

CMERTI

At a glance



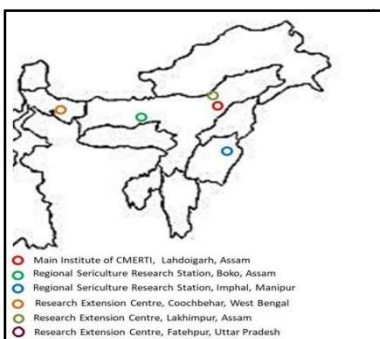
Central Muga Eri Research and Training Institute
(ISO 9001:2015 certified Institute)

Central Silk Board, Ministry of Textiles (Govt. of India)
Lahdoigarh, Jorhat – 785700, Assam, INDIA

THE INSTITUTE

Established by Central Silk Board (CSB), Ministry of Textiles, Govt. of India in 1999, Central Muga Eri Research and Training Institute (CMER&TI) has been the premier R&D centre catering to the needs of vanya sericulture industry in Northeast India. Situated in Northeast India (Lat 26° 47' 04" N/Long 94° 20' 01" E, Altitude 63 AMSL), a proud producer of all types of vanya silks, CMERTI focusses mainly on R&D activities in muga, eri and oak tasar culture.

In these 2 decades of existence, the Institute has developed a number of patented technologies to help the vanya sector. Most of these technologies are adopted by sericulture farmers of Northeast India. The Institute also conducts various training programs for needy stakeholders. The main objective of the Institute is to evolve new technologies for increasing the productivity of muga, eri and oak tasar silkworms, and thereby transforming these cultures from the state of traditional culture to a profit making and sustainable enterprise.



VISION

To emerge as an international research institute of excellence for muga, eri and oak tasar culture to ensure higher productivity and growth in sericulture.

MISSION

To achieve excellence in application oriented research for transforming the muga, eri and oak tasar industry from the subsistence level of production to a vibrant commercial base

MANDATE

- To act as an apex Research Institute for providing R&D support for muga, eri and oak tasar culture.
- To conduct basic, strategic and applied research to increase production and productivity of silkworms and their host plants.
- To conduct socio-economic research for assessing sustainability of newly developed technologies.



- To percolate the research findings to the end users through extension and training mechanism.

R&D Divisions and Sections

- Agronomy & Soil Science
- Biotechnology
- Host Plant Pathology
- Silkworm Pathology
- Entomology
- Post Cocoon Technology
- Extension & Training
- Host Plant Improvement & Management
- Silkworm Improvement & Management
- Silkworm Seed Technology
- Silkworm Rearing & Management
- Germplasm Conservation Centre
- Project Monitoring & Coordination

Services offered

- Technological support to all the sericulture farmers in Northeastern states of India.
- Basic planting material of high-yielding varieties of wild silkworm food plants.
- Region and season-specific package of practices for food plant cultivation and silkworm rearing.
- Pest and disease surveillance and control.
- Technology packages for reeling and spinning.
- Implementation of centrally sponsored programmes in collaboration with all state sericulture departments to provide central share of subsidy to the stakeholders of silk industry.
- Agro-advisory, Soil Health Card, Soil testing and soil analysis
- Production of basic seeds OF muga, eri and oak tasar silkworm and supply.
- Training on various aspects of vanya sericulture is provided to stakeholders.
- Library on sericulture for public use

Scientific expertise

The centre has a team of experts comprising, agronomist, pathologist, host plant specialist, entomologist, insect breeder, extension specialist, biotechnologists, Agri-statistician, etc.

Resources available

Genetic resources of host plants of wild silk moths (live gene bank), eri eco-races (15 Eco-races and 6 strains) and improved breeds, muga breeds CMR-1 and CMR-2, grainage for seed production, PCT in Vanya silks, Vermicompost, automatic weather station, state-of-the-art research laboratories for advanced research.

Facilities

Laboratories, library, conference hall, computational facilities, cold storage for pupae and eggs, insect repository, Vanya silk museum, training infrastructure, training hostel, guesthouse, residential complex.

