



वार्षिक प्रतिवेदन Annual Report 2016-17



केन्द्रीय रेशम बोर्ड Central Silk Board,
केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान
Central Muga Eri Research and Training Institute
(आईएसओ ISO 9001: 2015 प्रमाणित संस्थान certified institute)
वस्त्र मंत्रालय, भारत सरकार Ministry of Textiles, Govt. of India
लाहदोईगढ़ Lahdoigarh-785700, जोरहाट, Jorhat, असम, Assam

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Vision

To emerge as premier Research Institute for overall development of Muga and Eri silk industry

Our Mission

To achieve excellence in application oriented research for transforming the Muga and Eri industry from the subsistence level of production to a vibrant commercial base.

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प्रस्तावना



केन्द्रीय रेशम बोर्ड के अधीन केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान देश में मूगा और एरी रेशम उद्योग के विकास के लिए बुनियादी रूप में प्रायोगिक अनुसंधान, विकास और विस्तार का समर्थन करने के लिए एक प्रमुख अधिदेशित संस्थान है। रेशम उत्पादन के राज्य विभाग के साथ समन्वय करते हुए इसके प्रसार और विस्तार और किसानों की भागीदारी की भावना के जरिए संस्थान किसानों के अनुकूल प्रौद्योगिकियों के विकास पर ध्यान केंद्रित करते हुए रेशम के कीट पालन प्रबंधन, खाद्य पौध सुधार व प्रबंधन, बेहतर नस्लों का विकास, कीटनाशक और रोग प्रबंधन पर केन्द्रित किया गया है।

भारत के पूर्वोत्तर क्षेत्र विविध वनस्पतियों और जीवों के लिए एक प्राकृतिक निवास स्थान है तथा पूर्वोत्तर भारत के अनुकूल वातावरण की वजह से इस क्षेत्र को सिरीसिनेज कीड़े और इसके खाद्य पौधों के लिए एक प्राकृतिक निवास बन गया है। इस क्षेत्र में चार प्रकार के वाणिज्यिक रूप से शोषित रेशम, अर्थात्, शहतूत, मूगा, एरी और ओक तसर उपलब्ध हैं तथा इसके अतिरिक्त कई व्यावसायिक रूप से गैर-शोषित सिरीसिनेज कीड़े जैसे अटैक्स एटलस, समिया कैनिनी, क्रिकुला ट्राइफेनेस्ट्रेट आदि पाए जाते हैं।

असम की ब्रह्मपुत्र नद की घाटी को एरी रेशमशलभ का मूल निवास के रूप में माना जाता है। शहतूत रेशम और चीनी तसर के बाद एरी रेशमकीट द्वारा निर्मित रेशम को दुनिया में आर्थिक रूप से तीसरा सबसे महत्वपूर्ण रेशम माना जाता है। देश में एरी कटा हुआ कोसा तथा कता रेशम के उत्पादन में भारत के उत्तर-पूर्वी क्षेत्र अकेले कुल 98% से अधिक उत्पादित करता है। इसके अलावा, एरी संवर्धन उत्तर प्रदेश, आंध्र प्रदेश, तमिलनाडु और ओडिशा में आरंभ हो गया है। एरी रेशम का उत्पादन और इसकी मांग दिन-व-दिन बढ़ती जा रही है और इसका उत्पादन हर समय उच्चतर दिशा में पहुंच गया है जिसका अभिलेख वर्ष 2016-17 में 5629 मेट्रिक टन से अधिक रहा है। पूर्वोत्तर क्षेत्र में मूगा रेशम, सुनहरा रंगीन अति आकर्षक व सुंदर रेशम उत्पादन करने वाला एक स्थानिक रेशम है। वर्ष 2016-17 के दौरान मूगा कच्चे रेशम का उत्पादन भी धीरे-धीरे बढ़कर 171 मेट्रिक टन हो गया है जो अब तक की सबसे अधिक दर्शाया गया है। मूगा रेशम कीट अपने जैविक और अजीब चुनौतियों का सामना कर रहे हैं जिससे अपने संभावित कच्चे रेशम उत्पादन में बाधा डालती हैं। मूगा रेशम उद्योग पर ग्लोबल वार्मिंग का प्रभाव, परिलक्षित जलवायु परिवर्तन और पर्यावरण प्रदूषण के साथ मिलकर होनेवाली क्षति को नकारा नहीं जा सकता है।

मुझे खुशी है कि संस्थान द्वारा वर्ष 2016-17 के दौरान उल्लेखनीय लक्ष्य प्राप्त किया है। संस्थान ने पहले बार उच्च उपज वाले एरी रेशमकीट नस्ल सी 2 को विकसित किया है जिसे केन्द्रीय रेशम बोर्ड की संकर प्राधिकरण समिति द्वारा अनुमोदित किया गया है और इसे एरी किसानों द्वारा व्यापक रूप में ग्रहण किया गया है। केन्द्रीय रेशम बोर्ड को ई-गवर्नेंस में “ई-गवर्नेंस में जी.आई.एस. प्रौद्योगिकी के अभिनव उपयोग” पर प्रतिष्ठित राष्ट्रीय पुरस्कार से सम्मानित किया है। इस परियोजना के कार्यान्वयन करने में संस्थान एक प्रमुख भागीदारी रहा है। महिलाओं के

सशक्तिकरण, अतिरिक्त आय और प्रौद्योगिकीय हस्तक्षेप से पूर्वर्ती और कोसेत्तर के कोकून क्षेत्रों के साथ उत्पाद डिजाइन, विविधीकरण और एरी रेशम के प्राकृतिक रंगाई पर ध्यान केंद्रित करते हुए संस्थान ने असम के जोरहट, गोलाघाट और शिवा सगर जिलों में सेरी मॉडल विलेज का विकसित किया है।

वर्ष के दौरान संस्थानों और उसके क्षेत्रीय इकाइयों में विभिन्न वर्गों में अर्थात् पर्यावरणीय चुनौतियों और ग्लोबल वार्मिंग, कठोर और उबाऊ काम में कष्ट कम करना और महिलाओं के अनुकूल प्रौद्योगिकियों और पर्यावरण-अनुकूल और जैविक खेती के तहत 24 शोध परियोजनाएं शुरूवात हुईं जिनमें से 3 परियोजनाएं समाप्त हुईं और अन्य परियोजनाएं जारी हैं। संस्थान में राष्ट्रीय संगोष्ठी, कार्यशाला, विस्तार संचार कार्यक्रमों जैसे फ़िल्ड दिवस, कृषि मेला, जागरूकता कार्यक्रम, समूह चर्चाएं और प्रशिक्षण कार्यक्रम आयोजित किए गए। राज्य के विभिन्न स्थानों पर स्वच्छ भारत अभियान कार्यक्रम और विशेष रेशम उत्पादन-सह-यूपीआई जागरूकता कार्यक्रम (जो पचास हजार से अधिक), प्रधान मंत्री मन की बात संबंधी कार्यक्रम आदि का आयोजन किया गया।

केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान, लाहदोईगढ़ के अनुसंधान संबंधी प्रमुख उपलब्धियां इस प्रकार हैं- संस्थान ने खाद्य पदार्थों के बेहतर जीनटाइपों की पहचान और मूल्यांकन पर अध्ययन किया है, जंगली मूगा रेशम कीड़े का मूल्यांकन, उर्वरता और खोल उपज, कीट और बीमारियों के लिए पूर्वानुमान और पूर्वचेतावनी प्रणाली का विकास, मूगा रेशमकीट जननद्रव्य का स्वस्थाने संरक्षण, एरेंड के लिए एकीकृत पोषक प्रबंधन पैकेज, एरी और मूगा रेशमकीट बीज, नया मूगा रेशमकीट प्रजनन अर्थात् सीएमआर-1 तथा सीएमआर-2 का विकास का दीर्घकालीन संरक्षण आदि रही है। मिट्टी स्वास्थ्य कार्ड तैयार कर पूर्वोत्तर राज्यों के किसानों को वितरित किए गए। किसानों के दरवाजे तक प्रौद्योगिकियों के प्रशिक्षण और प्रौद्योगिकी के हस्तांतरण पर जोर दिया गया। संस्थान द्वारा मूगा व एरी पर असम, नगालैंड, पश्चिम बंगाल तथा उत्तर प्रदेश में बड़े पैमाने पर किसानों को शामिल करते हुए संस्थान ने सेरी-मॉडल विलेज, रेशम उत्पादन संसाधन केन्द्र, मूगा और एरी पर क्लस्टर प्रचार कार्यक्रमों को कार्यान्वयित किया गया। संस्थान में आयोजित विभिन्न प्रशिक्षण कार्यक्रमों के तहत 5000 से अधिक किसान, रेशम उत्पादन विभाग, के कर्मचारीवर्ग, बीमा कंपनियों और गैर-सरकारी संगठनों के अधिकारियों को प्रशिक्षित किया गया। संस्थान और इसके इकाइयों द्वारा कई तकनीकी जागरूकता कार्यक्रम, रेशम कृषि मेला, फ़िल्ड दिवस, प्रदर्शनी, समूह चर्चा, फ्रंट लोडिंग प्रदर्शनी आदि का आयोजन किया गया। संस्थान ने एडवेन्सड लेविल्ल इंस्टीट्यूशनल बायोटैक हब और सर्विगेजसस कीट रेपॉजिटरी की स्थापना करके इसकी बुनियादी सुविधाओं को मजबूत किया जो पूर्वोत्तर क्षेत्र में इस प्रकार की स्थापना करनेवाला पहला संस्थान है।

मैं नगालैंड विश्वविद्यालय के उप-कुलपति और अनुसंधान सलाहकार समिति (आरएसी) के प्रोफेसर बोलिन कुमार कुंवर और संस्थान के आर.ए.सी. के सभी सदस्यों के लिए उनके अमूल्य मार्गदर्शन और अनुसंधान व विकास के क्षेत्र में सबसे महत्वपूर्ण विषय पर गति बनाए रखने और और मूगा और एरी रेशम उद्योग की समस्याओं से निपटने के सुझावों के लिए आभार व्यक्त करता हूं।

मैं संस्थान को आगे सफल बनाने की योजना है उसे पूरा करने के लिए अनुसंधान एवं विकास गतिविधियों को पूरा करने में संस्थान के विकास के लिए सहायता प्रदान करने पर केन्द्रीय रेशम बोर्ड, बेंगलूर के सक्षम प्राधिकरण को धन्यवाद जापित करना चाहता हूं। मैं विकासात्मक और विस्तार संचार कार्यक्रमों को प्रभावी ढंग से लागू करने में सभी पूर्वोत्तर राज्यों के रेशम उत्पादन विभाग द्वारा

समर्थन और सहयोग की सराहना करता हूं। मैं सभी सहयोगी संस्थान और वित्तपोषण अभिकरण यथा डिब्रूगढ़ विश्वविद्यालय, गुवाहाटी विश्वविद्यालय, एनआईआईटी-जोरहाट, आईआईटी-खड़गपुर और गुवाहाटी, आईएआरआई-नई दिल्ली, असम कृषि विश्वविद्यालय, विज्ञान और प्रौद्योगिकी विभाग, भारत सरकार और जैव प्रौद्योगिकी विभाग, भारत सरकार की सराहना करता हूं जिनके सहकारिता और सहयोग ने संस्थान को देश में अनुसंधान एवं विकास की महत्वपूर्ण दिशा में संस्थान को सक्षम बनाने के लिए आभार व्यक्त करता हूं। अंत में, मैं अपनी हार्दिक धन्यवाद केन्द्रीय रेशम बोर्ड के अपने साथी वैज्ञानिकों और सहयोगियों और किसानों को जरूरी स्तर पर चुनौतियों को सामना करने में सहयोग देने तथा मूंगा व एरी क्षेत्र में जरूरत आधारित और उपयोगी अनुसंधान और विस्तार सेवाओं को पूरा करने पर आभार व्यक्त करता हूं।

डॉ. बी. के. सिंह

निदेशक

FOREWORD



Central Muga Eri Research and Training Institute under Central Silk Board is the leading institute mandated to carry out basic as well as applied research, developmental as well as extension support for the growth of muga and eri silks industry in the country. The institute has been focusing on development of farmers' friendly technologies in the areas of silkworm rearing management, host plant improvement and management, development of improved breeds, pest & disease management, etc. and its diffusion and dissemination through farmers' participatory mode and in coordination with State Department of Sericulture.

The North East region of India is a natural abode for diverse flora and fauna. The conducive environment of the North East India has made the region a natural home for sericigenous insects as well as their host plants. Four types of commercially exploited silks, viz., mulberry, muga, eri and oak tasar are available in this region besides numerous commercially un-exploited sericigenous insects such *Attacus atlas*, *Samia canningie*, *Oricula trifenestrata*, etc.

The Brahmaputra valley of Assam is considered as original home of cultivated eri silkworm. The silk produced by eri silkworm is considered economically the third most important silk in the world after mulberry silk and Chinese Tasar. The North Eastern region of India alone produces more than 98 % of the total eri raw silk in the country. Besides these, the eri culture has also undertaken in Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Odisha. The production and demand of eri silk is increasing day by day and its production has reached all time high i.e. more than 5629 MT during 2016-17. Muga silk is endemic to North East region producing golden coloured exquisite silk. The muga raw silk production has been also increasing gradually up to 160 MT during 2016-17 which is the highest reported so far. The muga silkworm is facing certain biotic and abiotic challenges hindering its potential raw silk production. Impact of global warming coupled with climate changes and environmental pollution on muga silk industry cannot be ignored.

I am happy to note the institute could fulfill its goal in a remarkable extent during 2016-17. The institute has developed first high yielding eri silkworm breed C2 which was approved by Hybrid Authorization Committee of CSB and widely accepted by the eri farmers with 30% increase in economic traits. The Central Silk Board was awarded prestigious National award in e-governance on "Innovative use of GIS Technology in e-Governance" in which the institute was one of the major stakeholders in implementing the project. The institute has developed Seri Model Villages in Jorhat, Golaghat and Sivasagar districts of Assam focusing women empowerment, additional income and employment generation through technological interventions both pre and post cocoon sectors as well as product design, diversification and natural dyeing of eri silk.

During the year, 24 research projects under different categories viz., environmental challenges and global warming, drudgery reduction and women friendly technologies and eco-friendly and organic farming were undertaken at the institute and its regional stations, out of which 3 projects were concluded, and other projects are being continued. National Seminar, workshop, extension communication programmes like Field days, Krishimelas, Awareness programmes, Group Discussions and Training programmes were conducted at the institute. Organization of Swachh Bharat Abhiyan programmes and Special Sericulture

cum UPI awareness Programmes (more than fifty thousand), Prime Minister Maan Ki Baat Programmes etc. were organized in different locations.

The major achievements in Research at CMERTI, Lahdoigarh are as follows -the institute has also carried studies on identification and evaluation of superior genotypes of perennial food plant *Ailanthus*, evaluation of wild muga silkworm for enhancement of fecundity and shell yield, development of forecasting and forewarning system for pest and diseases, *ex-situ* conservation of muga silkworm germplasm and integrated nutrient management package for castor, long term preservation of eri and muga silkworm seed, development of new Muga silkworm breed viz., CMR1 and CMR2 etc. Soil Health Cards were prepared and distributed to the farmers of NE states. More thrust was given on training and transfer of technologies to the doorsteps of farmers and institute implemented programmes such as Seri-Model Village, Sericulture Resource Centers, Cluster Promotion Programmes on muga and eri covering large numbers of farmers in Assam, Meghalaya, Nagaland, West Bengal and Uttar Pradesh. More than 5000 farmers, DOS staffs, officials of Insurance companies and NGOs were trained under various training programme. The institute and its nested units also organized a number of technology awareness programme, Reshom Krishi mela, field days, exhibition, group discussions, frontline demonstration, etc. The institute also strengthened its infrastructural facilities by establishing Advanced Level Institutional Biotech Hub and Sericigenous Insect Repository which is first of its kind in NE Region.

It gives me immense pleasure to record my deep sense of gratitude to Prof. Bolin Kumar Konwar, Vice Chancellor of Nagaland University and Chairman, Research Advisory Committee (RAC) and all the members of RAC of the institute for their invaluable guidance and suggestions to keep up the momentum of spirit and involvement in frontier areas of R&D and to tackle the problems of muga and eri silks industry.

I would like convey my thanks to Competent Authority of Central Silk Board, Bangalore for providing support for development of the institute to carry out the R&D activities in fulfilling the vision of the organization. I sincerely acknowledge and appreciate the supports and cooperation extended by Department of Sericulture of all North Eastern States in implementing developmental and extension communication programmes effectively. I also sincerely appreciate all the collaborating institute and funding agencies such as Dibrugarh University, Gauhati University, NEIST-Jorhat, IIT- Kharagpur and Guwahati, IARI-New Delhi, Assam Agricultural University, Department of Science & Technology, Government of India and Department of Biotechnology, Government of India whose cooperation and support enabled the institute a frontier R&D institute in the country. Last but not the least I would like to convey my heartfelt thanks and gratefulness my fellow scientists and colleagues of Central Silk Board and to the farmers for their cooperation and sharing challenges faced in grassroots level for carrying out need based and useful research and extension services in eri and muga silk sectors

Dr. B.K. Singh
Director

INTRODUCTION

CMER&TI, LAHDOIGARH AT A GLANCE

Central Muga Eri Research & Training Institute is a R&D institute in the field of muga and eri culture, which is under the control of Central Silk Board, Ministry of Textiles Govt. of India. The institute has been successfully undertaking entire gamut of R&D activities to cater the needs of the on-farm and post-cocoon sector of muga and eri culture. Muga and eri culture is a rural industry of all the North Eastern States and parts of the country. The institute is strengthening the infrastructural facilities in recent years for conducting research in the frontier lines. The main objectives of the institute are to evolve new technologies 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.

A. MANDATE OF THE INSTITUTE

- Providing R&D support for Muga and Eri sericulture.
- Basic, strategic and applied research to increase productivity of host plants and silkworms
- Improvement of food plants and silkworm eco-races and hybrids.
- Socio-economic research for assessing sustainability of newly developed technologies.
- Dissemination of findings to the end users through extension and training mechanisms.

B. HUMAN RESOURCES (including extension units)

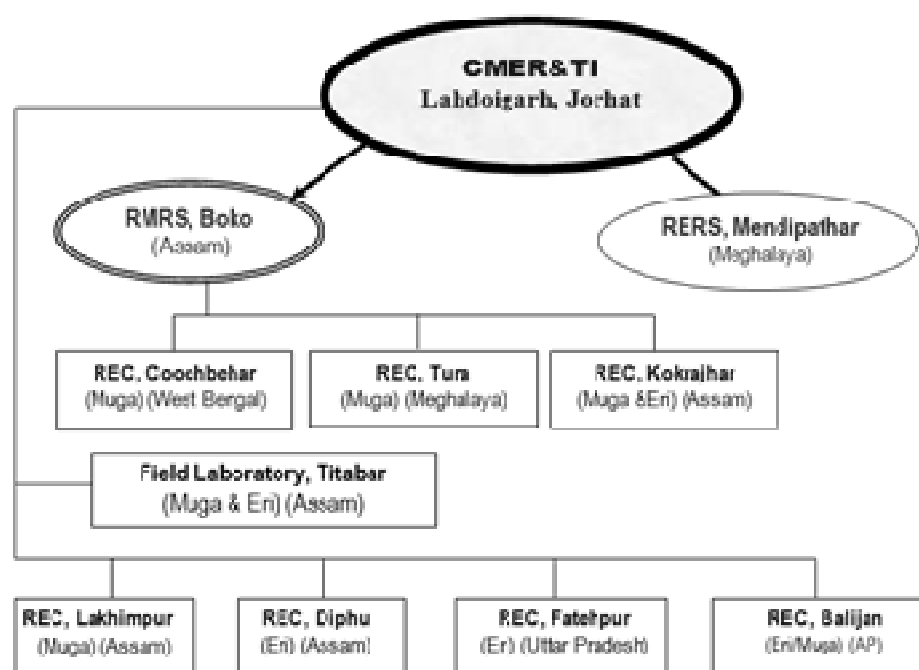
Scientists	36
Technical staff	57
Administrative Staff	57
Supporting Staff	37
Total Staff	178

The institute is located at Lahdoigarh, 16 km east of Jorhat, Assam, well connected with road. It has extension units in the North Eastern States, West Bengal, Uttar Pradesh and Andhra Pradesh. Scientists are working in close coordination towards the development of farmer's friendly technologies, their application in field, evaluation and fine tuning of the technologies and its dissemination. Research and Developmental activities of this institute are carried out under twelve divisions. There is a Project Monitoring Cell (PMC) in the institute for planning and monitoring of the institutional R&D activities.

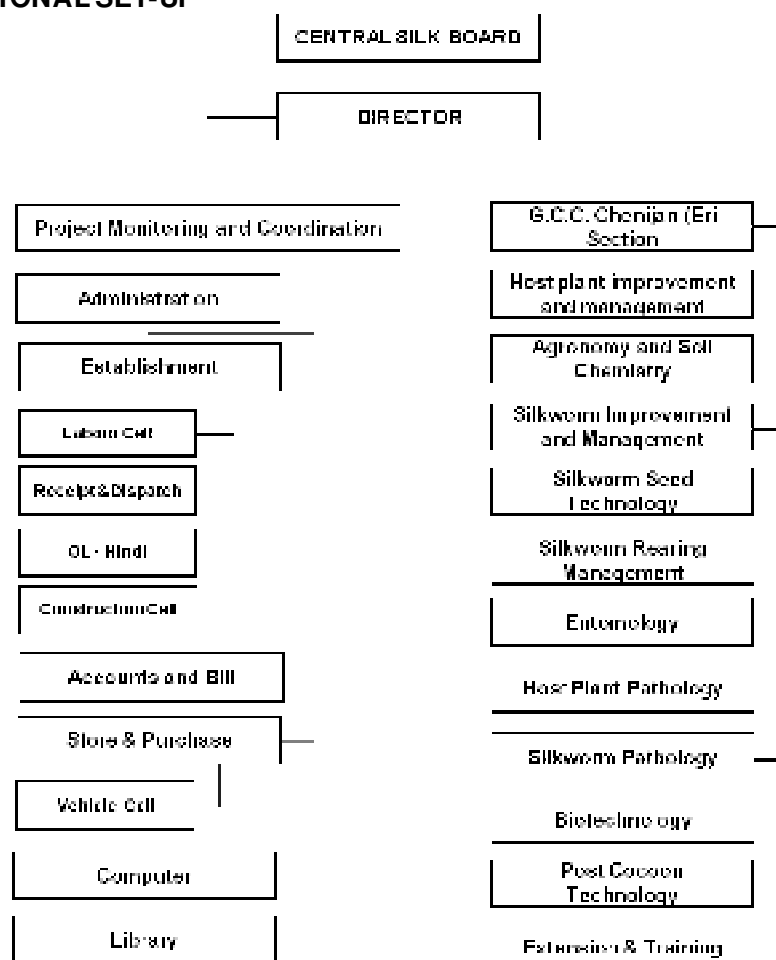
The administrative activities are carried out by ten sections viz., Establishment, Accounts & Bill, Stores and Purchase, Library, Vehicle, Construction, Labour, Computer, Hindi and Receipt & Dispatch.

To facilitate effective transfer of technologies developed by the institute and their validation in the field, Regional Research Stations and Research Extension Centres (REC) are established. Regional Muga Research Station (RMRS) is located in one of the major muga growing zones of Assam namely, Boko in the district of Kamrup. 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. Besides these, REC, Tura in Meghalaya is sharing the responsibility of maintaining basic stocks of muga silkworm. Two Regional Eri Research Stations (RERS) are located at Mendipathar (Meghalaya) and Shadnagar (Andhra Pradesh) with similar responsibilities for eri. There are two RECs for eri, located at Diphu (Karbi Anglong, Assam) and Fatehpur (Uttar Pradesh). There is a composite REC located at Mongaldoi, Assam and one at Navsari, Gujarat.

