite of being sumptuous, royal, heavenly, exotic, sensual and superior over the other silks, muga culture is highly confined to the Brahmaputra valley of Assam because of availability of host plants and favourable climatic conditions. In their indigenous home, the north-east India, especially in Assam productivity of muga cocoon as well as the silk is very low due to lack of adoption of improved technologies and scientific approaches at farmers' level. Contribution of muga silk to the total raw silk production of India is only 0.67 % (Anon., 2020). Since the muga silkworm, *Antheraea assamensis* Helfer is reared in outdoor condition high mortality occurred particularly at early stage of rearing. One of the reasons for these problems is that farmers adopted age old traditional technologies of host plant management and rearing technologies (Thangavellu *et al.*, 1988). Sericulture has been technologically advanced since last three decades in India (Rathore *et al.*, 2019). A number of farmers' friendly new technologies have been innovated by the scientists and by the experts of different institutes with a hope to improve the quality and quantity of muga silk. These

JUST AGRICULTURE
multidisciplinary e-Newsletter

innovations will enhance the muga silk production to meet the future demand. Recent technologies and innovations made in the muga sector are highlighted in this article.

Innovations in the field of host plant sector:

Cultivation of host plants to produce quality leaves is the most important factor in sericulture industry. Muga silkworm feeds on varieties of host plants which can be classified as primary, secondary and tertiary. The growth, development and other post cocoon factors are dependent on the quality and quantity of leaves consumed. Therefore, importance should be given on the host plant sector. As the rearing of muga silkworm is conducted in outdoor condition exposure to environmental fluctuations is more which leads to crop failure. Regional Muga Research Station (RMRS), Boko, Kamrup, Assam and Central Muga Eri Research and Training Institute (CMER&TI), Lahdoigarh, Assam has characterized the different morphotypes of *Som*, *Persea bombycina* (King ex Hook. fil.) Kosterm and *Soalu*, *Litsea monopetala* (Roxb.) Pers. Central Silk Board has popularized S3 and S6 accessions of som plant resistant to leaf spot disease, leaf blight and leaf rust in the field (Anon., 2019).

Muga silkworm rearing:

High mortality rate is observed during early instar muga silkworm rearing because of diseases, pests and environmental fluctuations, so, precautions should be taken to minimize the crop loss. Lahdoi - an anti muscardine formulation has been developed and recommended in the year 2009 by Central Muga Eri Research and Training Institute, Lahdoigarh which prevent the disease up to 70%. The dose is 1gm per litre of water before seven days of brushing in the leaves and soil and can be repeated in 15 days interval (Anon., 2021). It is non-corrosive and enhances leaf quality. A new indoor rearing device was fabricated by Barman and Das (2011) intended to make the early instar rearing more feasible in indoor condition. The device was made of polythene sheet and bamboo frame designed to maintain the freshness of detached som twigs by regulating high relative humidity with the help of foam pads. Barman and Rajan (2011) introduced a new technology where integrated rearing was carried out in completely indoor condition along with 'leaf freshness technology', 'nutrient supplemented phago-stimulant' and bacterial disease control by streptomycin sulfate. It minimized the early stage loss, bacterial infection and increased the feeding rate and production. A formulation of *Terminalia chebula* has been developed by Unni and Neog (2012) which can be applied to reduce the intensity of flacherie disease on muga silkworm as

JUST AGRICULTURE
multidisciplinary e-Newsletter

well as to increase cocoon production. An integrated chawki rearing technology (1st to 3rd instar larvae) was introduced by Goswami *et al*. (2015) to study its impact on muga cocoon production. The rearing was conducted in already prepared chawki rearing plot fully under nylon net with necessary measures. They noticed significant improvement in cocoon production by adopting chawki rearing technology over traditional practices. Box type bamboo mountage has been fabricated by CMER&TI, Lahdoigarh for cocooning which saves labour up to 60% and requires less space. Superior quality cocoons are produced from it and harvesting also made easy. Biological control of uzi fly using the parasitoids, *Nesolynx thymus* (Hymenoptera: Eulophidae) and *Exoristobia philippinensis* (Hymenoptera: Encyrtidae); use of "phytoblighton" to control of leaf blight (*Colletotrichum gloeosporioides*) disease of soalu; eco-friendly management of stem borer (*Zeuzera indica*) are some other technologies developed by CMER&TI.