Infrastructure

Land: Sufficient land area is available with this Institute to carry out research on muga, eri and oak tasar silkworm and their host plants on different aspects like silkworm improvement and management, silkworm pathology, entomology, host plant improvement, plant protection, soil and agronomy etc. The land area of CMER&TI is distributed in four locations: 3 farms at main campus Lahdoigarh (37.73 acres), Germplasm Conservation Centre (GCC) at Chenijan (16.67 acres), Field lab at Titabor (21.40 acres) and Quarter Complex at Cinnamara (5 acres) .

REGIONAL RESEARCH STATIONS

RSRS, BOKO

Regional Sericulture Research Station is a R&D station in the field of muga culture, which was established in the year 1982. The station is presently functioning under



CMER&TI (CSB), Lahdoigarh with one Research Extension Centres (RECs) at Coochbihar, West Bengal. The station has been carrying out region specific adaptive research suited to the regional requirements besides providing training to farmers and grass root level extension workers. The RECs have the responsibilities of transferring technologies to the beneficiaries and also to provide all technological and input support to them.

The station has been successfully undertaking R&D activities to cater the needs of the on-farm and post-cocoon sector of muga and eri. The main objectives of the station are to carry out on station trial and on field trial for test verifying the technologies developed by the main research institute and suggest fine tuning/modifications of such technologies to provide solutions to region specific problems for increasing the productivity of muga and eri silkworms and thereby transforming these cultures from the state of traditional culture to a profit making and sustainable enterprises.

MANDATE

- To identify region specific problems, undertake research studies and feedback analysis in consultation with respective DOSs and allied units.
- To carry out On Station and On Field Trial for test verifying the technologies developed by the main research institute and suggest fine tuning/modifications of such technologies to provide solutions to region specific problems.
- Conduct on-farm trials (OFT)/demonstration of the selected technologies with selected farmers in coordination with DOSs.
- Popularize the proven technologies using various extension methods through cluster area approach.
- Conduct training for both grass root level extension staff of DOSs and farmers on advanced technological aspects.

ACTIVITIES

- Crop monitoring and troubleshooting/crisis management.
- Conduct survey on crop yield, economics and disease & pest surveillances for forecasting/forewarning.
- Coordination of Cluster Promotion Programme.
- Conduct training for both grass root level extension staff of DOSs and farmers on advanced technological aspects.
- Carry out need based adaptive research project in Muga sericulture.
- Implementation of Swachh Bharat Mission.

Infrastructure

The station has one number each of Office, Technical and Grainage buildings in working condition. There is a separate reeling unit in the station. Presently, there are one number of Type-IV, six numbers of Type-III, four number of Type-II and 6 numbers of Type-I Quarters in working condition.

RSRS, IMPHAL

Regional Sericultural Research Station, Imphal, formerly called Regional Tasar Research Station, is a premier R&D station established in 1974 by the Central Silk Board in Manipur and was then mainly focused on the development of Oak Tasar culture. From 2018 onwards, it has been re-assigned as a multi-tasking station for providing R&D support for the development of mulberry and non-mulberry sericulture in North Eastern States of India.

RESEARCH & DEVELOPMENT

Since inception, Regional Sericultural Research Station has catered to the needs of R&D in Oak Tasar culture. 55 research projects funded by Central Silk Board and external funding agencies have been carried out at this station with the objective of improving Oak Tasar industry and many technologies were developed as a outcome of the projects.



MANDATE

- To act as an apex research station for providing research and developmental support for sericulture.
- To conduct basic, strategic and applied research to increase production and productivity of silkworms and their host plants.
- To conduct socio-economic research for assessing sustainability of newly developed technologies.
- To percolate the research findings to end users through extension and training mechanism.
- To provide extension and training support to stakeholders.
- To support the state government in all matters concerning R&D, extension and technological matters related to sericulture

ACTIVITIES

- Exploration, collection, conservation and utilization of Oak tasar, Muga and Eri food plants and silkworm germplasm.
- Development and evaluation of technologies for improving productivity of silkworms and their food plants.
- Improvement through breeding and biotechnological approaches.
- Carry out need based research project in Oak tasar, Mulberry, Muga and Eri sericulture

- Extension, HRD and training programmes on Oak tasar, Mulberry, Muga and Eri in association with DOS/NGOs/Academic Institutes

INFRASTRUCTURE

The station has one number each of Office, Technical and Grainage buildings in working condition. There is a separate reeling unit in the station. Presently, there are one number of Type-IV, six numbers of Type-III, four number of Type-II and 6 numbers of Type-I Quarters in working condition.