C. EXTENSION NETWORK



D. ORGANIZATIONAL SET-UP



E. SCIENTIFIC PERSONNEL (As on 31st March 2017)

I. MAIN INSTITUTE

1.	Dr. B.K. Singh	Director
2.	Shri D. Goswami	Scientist – D
3.	Dr. (Mrs) Ranjana Das	Scientist – D
4.	Mrs Ranuma Das	Scientist – D
5.	Dr. K. Neog	Scientist – D
6.	Dr. M.C. Sarmah	Scientist – D
7.	Dr. Urmimala Hazarika	Scientist – D
8.	Dr. T.J. Keisa	Scientist – C
9.	Mrs M.D. Senapati	Scientist – C
10.	Dr. B.N. Sarkar	Scientist – C
11.	Dr. M. Chutia	Scientist – C
12.	Dr. D.K. Gogoi	Scientist – C
13.	Dr. Rajesh Kumar	Scientist – C
14.	Dr. S. A. Ahmed	Scientist – C
15.	Shri D.K. Jigyasu	Scientist – B
16.	Dr. K. Subadas Singh	Scientist – B
17.	Dr. G. Subrahmanyam	Scientist – B
18.	Shri Rajal Debnath	Scientist – B
19.	Dr. Vinodakumar S. Naik	Scientist – B
20.	Dr. Ranjini M.S.	Scientist – B
21.	Dr. P. Sangannavar	Scientist – B
22.	Shri Jevan B.	Scientist – B
23.	Shri Vijay N.	Scientist – B

II. RMRS, BOKO, Assam

01	Dr. S. Paliwal	Scientist – D
03	Dr. M. De ka	Scientist – C
04	Shri L. Sonowal	Scientist – B

III. RERS, MENDIPATHAR, Meghalaya

02	Dr. H. Barman	Scientist – B
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IV. RERS, SHADNAGAR, Andhra Pradesh

01	Dr. T. Ravi Verma	Scientist – D
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V. REC, LAKHIMPUR, Assam

01	Shri D. Mech	Scientist – D
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VI. REC, COOCHBEHAR, West Bengal

01	Dr. N. Biswas	Scientist – D
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VII. REC, TURA, Meghalaya

01 Mr. G.K. Bharali TA

VIII. REC, KOKRAJHAR, BTC, Assam

01 Mr. J. Hazarika TA

IX. REC, FATEHPUR, Uttar Pradesh

01 Dr. A.U. Khan Scientist – D

X. REC, Diphu, Karbianglong, Assam

01 Mr. D. Khanikar TA

XI. REC, NAVSARI, Gujarat

01 Mrs. Hemlataben Patel TA

XII. REC, BALIJAN, Arunachal Pradesh

01 Mr. S. Pertin TA

F. DELEGATED AND NON-DELEGATED UNITS OF CMER&TI

DELEGATED UNITS

- ❖ Central Muga Eri Research & Training Institute, Lahdoigarh, Assam (Main Institute)
- ❖ Regional Muga Research Station, Boko, Kamrup, Assam
- ❖ Regional Eri Research Station, Shadnagar, Andhra Pradesh

NON-DELEGATED UNITS

- ❖ Regional Eri Research Station, Mendipathar, Meghalaya
- ❖ Research Extension Centre, Tura, Meghalaya
- ❖ Research Extension Centre, Coochbehar, West Bengal
- ❖ Research Extension Centre, Kokrajhar, Assam
- ❖ Research Extension Centre, Diphu, Assam
- ❖ Research Extension Centre, Lakhimpur, Assam
- ❖ Research Extension Centre, Fatehpur, Uttar Pradesh
- ❖ Research Extension Centre, Balijan, Arunachal Pradesh

वर्ष 2016-2017 की उपलब्धियां का मुख्यांश

केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान, लाहदोईगढ़, जोरहट ने अधीनस्थ अनुसंधान केन्द्रों और इकाइयों जैसे क्षेत्रीय मूगा अनुसंधान केन्द्र, बोको, क्षेत्रीय एरी अनुसंधान केन्द्र, शदनगर, क्षेत्रीय एरी अनुसंधान केन्द्र, मेन्दिपथर, मेघालय के साथ साथ लखीमपुर, कूचबिहार, तुरा, दिफू, कोकराझार और फतेहपुर में स्थित अनुसंधान विस्तार केन्द्रों इस उद्योगों के विकास के लिए मुगा और एरी क्षेत्रों में अनुसंधान व विकास में सहयोग प्रदान करते आ रहे हैं। 2016-17 के दौरान केन्द्रीय रेशम बोर्ड वित्तीय पोषित 15 अनुसंधान परियोजनाएं, डीबीटी वित्तीय पोषित 5 अनुसंधान परियोजनाएं और डीएसटी वित्तीय पोषित 4 अनुसंधान परियोजनाएं विभिन्न विषय अन्तर्गत अर्थात् पर्यावरणीय चुनौतियों और ग्लोबल वार्मिंग, कठोर और उबाऊ काम का घटाव और महिलाओं की अनुकूल प्रौद्योगिकियों और पर्यावरण-अनुकूल और जैविक खेती के तहत संस्थान में किया गया था और इसके क्षेत्रीय स्टेशन, जिनमें से 3 परियोजनाएं निष्कर्ष निकाली गईं, और अन्य परियोजनाएं जारी हैं 24 परियोजनाओं में से 12 परियोजनाएं नए मंजूरी दे दी गई हैं। इसके अलावा, रिपोर्ट प्रस्तुत करने की अवधि के दौरान संस्थान में 2 नियमित कार्यक्रम, 2 पायलट अध्ययन, सेमिनार, कार्यशाला, विस्तार संचार कार्यक्रम जैसे फील्ड डे, कृषि मेला, जागरूकता कार्यक्रम, समूह चर्चाएँ और प्रशिक्षण कार्यक्रम आयोजित किए गए थे। केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान, लाहदोईगढ़ में अनुसंधान में हुई प्रमुख उपलब्धियों के बारे में नीचे दी गई है।

खाद्य पौधा

- ऐलंथस ग्रैंडिस (बरपात) को एरी रेशमकीट के संभावित बारहमासी खाद्य पौधे के रूप में स्थापित किया गया है। किसान नर्सरी के मध्यम से पौधे उगाकर उसकी आपूर्ति की जा रहे हैं। मौजूदा के सारु पत्ती उपज 25 मै.टन/हे/वर्ष के विपरीत पर्ण उपज 32 मै.टन/हे/वर्ष दर्ज किया गया है जिससे कीटपालन की क्षमता में वृद्धि हुई है। बरपात की लोकप्रियता और सामूहिक गुणों को एक भविष्य के कार्य के लिए परियोजना के रूप में लिया जाएगा।
- मूगा पालन करने वाले फार्मों के निकट स्थित चाय बागानों में उपयोग की जाने वाली रासायनिक कीटनाशक दवा को सूचीबद्ध किया गया है। पत्तियों और मूगा रेशम कीड़ों के नमूने शिवसागर जिले के बराहिबारी, दीक्षित इलाको और लखिमपुर जिले के ढक्कुखाना के गोवाल गांव के किसानों के खेतों से एकत्रित कर इसे कीटनाशक अवशेषों के विश्लेषण के लिए संरक्षित किया गया है।
- पूर्वोत्तर क्षेत्र के कृषि-जलवायु क्षेत्रों में विभिन्न कीटपालन मौसमों के दौरान फ़ॉटीकाइकल के आकलन के लिए मृदा और पत्ती के नमूनों को एकत्रित और संसाधित किया गया है।
- अल्टेनिया रिसिनी को संक्रमित अरंडी के पत्तों से शुद्ध रूप में पृथक किया गया है। ऑल्टरनेरिया रिसिनी के आकृतिक लक्षण वर्णन से पता चलता है कि कॉनिडिया (conidia) आमतौर पर कॉनिडिफोरस (conidiophores) की कड़ी में उत्पादित कर रहे हैं। हाइफी हाइलाइन, सेप्टेट और अंगभूत शाखा (ब्रंचेड) हैं। कॉनिडिया (conidia) का रंग क्षैतिज और ऊर्ध्वाधर septations के साथ गहरे भूरे रंग है।
- असम, मेघालय, मणिपुर, मिजोरम, त्रिपुरा, नागालैंड, अरुणाचल प्रदेश और सिक्किम के रेशम उत्पादन के किसानों के मामले में मृदा स्वास्थ्य कार्ड (एसएचसी) तैयार करने के लिए असम, नागालैंड, मणिपुर, मिजोरम, मेघालय और अरुणाचल प्रदेश को शामिल करते हुए इन राज्यों के विभिन्न जिलों से 604 मिट्टी के नमूने एकत्र किए गए हैं। इन नमूने की पोषक तत्व स्थिति 12

पैरामीटर (पी एच, ईसी, कार्बनिक कार्बन, एन, पी, के, एस, बी, एफए, एमएन, जेएन और सीयू) का अध्ययन करने के लिए इसका विश्लेषण किया गया है। मिट्टी के नमूने का डिजीटलाइजेशन और एस एच सी बनाने की स्थिति प्रगति पर है।

- नाजिरा, लक्वा और शिवसागर जिले के गेलेकी से पेट्रोलियम तेल प्रदूषित मिट्टी को एकत्र कर बायो सर्फेटेंट बैक्टीरिया को पृथक किया गया है। पायसीकरण सूचकांक (ई आई) और ड्रॉप कोल्लैप्से (पतन) परख (डि सी ए) के 25 बैक्टीरियल आइसोलेट्स की जांच करते हुए उस में एन 2, एन 6, एन 9, एन 13 एन 14 बैक्टीरियल आइसोलेट को ई आई मूल्यों के लिए बेहतर पाया गया जबकि डि सी ए में एन 3, एन 5 और एन 6 वियोजन (आइसोलेट्स) अच्छे पाए गए। बैक्टीरियल आइसोलेट के सीटीएबी-माइटेलाइन बैक्टीरिया के अलग-अलग ब्लू परख से पता चला है कि बैक्टीरिया द्वारा उत्पादित जैव-सर्फेटेंट प्रकृति में एनोनिक है।

रेशमकीट में सुधार, उत्पादन और संरक्षण

- उपयुक्त पारिप्रजातियां से एपी संकरण YP, YS, YZ, GBP, GBS और GBZ का पृथकरण सात संकरण नामतः YP x GBZ x YZ x GBS, GBZ x YS x GBS, YZ x YS, GBZ x YP, GBS x GBZ में से चार परीक्षण किया गया है ताकि इन विकसित संमिक्षण तत्वों में आर्थिक लक्षण (लाभ) परिलक्षित हो सके। विकसित ब्रॉस में से दो संयोजन अर्थात YZ x YS और GBS x GBZ को कीटपालन निष्पादन के आधार पर आशाजनक पाया गया है। चयनित संयोजनों अर्थात YZ x YS और GBS x GBZ का एक बीजगार परीक्षण पूरा किया गया है। पैतृक स्टॉक अर्थात, YP, YS, YZ, GBP, GBS और GBZ को रखरखाव किया जा रहा है।
- मूगा रेशमकीट के एक घरेलू स्टॉक और जंगली स्टॉक के साथ-साथ दो नए विकसित जीनोटाइप को जीनोमिक अध्ययन के लिए रखा जा रहा है। एक उच्च वर्ग अर्थात सी एमआर -1 और सी एमआर -2 से डि.एन.ए पृथकित किया गया है और आगे के अध्ययन के लिए गहरी फ्रीज में संग्रहीत किया गया है। आई आईटी, गुवाहाटी के साथ मिटोकॉन्ड्रियल डिएनए का ट्रांसक्रोमिक अध्ययन प्रगति पर है।
- मूगा रेशमकीट के पांच बैक्टीरियल रोगजनकों के आणविक लक्षण वर्णन को पूरा किया गया है। बैक्टीरिया रोग की महामारी विज्ञान का अध्ययन किया गया है। रोगजनकों की पहचान लसिनिबसिलस शार्रिकस, सेरटिया मार्ससेन्स एंटरोकोकस कैसेलिफ्लुस स.एल.फ्यूसिफोर्मिस और स्यूडोमोनास एरुगिनोसा के रूप में की गयी है।
- कवक च्चनौती पूर्ण मूगा रेशमकीट के हेमोलिम्फ से एंटी-फंगल पेप्टाइड्स को अलग कर और उसकी पहचान की गई है। एसिडिक/मेथनॉल निष्कर्षण के बाद ट्रि स-टीरिकिन एस डी एस-पेज का विश्लेषण आणविक समूह के नीचे 21 kDa. के कई पॉलीप्टाइड दर्शाए गए हैं। आणविक समूह 3 और 14 kDa. के साथ असंक्राम्य हेमेलीमिफ अतिरिक्त पेप्टाइड बैंड निकालने का पता लगाया जब गैर-प्रतिरक्षा हेमेलीमिफ से प्रस्तुत निष्कार्षण से तुलना की गई। प्रोटीन बैंड की मालदी - टॉफ विश्लेषण प्रगति पर है। ताप गर्मी मारे गए कैंडिडा और एस्परगिलस के साथ 50 कीड़े इंजेक्ट किए गए और आगे के अध्ययन के लिए नमूने संसाधित किए गए हैं।
- मुगा पारिस्थितिकी तंत्र में बैक्टीरियल फ्लेवर की बीमारी को नियंत्रित करने के लिए एक नया रासायनिक रोगाणुनाशी तैयार किया गया है। जैवसं अध्ययन ने संकेत किया है कि हाल ही में किए

परीक्षण रोगाणुनाशी में मूगा रेशमकीट रोगजनकों (स्यूडोमोनस एसपी और बैसिलस एस पी) में दो संभावित बैक्टीरियोलिटिक गतिविधियां हैं।

- एंथेरिया असमनिसिस की भिन्न-भिन्न स्थिति को गर्मी उपचार (हॉर्मिज़िस) की स्थिति में डालना तथा मुगा रेशमकीट के ऑक्सिडेटिव तनाव का अध्ययन करने के लिए इस तकनीक को मानकीकृत किया गयाकरते हैं।
- एरी सी 2 नस्ल के अपनाने बड़े पैमाने पर लोकप्रियता के लिए किसानों के बीच जागरूकता कार्यक्रम, कौशल प्रशिक्षण, प्रदर्शन और समूह चर्चा के माध्यम से किया गया है। इसे अपनाने के बाद किसानों को 100 डीएफएल के विपरीत ₹10,000.00 से ₹ 15,000.00 रुपये मिल रहा है। असम के रेशम उत्पादन विभाग के कर्मचारी और असम के किसानों के लिए विभिन्न विस्तार संचार कार्यक्रम और क्षमता निर्माण कार्यक्रम आयोजित किए गए हैं। इस संबंध में कोहिमा, नगालैंड में दिनांक 6 सितंबर, 2016 को एक कार्यशाला भी आयोजित किया गया है। प्रौद्योगिकी पैकेज को सभी पूर्वोत्तर राज्यों के रेशम उत्पादन विभाग को भेजा गया है।
- संस्थान के डीबीटी प्रायोजित कार्यशालाओं में "रेशम उत्पादन और सेरी-जैव प्रौद्योगिकी" पर प्रशिक्षण कार्यक्रम आयोजित किया गया जिसमें 32 छात्रों ने भाग लिया था।
- सूचना, शिक्षा तथा संचार व्यवस्था ((आई.ई.सी.)) के तहत संस्थान के मूगा एरी रेशम उत्पादन संबंधी सार्वजनिक जागरूकता पैदा करने के संबंध में पूर्व कोसा तथा कोसात्तर गतिविधियां, विपणन आदि जैसे सभी पहलुओं को शामिल करते हुए दो सेरी ट्रांजिजम कोरिडर के विकास के लिए करवाई शुरुआत की गई है।
- आ.ई.टी. पहल के तहत 4 मुगा और एरी क्लस्टर के तहत किसानों के डेटा बेस को नई वेबसाइट www.cmerti-iec.in में अपलोड किया गया है। दो अनुसंधान परियोजनाएं "भू-स्थानिक तकनीक के साथ चुने गए मूगा रेशमकीट रोगों और कीटों की प्रारंभिक चेतावनी के लिए निर्णय समर्थन प्रणाली का विकास" रेशम उत्पादन किसानों के लिए मृदा स्वास्थ्य कार्ड" ई-मॉनिटरिंग के लिए अपलोड किए गए हैं
- प्रमुख तकनीक उत्पादक गांवों अर्थात् शिवसागर जिले के बराहिंग 35 मूगा किसानों की उपस्थिति में दो तकनीकी प्रदर्शन कार्यक्रम आयोजित किए गए तथा तथा मूगा संवर्धन में वास्तविक पर्ण उपज को पूरा करने के मूगा खाद्य पौधरोपन प्रबंधन पर डिब्रूगढ़ जिले के ख्वंग के 51 मूगा किसानों की की उपस्थिति आयोजित किया गया। मूगा बागान में पाए गए अंतराल को भरने के लिए शिवसागर तथा डिब्रूगढ़ जिले के लाभार्थियों को 5000 सोम पौधों वितरित किया गया। शिवसागर जिले में 1 प्रशिक्षण कार्यक्रम और 1 फील्ड डे का आयोजन किया गया।
- मूगा खाद्य पौध तथा इसके रेशमकीट के रोगों के लिए पूर्वानुमान और पूर्वाचेतावनी प्रणाली विकसित की गई है। वर्ष 2016-17 के दौरान 172080 किसानों को एसएमएस भेजे गए हैं।

मुगा रेशम कीटों का इन-सीटू संरक्षण

- चार स्थानों (एन.ई.आर.टी.पी.एस.) के तहत रेशम कीट और खाद्य पौधों के स्व-स्थाने संरक्षण के संबंध में अरुणाचल प्रदेश (पा सीघाट) असम (ऊपर डायोगरंग रिजर्व वन, गोलघाट) बी टी सी (भूटान बोर्ड) और मेघालय (बलपारकम नेशनल पार्क) एरिया, गारो हिल्स) को शामिल करते हुए चार स्थानों को चयनित किया गया है। वन विभाग के कर्मचारीवर्ग तथा रेशम उत्पादन विभाग के अधिकारियों के

साथ वन काथर गांव, ऊपर डयोगरंग रिजर्व वन, गोलाघाट में 22/10/2016 को जागरूकता कार्यक्रम आयोजित किया गया। सहायक निदेशक, रेशम उत्पादन, गोलाघाट, असम की उपस्थिति में दिनांक 06.02.2017 को 200 मूगा रोग मुक्त चकत्ते ऊपर डयोगरंग रिजर्व वन, गोलाघाट आपूर्तित किया गया। वन अधिकारियों और जंगल फंडिंग इन-सीटू संरक्षण स्थान के निवासियों को 200 मुगा डीएफएल आपूर्तित किया गया तथा संस्थान में दिनांक 21.03.2017 को आगे की आवश्यक अनुवर्ती कार्रवाई के संबंध में सहायक निदेशक, रेशम उत्पादन, असम सरकार, गोलाघाट के साथ एक बैठक आयोजित किया गया।

रेशमउत्पादन विस्तार

- वर्ष 2016-17 के दौरान मूगा और एरी संवर्धन में प्रौद्योगिकियों के प्रसार के लिए 4 मुगा सेरी मॉडल विलेज और 4 एरी सेरी मॉडल विलेज जिसमें 100 लाभार्थियों तथा एक पी सीटी एसएमवी जिसमें 62 लाभार्थियों को शामिल कर इसका कार्यान्वयन किया गया। चराईदेउ मूगा सेरी मॉडल विलेज के अधीन 10 गांव अर्थात् सुकाफा हाथीगांव, सातिवाल गांव, अंगेरा कुंवार गांव, इकोरनी गांव, चारिमुटिया कुंवर गांव, मथुरापुर भक्तगांव, सेकोलिया गांव, गरियापथार गांव, कुकुरचोवा गांव तथा घरफलिया गांव को शामिल करते हुए वाणिज्यिक फसल के लिए 85 किसान तथा बीज फसल के लिए 15 किसान चयनित किया गया था। बेंचमार्क सर्वे के मुताबिक, बीज फसल में 30 से 35 जबकि वाणिज्यिक फसल में 35 से 40 तक औसत कोसे की पैदावार हुई थी। सेरी मॉडल विलेज में, किसानों द्वारा कीटाणुशोधन से लेकर कोकून की कटाई तक पूर्ण रूप से कीटपालन पैकेज की सहायता से रोग मुक्त चकत्ते उत्पादन किए गए थे। केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान, लाहदोईगढ़ द्वारा लाभार्थियों को प्रौद्योगिकी इनपुट उपलब्ध कराया गया था। वाणिज्यिक फसल और बीज फसल का कीटपालन कर कोसा उपज का आंकड़ा एकत्र किया गया। सेरी मॉडल विलेज के अधीन प्रशिक्षित किसानों को अपने-अपने क्षेत्र में मूगा संवर्धन की विकसित तकनीक अपनाया हुआ पाए गए। सेरी मॉडल विलेज कार्यक्रम के अधीन प्रभाव का आकलन दर्शाया है कि मूगा कृषक 76.0% प्रतिशत विकसित प्रौद्योगिकी अपनाया गया जबकि इसके मुकाबले में मध्यम अपनाने वाले का प्रभाव 24.0% रहा। एसएमवी के तहत प्रशिक्षित मुगा किसानों के क्षेत्र में औसत कोकून उपज बीज की फसल में 25.8% और वाणिज्यिक फसल में 27.5% की वृद्धि हुई। सेरी मॉडल विलेज के अधीन प्रशिक्षण प्राप्त करनेवाले मूगा किसानों के क्षेत्र में औसत कोसा उपज 25.8% बीज फसल और 27.5% वाणिज्यिक फसल में वृद्धि हुई है।
- वर्ष 2016-17 के दौरान संस्थान में दो कृषिमेला, 22 प्रौद्योगिकी जागरूकता कार्यक्रम, 19 प्रक्षेत्र दिवस, 70 समूह चर्चाएं तथा दो कार्यशाला/सेमिनार आयोजित किए गए। मूगा संवर्धन के एकीकृत प्रौद्योगिकी पैकेज पर प्रौद्योगिकी स्थानांतरण (टी ओ टी) कार्यक्रम के तहत 6650 किसानों को शामिल किया गया। प्रमुख कृषकों के क्षेत्र में मूगा संवर्धन के एकीकृत प्रौद्योगिकी पैकेज तथा जीविका-संबंधी प्रशिक्षण पर प्रदर्शनी कार्यक्रम आयोजन किया गया। प्रभाव मूल्यांकन के परिणाम से पता चल कि किसानों द्वारा नवीनतम तकनीकी अपनाने पर प्रति रोग मुक्त चकत्ते के विपरीत मूगा कोसा उपज 50 से 61 वृद्धि हुई।
- संस्थान द्वारा सेरी मॉडल विलेज की स्थापना तथा संस्थान में विभिन्न प्रशिक्षण कार्यक्रम के आयोजन के माध्यम से मूगा व एरी संवर्धन पर संस्थान द्वारा विकसित प्रौद्योगिकियां से 4143 कृषक मूगा व एरी संवर्धन संबंधी समस्याओं के प्रति सचेत हुए हैं।

संस्थान द्वारा बी टी सी, कोकराझर में दिनांक 21 से 22, 2017 को "Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks in coordination with Directors of Sericulture, BTC" पर एक राष्ट्रीय सेमिनर आयोजित किया गया।

- संस्थान द्वारा 3.5 लाख रुपये की लागत से कुल एस.आर.सी. (रेशम उत्पादन अनुसंधान केन्द्र) स्थापित किया गया। इन राशि में से रु 3.0 लाख (पूँजी) प्रशिक्षण शेड (300 वर्ग फुट) के निर्माणार्थ तथा प्रशिक्षण/प्रदर्शनी उपकरणों अर्थात् टी वी, प्रोजेक्टर, ब्लैक बोर्ड, बुनियादी फर्नीचर आदि की खरीद और प्रशिक्षण आयोजनार्थ आवर्ती और विविध खर्चों की पूर्ति करने रु 0.50 लाख (राजस्व) एक समय व्यय का पूरा करने के लिए अलग से उक्त राशि रखी गयी है। रेशम उत्पादन अनुसंधान केन्द्र को सालाना 12 प्रशिक्षण/प्रदर्शनी सत्र आयोजन करना अनिवार्य है।

मानव संसाधन विकास:

- विभिन्न प्रशिक्षण कार्यक्रम के तहत कुल 18834 लाभार्थियों को विभिन्न सेरी-प्रौद्योगिकियों पर प्रशिक्षित किया गया। किसान कौशल प्रशिक्षण (सीबीटी) -785; प्रौद्योगिकी जागरूकता 60 के लिए एक्सपोजर दौरा; प्रौद्योगिकी उन्मुखीकरण कार्यक्रम -101; रेशम उत्पादन संसाधन केंद्र (किसान) -465; किसान कौशल प्रशिक्षण -57; रेशम उत्पादन विभाग यूपी -100 द्वारा प्रायोजित किसानों के कुशल प्रशिक्षण; ; रेशम उत्पादन विभाग-असम -21 द्वारा प्रायोजित किसानों के कुशल प्रशिक्षण; रेशम उत्पादन विभाग-नागालैंड -14 द्वारा प्रायोजित किसानों के कुशल प्रशिक्षण; केन्द्रीय रेशम बोर्ड के युवा वैज्ञानिकों (एमडीपी) -3 और यूनिफाइडपेमेंट इंटरफेस -1544 9 के लिए फाउंडेशन प्रशिक्षण आयोजित किए गए।
- संस्थान में दिनांक 28 से 30 मार्च, 2017 तक "रेशम उत्पादन और सेरी-जैव प्रौद्योगिकी" पर एक राष्ट्रीय स्तर के कार्यशाला-सह-प्रशिक्षण कार्यक्रम का आयोजन किया गया जिसमें विभिन्न संगठनों के 32 वैज्ञानिक/विद्वान/छात्र-छात्रा ने भाग लिया।
- संस्थागत बायोटेक हब परियोजना के तहत प्रदर्शन और जागरूकता कार्यक्रम आयोजित किए गए जिसमें संस्थान के पास स्थित स्कूल और कॉलेजों के कई छात्र-छात्रा ने भाग लिया।

भूमि उपयोग कार्यक्रम

- मांग के अनुसार 6 000 सोम और 6 400 केसरू के नवोदभिद पौधे आपूर्ति किए गए।
- वाणिज्यिक रूप में 1497 मूंगा डीएफएल और बीज फसलों के रूप में 2384 डीएफएल का कीटपालन किया गया।
- 441 एरी डीएफएल कीटपालन करने पर 336 किलोग्राम एरी कोसे का उत्पादन हुआ।
- 19917 मूंगा और 3915 एरी डीएफएल की उपज और आपूर्ति की गई।

प्रकाशन:

- संस्थान ने सीएमईआरटीआई सेरीकल्चर न्यूज (अंग्रेजी) और हिंदी न्यूजलेटर के 2 अंक, 2015-16 की वार्षिक रिपोर्ट, इक्सटेंशन मैनुअल, लीफलेट/तकनीकी बुलेटिन और 6 पुस्तकों/मैनुअल प्रकाशित किया गया। इसके अलावा, संस्थान के वैज्ञानिकों ने प्रतिष्ठित पत्रिकाओं में 7 शोध लेख प्रकाशित तथा विभिन्न संगोष्ठी/सम्मेलन/कार्यशाला की कार्यवाही में 13 शोध लेखों प्रकाशित किए

गए। प्रौद्योगिकी पोस्टर 24 मुद्रित किए गए। संस्थान के वैज्ञानिकों ने प्रायोजित रेडियो कार्यक्रम - 13, दूरदर्शन कार्यक्रम -10, आमंत्रित रेडियो कार्यक्रम -14 जैसे रेडियो और दूरदर्शन प्रोग्राम में भी भाग लिया।