Post cocoon sector:

CMER&TI, Lahdoigarh has designed a low cost muga cocoon drying chamber for stifling and drying of muga cocoons which runs on locally available firewood, twigs etc. It has a capacity of 8000 cocoons in one time and about 40,000 cocoons can be stifled in 8-9 hours without affecting silk quality. Central Muga eri research and training institute has recommended a cooking chemical 'Muga silk plus' in the year 2009 which enhances the silk

recovery up to 55%. The amount of the chemical required to cook 50 nos. of muga cocoon in one litre is 2.5 gm. It is easily soluble in water with no side effect. BANI - a weft reeling machine was designed by CMERTI, Lahdoigarh in 2008 for weft reeling of muga yarn. It is a four end capacity motor cum pedal operated machine which produce zero twist flat muga yarn. The productivity is 120-140 gm per day which is higher than bhir. Another reeling machine was developed by Central Silk Technological Research Institute to replace bhir

JUST AGRICULTURE
multidisciplinary e-Newsletter

reeling machine named as 'Sonalika' (Anon., 2018). This reeling machine can produce 1kg muga silk yarn in four man days with false twist mechanism.

Biotechnological sector:

Recent advances have been done in the molecular level also. Singh *et al*. (2017) has decoded the complete mitochondrial genome using next generation sequencing technology. They found that mitogenome of *Antheraea assamensis* is an AT rich circular molecule of 15,272 bp (A+T content~80.2%) and 37 genes along with a 328 bp control region. It will be an important addition to existing genome informatics and serve as a tool for future genomic studies. An attempt was done by Bhardwaj *et al*. (2016) to study 3D porous silk fibroin scaffolds from muga silkworm and to examine its ability to support cartilage tissue engineering. The surface morphology and structural conformation revealed the highly interconnected porous structure with increase stability within the structure. They have suggested as a promising scaffold for chondrocyte based cartilage repair.

Conclusion:

Innovation is the integral key to success. Dissemination of technologies to the farmer's field is more vital than its adoption. Though the research organizations claiming the development of new technologies in sericulture sector, there is a huge difference in field acceptance in the farmers level, because of which resulting in a wide gap between lab finding and field realization. It creates problems like loss of interest towards new technology adoption by the farmers. Technology innovation and awareness among the farmers should be done simultaneously so that the new innovation could meet the world's increasing demand of muga silk by boosting the production.

References:

Anonymous . (2018). Annual Report 2017-18, Central Silk Board, Ministry of Textiles, Govt. of India, pp. 5.

Anonymous . (2019). Annual Report 2018-19, Central Silk Board, Ministry of Textiles, Govt. of India, pp. 3.

Anonymous. (2020). Annual Report 2019-20, Central Silk Board, Ministry of Textiles, Govt. of India, pp. 95.

Anonymous. (2021). Retrieved from https://cmerti.res.in/wp-content/uploads/2021/03/Technologies-of-CMERTI.pdf on 25th December, 2021.

Barman, H., and Das, R. (2011). Development of a new indoor rearing polythene device and its performance in early stages indoor rearing of *Antheraea assamensis* (Lepidoptera. Saturniidae). *Elixir Bio. Phys*, **36**: 3148-3152.

Barman, H., and Rajan, K. (2011). Muga silkworm (*Antheraea assamensis*) indoor rearing by integrated "leaf freshness technology" – A new technology. *African Journal of Agricultural Research*, 7(23): 3490-3497.

Bhardwaj, N., Singh, Y.P., Devi, D., Kandimalla, R., Kotoky, J. and Mandal, B.B. (2016). Potential of silk fibroin/ chondrocyte constructs of muga silkworm *Antheraea assamensis* for cartilage tissue engineering. *Journal of Materials Chemistry* B, **4**: p.3670.

Goswami, D., Singh, N.I., Ahmed, M., Kumar, R., Mech, D. and Giridhar, K. (2015). Impact of integrated chawki rearing technology on cocoon production of muga silkworm, *Antheraea assamensis* Helfer, *Biological Forum*, **7(1)**: 146-151.

Rathore, R. A., Sonawane, M. A. and Roy, C. (2019). Technology advancement and its adoption: a booster for sericulture development and expansion in Madhya Pradesh, India. *International Journal of Social Science and Economic Research*, **4(5)**: 2455-8834.

Singh, D., Kabiraj, D., Sharma, P., Chetia, H., Mosahari, P.V., Neog, K. and Bora, U. (2017). The mitochondrial genome of muga silkworm (*Antheraea assamensis*) and its comparative analysis with other lepidopteran insects. *PLoS ONE*, **12(11)**: e0188077. https://doi.org/10.1371/journal. pone.0188077

Thangavellu, K., Chakroborty, A. K., Bhagowati, A. K. and Isa, Md. (1988). *Handbook of muga culture*. Central Silk Board, Bangalore, India. pp. 1-103.

Unni, B.G. and Neog, K. (2012). Current trend of biotechnological and molecular research in muga silkworm, *Antheraea assamensis* Helfer and future prospects. In: *Proceedings of National Seminar on "Recent Trends in Research and Development in Muga Culture* – Ideas to Action", 3-4 May, 2012, Guwahati, Assam. pp. 12-20.