Laboratories and research facilities

Agronomy and soil science: The section provides the facilities to analyze soil physical and chemical properties, plant essential nutrients, etc. It also provides information on soil health management, cropping system, muga/eri host plant cultivation for seri-farmers and other stakeholders. The section is working on soil health card for providing timely support to seri-farmers.

Biotechnology: The molecular biological aspects of wild silkmoths are being studied in this section. Plant-insect interaction studies, genomics of wild silkmoths and insect-gut microbiome analysis are some studies currently pursued. This section received DBT sponsored hub project for training students from national institutions to impart knowledge on silkworm molecular biology.

Entomology: Development of eco-friendly technology for the control of insect pests and predators infesting silkworm as well as host plants thereof for qualitative and quantitative enhancement of vanya silk production.

Silkworm seed technology: Deals with the production of quality vanya silkworm seeds for the use at institute and also by farmers. Responsible for providing disease free layings. The section is also involved in research and technology development for improving fecundity and hatching percentage.

Insect repository: Insect Repository was developed to preserve different wild sericigenous insects as well as other insect fauna found in Muga ecosystem including pests and predators for reference purpose. About 203 different species of insects are preserved in the repository and database has been developed.

Pathology: It was established to work on silkworm as well as host plant disease of Muga and Eri and to develop strategies for its management. The section has

developed technologies/ packages for silkworm disease and pest management, does survey and surveillance of diseases and pests and developed forewarning systems provide disease monitoring support.



Post cocoon technology: Wild silk quality test using various methods is carried out. The laboratory is equipped with muga reeling machines, cocoon dryer, silk plus for cooking, eri spinning machines.

Grainage: The centre is equipped with the state-of-the-art grainage facility for quality seed production of muga

and eri. Facilities for mother moth examination are available for detection of pebrine spores. On an average 20,000 certified diseases free layings (DFLs) of muga and 5000 DFLs of eri are produced every year and they are reared/ supplied as per the requirement in the field.

TECHNOLOGY DEVELOPED IN MUGA SECTOR

Improved genotypes of Som

S-3 and S-6 are the two improved genotypes of Som in terms of growth, leaf yield, cocoon production and disease resistance. Three improved accessions of Plus trees (PT-27, PT-11 & PT-16) are also identified as the best performing in terms of leaf yield and rearing performances.



Integrated control of stem borer

Technology has been developed to control the infestation of stem borer in Som and Soalu. Integrated control method comprising mechanical, botanical and chemical means is effective in controlling stem borer up to 95 % which causes 60 % damage in Som during September-October. The technology has been popularized and adopted by farmers and DOS.

High yielding Muga silkworm breeds

Two high yielding breeds of muga silkworm, CMR-1 and CMR-2 have been developed. CMR-1 has shown average fecundity of 166 nos., hatching of 72.28 %, cocoon yield of 86 per dfl. CMR-2 has shown average fecundity of 164 nos. hatching of 70.12 %, cocoon yield of 73 per dfl.

Management of leaf blight disease

The leaf blight disease of Soalu can be controlled by application Phytobligh-ton. Phytobligh-ton is a plant based product effective in controlling the leaf blight disease of Soalu (PDI ranges from 0.2 to 76.85) up to 85 %. Farmers are adopting the technology



Muga seed cocoon preservation technique

Preservation of Muga seed cocoons at 10 °C for 42 days during summer (Aherua) and for 62 days during winter (Jarua) seasons with normal fecundity, hatching and cocoon laying ratio is helpful to skip rearing during

unfavourable season and for improvement of seed production.

Anti-muscardine formulation “Lahdoi”

Muscardine in muga silkworm causes heavy loss during winter seed crop. An anti-muscardine formulation named as ‘Lahdoi’ has been developed to control Muscardine disease. Spray of 0.1 % “Lahdoi”, ensures 40–70 % ERR.