क्षेत्रीय रेशम उत्पादन केन्द्रों की उपलब्धियां

क्षेत्रीय मूगा अनुसंधान केंद्र, बोको, असम

- क्षेत्रीय मूगा अनुसंधान केंद्र, बोको, असम में बड़े पैमाने पर सोम के एस 3 और एस 6 के मॉफोटाइप प्रक्षेत्र में इसकी आपूर्ति के लिए गुणगुण किया जा रहा है। वर्ष के दौरान सोम के एस 3 और एस 6 के मॉफोटाइप के 41433 पौधों की आपूर्ति की गई।
- क्षेत्रीय मूगा अनुसंधान केंद्र, बोको, असम में 2 कृषिमेलाए, 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 2 फील्ड दिवस तथा रेशमविदों के बीच 10 समूह चर्चा आयोजित किए गए।
- वाणिज्यिक रूप में 1094 मूगा डीएफएल तथा बीज फसलों के रूप में 1982 डीएफएल कीटपालन करने पर 6100 वाणिज्यिक कोसे तथा 35479 बीज कोसे की उपज हुई।
- 460 मूगा डीएफएल उत्पादित हुए।

क्षेत्रीय मूगा अनुसंधान केंद्र, बोको, असम

- "एरी संवर्धन में सुधारित प्रौद्योगिकियों अपनाने और एरी संवर्धन में कौशल विकास के माध्यम से किसानों का सामाजिक-आर्थिक उत्थान" नामक परियोजना अनुमोदन के लिए डीएस्टी, नई दिल्ली को प्रस्तुत किया गया है।
- क्षेत्रीय एरी अनुसंधान केंद्र, मेन्दिपथार में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 2 फील्ड दिवस तथा रेशमविदों के बीच 9 समूह चर्चा आयोजित किए गए।
- किसान कौशल प्रशिक्षण कार्यक्रम आयोजित किया गया।
- 20000 केसेरू पौधों उगाए गए तथा 43 किलोग्राम अंडी के बीज आपूर्ति किए गए तथा मांग के अनुसार 7100 केसेरू पौधों की आपूर्ति की गई।
- 9651 एरी डीएफएल कीटपालन करने पर 23.33 किलोग्राम एरी कोसे उत्पादित हुए।
- मांग के अनुसार 9845 एरी डीएफएल की उपज कर 5170 डीएफएल आपूर्ति किए गए।
- इस केन्द्र के प्रौद्योगिकी अपनाने कार्यक्रम के माध्यम से संस्थान द्वारा एरी संवर्धन पर विकसित की गई प्रौद्योगिकियों से विकसित तकनीकी के साथ 100 किसान जागरूक हुए।

क्षेत्रीय एरी अनुसंधान केंद्र, शदनगर, आंध्र प्रदेश

- क्षेत्रीय एरी अनुसंधान केंद्र, शदनगर में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 2 फील्ड दिवस तथा रेशमविदों के बीच 6 समूह चर्चा आयोजित किए गए।
- 508 एरी डीएफएल कीटपालन करने पर 40.5 किलोग्राम एरी कोसे उत्पादित हुए।
- मांग के अनुसार 12983 एरी डीएफएल उपज कर 12470 डीएफएल आपूर्ति किए गए।
- राजस्व के रूप में ₹ 59,334.00 रुपये की आय अर्जन किया गया।

अनुसंधान एवं विस्तार केंद्रों की उपलब्धियां

अनुसंधान एवं विस्तार केंद्र, कूचबिहार

- एक अनुसंधान परियोजना "ए.पी.आर.5886: पश्चिम बंगाल के तराई क्षेत्र में प्रौद्योगिकी हस्तक्षेप और फसल के परिशोधन के माध्यम से मूंगा कोसा उपज का सुधार" का कार्यान्वयित किया गया है।
- अनुसंधान एवं विस्तार केंद्र, कूचबिहार में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 4 फील्ड दिवस तथा रेशमविदों के बीच 6 समूह चर्चाएं आयोजित किए गए।
- किसान कौशल प्रशिक्षण कार्यक्रम आयोजित किया गया।
- 6000 सोम/सोवालूनवोदभिद पौधे/पौधे उगाकर 3500 सोम पौधे आपूर्ति किए गए।
- वाणिज्यिक रूप में 1651 मूंगा डीएफएल तथा बीज फसलों के रूप में 518 डीएफएल कीटपालन करने पर 4725 वाणिज्यिक कोसे तथा 35479 बीजकोसे की उपज हुई।
- मांग के अनुसार 883 मूंगा डीएफएल उपज कर 765 डीएफएल आपूर्ति किए गए।

अनुसंधान एवं विस्तार केंद्र, तुरा

- अनुसंधान विस्तार केन्द्र, तुरा में 2 प्रौद्योगिकी जागरूकता कार्यक्रम, 2 फील्ड दिन और 5 समूह चर्चाएं आयोजित की गईं।
- किसान कौशल प्रशिक्षण कार्यक्रम आयोजित किया गया।
- बीज की फसल के रूप में 965 मुगा डीएफएल कीटपालन कर 17854 बीज उत्पादन किया गया।
- मांग के अनुसार 3650 मूंगा डीएफएल का उत्पादन कर 3410 डीएफएल की आपूर्ति की गई।

अनुसंधान एवं विस्तार केंद्र, लखीमपुर

- "ए.पी.आर. 5882: मुगा रेशमकीट बीज उत्पादन प्रणाली में जुड़े स्वदेशी तकनीकी ज्ञान (आई.टी.के.) का सत्यापन" शीर्षक एक रिसर्च प्रोजेक्ट कार्यान्वयित किया गया।
- अनुसंधान एवं विस्तार केंद्र, लखीमपुर में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 4 फील्ड दिवस तथा रेशमविदों के बीच 6 समूह चर्चाएं आयोजित किए गए।
- किसान कौशल प्रशिक्षण कार्यक्रम आयोजित किया गया।
- 6000 सोम/सोवालूनवोदभिद पौधे/पौधे उगाकर 3100 सोम पौधे आपूर्ति किए गए।
- वाणिज्यिक रूप में 769 मूंगा डीएफएल तथा बीज फसलों के रूप में 597 डीएफएल कीटपालन करने पर 10703 वाणिज्यिक कोसे तथा 17854 बीजकोसे की उपज हुई।
- मांग के अनुसार 1876 मूंगा डीएफएल का उत्पादन किया गया।

अनुसंधान एवं विस्तार केन्द्र, कोकरा झार

- अनुसंधान एवं विस्तार केन्द्र, कोकरा झार में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 2 फील्ड दिवस और रेशमविदों के बीच 5 समूह चर्चाएं आयोजित किए गए।
- वाणिज्यिक रूप में 296 मूंगा डीएफएल उगाए गए।

अनुसंधान एवं विस्तार केंद्र, फतेहपुर

- अनुसंधान एवं विस्तार केंद्र, फतेहपुर में 2 प्रौद्योगिकी जागरूकता कार्यक्रमों, 2 फील्ड दिवस और रेशमविदों के बीच 5 समूह चर्चाएं आयोजित किए गए।

अनुसंधान एवं विस्तार केंद्र, डिफु

- अनुसंधान एवं विस्तार केन्द्र, डिफु में 1 प्रौद्योगिकी जागरूकता कार्यक्रम, 1 फ़ील्ड दिवस और रेशमविदों के बीच 5 समूह चर्चाएं आयोजित की गईं।
- मांग के अनुसार एरंड बीज आपूर्ति किए गए।
- 200 एरी डी.एफ.एल का कीटपालन किए गए।
- मांग के अनुसार 4 650 एरी डी.एफ.एल उत्पादित कर 4550 डी.एफ.एल आपूर्ति किए गए।

अनुसंधान व विस्तार केन्द्र, बालिजान

- अनुसंधान व विस्तार केन्द्र, बालिजान में 1 प्रौद्योगिकी जागरूकता कार्यक्रम और रेशमविदों के बीच 3 समूह चर्चाएं आयोजित की गईं।
- 330 मुगा व्यावसायिक मूगा डीएफएल कीटपालन किया गया।

अनुसंधान एवं विस्तार केंद्र, नवसारी (गुजरात)

- 200 एरी डीएफएल कीटपालन कर 1 0,800 किलोग्राम एरी को से उत्पादित किए गए।
- 3677 एरी डीएफएल की उपज कर 3 500 एरी डीएफएल आपूर्ति किए गए।

अन्य विषय

- संस्थान को अगस्त, 2016 के दौरान आईएसओ 9001: 2015 प्रमाण पत्र प्राप्त हुआ।।

HIGHLIGHTS OF ACHIEVEMENTS (2016-17)

The Central Muga and Eri Research & Training Institute, Lahdoigarh, Jorhat along with its network of nested Research stations & units viz., RMRS, Boko; RERS, Shadnagar; RERS, Mendipathar and RECs located at Lakhimpur, Coochbehar, Tura, Diphu, Kokrajhar and Fatehpur provides R&D support in muga and eri sectors for the development of the industries. During 2016-17, 15 CSB funded, 5 DBT funded and 4 DST funded research projects under different categories viz., environmental challenges and global warming, drudgery reduction & women friendly technologies and eco-friendly & organic farming were undertaken at the institute and its regional stations, out of which 3 projects were concluded, and other projects are being continued. Out of 24 projects, 12 projects have been newly approved. In addition, 2 regular programmes, 2 pilot studies, seminar, workshop, extension communication programmes like Field day, Krishi mela, Awareness programmes, Group Discussions and Training programmes were conducted at the institute during the period under report. The major achievements in Research at CMERTI, Lahdoigarh are as follows:

A. Host Plant Improvement, Production and Protection

- *Ailanthus grandis* (Barpat) has been established as potential perennial food plant of Eri silkworm. Seedling has been raised and supplied through Kissan Nurseries. Leaf yield has been recorded as 32 MT/ha/yr against existing Kesseru leaf yield of 25 MT /ha/yr enhancing rearing capacity. Popularization and mass multiplication of Borpat will be taken in a Project mode as a future course of action.
- The chemical pesticides used in the tea gardens nearby the muga rearing fields have been enlisted. Samples of leaves and muga silkworms have been collected from farmers' fields of Borahibari, Dikshow areas of Sivasagar District, Goal Goan of Dhakuakhana, Lakhimpur district and preserved for insecticide residue analysis.
- For assessment of phytochemical constituents of som during different rearing seasons under agro-climatic zones of northeast region, soil and leaf Samples have been collected & processed.
- The *Alternaria ricini* have been isolated in pure form from the infected castor leaves. Morphological characterization of *Alternaria ricini* reveals that the conidia are typically produced in chains on the conidiophore. Hyphae are hyaline, septate and branched. The colour of the conidia is dark brown with horizontal and vertical septations.
- 604 soil samples have been collected from different districts covering Assam, Nagaland, Manipur, Mizoram, Meghalaya and Arunachal Pradesh for preparation of Soil Health Cards (SHC) for sericulture farmers of Assam, Meghalaya, Manipur, Mizoram, Tripura, Nagaland, Arunachal Pradesh and Sikkim. The samples have been analysed to study the nutrient status in terms of 12 parameters (pH, EC, Organic carbon, N, P, K, S, B, Fe, Mn, Zn and Cu). Digitalization of soil samples and generation of SHCs are under progress.
- Petroleum oil polluted soils have been collected from Nazira, Lakuwa and Geleky of Sivasagar districts and bio-surfactant bacteria have been isolated. Screening of 25 Bacterial isolates for Emulsification index (EI) and drop collapse assay (DCA) has been done. N2, N6, N9, N13 N14 bacterial isolates were found to be superior for EI values where L3, L5 and L6 isolates were found to be good at DCA. CTAB-Metyline blue assay of bacterial isolates revealed that bio-surfactant produced by bacteria is of anionic in nature.

B. Silkworm improvement, Production and Protection

- Isolation of Eri silkworm strains–YP, YS, YZ, GBP, GBS and GBZ from promising ecoraces. Four trials of seven crosses, namely YP x GBZ, YZ x GBS, GBZ x YS, YS x GBS, YZ x YS, GBZ x YP, GBS x GBZ have been completed to observe economic characters of evolved combinations. Among the developed cross, two combinations viz. YZ x YS and GBS x GBZ are found promising based on rearing performance. One trial grainage of selected combinations viz. YZ x YS and GBS x GBZ has been completed. Parental stocks viz. YP, YS, YZ, GBP, GBS and GBZ are being maintained.
- A domestic stock and a wild stock of muga silkworm along with two newly developed genotypes of muga silkworm are being maintained for genomic study. DNA from the elite stocks CMR-1 & CMR-2 has been isolated and stored in deep freeze for further study. Transcriptomic study of Mitochondrial DNA is under progress with IIT, Guwahati.
- Molecular characterization of five bacterial pathogens of Muga silkworm has been completed. Studied the epidemiology of the bacterial disease. Pathogens are identified as *Lysinibacillus shaeerius*, *Serratia marcescens*, *Enterococcus casseliflavus*, *L. fusiformis* and *Pseudomonas aeruginosa*.
- Anti-fungal peptides from the haemolymph of fungal challenged muga silkworm have been isolated and identified. Acidic / methanol extraction followed by Tris-Tricine SDS-PAGE analysis showed several polypeptides of molecular mass below 21 kDa. In the extract of immune haemolymph additional peptide bands with molecular mass 3 and 14 kDa were detected when compared to the extract prepared from non-immune haemolymph. MALDI – TOF analysis of the protein bands is under progress. 50 worms were injected with heat killed *Candida* and *Aspergillus* spp. and the samples are processed for further study.
- A new chemical disinfectant has been formulated for controlling bacterial flacherie disease in muga ecosystem. Bioassay studies indicated that newly tested disinfectant has bacteriolytic activity on two potential muga silkworm pathogens (*Pseudomonas* sp., and *Bacillus* sp.).
- Different developmental stages of *Antheraea assamensis* are exposed to heat treatment (hormesis) and standardized the technique to study the oxidative stress of Muga silkworm.
- Large scale popularization and adoption of eri C2 breed have been done among farmers through awareness programme, Skill training, demonstration and group discussion. The farmers are getting Rs. 10000-15000 per 100 dfls after adopting the C2 breed. Various Extension Communication Programme and Capacity Building programme have been organized for DOS, staffs and Farmers of Assam. One Workshop has also been organized on 6th September, 2016 at Kohima. Technology package has been sent to DOSs of all NE states.
- DBT sponsored workshops cum training on “Sericulture and Seri-biotechnology” were organized at the institute and 32 students were participated in the workshop.
- Action has been initiated for development of 2 nos. of Seri Tourism Corridor incorporating all the aspects from Pre cocoon to Post Cocoon activities, marketing etc. for creating public awareness on Muga and Eri silk production activities under Information, Education and Communication (IEC) activities of the Institute.
- Under IT initiatives, data base of farmers under 4 Muga and Eri Clusters have been uploaded in a new Website www.cmerti-iec.in. Two Research Projects “Development of Decision Support System for early warning of selected muga silkworm diseases &

pests with geospatial technique” and Soil health cards for sericulture farmers“have been uploaded for E-Monitoring.

- Two technology demonstration programs were organized in the major sericulture villages, Barhoiting of Sivasagar district in the presence of 35 muga farmers and Khuwang of Dibrugarh District in the presence of 51 muga farmers on the management of muga food plantation to meet the actual leaf yield production in muga culture. 5000 Som plants were distributed among the beneficiaries of Sivasagar and Dibrugarh district for gap filling in their muga plantation plot. 1 training programme and 1 Field day were organized at Sivasagar district
- Forecasting and forewarning system for pests and diseases of muga host plants and silkworm have been developed. During 2016-17, SMSs have been sent to 172080 farmers.

In-situ conservation of Muga silkworm

- Four sites covering Arunachal Pradesh (Pashighat), Assam (Upper Diogrong Reserve Forest of Golaghat), BT C (Bhutan Border) and Meghalaya (Balpakram National Park area, Garo Hills) for *In-situ* Conservation of silkworms and host plants (under NERTPS) have been selected. Awareness Programme was organized at Ban Kather Village, Upper Diogrong Reserve Forest on 22/10/16 with Forest Deptt. officials & DOS, officers. 200 muga dfls have been released at Upper Diogrong Reserve Forest, Golaghat (Assam) on 06.02.17 in presence of Asstt. Director of Sericulture, Golaghat (Assam), Forest officials and Forest fringes dwellers of the in-situ conservation site. 200 Muga dfls have been released to conservation site and a meeting was convened at the institute on 21st March, 2017 with ADS, Govt. of Assam, Golaghat for necessary follow-up action.

Sericulture Extension

- For dissemination of technologies in muga and eri culture, 4 muga and 4 eri SMV with 100 beneficiaries in each SMV and one PCT SMV covering 62 beneficiaries were implemented during 2016-17. Under Charaideo Muga SMV, 85 farmers for commercial crop and 15 farmers for seed crops were selected covering 10 villages viz., Sukafa Hatigaon, Satiwal Gaon, Angera Konwargaon, Ekoranigaon, Charimuthia Konwargaon, Mathurapur Bhakatgaon, Sokoliagaon, Goriapathargaon, Kukurachuwaigaon and Gharpholiagaon. As per the benchmark survey, average cocoon yield was 30 to 35 in seed crop and 35 to 40 in commercial crop. In SMV, dfls were reared by the farmers with full rearing packages right from disinfection to cocoon harvesting. The technology input were made available to the beneficiaries by CME&TI, Lahdogarh. Commercial crop and seed crop rearing was conducted and data of cocoon yield was collected. The farmerstrained under SMV were found to adopt improved technologies of muga culture in their field. Impact assessment of SMV shows that 76.0 % of muga farmers have adopted the improved technologies in full against the medium adopters of 24.0 % under Seri Model Village Programme. Average cocoon yield in the field of muga farmers trained under SMV increased by 25.8 % in seed crop and 27.5 % in commercial crop over bench mark
- Institute conducted two *Krishimela*(s), 22 Technology Awareness Programmes, 19 Field days, 70 Group Discussions and two Workshop / Seminar during the year 2016-17.

- Under Transfer of Technology (TOT) programme on Integrated Technology Package of muga culture, 6650 farmers were covered. Demonstration programmes on integrated technology package of muga culture and on job practical training at the field of Lead farmers were conducted. Impact assessment result showed that adopting the latest technologies by the farmers, average muga cocoon yield was increased from 50 to 61 cocoons per dfl.
- 4143 farmers were sensitized with the technologies developed by the institute on Muga and eri culture through implementation of Seri Model villages and different training programmes organized at the institute.
- Institute organized a National Seminar 'Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks in coordination with Directorate of Sericulture, BTCA at BTC, Kokrajhar during 21-22nd February, 2017.
- A total of 8 SRCs (Sericulture Resource Centre) were established till date by the institute with a unit cost of Rs.3.50 lakhs, out of which, Rs.3.00 lakh (Capital) has been earmarked for meeting one-time expenditure of construction of Training shed (300 sq ft) and procurement of training/demo equipments viz. TV, projector, blackboard, basic furniture etc and Rs.0.50 lakh (Revenue) for meeting recurring and miscellaneous expenditure for conducting training. The mandate of these SRCs is to conduct at least 12 training/demo sessions every year.

Human Resource Development

- A total of 18834 beneficiaries were trained on different sericulture technologies under different Training Programmes. Organized Farmers Skill Training (CBT)-785; Exposure visit for technology awareness-60; Technology Orientation Programme -101; Sericulture Resource Centre (Farmers)-465; Farmers Skill Training-57; Farmers skilled training sponsored by DOS-UP-100; Farmers skilled training sponsored by DOS-Assam- 21; Farmers skilled training sponsored by DOS-Nagaland-14; Foundation training for CSB Young Scientists (MDP)-3 and Unified Payments Interface-15449.
- Organized one national level workshop cum training programme on "Sericulture and Seri-biotechnology" was organized at the institute during 28th – 30th March, 2017 where 32 scientists/ scholars/ students from different organizations participated.
- Under Institutional Biotech Hub project, demonstration and awareness programmes were conducted where many students from nearby School and Colleges participated

Land utilization programmes

- Supplied 6000 Som and 6400 nos. of kesseru seedlings as per demand.
- Reared 1497 muga dfls as commercial and 2384 dfls as seed crops. Thereby produced 39918 commercial cocoons and 61501 seed cocoons.
- Reared 441 eri dfls and thereby produced 33.6 kg eri cocoons.
- Produced and supplied 19917 muga and 3915 eri dfls

Publications:

- The institute published 2 issues of CMERTI Sericulture News (English) and 2 issues of Hindi newsletters, Annual Report for 2015-16, extension manuals, leaflets / technical bulletins and 6 nos. of books / manuals. Besides, the scientists of the institute published seven research articles in reputed journals and 13 research articles in the proceedings of various seminar/conference/workshop. Printed technology posters 24, The scientists were

also involved in Radio and TV programmes like sponsored Radio programme-13, TV programme – 10, invited radio programme – 14.

Achievements of Regional Sericultural Research Stations

Regional Muga Research Station, Boko, Assam

- S3 and S6 morphotypes of som are being multiplied in large scale at RMRS, Boko for supply to the field. 41433 saplings of S3 and S6 morphotypes of som have been supplied during the year.
- Conducted one Krishimela, 2 Technology Awareness Programmes, 2 Field days and 10 Group Discussions among the sericulturists.
- Reared 1094 muga dfls as commercial and 1982 dfls as seed crops. Thereby produced 6100 commercial cocoons and 35479 seed cocoons.
- Produced 460 muga dfls.

Regional Eri Research Station, Mendipathar, Meghalaya

- One Research Project entitled "Socio-economic upliftment of farmers through adoption of improved technologies and skill development in eri culture" has been submitted to DST, New Delhi for approval.
- Conducted 2 Technology Awareness Programmes, 2 Field day and 9 Group Discussions among the sericulturists.
- Organized Farmers skill training programmes.
- Raised 20000 kesseru seedlings supplied 43 kg castor seeds and 7100 nos. of kesseru seedlings as per demand.
- Reared 9651 eri dfls and thereby produced 23.33 kg eri cocoons
- Produced 9845 eri dfls and supplied 5170 dfls as per demand.
- 100 farmers were sensitized with the technologies developed by the institute on eri culture through technology adoption programme of the station.

Regional Eri Research Station, Shadnagar, Andhra Pradesh

- Conducted 2 Technology Awareness Programmes, 2 Field day and 6 Group Discussions among the sericulturists.
- Reared 508 eri dfls and thereby produced 40.5 kg eri cocoons.
- Produced 12983 dfls and supplied 12470 eri dfls as per demand.
- Generated Rs. 59,334/- as Revenue.

Achievements of Research & Extension Centres

Research & Extension Centre, Coochbehar

- One Research Project entitled "APR 5886: Improvement of Muga cocoon yield through technology intervention and refinement of crop schedule in Terai region of West Bengal" has been implemented.
- Conducted 2 Technology Awareness Programmes, 4 Field day and 6 Group Discussions among the sericulturists.
- Organized Farmers skill training for farmers.
- Raised 6000 som / soalu seedling / sapling and supplied 3500 nos. of som seedlings
- Reared 1651 muga dfls as commercial and 518 dfls as seed crops. Thereby produced 4725 commercial cocoons.
- Produced 883 muga dfls and supplied 765 dfls as per demand.

Research & Extension Centre, Tura

- Conducted 2 Technology Awareness Programmes, 2 Field day and 5 Group Discussions among the sericulturists.
- Organized Farmers skill training for farmers.
- Reared 965 muga dfls as seed crop and produced 17854 seed cocoons.
- Produced 3650 muga dfls and supplied 3410 dfls as per demand.

Research & Extension Centre, Lakhimpur

- One Research Project entitled "APR 5882: Validation of Indigenous Technical Knowledge (ITK) associated in muga silkworm seed production system" has been implemented.
- Conducted one Krishimela, 2 Technology Awareness Programmes, 2 Field day and 5 Group Discussions among the sericulturists.
- Organized Farmers skill training of 6 days duration for farmers
- Raised 6000 som / soalu seedling / sapling and supplied 3100 nos. of som seedlings
- Reared 769 muga dfls as commercial and 597 dfls seed crop and thereby produced 10703 commercial 17854 seed cocoons.
- Produced 1876 muga dfls as per requirement

Research & Extension Centre, Kokrajhar

- Conducted one Krishimela, 2 Technology Awareness Programmes, 2 Field day and 5 Group Discussions among the sericulturists.
- Reared 296 muga dfls as commercial.

Research & Extension Centre, Fatehpur

- Conducted one Krishimela, 2 Technology Awareness Programmes, 2 Field day and 5 Group Discussions among the sericulturists.

Research & Extension Centre, Diphu

- Conducted 1 Technology Awareness Programmes, 1 Field day and 5 Group Discussions among the sericulturists.
- Supplied Castor seeds as per demand.
- Reared 200 eri dfls.
- Produced 4650 eri dfls and supplied 4550 dfls as per demand.

Research & Extension Centre, Balijan

- Conducted 1 Technology Awareness Programmes, and 3 Group Discussions among the sericulturists.
- Reared 330 Muga commercial dfls.

Research & Extension Centre, Navasari (Gujarat)

- Reared eri 200 dfls and produced 10,800 kg eri cocoons
- Produced 3677 eri dfls and supplied 3500 eri dfls..

Others

- ❖ The institute received ISO 9001:2015 certificate during August, 2016.

FINANCIAL TARGET AND EXPENDITURE

(Rupees in lakhs)								
Particulars	Consolidated provision							
	Estimated budget				Actual expenditure			
	Recurring	Capital		Total	Recurring	Capital		Total
		assets	Salary			assets	Salary	
	GIA-31	GIA-35	GIA-36		GIA-31	GIA-35	GIA-36	
Non-plan	0.00	0.00	1356.48	1125.53	0.00	0.00	1356.48	1356.48
Normal plan								
NE	258.72	319.99		578.71	258.72	319.99		578.71
Plan	22.40	0.23		22.63	22.40	0.23		22.63
Total	281.12	32.22	1356.48	1957.82	281.12	320.22	1356.48	1957.82

Research Advisory Committee of CMER&TI, Lahdoigarh

Chairman

Prof. Bolin Kr. Konwar; Former Vice Chancellor, Nagaland University, Lumami – 798 627, Nagaland

Members

Dr. N. Muraleedharan, Director, Tocklai Tea Research Institute, Jorhat

Prof. D.K. Jha, Head, Dept. of Botany, Gauhati University, Guwahati

Dr. T.C. Bora, Retired Chief Scientist, Biotechnology Division, North East Institute of Science & Technology, Jorhat

Prof. S.K. Dutta, Dept. of Entomology, Assam Agriculture University, Jorhat, Assam.