Intercropping with Som plantation

Suitable intercrops like Ginger (*Zingiber officinale* Rosc), Turmeric (*Curcuma longa* L.) and Colocasia (*Colocasia esculenta* L.) can be raised in the effective interspaces of existing Som plantation without any adverse affect on growth and leaf yield of Som plants. Intercropping of Ginger, Turmeric and Colocasia in one-hectare Som (*Persea bombycina* Kost) plantation can generate additional farm income by 47%, 55% and 85% over sole cropping of Som.



TECHNOLOGY DEVELOPED IN ERI SECTOR

Improved castor variety

NBR-1 is the most promising variety of castor which produces 12 MT leaf yield /ha/yr. Another two castor accessions, NBR-2 and NBR-3 have also been evaluated as superior which produce 13.79 and 13.38 MT leaf yield /ha/yr.



Intercropping in Kesseru

Intercropping in Kesseru plantation with Ginger (*Zingiber officinale* Rosc), Turmeric (*Curcuma longa* L.) and Colocasia (*Colocasia esculenta* L.) in one hectare Kesseru (*Heteropanax fragrans* Seem) plantation can check weed growth and can enhance farm income by 58%, 74% and 204% respectively over sole cropping of Kesseru. The technology is being popularized.



Varieties of Kesseru

Two high yielding accessions of Kesseru (*Heteropanax fragrans*), a perennial host plant were evaluated. HF 008 accession with medium leaves showing potentiality of 27.57 MT leaf yield/ha/year. HF 005 with smaller leaves showing potentiality of 26.72 MT leaf yield/ha/year. Both varieties are recommended to farmers.



Improved eri silkworm breed

An improved and high yielding eri silkworm breed C2 is developed at RERS, Mandipathar which is produces 12-13 kg cocoon shells /100 dfls against 6.5-7.8 kg/100 dfls in local race. C2 is approved by Hybrid Authorization Committee of CSB. C2 breed is showing above 350 fecundity and shell weight above 0.50 g. It is the first authorized breed



Platform eri rearing technology

The platform rearing device is found to be advantageous to accommodate double quantity of silkworms per unit area against the round bamboo tray (1m in diameter with capacity of 300 nos. 5th instar worms). In a 3 tier bamboo rack of size LBH 2.2 x 0.75 x 1.60 m, a total 10-12 dfls can be reared during 5th instar in the device.



Collapsible split type moutage for eri silkworm

A new wooden collapsible strip type moutage has been developed in which good cocoon recovery is 99.75 %. It takes very less time for harvesting (100 cocoons / minute against 10 cocoons /minute in traditional jali). In a 90 X 60 cm size moutage, around 500 ripened worms can be mounted for cocoon formation.



Agronomical practices for Kesseru

Approx. 25-35 cm tall healthy Kesseru seedling should be transplanted to the pits (30 x 30 x 30 cm) prepared at 2x 2 m spacing in plains and 3 x 3 m in hills. Seedling should be planted during the month of August

to September. FYM @ 0.5 cft per plant and NPK @ 150:75:25 kg/ha/year should be applied for better growth and leaf yield.

TECHNOLOGY DEVELOPED IN OAK TASAR SECTOR

Host Plant Technologies

- Developed package of practices for raising Oak Tasar host plant nursery.
- Developed technology for raising of oak tasar host plants, viz. *Quercus serrata*, *Lithocarpus dealbata*, *Q. semicarpifolia* and *Q. himalayana*.
- Development of pruning schedule of oak plants during different seasons to proliferate uniform sprouting coinciding with brushing of silkworms.

Pre-Cocoon Technologies

- Developed technologies of chawki and late age rearing.
- Additional crop can be raised by brushing worms from 20th July to 10th August at high altitudes (1200m ASL) and from 20th August to 10th September at low altitudes (785m ASL) to get maximum cocoon yield.
- Developed effective Oak Tasar silkworm disease control measure methods using integrated disease and pest control measures and chemical egg disinfectants.
- Development of management strategies for containing diseases and pests of the host plants.