Dr. Kailas Chandra, Scientist 'F' & Additional Director, Zoological Survey of India, New Alipore, Kolkata-700 053

Director (HQ), Central Silk Board, CSB, Bangalore

Director, CSTRI, Bangalore

Director of Sericulture, Govt. of Assam, Khanapara, Guwahati-4

Director of Sericulture, Govt. of Nagaland, Kohima

Director of Sericulture, Bodoland Territorial Council (BTC), Kokrajhar

Director of Sericulture, Govt. of Manipur, Project Management Complex, Sangaipat, Imphal East, Manipur, Imphal-795 0048

Director of Sericulture, Govt. of Mizoram, Aizawl – 796 001.

Scientist – D, Muga Silkworm Seed Organization, CSB, Guwahati-38

Joint Secretary (Tech), Regional Office, Central Silk Board, Guwahati-38

Conservator of Forests, Jorhat, Assam

Sri Hema Gogoi, Muga Farmer, Bogorijeng, Pulibor, Golaghat, Assam.

Smt. Lakhimai Lahon, Eri Farmer, Borholla Grant, Titabar, Assam

Member Convener

Director, CMER&TI, Lahdoigarh, Jorhat.

Section – 2

Central Silk Board, Ministry of Textiles, Bangalore, India

RESULTS FRAMEWORK DOCUMENTS (RFD) OF CMERTI, LADOIGARH 2016-17

Progress report (2016- 2017)

Section – 2. Centre se priorities among key objectives, success indicators and targets

#	Objectives	Wt.	#	Actions	#	Success Indicator	Unit	Rel. Wt.	Target/Criteria Value		Achievement
									Excellent	Very Good	
									100%	90%	
1	Conduct scientific, technical and economic research to enhance production, productivity and quality of Indian silk.	15	1	Undertaking Research projects to enhance quality and productivity. (Research Projects-coded by CO)	i	Total on-going Projects	Nb.	1	10	9	24
					ii	Projects Concluded	Nb.	2	3	2	3
					iii	New Projects taken up	Nb.	2	12	10	15
					iv	New Projects taken up at RMRSs & RERSs	Nb.	2	5	4	4
					v	No of Technologies / innovations developed /likely to be developed out of concluded projects.	Nb.	2	2	1	2
					vi	New Technologies for field testing	Nb.	2	3	2	3
			2	Mechanization of sericulture industry	i	Equipment/ machines newly developed for sericulture mechanization	Nb.	2	1	0	2
2	Commercialization of products and Technologies	4	3	Sericulture technologies including chemical taken up for commercialization /patenting	ii	Machines / equipment absorbed in the field	Nb.	2	1	0	2
					i	Technologies commercialized.	Nb.	2	1	0	2
	IT Initiatives	12	5	Development of data base and technology under IT initiatives	ii	Technologies applied for patenting	Nb.	2	1	0	0
					i	No. of Farmers database created for mKisan Portal	Nb.	2	1000	900	2800
					ii	No. of Messages up-loaded in M-Kisan Portal	Nb.	2	40	30	118
					iii	Designing & Up-loading of data for Vanya Cluster	Number	2	4	3	4
					iv	No. of Research Projects uploaded for E-Monitoring	Nos.	2	2	1	2
					v	Digitization of Soil Health Records	Acres	2	600	540	604

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					vi	Preparation of Technology descriptor adoption document	Date	2	01-05-2016	01-06-2016	01-05-2016
		4	5	Implementation of DBT	i	% of implementation of Direct Benefit Transfer(DBT)	%	2	100	90	100
					ii	No of farmers covered under DBT	Number	2	300	275	1050
3	Field level Interventions for Quality and productivity Improvement through Information, Education and Communication and Capacity Building	37	6	Interventions through main Institutes level	i	Number of Seri-model Village identified	Number	1	9	8	9
					ii	No. of farmers adopted	No.	2	862	800	862
					iii	Expected raw silk Output	MT	2	5	4	6.355
			7	Large scale trial of new technologies developed by the Institute	i	Collapsible Mountages for Eri spinning	No. of farmers	3	4000	3700	3150
					ii	Large scale trials for Borkessaru and Borpat	Acres	2	20	18	35
			8	Interventions through RERS/ /RMRS/REC level	i	Number of Blocks/ Districts adopted	Number	1	12	10	39
					ii	No of farmers covered	No.	2	1200	1000	6907
					iii	Raw silk Output	MT	2	5	4	19.347
			9	Organization of Swachha Resham Gram	i	No of villages covered	No.	2	2	1	3
					ii	Adoption of villages	%	2	100	90	100
			10	100 % Adoption of Technologies amongst different stake holders	i	Number of farmers covers under 100% adoption of technology	Number	2	1200	1000	1284
			11	Extension communication program mes viz, Group discussion, Awareness programme, Field days,Krishi Melas etc.	i	No of program mes conducted	No.	1	115	100	159
					ii	No of farmers covered	No.	2	5750	5000	10339
					iii	Post programme follow up	%	2	70	60	75
					iv	Participation in Radio Programm	No.	2	12	10	13
					v	Participation in TV Programm	No.	2	12	10	20
					vi	No of Seri Tourism coridor developed	No.	2	2	1	2
			12	Skill Development	vii	Beneficiaries trained under structured program mes, need based programme etc.	No	2	1450	1250	4235
			13	Development of improved silkworm breed	i	Development of new eri silkworm breed	No.	2	1	0	1
					ii	Multilocation trials of improved breed	No. of Dfl	1	500	400	700

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6	Revenue Generation	4	14	Generation of funds as per XII Planguidelines	i	Revenue generation through commercialization of Technology	Rs. In lakh	2	2	1.5	4.126
					ii	Revenue generation through other methods	Rs.in lakh	2	28	26	34.174
7	Strengthening institutional framework to support ongoing research and related program mes	8	15	Utilization of existing land holdings	i	Effective utilization of cultivable land for assigned mandates	Acres	1	50	45	74
			16	Utilization of service buildings (laboratory, rearing house, grainages, staff quarters, hostels, guest house etc)	i	Extent of utilization of facilities for the core purpose of assigned mandates	%	1	90	80	90
			17	Optimum utilization of manpower	i	Utilization of scientific manpower for research activities	%	1	100	90	100
			18	Effective Monitoring of Civil Works	i	Monitoring of progress of construction works at Institute & sub-units	%	2	100	90	100
			19	Utilization of Grants	iv	Submission of UCs Ex penditure under Central Sector Schemes.	Rs. In Ore	1	6	5.5	6.0055
8	Collaborative Research Programmes with other R&D organizations in India and abroad	2	20	Identifying potential R&D institutes in India and abroad and undertakes collaborative research program mes for the benefit of both the countries.	i	Projects taken up for collaborative research	No.	2	2	1	6
Mandatory Success Indicators											
9	Efficient functioning of RFD system	2	21	Timely submission of draft RFD for 2016-17	i	On time submission	Date	1	30.4.2016	1.5.2016	20.4.2016
			22	Timely submission of results of 2016-17	i	On time submission	Date	1	1st Qt - 4/7/16 2nd Qt- 4/10/16 3rd Qt- 4/1/17 4th Qt- 4/4/17	1st Qt 5/7/16 2nd Qt 5/10/16 3rd Qt 5/1/17 4th Qt 5/4/17	05-07-2016 05-01-2017 05-04-2017
			23	Implement mitigating strategies for reducing potential risk of corruption	i	% of implementation	%	1	100	90	100
			24	Swachha Bharat Abhiyan	i	% of implementation	%	2	100	90	100

CSB - CME RTI Annual Report 2016-17

			25	Submission of Annual Accounts to CSB	i	Date of submission of Annual Accounts to CO	date	2	April	May	Apr16
			26	Biometric Attendance	i	Units functioning under the Institute	Nos.	1	9	8	9
					ii	Units covered under Biometric attendance	%	2	90	85	75
11	Improving internal efficiency / responsive- ness / service delivery of the organization	2	27	Implementation of Sevottam	i	Independent audit of implementation of Citizen's charter	%	1	100	90	100
					ii	Independent audit of implementation of public grievances redressal system.	%	1	100	90	100
12	Ensuring compliance of the Financial Accountability Framework	2	28	Timely submission of ATNs on Audit paras of AG & Internal Audit	i	Percentage of ATNs submitted with in due date (4 months) from date of presentation of report	%	0.5	100	90	100
			29	Timely submission of ATRs to AG & CSB, HQ.	i	Percentage of ATRs submitted within due date (6 months) from date of presentation of report	%	0.5	100	90	100
			30	Early disposal of pending ATNs on Audit paras of AG reports.	i	Percentage of outstanding ATNs disposed off during the year	%	0.5	100	90	100
			31	Early disposal of pending ATRs on AG reports.	i	Percentage of outstanding ATRs disposed off during the year	%	0.5	100	90	100

LIST OF THE R&D PROJECTS

Sl. No.	Project code	Title of the project	Principal Investigator
CONCLUDED PROJECTS			
1.	APR 5866	Sustainable Eri Silkworm rearing: Evaluation of <i>Ailanthus</i> species	Dr. S.A. Ahmed
2	ARP 5865	Etiology of bacterial diseases and molecular characterization of the pathogens of muga silkworm (<i>Antheraea assamensis</i> Helfer) from North East India	Dr. M. Chutia
3.	AIB 5869	Popularization of new eri breed C2 at farmers' field	Dr. S.A. Ahmed
ONGOING PROJECTS			
1	PPA 5879	Assessment of phytochemical diversity in Som (<i>Persea bombycina</i> Kost), the primary host plant of <i>Antheraea assamensis</i> Helfer from Northeast India	Dr. P. Sangnnavar
2	PRP-5880	Characterization and efficacy of bacterial antagonists against <i>Alternaria riani</i> infecting Castor in North-eastern India	Sri
3	ARP 5867	Characterization, transmission and cyto-pathology of infectious flacherie and cytoplasmic polyhedrosis virus in muga silkworm, <i>Antheraea assamensis</i> Helfer (funded by DBT, New Delhi).	Dr. M. Chutia
4	ARP 5874	Development of Decision Support System for early warning of selected muga silkworm diseases and pests with geospatial technique	Dr. S.A. Ahmed
5	AIT 5885	Development of microbial biocatalyst by heterologous expression of <i>hpaC</i> & <i>soxABC</i> gene cluster in biosurfactant producing bacterium for effective desulfurization of dibenzothiophene	Dr. Subrahmanyam G.
6	AIB-5879	Development of suitable combinations /hybrids of eri silkworm with sustainable performance for commercial exploitation.	Dr. B.N Sarkar
7	APS 5881	Development of suitable incubation device of Eri silkworm to overcome hatching problem during summer	Dr. M.D. Senapati
8	MOE-5875	Effect of plant protection formulations on the growth, development and productivity of Muga Silkworm, <i>Antheraea assamensis</i> Helfer (Saturniidae: Lepidoptera).	Dr. K. Neog
9	AIT 5876	Establishment of Institutional Biotech Hub (DBT funded project)	Dr. M. Chutia
10	AIT-5872	Whole Genome Sequencing and functional genomics of Golden Silk Moth <i>Antheraea assamensis</i>	Dr. K. Neog
11	MOT 5883	Impact of Training on Knowledge and Adoption Level of Improved Technologies of Muga Culture	Dr. Vijay N.
12	ARP 5868	Isolation and characterization of anti fungal peptides from muga silkworm <i>Antheraea assamensis</i> Helfer	Dr. K. Neog
13	ARP 5878	Next generation sequencing studies and	Dr. G.

		bioinformatics analysis of microbiome of flacherie infected <i>Antheraea assamensis</i> Helfer for developing effective disease control measures	Subrahmanyam
14	APR 5877	Role of hormesis in mitigating oxidative stress and its impact on growth and yield of Muga silkworm, <i>Antheraea assamensis</i> Helfer	Dr. Ranjini M.S.
15	PPS 5884	Soil health cards for sericulture farmers of Assam, Meghalaya, Manipur, Mizoram, Tripura, Nagaland, Arunachal Pradesh and Sikkim	Dr. U. Hazarika
16	APR 5882	Validation of Indigenous Technical Knowledge (ITK) associated in muga silkworm seed production	D. D. Medh
17	MOE 5873	Enhancement of rural economy through technology intervention for sustainable muga culture in Upper Brahmaputra Valley of Assam (funded by DBT)	Dr. (Mrs) R. Das
18	APR 5886	Improvement of Muga cocoon yield through technology intervention and refinement of crop schedule in Terai region of West Bengal	Dr. N. Biswas
19	ARP 5888	Isolation and characterization of lytic bacteriophages infecting bacterial pathogens of muga silkworm, <i>Antheraea assamensis</i> Helfer (DST funded project)	Dr. M. Chutia
20	-	Biodiversity assessment of wild silkmoths and rearing potentialities of muga (<i>Antheraea assamensis</i> Helfer) and eri silkworm (<i>Samia ricini</i> Donovan) for sustainable development in Nagaland.	Dr. K. Neog
21	AIT 5876	Standardization & Popularization of Treated Bamboo Products in Eri culture	Dr. B.K. Singh
REGULAR PROGRAMMES			
1	CMERTI-RP1	Induction of Indoor rearing technique for <i>Antheraea assamensis</i> Helfer through field trials	Dr. T.J. Keisa
2	CMERTI-RP4	Forecasting and forwarning for pest and disease of muga host plants and silkworm	Dr. (Mrs) R. Das
3	CMERTI-RP3	Biological control of uziflies	Dr. K Subadas Singh
PILOT STUDIES			
1	-	Assessment of Bio-chemical Properties and Nutritional Composition of Muga Silkworm (<i>A. assamensis</i> Helfer) Litter	Dr. VKS Naik
2	-	Effect of liquid organic manures on quantitative & qualitative parameters of castor (<i>Ricinus communis</i> Linn.) leaves towards sustainable Eri cocoon production	Dr. VKS Naik

ACHIEVEMENTS IN CONCLUDED PROJECTS

Project code: APR - 5866

Project title: Sustainable eri silkworm rearing: evaluation of *Ailanthus* species

Project period : March 2013–June 2016

Funding Agency : DST, New Delhi

Total project cost : Rs. 18.74 Lakhs

Project investigators : SA Ahmed, Principal Investigator
M.C. Samah, Co-investigator
P.K. Handique, Co-investigator
B.N. Sarkar, Co-investigator

Objectives

1. To evaluate and biochemical analysis of different *Ailanthus* germplasm
2. To evaluate and define superior genotype (s) / species of *Ailanthus* through bioassay for eri silkworm rearing.
3. To extend the information on silkworm nutrition of different *Ailanthus* species

Highlights of achievements

Carbohydrate was found highest in semi mature leaves of Castor (44.55 %), which was at par with *A. grandis* (46.97 %) in all maturity level. High content of lignin was found in tender leaves of castor (69.63 %) which was at par with borpat (59.57 %) and lowest in borkesseru (13.33 %). Crude protein highest in borkesseru (16.25%) and lowest in kesseru (6.82 %) which was found nearly equal in both castor and borpat (8.55 - 9.76 %). Crude fat was recorded highest in castor (8.10 %) and was at par with *A. grandis* (7.60 %) and lowest in *A. excelsa* (5.10 %). Content of β -sitosterol (mg/g) recorded highest in semi-mature leaves (69.63) followed by mature (45.95) and tender leaves (31.34) of *A. grandis* compared to other food plants which was at par with castor (66.58). Chlorogenic acid which is considered as anti-herbivore chemicals recorded lowest in both *A. excelsa* (0.28 %) and *A. grandis* (0.43 %) than Kesseru (1.92 %) and castor (1.04 %) in all maturity level. Phytic acid was found comparatively highest in both castor (4.08 %) and borpat (2.89 %) than kesseru (1.29%). Crude fibre content was observed highest in semi mature leaves of Kesseru and was at par with *A. grandis* (19.54 - 25.51 %) and the castor recorded the lowest i.e., 8.47 %. Total phenol recorded comparatively lower in *A. grandis* (1.09 %) than castor (2.40%) and *A. excelsa* (2.49 %) in all maturity level. Low tannins contents were recorded in *A. grandis* (0.42 %) and *A. excelsa* and Kesseru (0.35 %) compared to Castor (2.40 %).

The lowest larval period (18.33 ± 0.58 days) was observed during July-August season in the treatment of Castor (I-II) + *Ailanthus grandis* (III-V) i.e., T_2 , which was at par with *A. grandis* feeding from brushing till spinning (T_1). The highest cocoon yield per 100 dfls (14.36 ± 1.44 kg) was recorded in the treatment T_2 with average single shell weight (g) of 0.52 ± 0.04 and effective rate of rearing (%) of 90.15 ± 3.14 . The highest silk recovery of 86.70 % recorded in T_2 with 11.50 % of boil off loss which was due to less content of sericin in *A. grandis* fed cocoon. Hence, *A. grandis* can be effectively utilized throughout the year in eri silkworm rearing and as the best supplement to castor during late stage rearing i.e., 3rd to 5th instars. It was also found that T_2 (Castor + Borpat) is the best treatment among all other combinations

The efficiency of conversion of ingested (ECI) in percent found highest in mature larval stage of castor (18.08 ± 0.02) which is at par with borpat (17.19 ± 0.06). The lowest ECI was recorded in borkesseru (0.11 ± 0.001). The efficiency of conversion of digested (ECD) in percent is highest in castor (1.724 ± 0.012) in later stage and lowest in borkesseru

(0.088 ± 0.002), where borpat (1.522±0.018) the second highest among them. The approximate digestibility (AD) in percent highest in early stage of borkesseru (97.745 ± 0.102) and lowest in castor (42.187 ± 0.038) and borpat (45.12 ± 0.015). The growth rate (GR) in percent is highest in 2nd instar larva of borpat (0.028 ± 0.001) and lowest in borkesseru and kesseru (0.004±0.002). The consumption index (CI) in percent was highest in early stage of borkesseru (50.962 ± 0.129) and lowest in kesseru (0.472 ± 0.028).



Project code: APR -5865

Project title: Etiology of bacterial diseases and molecular characterization of the pathogens of muga silkworm in NE India

Project period : March 2013-February 2016
Funding Agency : DST, New Delhi
Total project cost : Rs. 27.37 Lakhs
Project investigators : M. Chutia, Principal investigator
R. Das, Co-investigator

Objectives

1. Isolation of bacterial pathogens through standardization of cultural media from diseased cadavers of muga silkworm.
2. To study the biochemical and molecular characterization of the pathogens.
3. To study the epidemiology of the disease.

Highlights of achievements

Collection of silkworms and isolation of the bacterium:

The infected cadavers of *A. assamensis* were collected from different silkworm rearing farms (Dibrugarh, Sivasagar, Jorhat and Golaghat districts) during the regular monitoring surveys conducted as part of the disease forewarning and forecasting programme of the Central Silk Board. For experimental purpose, Muga silkworms were reared in the farm of Central Muga Eri Research and Training Institute, Central Silk Board, Jorhat, Assam (India). Naturally infected silkworms were collected in sterile polythene bags separately. The larvae were disinfected with 70% (v/v) ethanol for 1 to 2 min. and washed twice with sterile distilled water after it had just begun to soften.

The larvae were then dissected with the help of sterilized scissors in PBS buffer and the mid gut portion was collected separately in distilled water and homogenized. The bacterial pathogen was isolated using serial dilution agar plating method. The body fluid of the infected larvae was also collected separately with the help of sterilized insect needles. The diluted body fluid and mid gut samples were then inoculated onto Nutrient and Bacillus Agar media (Hi-media) and incubated at 35°C for 48 h (Tao *et al.*, 2011).

The other different media used for the isolation of the bacteria from the diseased cadavers of muga silkworm are as follows:-

- HiCrome Bacillus Agar
- MYP Agar Base
- EMB Agar

- Cetrimide HiVeg Agar Base
- Azide Blood Agar Base
- Streptococcus Agar Base
- Pseudomonas Agar

Each of the different bacterial colonies was purified and preserved at 4°C for further experiments. Further, the purified strain was fed to test silkworms and clinical symptoms were observed in the infected silkworm in order to confirm pathogenicity by the strains (Koch's laws). After confirmation of the pathogenicity, the isolated pathogenic bacterium (strains) was purified and incubated on a nutrient agar plate at 30°C for 24 h. During this period, the colony characteristics, such as size, colour, transparency, shape and edge (boundary) were observed. The bacterial colony that had been cultured for 24 h was subjected to Gram's staining and observed using an oil immersion objective under bright field and phase contrast microscope (Lica DM 750).

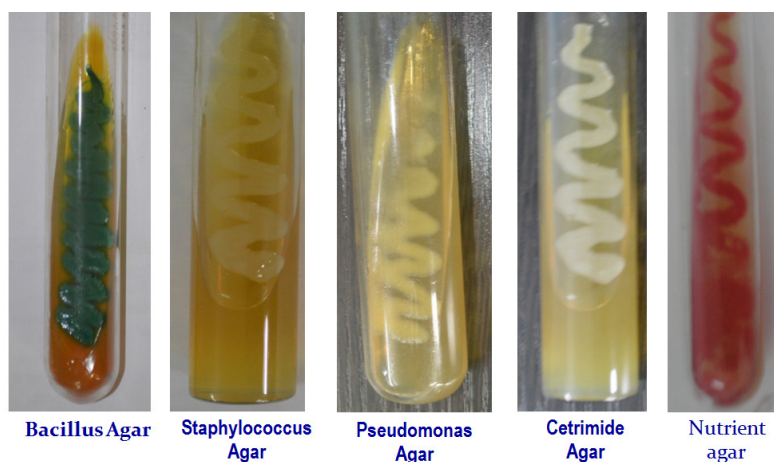


Fig.: Pathogenic bacteria isolates collected from disease cadavers

The purified bacteria were washed with 5 ml of sterile phosphate-buffered saline (PBS: 2 mol/l, pH 7.4) by repeated blowing and suction. Bacterial suspension was centrifuged at 4,000 rpm for 15 min in a new sterile centrifuge tube. The supernatant was removed and re-suspended in 5 ml of PBS buffer and calculated bacterial population by plate colony-counting method for counting the bacteria in the solution (Luo *et al.*, 2007). The bacterial inoculums were diluted up to 10^{-7} in PBS. Fifty healthy 4th instars larvae were considered in one experimental group (*in vitro*) and treated with bacterial suspension, along with feed. The host plant leaves were grown indoor with appropriate precautionary measures to check contamination. Concurrently, the control sets were administered with PBS only. The infected larvae were observed at every 12 hours and the mortality was recorded. The isolates from gut portion of infected silkworms were again plated on the NA for the confirmation of the same bacteria. Statistical analysis was done using SPSS 16.0 and Origin Pro 8.0 (Jia, 2006).

Pathogenicity test of the bacterial isolates

The Bacterial isolates were used for pathogenicity test in laboratory by following Koch's Postulates. After performing pathogenicity test, the bacteria cultures were confirmed as bacterial pathogens isolated from the silkworms and are named as Patho-1, Patho-2, Patho-3 and Patho-4 respectively.

The new pathogenic gram positive and negative bacteria i.e. Patho-1, Patho-2, Patho-3 and Patho-4 were identified through sequencing of 16S rDNA gene of different sizes. The larvicidal activity of one of the bacterium were very high ($LD_{50}=9.4 \times 10^3$ at 48 h; 8.2×10^4 at 72 h) and the disease occurred throughout the year irrespective of varying temperature and relative humidity in the silkworm rearing sites. The molecular identity of the bacteria were confirmed and identified accordingly.

Disease symptoms and the pathogenic bacteria

The infected larvae became lethargic and motionless, soft and flaccid, inactive and vomited gut juice. The larvae released chain type excreta and exhibited rectal protrusion as well. Larval head and thorax became translucent and paralyzed. After death, the larval body turned slightly hard and blackish in colour with foul smell. The isolated pathogen was a gram-positive, rod-shaped, non-motile spore forming bacterium with the active cell size of $2.4-3.2 \times 0.5-0.8 \mu\text{m}$.

Biochemical tests

The utilization of sugars under aerobic and anaerobic conditions was tested according to Bergey's manual through bacterial minimum biochemical reaction tubes (Dong and Cai, 2001). The tests were conducted for starch hydrolysis, citrate utilization, gelatin liquefaction, H_2S production, phenylalanine deamination, mannitol, lysin utilization and ornithine utilization in addition to Voges-Proskauer test, urease test, methyl red test, catalase test, oxidase test, sorbitol test, lactose test, glucose test, trehalose test, arabinose test and adonitol test.

Table: The biochemical characteristics of isolated *Lysinibacillus sphaericus*

Characteristic	Result	Characteristic	Result
Starch hydrolysis	+ve	Voges-Proskauer test	-ve
Citrate utilization	-ve	Urease test	-ve
Gelatin liquefaction	-ve	Catalase test	-ve
Methyl red test	+ve	Oxidase test	+ve
H_2S production	-ve	Glucose test	-ve
Phenylalanine deamination	+ve	Sorbitol test	-ve
Arabinose test	-ve	Adonitol test	-ve
Lactose test	-ve	Lysin utilization	+ve
Trehalose test	-ve	Ornithine utilization	+ve

It was positive towards starch hydrolysis, methyl red test, phenylalanine deamination, ornithine utilization, lysin utilization and oxidase test while there were negative results for citrate utilization, gelatin liquefaction, H_2S production, arabinose test, lactose test, trehalose test, adonitol test, urease test, catalase test, glucose test, sorbitol test and Voges-Proskauer test. These observations are in accordance with the reported biochemical characters of *Lysinibacillus* sp.