Development of high yielding Oak Tasar silkworm breeds

- RTRS, Imphal has evolved several high yielding silkworm breeds like *Antheraea proylei*, *A. pernyi*, B6, BY1, Blue as a means to enrich breeding stocks in Germplasm Bank. Two superior lines RP (A hybrid -*A. roylei* x *A. pernyi*) and RTRSI-1 (backcross line (*A. roylei* x *A. pernyi*) x *A. pernyi*) which produce cocoons @ 40-50/df were developed against 32 cocoons /df of *A. proylei*.

Maintenance of germplasm bank of Oak Tasar silkworm

- RSRS Imphal has been maintaining thirteen breeds, viz, PRP2 PRP3, PRP5, PRP12, RPP4, RP, PR, PPR, RPP,BY-1, B6, Blue and C27. The indigenous and exogenous species like *A. proylei*, *A. pernyi* (from China), *A. frithi*, *A. roylei* and different breeds are also maintained in the silkworm germplasm bank at RTRS, Imphal



Grainage Technologies

- Developed technology for elimination of pupal diapause through light treatment (150 ± 5 lux) at $27 \pm 1^\circ\text{C}$ and $80 \pm 5\%$ R.H. for a period of 25-30 days to raise additional crops during summer and autumn seasons.
- Seed cocoon preservation for 8-9 months should be carried out at 8-12h photophase to maintain pupal diapause and reduce the erratic emergence to less than 10%.
- Developed effective technology for synchronized emergence of male and female moths to suit with the availability of leaf.
- Developed technology for silkworm eggs preservation at low temperatures ($5-10^\circ\text{C}$ & $80 \pm 5\%$ R.H.) for 25-30 days to avoid wastage of eggs and to synchronize with the sprouting of foliage

POST COCOON TECHNOLOGY

Muga Weft Yarn Reeling Machine: A reeling machine (BANI) has been designed for weft Muga yarn reeling which is a motor cum pedal operated, single basin, 4 end capacity machine. The machine works on cottage basin principle and produces zero twist flat Muga yarn suitable for weft in weaving. It can be operated by a single person in sitting posture and productivity is more than double than Bhir (120-140 g/day) against 80-100 g by two persons. The machine can also be used for mulberry cocoon reeling.



Muga Weft Yarn Reeling Machine



Muga cocoon dryer



Muga silk plus

Muga cocoon dryer: This machine was fabricated for stifling and drying of Muga cocoons using locally available fuels like firewood, dry leaves etc. Muga cocoon dryer works on hot air drying principle and its capacity is 8000 number of Muga cocoons at a time. Approx. 40,000 numbers of cocoons can be stifled and dried uniformly in 8-9 hours without loss of yarn quality. This is very useful in areas where electric power is not available for drying of cocoons. Silk recovery and productivity increases from the cocoons stifled and dried by this method. Cocoons dried in the dryer are suitable for longer storage and is technologically better than sun drying and smoke stifling.

Muga silk plus : An effective cooking chemical for Muga cocoon A chemical formulation has been developed for cooking Muga cocoon which can enhance the Muga silk recovery up to 55%, against 40- 48% silk recovery in

traditional Khar and soda cooking method. This low cost chemical (Rs. 30/ per 500 gm) is soluble in water. Hence, the cooking process is simple. The quality of reeled yarn is also improved by this chemical

[All these 3 post cocoon technologies are patented]

Training Section

Training is one of the key functions of this research institute. Short term and capsule courses are conducted for development of human resources in both pre-cocoon and post cocoon sectors. Some of the training programmes conducted by CMER&TI are as follows.

- Peripatetic training of women in post-cocoon technology on cocoon stifling, reeling, spinning, re-reeling etc.
- Farmers training on muga culture.
- Farmers training on eri culture.
- Capsule training programme for in-service staff of Sericulture Department of different States.



Extension activities

The Institute organizes various Extension Communication Programmes to disseminate technologies, enlighten the farmers on different aspects of improved host plant cultivation and silkworm rearing practices / technologies through Vanya Resham Krishi Mela, Workshops, Field Days, Farmers Days, Awareness Programmes, technology demonstration and Exhibitions.

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