Molecular identification of the pathogen

Bacterial genomic DNA was isolated from previously grown overnight culture on nutrient broth at 37°C . The phenol-chloroform method for extracting DNA was used as previously described (Cheng and Jiang, 2006). Universal primers for amplification of the bacterial 16S rDNA gene were used as previously reported (Weisburg *et al.*, 1991). Quality

was evaluated on 0.8 % agarose gel, a single band of high-molecular weight DNA was observed. Fragment of 16SrDNA gene was amplified by PCR using 8F (5'-AGAGTTTGATCCTGGCTCAG-3') and 1492R (5'-GGTACCTTGTTACGACTT-3') primers. The PCR reaction was performed as follows: 95°C for 5 min; 30 cycles of 95 °C for 20 s 50 °C for 20 s and 72 °C for 3 min; and a final extension at 72 °C for 10 min. PCR product was visualized through 1% agarose gel electrophoresis. The PCR amplicon was purified and further processed for sequencing. Forward and Reverse DNA sequencing reaction of PCR amplicon was carried out with 704F and 907R primers using BDT v3.1 Cycle sequencing kit on Applied Bio-systems 3730xl DNA Analyzer. Consensus sequences of 16S rDNA gene were generated from forward and reverse sequence data using aligner software. The 16S rDNA gene sequence was used to carry out BLAST alignment search tool of NCBI genbank database. Based on maximum identity score, first fifteen sequences were selected and aligned using multiple alignment software program Clustal W. Distance matrix was generated using RDP database and the phylogenetic tree was constructed using MEGA 5.

Consensus sequences of 16S rDNA gene was used to carry out BLAST alignment search tool of NCBI genbank database and based on sequence data, one of the pathogenic bacterium was identified as *Lysinibacillus sphaericus* strain (AAB-13) (similar to JUN-6 GenBank Accession Number: KF228925.1) based on nucleotide homology and phylogenetic analysis. The nucleotide sequence data were submitted to the NCBI with accession number KP888564.

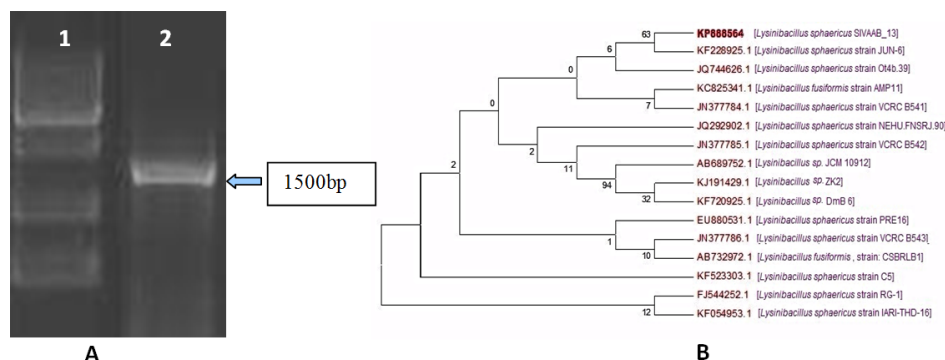
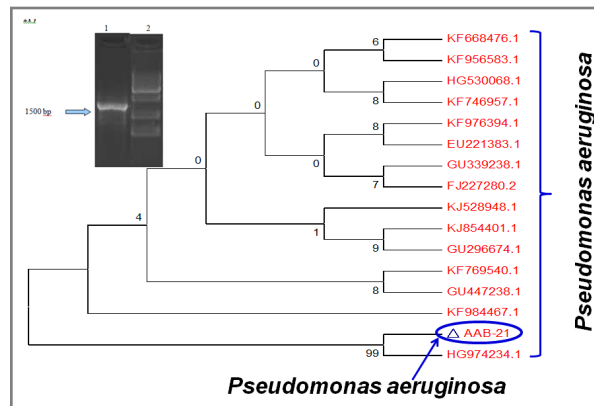


Fig: A- PCR amplicon of 16S rDNA gene in Agarose gel (1.2%) of AAB-13. [Lane 1: DNA marker (1 kb ladder); Lane 2: 16S rDNA amplicon]. B - Phylogenetic tree of the 16S rRNA sequences of the AAB-13 strain. The phylogenetic tree was constructed by the NJ method

We have reported five different species of bacterial pathogens from the infected cadavers.

1. *Lysinibacillus sphaericus*
2. *L. fusiformis*
3. *Pseudomonas aeruginosa*
4. *Serratia marcescens*
5. *Enterococcus casseliflavus*

The larvicidal potential of *P. aeruginosa* was high ($LD_{50}=9.4 \times 10^5$ at 48



h; 8.2×10^4 at 72 h) and the disease occurred throughout the year irrespective of temperature and RH.

Fig: PCR amplicons of 16S rDNA gene in Agarose gel (1.2%) bacterial isolates. [Lane 1: DNA marker; Lane 2: 16S rDNA amplicon]. Phylogenetic trees of the 16S rRNA sequences of the strains. The phylogenetic trees were constructed by the NJ method.

Table: Pathogenic status of the selected known *L. sphaericus* strain

Pathogenic status	Source	Strains name	Reference
Pathogenic in vegetative and sporulated cultures	Silkworm dead larva	AAB-13	This study
	Coleopteran larvae	OT4b.2,OT4b.20,OT4b.25,OT4b.26,OT4b.28,OT4b.32,OT4b.35,OT4b.39,OT4b.49,	Lozano and Dussan, 2013
	Contaminated soil	CBAM5	
	Oakforest soil	III(3)7	
	Forest soil	CH2.17	
	Agricultural soil	SB2.94, SB2.124	
	Shrimp disease	WPD2	-
Pathogenic	Oakforest soil	IV(4)10, IV(4)13	Lozano and Dussan, 2013
Non-pathogenic	Coleopteran larvae	OT4b.31	
	Oakforest soil	III(2)4, IV(3)13, IV(7)11	
	Type culture	ATCC 14577, NRS400	
Pathogenic status unknown	Sea water	Dmgp	Hu et al, 2014
	Agricultural soil	X050, WPD, FLQ-11-1	-

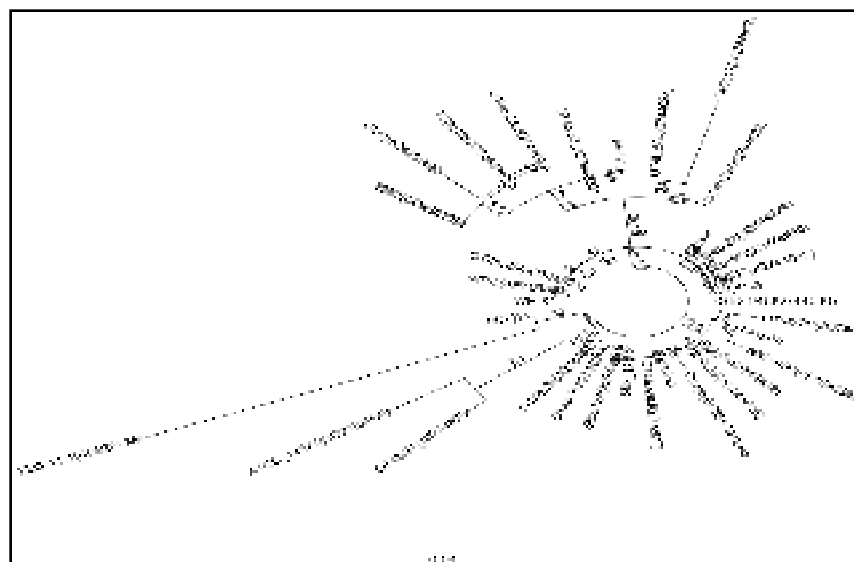


Fig.: A Phylogenetic tree was constructed based on neighbouring joining method based on 16SrDNA sequences selected known strains of *L. sphaericus* obtained from the database

having similar importance of pathogenicity along with the strain AAB-13.

Pathogenicity of *L. sphaericus*

The isolated *L. sphaericus* strain (AAB-13) was confirmed to be pathogenic after re-inoculation in mature larvae which was administered *per os*. The pathogen was so virulent that the visual symptoms, such as cessation of feeding, vomiting, lethargic movement *etc.* were displayed within 6-12 h after inoculation. The larvae died within 2-3 days after infection. However, the degree of virulence may depend on the inoculum concentrations, host plants variability and quality, and prevailing environmental parameters (Das *et al.*, 2010). The inoculum load of $\geq 10^6$ CFU/ml (LD_{50} , 8.2×10^4) was observed to be sufficient for causing mortality of the larvae. To find out the virulence of AAB-13, the LD_{50} was determined in 4th instar larvae. Larvae were inoculated orally for establishment in the gut, with different doses, and their deaths were recorded for 3 days after challenge. The LD_{50} of the AAB-13 isolates was 9.4×10^5 at 48 h, whereas it was 8.2×10^4 at 72 h. The virulence was much higher and proportionate to the inoculum concentration and also differed at different time point.

Disease epidemiology

It was observed that the disease appeared throughout the year (2013-14) with the intensity varying in different months. This was because of the environmental factors particularly the temperature variations round the year. The season wise variations of relative humidity ($82 \pm 10\%$) and precipitation (11.92 mm) were not significantly different (data not shown) in the sites. Extremely heavy rainfall and wind may affect the silkworm larvae during outdoor rearing if proper precaution (*e.g.*, use of nylon net) is not taken. The disease was recorded throughout the year in the rearing fields and the infection percentage varied from season to season. Temperature variations were not significantly different in the rearing sites ($n=4$, $r^2=0.98$, $P<0.001$), but varied season wise. The per cent disease infections (PDI) were negatively correlated with the temperature but not dependent on the RH ($r^2=0.16$). The disease was more prevalent during summer months (June-August) when temperature rises up to 30-35°C. However, higher temperature and RH were the most important factors for disease development.

Information on many silkworm diseases and the causative pathogens were previously reported by many workers (Lu-Yun-Lian, 1991; Nataraju *et al.*, 2007; Priyadharshini *et al.*, 2008; Tao *et al.*, 2011; Ayoade *et al.*, 2014). However, there was no report of *L. sphaericus* infection in silkworm till date even in mulberry and tasar silkworm. *L. sphaericus* is a naturally occurring, common environmental soil borne bacterium. The bacterium produces an insecticidal toxin similar to that produced by *B. thuringiensis* and hence, is normally used as a biopesticide to kill mosquito larvae (Wirth *et al.*, 2014). The bacterium is not harmful to humans and other animals (Hu *et al.*, 2008).

It is not known whether the bacterium has been infecting silkworms since long or else, it became pathogenic to the silkworm recently, as it is a soil borne, naturally occurring bacterium. Probably, the bacterium became virulent recently due to many unknown evolutionary mechanisms (Tinsey *et al.*, 2006). A recent review reported that phage-like particles (gene transfer agents) are involved in this process and they can transfer bacterial genes driving bacterial evolution and promoting the emergence as novel pathogens (Penadés *et al.*, 2015). Hence, the diversity of this bacterium in terms of virulence to the silkworm should be properly studied and understood. The bacterium can form dormant endospores that are resistant to heat, chemicals, and ultraviolet light and can remain viable for a long time (Wirth *et al.*, 2014).

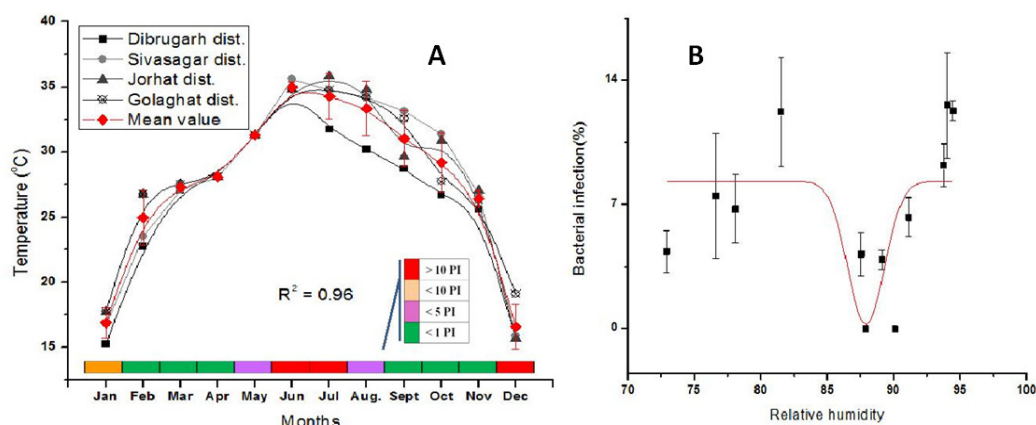


Fig.: A- Temperature variation and disease occurrence (monthly forecasting) (PI percent disease infection, $n=50$), B - Nonlinear regression curve between bacterial infection and relative humidity during 2013-14 in the four different regions

So, it is necessary to take proper disinfection measures to check the disease in the rearing field. However, even the infected mosquitoes may disseminate and contaminate the sites. The cross infectivity of this bacterium has to be studied to understand the pathogen transmission patterns. An integrated approach is required for application of the bacterium as bio-pesticide to control the mosquito larvae and also to check cross contamination and infection to the beneficial silkworms. It is worthy to mention that muga silkworm is endemic to this region and not reported elsewhere for which it has a great significance in terms of ecology, ecosystem and culture. Previous study suggested that the silkworm is having single race from the evolutionary point of view and there is no significant genetic diversity within and between the populations ($n=5$) and the populations reported from the different areas of the region derived from a single population (Arunkumar *et al.*, 2012). This is very important from the conservation point of view to preserve this unique genetic pool surviving in this particular niche of the globe. Only a few populations have been reported in the wild habitat in the surrounding area (Kakati and Chutia, 2009; Tikader *et al.*, 2013).

Further, disease monitoring and its prevention in wild and domesticated silkworms are utmost necessities to save their population and ultimately to conserve them. *L. sphaericus* (AAA-13) is the new report as the bacterial pathogen of Muga silkworm and needs further study of the disease biology as well as control measures.

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ONGOING R&D PROJECTS

Project Code: PPA-5879

Project Title: Assessment of phytochemical diversity in Som (*Persea bombycina* Kost) the primary host plant of *Antheraea assamensis* Helfer from Northeast India

Project Period: October 2016 – September 2019

Funding Agency: Central Silk Board

Total Budget allocation: 15. 20 Lakhs

Total expenditure (during the year): 1.60 Lakhs

Scientists involved: Dr. P. Sangannavar, Sc-B
Dr. Ranjini M. S. Sc-B
Dr. D. K. Gogoi, Sc-C
Dr. Ranjana Das, Sc-D

Objective

1. Assessment of phytochemical constituents of Som during different rearing seasons under agro-climatic zones of northeast region
2. To develop a comprehensive nutrient management package for muga host plant.

Summary of the findings/achievements

Collected soil and leaf sample from Jarua (Dec-Jan) and Chatua (Feb-Mar) crop from three different study areas i.e, Goalpara, Dhakuakhana and Tura. Soil sample were analyzed for physio-chemical properties and it found variation in availability from area to area. Jarua and Chatua crop leaf samples were processed and are under analysis.

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Project Code: PRP-5880

Project Title: Characterization and efficacy of bacterial antagonists against *Alternaria ricini* infecting Castor in North-eastern India

Project Period: 3 years

Funding Agency: Central Silk Board

Total Budget allocation: 15.25 lakhs

Total expenditure (during the year): 33,144

Scientists involved: Sri Jeevan B, Scientist - B
Dr. Mahananda Chutia, Scientist - C
Sri Vijay N, Scientist - B
Dr. (Mrs) Ranjana Das, Scientist - D

Objectives

1. To isolate and characterize bacterial antagonists from different castor growing areas against *Alternaria ricini*.
2. To evaluate the efficacy of different bacterial antagonists against *Alternaria ricini* causing leaf blight of castor.
3. Development and field evaluation of promising bio-formulation against *Alternaria* leaf spot of castor.

Summary of the findings/achievements:

- ❖ Isolate of *Alternaria ricini*, was collected from infected castor leaves and maintained on potato dextrose agar in laboratory at 24°C.
- ❖ The morphological characterization of *Alternaria ricini* reveals that the conidia were typically produced in chains on the conidiophore. Hyphae were hyaline, septate and branched. The colour of the conidia was dark brown with horizontal and vertical septations
- ❖ The bacterial antagonists were isolated from the soil samples collected from the different castor growing areas.
- ❖ Rhizosphere soil of castor were collected and Bacteria were isolated by the collected soil samples the obtained bacterial colonies were purified and maintained on suitable media and stored at 4°C for further use.
- ❖ In the dual culture Bioassay the antagonistic efficacies of isolated rhizobacteria were tested against *Alternaria ricini*. Most of the antagonists showed varying levels of antagonism. The isolate LRP- 4, HF-3, showed the maximum inhibition of test pathogen followed by LRB-2, KRP- 9 and KRP- 5 over the control.

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Project code: ARP-5867

Project title: Characterization, transmission and cyto-pathology of infectious flacherie and cytoplasmic polyhedrosis virus in muga silkworm *Antheraea assamensis* Helfer

Project period: July, 2013 - June 2016

Funding Agency: DBT, New Delhi

Total project cost: Rs26.35 Lakhs

Project investigators: Dr. M. Chutia, Principal investigator
Dr. R. Kumar, Co- investigator

Objectives

1. Characterization of infectious flacherie and cytoplasmic polyhedrosis virus in muga silkworm.
2. To study the transmission pattern of the viral agents.
3. To study the cyto-pathology of midgut and silk gland from infected larvae.

Highlights of achievements

Isolation of Virus

The viral isolates were obtained from the midguts of infected larvae collected. The midguts of the diseased larvae were homogenized to collect the crude extract. This extract was used for isolation of viral agent.

Purification of Polyhedral Bodies

Then we have purified the polyhedra from infected larvae by Sucrose-Density-Gradient centrifugation according to a modification (Qanungo et al., 2000) of the method Hayashi & Bird (1970).

Isolation of Total Genomic RNA

The samples were first homogenized in liquid nitrogen in sterile mortar pestle followed by Trizol reagent. Finally, RNA pellet was then washed with 70% ethanol and centrifuged. Pellet was dried and dissolved in DEPC water and stored at -80°C. Integrity of RNA was confirmed by 1% agarose gel electrophoresis. The process is being further repeated.

We have also tried to detect Nuclear Polyhedrosis Virus in infected muga silkworm. It is a dsDNA virus. So, we have isolated viral DNA from the collected samples

Extraction of OBs

At first, the OBs were extracted from individual diseased larvae for characterization of Nuclear Polyhedrosis Virus. To each cadaver 1ml sterile distilled water was added and disrupted by vortexing. Extract was filtered through cheese cloth. The filtrate was centrifuged at 15,000×g for 5 min. The supernatant was removed. Pellet was washed with 2 ml distilled water and centrifuged. The pellet was resuspended in 1ml of sterile distilled water and stored at 4°C. These OBs were then observed under light microscope.

Isolation of Viral DNA and PCR

DNA extraction was performed by using viral DNA isolation kit according to the protocol given with the kit. The DNA yields were stored at -20°C until use. Then we have performed the PCR to identify the polyhedrin gene in viral DNA, by using previous reported degenerate primers.

Electrophoresis of PCR Product

We have performed agarose gel electrophoresis to concentrate the PCR product to discrete a band on the gel. The PCR product was analysed by one percent agarose gel electrophoresis.

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Project code: ARP 5874

Project title: Development of Decision Support System for early warning of selected muga silkworm diseases and pests with geospatial technique
[Details not received yet]

Project Code: AIT5885

Project title: Development of microbial biocatalyst by heterologous expression of *hpaC* & *soxABC* gene cluster in biosurfactant producing bacterium for effective desulfurization of dibenzothiophene (DST Fast track young scientist project)

Project Period: August 2016 - July 2019

Funding Agency: DST, New Delhi

Total Budget allocation: 28.00 Lakhs

Total expenditure (during the year): 3.09 Lakhs

Scientists involved: Dr. G. Subrahmanyam, Principal Investigator

Objective

1. Cloning, expression and purification of hpaC and soxABC gene cluster in a biosurfactant producing bacterium *Bacillus subtilis* LBBMA 155
2. Characterization of the DBT desulfurization activity by recombinant strain LBBMA 155
3. Industrial applications of recombinant strain in biorefining the hydrotreated fuels

Summary of the findings/achievements

The project has been started during August 2017. One JRF is recruited as for the DST guidelines. Triplicate soil samples were collected from hydrocarbon contaminated sites viz Lakua, Gelaki and Nazeera (Fig. 1). The samples were collected in plastic zipper bags and transported to the laboratory for bacterial screening and isolation. Samples were processed and kept at 20 °C for molecular biology analysis. Biosurfactant-producing bacteria were isolated from these contaminated soils with plating on nutrient agar. Morphologically distinct colonies were re-isolated by transferring them onto fresh nutrient agar plates at least three times, to obtain pure cultures, and were subsequently Gram stained. Pure cultures were stored at 4 °C in nutrient broth with sterile glycerol at a final concentration of 30%. 25 Bacterial isolates have been obtained from contaminated soils. Screening of 25 Bacterial isolates for biosurfactant-production was performed as per the standard protocols. Briefly, the selected bacterial isolates were grown in mineral salt medium supplemented with diesel (1%) as carbon source at 37°C for 24hrs. The supernatant of each bacterial isolates were collected using centrifugation at 10000 rpm for 15 min.

The biosurfactant property of bacterial culture supernatant was assessed by standard techniques as follows:

Drop collapse assay (DCA)

The supernatant from the two different bacterial cultures (24 hrs old) were taken in a clean glass slide individually and added with 0.1ml of diesel oil. The flattening property of diesel oil was observed for a period of 1 minute and the result were recorded.

Emulsification index (% EI)

Equal volumes of culture supernatant of bacterial isolates with diesel oil (1:1) were mixed in a glass tube (125mm x 15mm). Then the mixture was vortexed for 2 minutes and left to stand for 24 hours. The emulsification index was calculated by the dividing height of the emulsion layer by total Height $\times 100$.

Oil spreading test

40 μ l of distilled water was added to a Petri dish (15 cm diameter) followed by the addition of 20 μ l of oil to the surface of water then 10 μ l of culture extract from bacterial isolates were dropped on to the oil surface. The diameter of clear zones on the oil surface was measured and the results were recorded

Blue agar plate method

Bushnell- Hass agar medium (BHA) supplemented with glucose as a carbon source (2%) and cetyltrimethyl ammonium bromide (CTAB-0.5 mg/ml) and methylene blue (0.2 mg/ml) were used for determination of anionic biosurfactants. Different wells (4mm dia) with equal distance were prepared in blue agar plate using cork borer. 30 μ l of culture extract were loaded into respective labelled wells and incubated at 37°C for 48-72 hours. A dark blue halo zone was observed and the results were recorded.

Results indicate that out of 25 bacterial isolates, N2, N6, N9, N13, N14 bacterial isolates were found to be superior for EI% values (Fig. 3), whereas L3, L5 and L6 isolates were found to be good at DCA (Fig. 2). CTAB-Metyline blue assay of bacterial isolates revealed that biosurfactant produced by these bacteria is of anionic in nature (Fig. 4). Among 25 bacterial isolates, L3, L5, N6, N9, N13, G1, G8 and G9 are shown good anionic biosurfactant production on CTAB plates (Fig. 4). Gram staining results deciphered the abundance of gram positive bacteria at contaminated site. Isolates L5, L6, N2, N9, G1, G9 were found to be gram positive coccus, very minute even under 100x; Isolates G3, G8, G7 were gram positive, thin, longer chains, streptobacillus; isolate G10 was gram positive, short chains, bacillus; Isolate N6 gram +, short chains cocci; N 14 gram positive, diplococcus; Genomic DNA extraction of the good biosurfactant producing bacterial isolates was done with CTAB-NaCl Method (Fig. 5). Molecular identification of the biosurfactant producing bacteria by 16 S rRNA based PCR is being studied.

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Project Code: AIB-5879

Project Title: Development of suitable combinations/hybrids of eri silkworm with sustainable performance for commercial exploitation

Project Period: November, 2014 - October, 2017

Funding Agency: Central Silk Board, Bangalore

Total Budget allocation: Rupees 3.80 Lakhs

Scientists involved: Dr. B.N. Sarkar, Scientist-C
Dr. M.C. Sarmah, Scientist-D
Dr. S.A. Ahmed, Scientist-C

Objective:

1. To evolve suitable eri silkworm cross / breed for quantitative and qualitative improvement.
2. To evaluate the evolved crosses at farmers' level based on primary food plants (Castor and Kesseru).

Summary of the findings/achievements:

The specific combining ability (SCA) effect and Reciprocal effect in 6 x 6 diallel cross of eri silkworm hybrid showed the combination / hybrid, YP X GBZ and GBS X GBZ is superior than others combination/hybrid. The trial rearing at farmers level at SMV Tamulisiga and SMV Dadhara in different three season result indicated that hybrid of YP x GBZ showed highest average shell weight (0.54 g) with highest fecundity (351 nos) and hybrid of GBS x GBZ showed highest average shell weight (0.53 g) with highest fecundity (354 nos). Therefore the two hybrids of YP X GBZ and GBS X GBZ may consider as high yielding combination and may be recommended for commercial exploitation.

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Project Code: APS5881

Project Title: Development of suitable incubation device of Eri silkworm to overcome hatching problem during summer

Project Period: September 2016 – August 2019

Funding Agency: Central Silk Board

Total Budget Allocation: 3.46 lakh

Total expenditure (during the year): 1.11 lakh (16-17)

Scientist involved: Dr. M.D. Senapati, Scientist - D

Dr. M.C. Sarmah, Scientist - D

Dr. B.N. Sarkar, Scientist - C

Dr. S.A. Ahmed, Scientist - C

Objective

1. To evaluate a suitable device for incubation of eri silkworm egg for proper and uniform hatching.

Highlights of achievements

The project has been initiated during August, 2016. The required articles were received and utilized for the project. Back up stock maintenance of C2 breed for experimentation purpose as well as bioassay of the experimental lots and control lot have been done.

Bioassay

The bioassay i.e. rearing performance of eri silkworms hatched in different incubation devices as per treatments conducted for four rearing seasons during 2016-17 and the observations are as follows:

The nature of significance of the difference between the five different treatments during August crop in which device 4 significantly differs from other devices are given as below:



Different devices used for experimentation

The device 3 and device 2 were at par during August with hatching percentage 71.6 ± 0.13 and 70.8 ± 0.93 respectively. During September - October (favourable season) devices 1,3,2 with a range of 85.4 – 87.4 hatching percentage and devices 5,6,4 with a range of 78.6 -80.2 hatching percentage were at par with respect to hatching percentage.

During November – December the performance of device 4 and device 3 were at par with hatching percentage 89.8 ± 5.00 and 87 ± 2.20 respectively. The device 4 significantly differs from others with highest hatching percentage 94.60 ± 5.57 during February, 2017.

As per suggestion of the institute multilocal trial will be conducted at farmers level in the next phase.

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Project Code: MOE-5875

Project Title: Effect of plant protection formulations on the growth, development and productivity of Muga Silkworm, *Antheraea assamensis* Helfer (Saturniidae: Lepidoptera).

Project Period : 3 years (2014-17)

Funding Agency: Central Silk Board, Bangalore

Total Budget allocation: Rs. 15.95 lakhs.

Total expenditure (during the year): Rs. 3.828 lakhs

Scientists involved: Dr. Kartik Neog, Scientist-D
Sri D. Goswami, Scientist-D
Dr. (Mrs) U. Hazarika, Scientist-D
Dr. S.A. Ahmed, Scientist-D

Objectives

1. To study the effect of chemical pesticides / plant protection formulations on the growth and development of Muga Silkworm.
2. To study the effect of biopesticides / biocontrol agents on the growth, development and productivity of Muga Silkworm.
3. To develop suitable methodologies/ procedures to reduce the effect of pesticides on muga silkworm.

Summary of the findings/achievements:

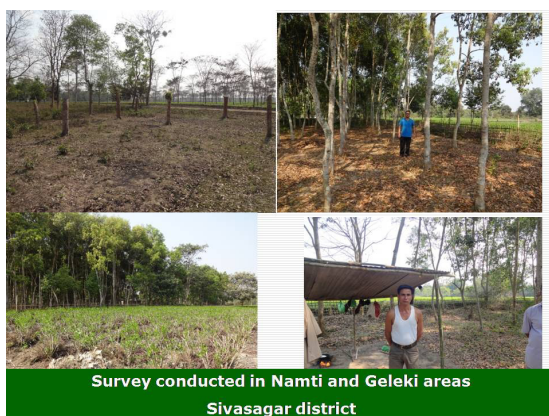
Survey on the effects of pesticides used in agricultural and plantation crops on muga silkworm productivity was done in survey was conducted in Amguri, Barahibari and berhoiting areas of Sivasagar district; Cinatoli area of Golaghat district; Tingkhong and Khowang areas of Dibrugarh districts of Assam in areas where Jethua, Aherua, Bhadia, Jarua etc. crops was done by the farmers. The chemical pesticides used in the tea gardens nearby the muga rearing fields have been enlisted. Experiments with commonly used insecticides viz., Instant, Ennova and Atom have been conducted to test the lethal dose for Muga silkworm.

Works done / achievements made during the year (2015-16) under report

1. Survey was conducted in different district of Assam viz. Jorhat, Sivasagar, Dibrugarh and Golaghat, in areas where Jethua, Aherua, Bhadia, Jarua etc. crops was done by the farmers.
2. Samples of leaves and muga silkworms have been collected from farmers' fields of Borahibari, Dikshow, Sapekhati areas of Sivasagar District, Borpathar and Cinatoli areas of Golaghat district and preserved for insecticide residue analysis.
3. Experiments with commonly used insecticides viz., Instant, Ennova and Atom have been conducted to test the lethal dose for Muga silkworm. Instant was found to be the potent killer even at very low dose. (0.0025%). Atom and Innova (0.1 % conc.,

recommended dose) on muga silkworms resulted in loss of appetite, immediate haemolymph vomiting, sluggishness, inactivity, lethargy, colour changes and ultimately death. At lower concentrations the effects were not immediate and the mortality was much lesser. Restoration of health, appetite, colour and stability was also recorded after 6-7 hrs

4. Changes in biochemical components, viz. total protein, total soluble sugars, free amino acids, soluble protein and reducing sugars have been determined.
5. Activity of Acetyl Choline Esterase enzyme was determined during different periods after treatment.



Survey conducted in Namti and Geleki areas
Sivasagar district



Survey conducted in Barahibari areas
Sivasagar district

Table 1. Few commonly used insecticides used in tea gardens with a.i. and use.

Sl. No.	Name of insecticide	Active Ingredient	Use
1.	Mitigate	Fenpyroximate 5 % EC	Leaf hoppers, mealy bug, yellow mite, psyllid, red spider mite
2.	Propargite, omite	2-(p-tert-butylphenoxy)cydohexyl 2-propynyl sulfite	Mites
3.	Profex	Profenofos (40%) Cypermethrin (4%)	Sucking pests like aphids, jassids. Thrips and white fly and also very effective on cotton Boll worms
4.	Rocket	375g/l (32.9% w/w) metazachlor and 125g/l (10.9% w/w) quinmerac	Annual meadow-grass and broadleaved weeds, including difficult to control weeds
5.	Deltamethrin	Pyrethrins	Ants, firebrats, gnats, midges, centipedes, millipedes, pantry pests, silverfish, bees, bed bugs, carpet beetles, cockroaches, fleas, crickets, flies (including stable flies, horseflies, house flies, cluster flies), hornets, killer bees, lice, mosquitoes, pillbugs, scorpions
6.	Quick, Quinalphos	Quinalphos	Aphids, thrips, BPH, Mites, Borers of Paddy, Red Gram Jute, Chillies, Tea, Cardamom etc.
7.	Rogor	Dimethoate	Mites and insects systemically and on

8.	Benzofos	Phosalone	contact (Banned)
9.	Luphos36	Monocrotophos	Acaricide and insecticide
10.	Nuvan	DDVP (Dichlorovos 76 % EC)	<u>persistent organic pollutant</u> , banned
11.	Ennova	Acetamiprid 20% SP	Crawling and flying pests
12.	Instant	Lambda-Cyhalothrin 5% EC	Heliopeltis on tea plantations
			Red spider & loopers

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Project Code: AIT-5872

Project Title: Whole Genome Sequencing and functional genomics of Golden Silk Moth *Antheraea assamensis* (Collaborative project with SBRL, Kodathi, IIT, Guwahati, ISC, Bangalore and CDFD, Hyderabad)

Project Period: 3 years (2015-18)

Funding Agency: Central Silk Board

Total Budget allocation: Rs. 15.20 lakhs.

Total expenditure (during the year): Rs. 2.82119 lakhs

Scientists involved: Dr. Kartik Neog, Scientist - D

Objectives

1. To perform whole genome sequencing of prototype of *A. assamensis* and its assembly.
2. To analyze transcriptome profile of specific larval tissues of *A. assamensis* after bacterial infection and control normal larvae.
3. Identification of functional gene makers associated with silk quality from silk gland by RNA sequencing

Summary of the findings/achievements:

1. A domestic stock and a wild stock of muga silkworm are being maintained for genomic study.
2. Two newly developed genotypes of muga silkworm are also being maintained for genomic study.
3. Fund for IIT, Guwahati and SBRL, Kodathi have been released.
4. Plots for rearing of the next crop of muga silkworm for conducting the experiment with pathogen have been prepared.
5. Rearing of 100 g of Muga silkworm is under progress. The worms are just entering 3rd stage
6. Treatment of the worms in isolated condition with pathogenic bacteria was done when the worm entered 4th/5th stage.
7. DNA from the elite stocks CMR-1 & CMR-2 has been isolated and stored in deep freeze for further study.
8. Transcriptomic study of Mitochondrial DNA is under progress with IIT, Guwahati.
9. Mitochondrial transcriptomic analysis of Muga silkworm has been completed.

- was successfully performed.



Fig.1. *A. assamensis* mitogenome (15,247 bp)

Special features of Mitochondrial genome of Muga silkworm.

- (Saturniidae+Bombycidae+Sphingidae) consistent with traditional classification system.

Project Code: MOT-5883**Project Title: Impact of training on knowledge and adoption level of improved technology of muga culture**

Project Period : September 2016 - March 2018

Funding Agency: Central Silk Board

Total Budget allocation: Rs. 4.75 lakh

Total expenditure (during the year): 0.85561 lakh

Scientists involved: Sri Vijay. N, Scientist - B
Sri D. Mech, Scientist - D

Objective

1. To assess the extent of knowledge and adoption of improved technologies among the trained muga farmers.
2. To identify socio-economic factors influencing knowledge and adoption of technologies.
3. To assess the impact of training on production of muga farmers.

Summary of the findings/achievements

Data collection is under the progress.

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Project Code: ARP 5868**Project Title: Isolation and characterization of antifungal peptides from Muga Silkworm *Antheraea assamensis* Helfer**

Project Period : 3 years (2014-17)

Funding Agency: Dept. of Biotechnology (DBT), New Delhi

Total Budget allocation: Rs.32.58 lakhs.

Total expenditure (during the year): Rs. **6.18982 lakhs**

Scientists involved: Dr. Kartik Neog, Scientist – D

Objectives

1. Isolation and purification of antifungal peptides from the haemolymph of fungal challenged muga silkworms *Antheraea assamensis* Helfer.
2. Biochemical characterization of isolated antifungal peptides.
3. Determination of mode of action of antifungal peptides against various fungi of *Candida* and *Aspergillus* sp.

Summary of the findings/achievements:

Antimicrobial peptides play the vital role and act as a first line of defense (innate immunity) to invading microbes to prevent infections in silkworm. In insect, most of the AMPs are expressed by various gene families and only few of them are characterized well: such as cecropin and drosomycin in *Drosophila melanogaster*; cecropin, moicrin and gloverin in *Bombyx mori*. It is also documented that each insect species produces an individual set of antimicrobial peptides after induction to kill the invading pathogens in order to protect from the infection. In this study, we have purified and characterized one gloverin-like peptide from

the immunized hemolymph of muga silkworm, *A. assa mensis* through successive preparative and analytical HPLC. Characterization of this peptide through MALDI-TOF/TOF mass spectrometry shows its molecular mass as 9.052 kDa. Peptide mass fingerprinting analysis followed by MASCOT database search reveals the peptide rich in glycine residue and bears homology with gloverin.

Extraction and purification of Antimicrobial proteins (AMPs)

Haemolymph collected from the treated Muga silkworm larvae (5th instar) was extracted with methanol and acetic acid which was again separated by reverse-phase HPLC (Agilent 1260 series) using ZORBAX semi-preparative column for 50 minutes. HPLC profile showed several peaks which were collected at 5 minutes interval (Fig. 1a). Ten such collected fractions were concentrated by lyophilization and assayed for antimicrobial activity. Among all these fractions, fraction eluted between 40 to 45 minutes (marked in the figure) showed highest antimicrobial activity among them. This fraction was further separated using analytical ZORBAX-XDB C18 column and four peaks (I, II, III, IV) were collected individually. Antimicrobial activity assay showed that only fraction (IV) (marked in the figure) (Fig. 1b) contained the activity among them. Purity of this peptide was checked by TLC and tricine SDS-PAGE (Fig. 1c and 1d). A single spot and band was observed by TLC and SDS-PAGE, respectively confirming purification of single peptide. The molecular weight of the purified peptide was also estimated approximately as 8-9 kDa.

Antimicrobial activity

To evaluate the antimicrobial efficacy, isolated peptide was incubated with *C. albicans* (fungi), *E. coli*, *E. cloacae* (Gram-negative bacteria) and *S. epidermidis* (Gram-positive bacteria) at the concentration of 1 µg.mL⁻¹. No growth inhibition was observed for *C. albicans* (fungi) and *S. epidermidis* (Gram-positive bacteria) but the peptide showed significant growth inhibition (16 to 18%) of both the Gram-negative *E. coli* and *E. cloacae* bacteria (Table 1). MIC value was determined against *E. coli* and *E. cloacae* and was found to be 64.32 µM.mL⁻¹ (Fig 2a). Growth curve of *E. cloacae* was prepared in the presence and absence peptide. Microbial growth kinetics was assessed with sub MIC value (30 µM.mL⁻¹) of the peptide and observed that peptide effectively increase the lag phase of the bacterial growth (Fig. 2b).

Table 1: *In vitro* antibacterial activity of HPLC purified Fraction-IV

Microorganism	Inhibition (%) of HPLC purified Fr-IV (1 µg. mL ⁻¹) respect to control.
<i>S. epidermidis</i>	00
<i>E. coli</i>	16.24
<i>E. cloacae</i>	18.56
<i>C. albicans</i>	00

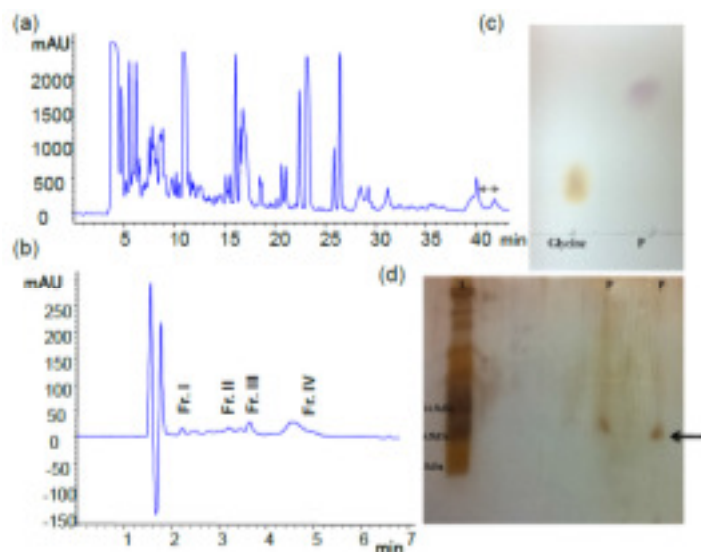


Fig. 1. (a-d). Purification of AMP from the immunized hemolymph of *A. assamensis* larvae. Reversed-phase HPLC fractionation of methanol/glacial acetic acid/water extracted hemolymph through semi-preparative C-18 column where arrow indicates the peak fraction having antimicrobial activity (a). Further purification of this active peak fraction by analytical C-18 column and fraction IV shows maximum antibacterial activity (b). Analysis of purified peptide through TLC and p indicates purified peptide (c). Analysis of purified peptide by tricine 15% SDS-PAGE, and stained with silver. Lane L, Protein molecular weight marker; P, purified peptide. Arrow indicates position of single protein bands in the gel (d).

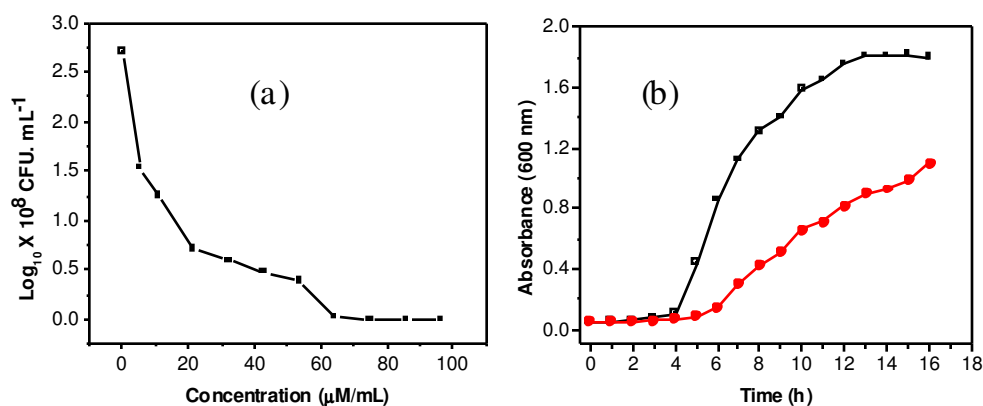


Fig 2: Effect of different concentration of peptide on the growth of Gram-negative bacteria, *E. cloacae* to determine MIC value (a). Growth curve of *E. cloacae* in the presence or absence of the sub-inhibitory concentration of peptide (32 µM), red line and without peptide, black line (b).

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Project Code: APR 5878

Project Title: Next generation sequencing studies and bioinformatics analysis of microbiome of flacherie infected *Antheraea assamensis* Helfer for developing effective disease control measures

Project Period: August 2016 - July 2019

Funding Agency: Central Silk Board, Bangalore

Total Budget allocation: 20.95 Lakhs

Total expenditure (during the year): 1.2 Lakhs

Scientists involved:

- Dr. G. Subrahmanyam, Scientist - B
- Dr. Rajal Debnath, Scientist - B
- Dr. Ranjana Das, Scientist - D
- Dr. M. Chutia, Scientist - C

Objective

1. High throughput sequencing analysis of microbiome of flacherie infected muga silkworm.
2. Bioinformatics analysis and detection of causative bacterial pathogen responsible for flacherie disease in *Antheraea assamensis*
3. Establishing the bacterial pathogen and development of effective disease management practices

Summary of the findings/achievements

Flacherie infected silkworms and dead cadavers (24 nos) have been collected during Bhadia and late- Bhadia crops. Silkworm mid gut has been dissected and bacterial pathogens are isolated by plating methods. Bacterial pathogens were identified as gram negative *Pseudomonas* sp. and Gram positive *Bacillus* sp. These bacterial isolates were further used as test organisms for developing formulations for controlling bacterial flacherie disease. Effect of different commonly used disinfectants (Bleaching powder, Sodium hypochlorite, Lime, Formalin and mixture of disinfectants) on gram positive and gram negative bacterial pathogens of silkworm have been evaluated by plating studies. A new disinfectant formulation i.e. "T4" is being developed and tested on bacterial pathogens.

Preliminary studies indicated that the newly tested disinfectant "T4" had bacteriolytic activity on two potential muga silkworm pathogens *Pseudomonas* sp., and *Bacillus* sp. Antimicrobial activity of the T4 was comparable with standard disinfectants that are widely using in rearing field (Fig. 1). Both 3% and 2% concentrations of the T4 showed antibacterial activity against bacterial pathogen. The disinfectant is much more effective in controlling gram positive bacteria. Some saplings were established for conducting laboratory microcosm studies. In vitro bioassay studies with flacherie causing pathogenic bacteria (*Bacillus* sp. and *Pseudomonas* sp.) were conducted (Fig. 2).

Newly developed formulation has been tested on 4th and 5th instar Muga silkworm larvae in onsite rearing during Jarua pre seed and Chatua seed crop. Bioassay studies also indicate the disinfectant is much more effective on gram positive pathogenic bacteria. The newly developed disinfectant does not have any negative/Side effects on growth and cocoon production of Muga silkworm (Table 1, Fig. 4). Cocoon characteristics and silkworm physiology were found to be normal in both control and disinfected treated experiment ($p > 0.01$) (Fig. 3 and 4). Diseased muga silkworm mid gut is dissected and processed for gut microbiome analysis.

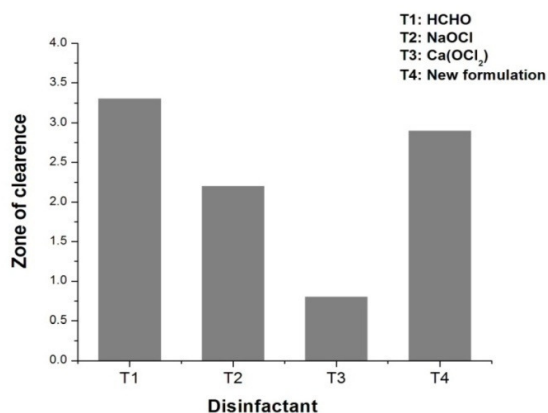


Fig. 1: Anti microbial activity different disinfectants including newly developed formulation (T4) on the growth of *Pseudomonas* sp.

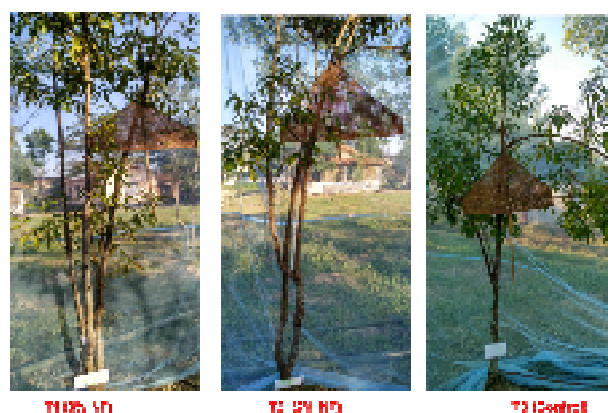


Fig. 2: Field studies to reveal the developed formulation on the growth and cocoon characters of muga silkworm (Jarua pre-seed crop)

Table 1: Characteristic of larvae reared on newly formulated disinfectant.

Treatment	T1 (3%)	T2 (%)	T3 (Control)
Larval Behaviour	Normal	Normal	Normal
Eating pattern	Normal	Normal	Normal
Weight of the faeces (10nos)	0.62 (0.01)	0.64 (0.01)	0.63 (0.02)
Size of the larvae (after 3 days feeding)	8.07 (0.12)	8.13 (0.22)	8.07 (0.21)
Weight of the larvae (g) (After 3 days feeding)	6.9 (0.06)	7.04 (0.1)	6.97 (0.17)

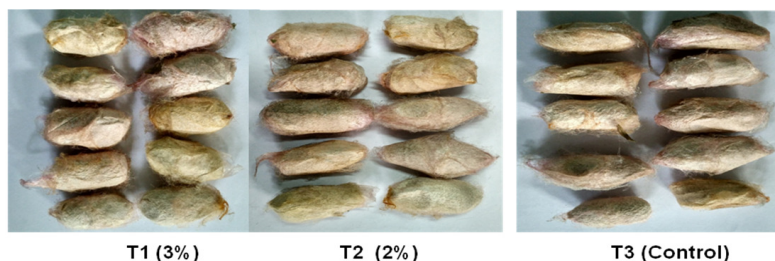


Fig. 3: Cocoon harvested during jarua crop treated with new formulation

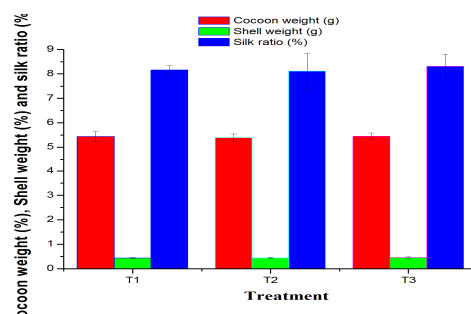


Fig. 4: Cocoon characters of the muga silkworm treated with T4 formulation at two different treatments. No significant difference among cocoon parameters of the treatments were observed ($p < 0.01$)

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Project Code: APR 5877

Project Code: Role of hormesis in mitigating oxidative stress and its impact on growth and yield of Muga silkworm, *Antheraea assamensis* Helfer

Project Period: October 2016 – September 2019

Funding Agency: Central Silk Board, MoT

Total Budget allocation: 7.85 Lakhs

Total expenditure (during the year): 0.1777 Lakhs

Scientists involved: Dr. P. Sangannavar, Scientist - B

Dr. D. K. Gogoi, Scientist - C

Dr. Rajesh Kumar, Scientist - C

Shri D. Goswami, Scientist - C

Objectives

1. Study on the impact of hormetic effect of heat shock on growth and yield of muga silkworm
2. Understanding the level of oxidative stress and antioxidants in muga silkworm

Summary of the findings/achievements

- Heat treatment to different development stages of *Antheraea assamensis* had been standardized at three different temperatures for short duration.
- Analysis had been made on different development activities like hatching, survivability of eggs by hatching, ability of larvae to spin healthy cocoons, successive emergence of adult by pupa, successful copulation, egg laying capacity in both treated and control in one seasonal crop and statistical analysis is in process. Rearing in next seasonal crop is in progress.

- Heat treatments at two different temperatures had shown positive hormetic effect on performance of *Antheraea assamensis* in a commercial crop.
- Further analysis will help us to understand the impact of hormones in other seasonal crops and extend the studies on estimation of oxidative stress and antioxidants in Muga silkworm.

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Project Code: PPS 5884:

Project Title: Soil health cards for sericulture farmers of Assam, Meghalaya, Manipur, Mizoram, Tripura, Nagaland, Arunachal Pradesh and Sikkim

Project Period: August 2016- August 2019

Funding Agency: CSB

Total Budget allocation: Rs. 27.75 lakhs (excluding JRF).

Total expenditure (during the year): Rs. 6.370 lakhs

Scientists involved: Dr. Urmimala Hazarika, Scientist - D
Dr. Vinod S. Naik, Scientist - B
Dr. S.A. Ahmed, Scientist - C
Dr. D. Jigyasa, Scientist - B

Objectives

1. To make the farmers aware about the importance of soil fertility on the production of quality leaves of muga and eri host plants by issuance of soil health cards.

Summary of the findings/achievements

- Soil samples have been collected from Assam, Nagaland, Arunachal Pradesh, Meghalaya and Mizoram states of NE region. During 2016-17, 618 samples have been collected covering 329 Muga farmers (139-Assam, 40-Nagaland, 55 Meghalaya, 14 Manipur, 1 Arunachal Pradesh and 74 from Mizoram state) and 289 Eri farmers (108-Assam, 40-Nagaland, 55 Meghalaya, 16 Manipur, 29 Arunachal Pradesh and 40 from Mizoram state).
- All the Collected soil samples have been processed for analysis of nutrient status.
- Analysis for pH, E C, Organic carbon, Macro (N, P, K, S) and Micro (Fe, Mn, Zn, Cu & B) nutrients for 250 collected samples has been completed.
- Analysis of remaining samples is under progress.
- Process for digitalization of Soil Health Cards is under progress. During 2016-17, 95 SHC for Morigaon district of Assam has been digitalized.
- For digitalization of SHC of different states, correspondence is being done with state nodal officers of the respective states.
- Organized “*Hands on Training: Mridaparikshak – a soil testing lab*” at the institute during 28th - 31st December, 2016 for the selected scientists and technical / field assistants of the institute.



Project code: APR-5882

Project title: Validation of Indigenous Technical Knowledge (ITK) Associated in Muga Culture

Project period: August 2016 - March 2019

Funding agency: Central Silk Board

Total project cost: Rs. 12.25 lakh

Total expenditure during the year: Rs. 0.215

Scientists involved: Sri D. Mech, Scientist - D,
Dr. (Mrs) Ranjana Das, Scientist - D,
Dr. Rajesh Kumar, Scientist - C
Sri Vijay N. Scientist - B

Objectives

1. Scientific validation of the selected ITKs associated with *muga* culture.
2. Integration of the selected effective ITKs with the modern technology packages for enhancing the production and productivity of *muga*.
3. Assessment of muga cocoon production through adoption of ITK hybridized modern technologies at farmers' field.

Summary of the findings/achievements

- The most commonly used traditional practices/indigenous technologies by the traditional farmers were identified for validations.
- Based on identified ITKs, silkworm seed production followed by rearing was conducted and performance has been evaluated for winter crop (Dec-Jan) 2016-17.
- Excellent grainage performance with shorter pupal period (21-26 days), emergence of 92% moths, higher percentage of natural coupling (93%) and higher fecundity (Av.168) has been recorded under ITK during winter season.
- Encouraging rearing performance with 92% hatching, very less incidence of disease (3%-5%), less incidence of uzi (20%-25%), production of 72 cocoons/df (36% gain over control) was recorded during winter crop.
- Production of 76 cocoons/df with no incidence of disease in case of early stage rearing conducted at Dighlati followed by late stage rearing at Som is highly encouraging

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Project Code: MOE, 5873)

Project Title: Enhancement of rural economy through technology intervention for sustainable muga culture in upper Brahmaputra Valley of Assam

Project Period: April 2016-March, 2019

Funding Agency: Department of Biotechnology, New Delhi, India

Total Budget allocation: Rs. 37.022 Lakhs

Total expenditure (during the year): Rs. 13.37 Lakhs

Scientists involved: Dr. Ranjana Das,
Sri D. Goswami,
Dr. M. Chutia
Sri.D. Mech

Objective

1. To create awareness and popularize muga cultivation among the farmers of three upper Assam District
2. To increase income and employment generation avenues among the rural youth of weaker section through adoption of SHG approach
3. To train 150 beneficiaries for upgradation of skills for sustainable employment generation through activities like rearing of muga silkworm, rearing of cocoon, marketing of cocoon, yarn, fabrics, utilization of pupae et.

Summary of the findings/achievements

The project has been initiated during the month of March, 2016. During the period, 150 nos. of beneficiary were selected from 3 districts i.e. Sivasagar, Dibrugarh and Lakhimpur of Assam for up gradation of skills for sustainable employment generation through technology intervention. Till the completion of March, 2017, 6 nos. of awareness programs (Sivasagar, Dibrugarh and Lakhimpur districts) were conducted for creating awareness among 389 nos. farmers towards expansion and development of muga culture in connection with maintenance and management of muga host plant for rearing of muga silkworm. 9 nos. of Front line Demonstration of Technology conducted to the selected 438 nos. of farmers where, all the pre cocoon improved technologies were demonstrated to the farmers from host plant management to cocooning of muga silkworm in the major sericulture villages of Sivasagar, Dibrugarh and Lakhimpur districts to meet the actual leaf yield production in muga culture.

A total of 5000 nos of improved variety of Som (*P. bombycina*) seedlings were supplied to the farmers of Sivasagar and Dibrugarh districts for gap filling in their existing farms. The result demonstration of muga silkworm technologies were demonstrated to the interested youth generation through 02 nos of Field demonstration by which the 119 nos of rural youth inspire with the muga culture. 03 nos of training were conducted covering 150 youths in each district on pre cocoon sector for sensitization and motivation of younger generation towards muga culture. A total 6313 nos. of improved disease free muga layings were supplied to 32 nos of beneficiaries for conducting muga seed crop rearing to fulfill their seed crop. A total 1604 nos. of rural youth generation sensitized towards muga cultivation. The work is being continued.



Project code: APR-5886

Project title: Improvement of Muga Cocoon yield through technology intervention and refinement of crop schedule in Terai region of W.B.

Funding Agency: Central Silk Board

Project duration: February 2017- January 2020

Project Investigators: Dr. N. Biswas, Scientist - D
Dr. S.N. Bagchi, Scientist - D
Sri S. Paliwal, Scientist - D

Objective

1. To improve the muga cocoon productivity in Terai Region of West Bengal through technology intervention and crop scheduling.

Summary of Achievement

The rearing is under progress as given below

- i) 1st Brushing w.e.f 5th May
- ii) 2nd Brushing w.e.f 11th May
- iii) 3rd Brushing w.e.f 16th May).

Rearing of 25 gm Muga dfl each during three brushing schedule w.e.f. 05.05.2017, 11.05.2017 and 16.05.2017 is under progress

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Project code: **ARP-5887**

Project title: **Isolation and characterization of lytic bacteriophages infecting bacterial pathogens of Muga silkworm *Antheraea assamensis* Helfer**

Duration: March, 2017 – February 2020

Total Budget allocation: Rs. 37.022 Lakhs

Scientist involved: Dr. M. Chutia, Scientist-C
Dr (Mrs) Ranjana Das, Scientist-D
Dr. G. Subrahmanyam, Scientist-B

Objectives

1. Isolation and characterization of bacteriophages against muga silkworm bacterial pathogens
2. Study of the phage biology and genome organization.
3. Evaluation of the potential phages cocktail against muga silkworm pathogens

Summary of achievements

The project was actually started in the last week of March 2017 only.

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Project code: **ARP 5888**

Project title: **Standardization & Popularization of Treated Bamboo Products in Ericulture (Collaboration with Rain Forest Research Institute, ICFRE, Jorhat and NABARD, Jorhat)**

Funding agency: Central Silk Board

Duration: July 2016 - June 2017

Total Budget:

Scientist involved: Dr. S.A. Ahmed, Scientist-C
Dr. M.C. Sarmah, Scientist-D
Dr. B.N. Sarkar, Scientist-C
Dr. B.K. Singh, Director

Objectives

1. To validate and standardize the existing treatment process of bamboo and products.
2. Skill Development and to develop entrepreneurship in value added bamboo products.
3. To popularize the value added treated bamboo products in Sericulture to make it for cost effective and remunerative.

Summary of achievements

A team of Scientists lead by PI visited Bamboo Resource Centre on 4th August 2016 and acquired firsthand knowledge on treatment of bamboo, fabrication of different appliances and house, etc. The bamboo treatment carried using CCB @ 8% at RFRI. Muga mountages prepared by treated bamboo were distributed to five farmers of Nagaland during Sept., 2016 and obtained encouraging results without deleterious effect.

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Project code: APR -5890

Project title: Biodiversity assessment of wild silkmths and rearing potentialities of muga (*Antheraea assamensis* Helfer) and eri silkworm (*Samia ricini* Donovan) for sustainable development in Nagaland

Funding agency: DST, New Delhi

Duration: February, 2017 - January, 2020

Total budget: 15.00 lakhs

Project Investigators: Dr. K. Neog, Scientist - D

Objective

1. Exploration of wild silk moth species. Assessment of genetic diversity based on molecular markers and hybridization with reared ones.

Summary of achievements

The project was actually started in the last week of March 2017 only.

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Project code: AIT 5876

Project Title: Establishment of Institutional Biotech Hub (Phase-II)

Duration: April 2014 – Dec., 2016

Funding agency: DBT, New Delhi

Project investigators: Dr. M. Chutia, Scientist - C

Dr. (Mrs) R. Das, Scientist - D

Objectives

1. To create basic infrastructure facility for advanced research activities in the field of biological science
2. To create awareness for basic science among the young generation through workshop, training etc.

Highlights of achievements

- ❖ A DBT sponsored workshops cum training on “Sericulture and Seri-biotechnology” was organized at the institute and 32 students were participated in the workshop.

- ❖ The workshop was attended by post graduate students, research scholars and young faculty member, delegates, including special invitees from universities and research institutes including Central Muga Eri Research & Training Institute (CMER&TI), Central Silk Board (CSB), Jorhat.
- ❖ A total of 31 participants attended the event including young faculty members, research scholars and post graduate students different institutes etc.
- ❖ Many college students have been utilizing the laboratory facilities for the completion of graduate level internship project
- ❖ Many demonstration programme have been conducted during the period from 2016-17.



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REGULAR PROGRAMME

Project code: CMERTI- RP1

Title of the project: Forecasting and forewarning for pest and diseases of muga host plants and silkworm

Project Period: Jan, 2014 – Dec., 2020

Scientist involved: Dr. (Mrs) Ranjana Das CMERTI, Lahdoigarh
Dr. M.Chutia, CMERTI, Lahdoigarh

Objectives

1. Development of forecasting and forewarning system for pests and diseases of Muga host plants and silkworm to provide timely forewarn that Muga farmers able to take disease management strategies against the host plant and silkworm diseases and pests

Summary of the findings/achievements

Pest and diseases are one of the major causes for reduction of muga production. Major foliar diseases of muga food plant som are leaf spot (*Phyllosticta perseae*), red rust, (*Cephaleuros parasiticus*), anthracnose (*Colletotrichum gloeosporioides*) and grey blight disease (*Pestalotiopsis desiminata*). In soalu, brown blight (*Colletotrichum gloeosporioides*) and grey blight (*Pestalotiopsis thea*) are the major diseases. Similarly in case of pests, the major pests are Stem borer (*Zeuzera indica*) and leaf gall (*Aspondylia spp* and *Pauropsylla beelsoni*). Uzi fly (*Exorista sorbillan / Blepharipa zebina*) is the major pest of muga silkworm. The major muga silkworm diseases are flacherie (*Bacillus thuringensis*, *Pseudomonas aeruginosa*) and muscardine (*Beauveria bassiana*). These diseases and pest causes a huge loss (10-43%) in leaf and cocoon productivity.

On the basis of data recorded during the period, forewarning calendar has been updated. Leaf spot disease in som was reported from May to November but disease intensity was less than 10 PDI. Anthracnose disease of som was recorded from May to December with more than 10% PDI during September to November. In case of Soalu, the brown blight disease was occurred throughout the season which was the highest in Upper Assam during September to November with 13.5 to 18 PDI. In Lower Assam and West Bengal, the disease occurred during September-October with more than 10 PDI. Similarly, grey blight disease was highest (more than 10%) during September-October. The leaf gall was recorded with more than 10% during April-May and September-October. The stem borer was recorded through out the year in all the localities, but during Sept-October it is the highest.

Muga silkworm fungal disease was recorded during December (less than 5% infection) and in January (5- 10% crop loss). But, it was highest during April, 2016 (more than 10%) in Upper Assam. Bacterial disease was recorded throughout the year but maximum with more than 10% crop loss was recorded during June-July and December. Viral disease was noticed during Feb-March, June –Aug and Nov-Dec only in Lower Assam.

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PILOT STUDIES

Project title: Assessment of Bio-chemical Properties and Nutritional Composition of Muga Silkworm (*A. assamensis* Helfer) Litter

Duration: September 2016 - August 2017

Investigators: Dr. Vinodakumar S. Naik, Scientist - B

Dr. (Mrs) U. Hazarika, Scientist - D

Objectives

1. To study the Bio-chemical properties and nutritional composition (Major and micronutrients) of muga silkworm litter.
2. To study the standard procedures for collection and preservation of silkworm litter.

Summary of achievements

The mean values obtained of muga silkworm excreta collected out of six crops viz., Aheirua, Bhoidia, Katia, Jarua, Chotua and Jethua for moisture percentage, dry matter, total ash, organic carbon, nitrogen, phosphoric acid, potash, calcium, magnesium, iron, manganese, zinc, copper, boron and C:N ratio are 11.21%, 88.79%, 23.10%, 23.77%, 1.22%, 0.63%, 1.03%, 0.60%, 0.53%, 0.11%, 18.99 ppm, 11.93 ppm, 5.45 ppm, 96.35 ppm and 11:1 respectively.

The moisture content of muga silkworm excreta ranged from 9.97 to 12.19%. Highest organic carbon content and C: N ratio recorded during Jethua crop 29.01 & 13:1, respectively. Primary nutrients viz., N, P₂O₅ & K₂O composition of muga silkworm litter revealed 0.89 -1.73%, 0.45 - 0.81% and 0.88 - 1.21%, respectively. The results are in harmony with the results of Ahmad *et al.* (2000) and Farhat Iqbal Qadri *et al.* (2015). Chen Yao wang (2003) reported the nutrient composition of silkworm excreta as 12.2 % moisture, 15.4% crude protein 2.6% crude fat, 19.6% crude fiber, 36.2% non-nitrogen extracts and 4.5% minerals. Secondary nutrient elements viz, Ca, Mg & Fe were recorded in muga silkworm excreta as 0.40 - 0.83%, 0.38 - 0.72% and 0.07 – 0.18% respectively). Trace elements like manganese, zinc, copper and boron were present substantially in the muga litter which ranges from 12.89 – 24.36, 7.36 – 16.71, 3.99 – 7.12 and 87.14 -110.31 ppm, respectively. The results are in accordance with the findings of Hossain *et al.* (2011) who reported the chemical analysis of silkworm excreta as 6.08% moisture, 93.92% dry matter, 24.67% ash, 1.9% ether extract, 18.74% crude protein and 13.84% crude fiber. The variation in the chemical composition of silkworm excreta may be due to the variation in feeding habit, leaf quality, season and stage of silkworm.

The study which evaluated the proximate composition of the muga silkworm rearing waste (excreta/ litter) has explored the practical possibility of incorporation of excreta in to recycling of organic wastes in the soil as an organic manure source to maintain optimal level

of soil organic matter. Thus the proper utilization of major waste products of muga-culture industry can reduce the input cost on synthetic fertilizers and purchased organic manures. Application of muga silkworm litter improves soil physico-chemical, biological conditions and fertility status and at the same time it supplies major, minor nutrients and trace elements to the host plants.

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Project title: Effect of liquid organic manures on quantitative & qualitative parameters of castor (*Ricinus communis* Linn.) leaves towards sustainable Eri cocoon production

Duration: September 2016 - August 2017

Investigators: Dr. Vinodakumar S. Naik, Scientist - B
Dr. (Mrs) U. Hazarika, Scientist - D

Summary of achievements

Liquid organic manures (Panchagavya, Jeevamruth, Beejamrut and New Mixture) were prepared as per the standard protocols and fermentation methods. Analysis of Nutrient status of different organic liquid manures was done. Soil and foliar application of liquid organic manures to the host plant at various stages of castor plant was carried out and growth and yield attributes were recorded.

Soil chemical analysis (Before and after intervention)

Results reveals that, application of foliar and soil application of above Liquid organic manures (Panchagavya, Jeevamruth, Beejamrut and New Mixture) were beneficial for leaf growth, yield and quality parameters of the castor plant

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Project title: Formulation of Artificial food/Semi-synthetic diet for rearing of Muga silkworm, *Antheraea assamensis* Helfer

Project Period: 2015-16

Scientists involved: Dr. T. James Keisa, Scientist - C
Sri D. Goswami, Scientist - D,
Dr. R. Kumar, Scientist - C,
Dr. Subadas Singh, Scientist - B,

Objective:

1. Formulation and standardization of artificial food/diet for Muga silkworm rearing.

Summary of the findings/achievements

Experiment – I: Preparations of various ingredient combinations of artificial diet. Five different combinations of various ingredients along with leaf powders of Som (DSm-1 to DSm-5) and Soalu (DSI-1 to DSI-5) were prepared.

Experiment - II: Studies on the rearing performance of young age muga on artificial food/diet. 50 numbers each of newly hatched worms were brushed on the freshly prepared diets in perforated lid plastic (11x9.5cm) container in laboratory conditions up to 2nd/3rd

instars and the worms will be transferred to outdoor on natural host plant. Moulting period was delayed in first and second moult when compared to control and changes of ingredient quantities will be made as per suitability of intake by the worms. It was observed that the newly hatched worms were not easily attracted to diet compare to control. Necessary datas were observed along with control.



IMPORTANT EVENTS

World Environment Day 2016 at CMER&TI, Lahdoigarh

The institute celebrated World Environment Day 2016 with a three days long programme on 3-5th June 2016 with different activities and programmes under the new established **Silk Board Nature Club** of CMER&TI, Lagdoigarh. The event was held with massive plantation (10,000 seedlings) in its farms, Germ Plasm Conservation Centre, Quarter Complex, Field Laboratory, Titabor, Schools and by organizing environmental related quiz and extempore speech competition among the scientists and staff.



On this occasion, the institute started its activity a week before and visited nearby schools, colleges and social organizations to create awareness about the environmental conservation and the significance of the World Environment Day. The institute made the concrete efforts among the public, school students about the need of environmental conservation and plantation of the tree as much as possible. Seedlings were distributed among the schools and other organizations for plantation during the celebration of the event. Besides these, necessary information and guidance were also given to them to maintain precious seedlings of Sericulture, horticulture and agricultural crops.

The main event was organized by the Silk Board Nature Club, CMER&TI, Lahdoigarh at the conference hall of the institute on 4th June 2016 in presence of Director, all the scientists and staff of the institute including media and press people. Dr. BK Singh, Director of the institute delivered lecture on World Environment Day and Dr. M. Chutia, Secretary of the Club explained about the club and its objectives. Dr. Singh in his talk on the day critically pointed out many tips of our day to day life linked to the environmental conservation. Dr. Ranjana Das, President of the Club also spoke on the environmental problems and its impact on the living beings.



In the afternoon programme on 4th June 2016, Dr. R.S.C. Jayaraj, IFS, Director of Rain Forest Research Institute, Jorhat attended as Chief Guest and also delivered a talk on the environmental problems, present situations and how to reduce the environmental degradation. Dr. Jayaraj also planted a seedling at the institute campus along with the Director CMER&TI, Lahdoigarh. Later, he also visited the institute's insect repository and other sections with the Director and Scientists of the institute.

In connection with the World Environment Day and as per instruction of the Member Secretary, Central Silk Board, Bangalore the major important plants of the main institute, all

farm and Germ Plasm Conservation Centre, Chenijan and also Quarter Complex have been identified and planned for preparing the name plates. In the 1st round, 25 name plates were made and displayed in the plants of the main campus. The trend was continued and completed for all the important plants of farms, GCC, Chenijan and Quarter Complex.

An awareness rally was also organised by the Scientists and Staff with displaying placards and slogans starting from the institute and walked through the village roadsides.



In the morning and evening session, massive plantations were done in the institute farms, campuses and units by all the staff of the institute. The programme of the World Environment Day 2016 was ended with the massive plantation at Field Laboratory, Titabar. Director, Scientists of the Institute and all the staff of the unit actively took part in the event.

Establishment Day of CMER&TI, Lahdoigarh

Central Muga Eri Research & Training Institute a premier R&D institute of Central Silk Board located at Lahdoigarh, Jorhat had organized its 17th Establishment Day on 30th September, 2016 at the institute premises. The day was organized by hoisting of CMER&TI flag by Dr. B. K. Singh, Director of the institute. An exhibition was also organized on the occasion displaying different technologies developed by the institute along with diversified fabrics of Muga and Eri. Farmers from Borhola, Borpathar and BTC participated in the exhibition and displayed their products. The exhibition was inaugurated by Hon'ble Minister of Sericulture, Handloom & Textiles Shri Ranjit Dutta. He was very much impressed observing the exhibits and products and appreciated the efforts of the Institute.



Hon'ble Minister of Sericulture, Handloom & Textiles Shri Ranjit Dutta participated in the inaugural session as "Chief Guest". Dr. B.K. Singh, Director of the institute delivered welcome address and felicitated all the dignitaries. The session was inaugurated by an invocation and lighting of lamp. Smt. Renupama Rajkhowa, Hon'ble MLA Teok graced the occasion as "Guest of Honour".



In his inaugural speech, the Hon'ble Minister expressed his extreme happiness and praised the Director, Scientists and Staff of the Institute for successfully organizing the programme in a befitting manner. He also appreciated the R&D efforts of CMERTI and highlighted that average yield 12 kg eri cocoon per 100 dfls in the newly developed C-2 breed against 7-8 kg per 100 dfls in other local race is an excellent achievement and will be a boon to Eri farmers of the state as well as the country. He also expressed that more than 2.5 lakh people are associated in sericulture in Assam and productivity has increased significantly in last decades in both muga and eri due to dissemination of R&D findings.

He also appealed State Sericulture officials to help and cooperate with CSB organization in extension programme. He also expressed on development in sericulture in BTC due to their hard work and suggested that CSB and DoS, Assam to put combined efforts for development of sericulture in the state and the region. Dr. B.K. Singh, Director of the institute presented the technologies developed by the institute through audio visual aid. Dr. R. Chakravorty, Retired Director spoke on chronological development of the institute. He stressed on development of disease tolerant Muga and suggested for collaboration with IIT, Guwahati for post cocoon sector.



Dr. S. K. Sen, Retired Director spoke on new development in R&D sector of Muga and Eri. Dr. T.C. Borah Retired Senior Scientist of NEIST, Jorhat expressed that besides R&D more focus should be given on extension programme also and stressed that product diversification and sustainable societal development should be taken up priority areas. Besides, retired scientists, officers and staff along with scientists from different units of CSB also took part in the event and everybody was felicitated by the organizer.

An award distribution ceremony was also conducted on the occasion, where successful farm workers, sincere technical staff and scientists and staff of Central Silk Board were awarded. Nos. of books, leaflets and technical brochures were also released on the occasion.

Besides releasing C-2 breed of Eri by the Hon'ble Minister, various seedlings/Seeds of Muga and Eri food plants were distributed among the progressive farmers. On the occasion Muga and Eri host plants were planted by the Minister and MLA.

Vanya Reshom Krishimela

Vanya Reshom Krishimela, of CMERTI, Lahdoigarh was organized on 11th January 2017 at CMERTI, Lahdoigarh main institute campus. Above thousand sericulture farmers including participants from NGOs, SHGs, DOS staff and Entrepreneurs from different districts of Assam viz, Sivasagar, Dibrugarh, Golaghat, Jorhat and BTC participated in the event.



On the occasion, exhibition was also organized on different technologies on pre and post cocoon sector evolved by the institute along with displaying of diversified products. Several Entrepreneurs and members of SHGs participated in the exhibition and displayed

their products. All dignitaries and farmers were impressed on the innovations of the new technologies, products etc. developed by the institute as well as SHGs.

Different press and media persons also participated on the occasions. Technical sessions were organized and the scientists presented and demonstrated about different improved technologies both in muga and eri sector through audiovisual aids. Fruitful interaction took place between farmers and the scientists. Feed back of Vanya Reshom Krishimela was also collected from the farmers in prescribed format.



Krishimela at REC, Lakhimpur

The Vanya Reshom Krishimela of REC, Lakhimpur was organized at Jalbhari Gramya Kriya Prakalpa, Dhakuakhana in Lakhimpur district of Assam on 14th February 2017. More than 500 muga and eri farmers and 100 DoS staffs of Lakhimpur and Dhemaji districts of Assam were participated in the Krishimela. An exhibition on recent technologies of muga and eri was also arranged on the occasion in coordination with CMER&TI, Lahdoigarh. Dr B.K. Singh, Director, CMER&TI, Lahdoigarh, Shri Debojit Bora (ACS), Assistant Commissioner, Dhakuakhana Sub-Division, Dr. I. Borgohain, Lecturer, Dhakuakhana College, Shri Hem Borah, President of SERIFED (NGO) and Shri A. Pathak, ADS, Lakhimpur were participated as guests and delivered their precious suggestions and experiences for development of muga as well as eri culture in a effective way.



In the Technical Session, *“Improved technology package muga culture”* and *“Improved technology package eri culture”* were demonstrated through multimedia projector by Shri D. Goswami, Scientist-D and Dr. B.N. Sarkar, Scientist-C of CMER&TI, Lahdoigarh respectively. In addition to demonstration of technologies, the farmers were provided with technological pamphlets of muga and eri published by CMER&TI, Lahdoigarh. After demonstration of technologies, a fruitful interaction session between scientists of the institute and farmers was held. Various problems viz, scarcity of muga seeds on time, non-hatching of dfls, incidence of pest and diseases of silkworms, etc being faced by the farmers were discussed and necessary remedial measures were suggested during the session.



Organization of National Seminar

Central Muga Eri Research & Training Institute (CMER&TI), Lahdoigarh, Jorhat jointly with the Directorate of Sericulture, Bodoland Territorial Council (BTC) organized a National Seminar on “Economic Insects of NE India:



Thrust on Recent Advances in Vanya Silks” at Kokrajhar Science College Auditorium on 21st -22nd February, 2017. More than 270 sericulturists including participants from Directorate of Sericulture, BTC, Scientists from CMER&TI, Lahdoigarh and its nested units and farmers from different areas of Assam and Boroland, Kokrajhar.

The Inagural session was graced by Shri Kampa Borgoyary, Deputy Chief, BTC; Shri Deben Boro, Executive Member, BTC; Shri Jogesh Deori, Director of Sericulture, BTC; Shri S. Deori, Joint Secretary (Tech), RO, CSB, Guwahati and Shri Tridip Doimary, Hon'ble Speaker, BTC, LA.

In the Technical sessions, Prof. L.K. Hazarika, Deptt. of Entomology & Dean, College of Sericulture, AAU, Jorhat; Prof. B. Konwar, Tezpur University; Dr. B. Saratchandra, Retd. Director (Tech), CSB; Dr. Nirmal Kumar, Director (Retd.), CSB; Dr. T.C. Borah, Retd. Chief Scientist, NEIST, Jorhat; Prof. K. Goswami, IIT, Kharagpur and Prof. Utpal Bora, IIT, Guwahati took active part for successful completion of the event.



DBT sponsored Workshop-cum-training Programmes

A three-days DBT sponsored National Workshop – cum - Training Programme on “Sericulture and Seri-Biotechnology” was organized for graduate, post graduate students and research scholars during 28 - 30th March 2017 at Central Muga Eri Research & Training Institute, Lahdoigarh. A total of 32 participants attended in the event. Dr. B.K. Singh, Director, CMER&TI, Lahdoigarh and Dr. K. Das, retired Scientist of Central Silk Board graced the inaugural session of the programme as Chief and Special Guests and interacted with the participants.



In the inaugural session, Dr. M. Chutia, Organizing Secretary of the workshop briefed about the event at the very beginning. Dr. Ranjana Das highlighted the main objectives and recent developments in Seri-biotechnology sector and importance of hands on training on basic techniques related to Sericulture and Seri-biotechnology. Dr. B.K. Singh, Director (CMER&TI) explained in brief about the activities of the institute, research areas and facilities together with its mandate areas. CMER&TI is the only institute in the country doing research and developmental activities in the field of Muga and Eri silkworm. He expressed the role of Central Silk Board especially CMER&TI, Lahdoigarh in sericulture sector and highlighted its new technologies which are presently being disseminated to the farmers for higher silk recovery.



The scientists of CMER&TI, Lahdoigarh delivered lectures on different aspects of Muga and Eri culture in the workshop. The participants were also informed about the available facilities at CMER&TI and the provision of subsidies to procure reeling machines, procuring dfls and seedlings of host plants etc. Laboratory experiments, field demonstration and visits to the Insect Repository, Grainage Operation and Museum were arranged for the participants. The trainees were exposed to firsthand experience on modern tools that can be adopted for their research programmes.

Valedictory Session was held on the last day of the event. Certificates to participations were distributed by the Director, CMER&TI. Further, three best participants were selected.

Blood Donation Camp

On the occasion of National Voluntary Blood Donation Day, the Institute had organized a Voluntary Blood Donation Camp successfully at its office premises in association with



Jorhat Medical College on 01.10.2016. All the employees of CMER&TI, Lahdoigarh, and GEC, Chenijan Farm came forward in the Camp and after a thorough medical check-up by the Doctors; many employees of this institute have donated their blood voluntarily.

EXTENSION EVENTS

Swacch Bharat Campaign

Central Muga Eri Research & Training Institute (CME&TI), Lahdoigarh, Jorhat organized Swacch Bharat Campaign on the occasion of World AIDS Day 2016 on 1st December, 2016 in a befitting manner at different places of Mariani Block of Jorhat district with active support from District Administrations, NGOs, SHGs and all other stakeholders.

Various organizations/Schools/public locations were covered during the programme for different activities during Swacch Bharat Campaign for ensuring inclusive development including health, hygiene, drinking water facilities and quality education. The sanitation measures were undertaken through application of bleaching powder in the water drainage system. Further, two dustbins (each with 80 L capacity) were provided to each of the locations. The branded radio (Philips) was distributed elderly persons of the area to listen the programme *Mann Ki Baat* of Honourable Prime Minister and Krishi/ Sericulture programmes broadcasted by All India Radio. The traditional Assamese *Mekhela Chadors* were distributed to the poorest of the poor sericulture women farmers of the village. Kesseru and Som seedlings were also distributed to the sericulture farmers.



Jungle Block High School, Mariani

The area was located in the foothills area of Nagaland. The programme was started with the cleaning and disinfection of the campus of the “Jungle Block High School” under cleanliness drive and planted Som seedlings (Muga silkworm host plant) in the school premises. All the teachers and students also cooperated with us in this mission. An awareness talk on World AIDS day was delivered by Dr. Ranjini M.S., Scientist-B and dustbins, disinfectant, books etc. were distributed to school authority to maintain the hygienic condition. Demonstration on vermicomposting were given to the school authorities and students and provided a low cost vermicomposting pit along with the earthworms (*Eisenia foetida*) for their practices.



Gotonga Sonapur School, Mariani

Similar programme was also organized at Gotonga Sonapur School, Mariani in the morning session. The programme was started with the cleaning and disinfection of the campus and planting of Som seedlings (Muga silkworm host plant) in the school premises.

All the teachers and students also participated with us in this mission. Dustbins, disinfectant, books, booklets etc. were distributed to school authority to maintain the hygienic condition.

Distribution of seedlings and plantation programme

The programme was followed by systematic plantation of 200 lesseru seedlings by the scientists and staffs of the institute in 2 bighas of land belong to a progressive eri farmer Smt. Jayanti Bora, Mariani.



Nagajanka PHC, Mariani

On the day, one more Swaccha Bharat Abhiyan campaign was conducted by the institute in the Nagajanka PHC and distributed bleaching powder, lime and other disinfectant materials to Nagajanka PHC officials. Dr. Indu Saikia, Senior Health Officer of the PHC acknowledged the effort made by this institute and delivered speech on World Aids Day.

Awareness on Vermicomposting

In this connection, low cost vermicompost pits (5 nos) were also distributed and demonstrated by Dr. Urmimala Hazarika, Scientist-D of the institute to the farmers of the areas.

Awareness meeting at Mariani MS Public auditorium

In the afternoon on the day, an awareness meeting was organized in Mariani public auditorium where the local MLA Mr. Rupjyoti Kurmi; Ms. Kirthy Jolly, IAS, SDO, Titabar; Dr. Selim Ali, Jorhat Medical College and Dr. B.K. Singh, Director, CMER&TI, Lahdoigarh addressed the farmers present in the meeting as special guests. Dr. B. K. Singh highlighted the objectives and different activities for achieving the goal of Swacch Bharat Abhiyan till 2019 and emphasized all stakeholders, Government and NGO agencies to actively participate in the programme to the greater cause of the society and to fulfil the dream of Father of the Nation Mahatma Gandhi. Ms. Kirthy Jolly, IAS has informed the farmers that they are going to establish a hub for entrepreneurship and marketing of eri and muga silk product shortly in Titabar area. She also suggested them to work hard as sericulture activity can come up as sustainable source of livelihood. Dr. Selim Ali a renowned medical officer of Jorhat district delivered a special talk to make aware the participants on World AIDS day in a simpler way.

During the meeting altogether 16 eri spinning machines developed by CSB were distributed among the progressive eri farmers of the locality in Govt. subsidized rate. Further, muga and eri food plant seedlings, sarees and radios were also distributed among the poor sericulturists of the area to attract the people towards sericulture. Sri Diganta Gogoi, a local youth of the area was appreciated for his silent contribution towards the upliftment of the sericulture activities of this area.

Seri Model Village Programme

Muga and eri culture is a traditional and age old practice and sustaining amidst the rural populace. In the recent past, various technologies were recommended for enhancing production in muga and eri culture. Keeping in view of the above, CMER&TI, Lahdoigarh has adopted 4 muga and 4 eri Seri Model Villages covering 100 beneficiaries in each village and

one PCT village covering 62 beneficiaries during XII Plan for disseminating the integrated technology package to the farmers' field through demonstration, organization of awareness programme, field day, training, etc.

Further, need based critical items also arranged for providing to the beneficiaries for encouraging to quick adoption of technologies. Adoption of technologies is found encouraging in all the SMV. Cumulative impact assessment from the rearing performance of 2014-15 and 2015-16 revealed that level of cocoon production has enhanced by 21.2 % in seed crop and 26.5 % in commercial crops in Muga SMVs. Similarly, cocoon production is enhanced by 30-40.0% in Eri SMVs.

Improvement of cocoon production, also resulting enhancement of raw silk production and higher income generation among the farmers covered under SMVs. Further, implementing the Eri PCT SMV in last two years, it has recorded that the traditional method of eri spinning (Taki) has shifted to Pedal cum Motorized eri spinning machines among 62 beneficiaries covered under the SMV. Adopting the improved eri spinning technology by the beneficiaries, production of eri spun yarn has increased up to 100-120 gm from the benchmark production of 50-60 gm per day per person. Similarly, annual income of the beneficiaries from eri post cocoon activities has been increased up to Rs. 20,000/- to 40,000/- against the benchmark Rs. 6,000/- to 22,000/- per annum.



Establishment of Sericulture Resource Centre (SRC)

Sericulture Resource Centre (SRC) is a new initiative of Central Silk Board under CBT which is proposed to be continued for the remaining period of XII Plan with revised unit cost of Rs.3.50 lakhs each. The units are established to act as an important link between Extension Centres of the institute and the beneficiaries. The purpose of these SRCs is – technology demonstration, skill enhancement, one-stop shop for Seri-inputs, doubt clarification and problem resolution at cluster level itself. SRCs are managed by handpicked lead/elite farmers or any 'not for profit' organizations, Seri-Societies etc for the benefit of cluster farmers' sericulturist.

A total of 8 SRCs were established till date by the institute with a unit cost of Rs.3.50 lakhs, out of which, Rs.3.00 lakh (Capital) has been earmarked for meeting one-time expenditure of construction of Training shed (300 sq



ft) and procurement of training /demo equipments viz. TV, projector, black board, basic furniture etc and Rs.0.50 lakh (Revenue) for meeting recurring and miscellaneous expenditure for conducting training. These SRCs would be mandated to conduct at least 12 training /demo sessions every year.

World Health Day

On the occasion of World Health Day, a health and wellness programme was organised by CMERTI, Lahdoigarh at its premises on 07.04.2017 from 9.30 AM onwards. All the Scientists, Administrative Staff, Field workers and Sericulture farmers from nearby villages participated in the programme. Dr. Salim A. Ahmed, Sr. Medical Officer along with medical team from District Primary Health Centre, Salmora, Jorhat participated in the programme. Dr. Salim Ahmed explained in detail about the importance of health, hygiene and sanitation. A general health checkup of 58 persons including Scientists, staff, Field workers and local sericulture farmers was conducted by the medical team including prescribing medicines for needy staff. Dr. B.K. Singh, Director of the Institute distributed First Aid Kit boxes to 8 progressive sericulture farmers of nearby villages on the occasion.



OTHER IMPORTANT ACTIVITIES OF THE INSTITUTE

Issue of the Soil Health Cards to the sericulture farmers

So far 604 soil samples have been collected from Assam and Nagaland districts. Processing of all the collected soil samples has been completed.



Analysis of pH, EC, Organic carbon, Macro (N, P, K, S) and Micro (Fe, Mn, Zn, Cu & B) nutrients for 350 samples have been completed. Fertilizer recommendation, preparation and distribution of Soil Health Cards are in progress.

Grainage Building & Activities

New grainage building measuring 357.40 sq.m (3845.62 sq.ft) constructed at a cost of Rs.71.38 lakh was inaugurated on 11th January 2017 by Smt. Renupama Rajkhowa, Hon'ble MLA Teok, Jorhat Assam. New grainage building fully equipped with latest equipments / implements have made to full use for strict microscopic examination of individual mother moth through Fujiwara technique to ensure 100 % pebrine free. So far 12,550 basic muga dfls have been produced and supplied to different agencies including MSSO, DOS, Assam, Arunachal Pradesh, West Bengal and progressive Muga rearers of Assam.



Grainage activities in progress in new Grainage building

Installation of Cold storage facility

DX type cold storage with 45 KVA DG set and Generator shed has been installed at CMERTI, Lahdoigarh, after a long gap at a total cost of Rs 80.00 lakhs. Cold storage will be put to use for preservation of muga and Eri seeds under different experimental purposes.



Newly installed Cold storage unit

Construction of boundary walls at Farm No 2

90 % of constructions of boundary walls at Farm No 2 of CMERTI, Lahdoigarh measuring a length of 1748 meter with 1.80 meter height have been completed at a total cost of Rs 1.44 crores. Construction of boundary wall of Farm No 1 is also in progress.



Boundary wall of Farm No 2

Prime Minister's Mann Ki Baat

The regular program "Mann Ki Baat" of Hon'ble Prime Minister of India 'Shri Narendra Modi, becomes a very popular Radio program among all sectors of people of India. Even the villagers hardly miss to listen the program on that particular day to clarify their queries on different topics and also on the changing economic pattern of the country. Through this program Hon'ble Prime Minister had tried to explain some complex issues of the common people in a very simple and convincing way citing examples.



Central Muga Eri Research & Training Institute, Central Silk Board, Lahdoigarh, Jorhat, Assam had distributed a few numbers of 'radio handsets' among the selected Sericulture farmers of Muga and Eri growing areas of Golaghat district of Upper Assam with

an objective to keep themselves up to date with the developing process of the country through regional and national news on Sericulture related programs and some other effective programs.

On 27th November 2016, a survey was conducted by a team of employees of this institute to assess the impact of the said program on the villagers and farmers of Muga & Eri growing areas of Golaghat district of Upper Assam.

Publicity - Phone in Live TV programme

The scientists of the institute are associated with a number of programme through different print and audio visual media for popularization of its technology and activities of sericulture as a whole.



A Phone in Live TV programme was broadcasted in 10 episodes encompassing proven and adoptable pre and post cocoon technologies of Muga and Eri through Dordarshan NE under the Programme Production Centre (NE) in Assamese, English and Hindi during December 2016 to February 2017 without any interruption under Society Welfare Scheme of Central Silk Board, Govt. of India. The list of the phone in Live TV programmes are given below-



Phone in Live from PPC (NE)

#	Topic of Script	Name of scientists	Date for live telecast
1	Technology for early and late stage rearing of Muga silkworm	Sri Dulal Goswami, Sc-D Sri B. Chaudhury, Sc-D & Head, MSSO, Guwahati Dr. B.K. Singh, Director, CMER&TI, Lahdogarh	23.12.2016
2	Pest and Disease management technologies of	Dr. Panjana Das, Sc-D Sri B. Chaudhury, Sc-D & Head, MSSO,	30.12.2016

	Muga host plants	Guwahati	
3	Agronomical practices for raising nursery, plantation and maintenance of eri host plants	Dr. M.C.Samah, Sc.-D Sri B.B.Singha, Sc-D, ESSPC, Azara	06.01.2017
4	Improved Eri silkworm breed-C2 and its impact at farmers level	Dr. S. A. Ahmed, Sc-C Dr. B.K.Singh, Director, CMER&TI, Lahdoigarh Sri B.B.Singha, Sc-D, ESSPC, Azara	13.01.2017
5	Technology for early and late stage rearing of Eri silkworm	Dr. B. N.Sarkar, Sc-C Sri B.B. Singha, Sc-D, ESSPC, Azara	20.01.2017
6	Pest and Disease management technologies of Muga silkworm	Dr. B.K.Singh, Director, CMER&TI, Lahdoigarh Dr. K. Neog, Sc.-D Dr. R. Kumar, Sc-C	27.01.2017
7	Improved technologies on production of muga and eri silkworm seeds	Dr. B.K.Singh, Director, CMER&TI, Lahdoigarh Sr. B. Choudhury, Sc-D	03.02.2017
8	Agronomical practices for raising nursery, plantation and maintenance of muga host plants	Dr. U. Hazarika, Sc-D Dr. Ranjana Das, Sc-D	10.02.2017
9	Eri cocoon spinning technologies, Product diversification and value addition	Mrs. Ranuma Das, Sc-D Mr. Soni V K Ram das, Sc-C RSTRS, Khanapara	17.02.2017
10	Muga cocoon reeling, Product diversification and value addition	Mrs. Ranuma Das, Sc-D Mr. Soni V K Ram das, Sc-C RSTRS, Khanapara Mr. A. K. Pal, Sc- C, RSTRS, Khanapara	24.02.2017

Special Sericulture cum UPI Awareness Programme

CMER&TI, Lahdoigarh and its nested units organized Awareness camps among the employees of the institute, farmers to sensitize them about UPI for promotion of digital payment through Unified Payments Interface. A total of **52507** beneficiaries were covered till March 2017'



RECOGNITION AND AWRARDS

ISO 9001:2015 certificate to the institute

The quality management system of CMER & TI has been assessed and found to be in competence with the requirement of the standard ISO 9001: 2015 from the ISO 9001:2008 for the following scope: Rendering research, Development, Technical, Technological, Innovative Trading, Extension and Service Support to Silk Industry.



Awards received by CMERTI Scientists

1. Dr. B. K. Singh, Director, CMER&TI received Dr. Lefroy Medal from Zoological Society of India, in 28th All India Congress of Zoology, (AICZ) at Davangere, Karnataka on 20th – 22nd October 2016.
2. Dr. S. A. Ahmed, Scientist-C of CMER&TI received Madhavi Shyam Medal from Zoological Society of India, in 28th All India Congress of Zoology, (AICZ) at Davangere, Karnataka on 20th – 22nd October 2016.
3. Dr. K. Neog, Scientist-D received Best Scientist Award from Central SilkBoard on the occasion of Launch of Indigenous Automatic Silk Reeling Machine, Inauguration of Centre of Excellence for Training and CSB award Function held on 20th December, 2016 at CSB, Bengaluru.
4. Dr. G. Subrahmanya received best poster presentation award (Second prize) for his paper "Advanced molecular methods in the diagnosis of microbial pathogens of *Antheraea assamensis* Helfer" in the "National Symposium on Molecular Insect Science" held at Department of Entomology, Assam Agricultural University, Jorhat, during 6-8th Feb 2017.

INTERNATIONAL VISIT

1. Dr. B.K. Singh, Director visited and participated in the 24th International Congress on Sericulture and Silk Industry held during 10-13th August 2016 in Bangkok, Thailand and presented Research Paper.
2. Dr. Rajesh Kumar visited State Key Laboratory of Silkworm Genome Biology, Southwest University, Chongqing, China from 11.09.2016 to 18.09.2016. delivered a Lecture about the "Diversity and conservation of WildSilk Moths in North East India – a biodiversity hotspot"
3. Dr.K.Neog, Scientist-D, visited Japan and attended Training Programme on Micro-injection Technique for genetic transformation of Eri silkworm through CRISPR-CAS-9 technology at the University of Tokyo, Japan during 06.03.2017 to 10.03.2017.



Visit of Dignitaries & Guest Lecture

Distinguished visitors

- 1) Prof Kazuei Mita (Formerly with NIAS Tsukuba, Japan) and his student Ms Jianqiu Liu visited the institute on 25th March, 2017. Prof. Mita delivered a talk on the topic: "Genomic adaptation of Noctuidae to Polyphagy, pesticides and wide distribution in East Asia".
- 2) A team of Experts, Prof. P.J. Handique, Biotechnology Deptt, G.U., Prof. S.K. Borthakur, Botany Deptt., GU and Dr. G. Khataniar, Academic Registrar, GU visited Central Muga Eri Research & Training Institute, Lahdoigarh, Jorhat for renewal of recognition of Ph.D. level Research Laboratory in the institute on 14th February, 2017.
- 3) Dr. Mrinal Saikia, Principal Scientist (Agronomy), Directorate of Research (Agri), AAU, Jorhat delivered a talk on "Organic Farming: Basic Steps and Registration" On 28th April, 2016.
- 4) Dr. R.S.C. Jayaraj, IFS, Director of Rain Forest Research Institute, Jorhat delivered a talk on "Environmental problems, present situations and measure to address the existing environmental problems" on 4th June 2016
- 5) Dr. Utpal Barman, Associate Professor, Department of Extension Education, Assam Agricultural University, Jorhat delivered a lecture on the topic "Training Designing and Management as well as Extension Methods and Tools" on 24th June, 2016 during training programmes organized at the institute to the field level Extension Officials of Sericulture Department, Govt. of Nagaland.
- 6) Guest lecture delivered by Dr. Toru Shimada, Professor, Deptt. of Agriculture and Environmental Biology, University of Tokyo, Japan on 9th February, 2017 on the following topics:
 - 1) Transgenesis in muga and eri
 - 2) Bombyx mori and nucleopolyhedroviruses

EXTENSION AND TRAINING ACTIVITIES

Extension Activities

For dissemination of technologies in muga and eri culture, 4 muga and 4 eri SMV with 100 beneficiaries in each SMV and one PCT SMV covering 62 beneficiaries were implemented during 2015-16. Improvement was noticed in respect of cocoon production, raw silk production and income generation among the farmers. Cumulative impact assessment from the rearing performance during 2016-17, revealed that level of cocoon production is enhanced by 28.0 % in Muga SMV and 40.8% in Eri SMVs.



Under Transfer of Technology (TOT) programme on Integrated Technology Package of muga culture, 508 farmers were covered. Demonstration programmes on integrated technology package of muga culture and on job practical training at the field of Lead farmers in 4 different muga FFS were conducted. Impact assessment result showed that adopting the latest technologies by the farmers, average muga cocoon yield was increased from 50 to 61 cocoons per dfl.

300 farmers were covered in the demonstration programmes on Integrated Technology Package of eri culture and on job practical training at the field of Lead farmers in 3 different eri FFS. Impact assessment result showed that adopting the latest technologies by the farmers, average eri cocoon (shell) yield was increased from 7.5 kg to 9.50 kg per 100 dfls.



A total of 4143 farmers were sensitized with the technologies developed by the institute on muga and eri culture through implementation of Seri Model villages and different training programmes organized at the institute.

Organization of Exhibitions

Central Muga Eri Research & Training Institute, Lahdoigarh, Jorhat, Assam organized a day long exhibition programme at Regional Agricultural Research Station, Titabor, Assam on November 10, 2016. Improved technologies of muga and eri host plant cultivation and their management, muga and eri silkworm rearing, muga reeling and eri spinning and different diversified products of muga and eri were attractively displayed in the exhibition. Sri N.M S. Deka, Honble' Minister of Agriculture in Assam, Dr. K.M Bujorbaruah, Honble' Vice Chancellor, AAU, Jorhat, Assam and more than 1000 farmers were visited the exhibition stall to see and learn different technologies of muga and eri culture.



Many of the farmers and youth groups from different parts of Assam were found to show their keen interest to take up muga and eri culture newly with the technologies after visit the exhibition stall. Sri D. Goswami, Sri D. Mech, Scientist-C and Sri SA Ahmed, Scientist –C of CMER&TI, Lahdoigarh actively took part for demonstration the technologies displayed in exhibition invited by RARS, Titabar on the occasion of its Farmer's day.



Institute also participated in different exhibitions organized by other institute/ organization time to time (e.g. Bahona College, Jorhat; Dibrugarh University, Dibrugarh etc)

Technology Awareness Programmes

A Technology Awareness programme on eri culture was organized at Adhalkotia, Titabar on 12.08.2016 in coordination with Bharatiya Janata Yuva Morcha (BJYM) Titabar. More than 120 persons including the member of BJYM were participated in the programme.

At the outset of the programme, Sri D. Mech, Sc-D highlighted about the importance of eri culture, recent technology development in eri culture, role of CMER&TI, Lahdoigarh for popularization of the technologies among the farmers, etc. and appealed all the farmers to come forward and take benefit of new technologies. He also suggested the farmers to contact with the scientists over phone and visit the Institute, if they are facing any kind of technological problems related to the eri culture.

Sri D. Goswami, Sc-D highlighted the overall scenario of sericulture industry in the country and its economic importance especially in eri culture. He also called upon the farmers to involve themselves in sericulture for economic up-liftment of the family as well as the society.

During the programme, Dr. B.N. Sarkar, Sc-C demonstrated about the improved technologies of raising and maintenance of different types of eri food plant, eri silkworm rearing, seed production, importance of disinfection, management of pest and diseases of silkworms, etc. using multimedia projector. He also explained the economics of eri culture and present market feasibility of both eri cocoons and eri pupae. Dr. D.K. Gogoi, Sc-C showed and explained about the product diversification of eri and their demand in the present market. He appealed the farmers to come forward towards eri culture and assured the farmers to provide the possible support from the Institute for development of eri culture in the area.



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Appreciating the programme, Sri Rajib Dutta, member of BJYM, Titabar Mondal informed that Adhalkotia area is a highly potential area for eri culture, but due to scarcity of food plants the people cannot take it as commercial venture. He requested the farmers to raise the sufficient plantation for taking the eri culture in commercial way. He also requested the farmers to adopt the improved technologies of eri culture for higher yield and higher return. Some of the eri farmers also shared their experience and expressed their happiness

for organizing such events on eri culture. Different problems facing by the eri rearers are also discussed and provided suitable suggestions to resolve the problems.

As such, Technology Awareness programmes on both Muga and Eri culture were organized at the different Muga and Eri growing regions of the country. The programmes were organized in association with the State Sericulture Departments. Awareness programmes on improved technologies involved in Muga and Eri culture starting from systematic plantation of host plants, improved silkworm rearing technology and post cocoon technology etc were organized. An average 100 farmers are covered in each awareness programme. A total of 22 such programmes were organized during 2016-17.



Technology Demonstrations

CME&TI conducted technology demonstration programme on different Technologies developed by the institute.

A Demonstration cum trial of Eri egg preservation technology was organized at Director of Sericulture, Aizawl, Mizoram on 18th July 2016. Director and Joint Director from Directorate of Sericulture, Mizoram, Dr. L. Pauchou, Scientist - C of REC, Aizawl and all the district officers of Sericulture, Mizoram took part in the Demonstration cum trial programme Eri egg preservation technology. Sri Lalrinmawia, DOS, Mizoram inaugurate the training programme and explain overall objective and impact and necessity of the Demonstration cum trial of Eri egg preservation technology. A total of 30 beneficiaries participated in the programme.

Dr. B.N. Sarkar, Sc-C explained overall impact Eri egg preservation technology. He explained that among the constraints identified in eri culture, the eri seed production and supply is the most crucial aspect which is considered as bottleneck in augmenting eri raw silk production in our country. To fulfill the heavy demand for eri dfls a well developed preservation technique is the need of the hour. Eri silkworm egg preservation technology is essential to skip the hazardous climatic



condition and also to systematize the eri seed production and supply system. In this regards, it is required to study certain important parameters of eri silkworm like different stages of embryonic development to find out suitable embryonic stage for long term preservation without affect of hatching, rearing and pre-cocoon characters.

Dr. Sarkar told that embryonic studies of eri silkworm is most essential to find out the optimum time and ages for preservation of eri eggs. For studies of different stages of embryo several methods of isolation of silkworm embryo were practiced and the KOH method was found suitable for the isolation of eri embryo. He showed all the different stages of eri silkworm developing embryo and suitable stages of and ages for preservation of eri eggs.

He also expressed the calculation of zero hours of eri silkworm eggs. For preservation of eri silkworm egg preservation, zero hours were calculated on the basis of time pairing. The eri silkworm eggs should be preserved in descending order of temperature viz. 25°C (2 hrs.) >

20°C (2 hrs) >15°C (2 hrs.) >10°C (2 hrs.) >5°C to avoid thermal shock or injury. The long duration preservation temperature is 5°C constant. The eggs should be released from the preserved temperature in exposing at the ascending order viz. 5°C >10°C (2 hrs.) >15°C (2 hrs.) >20°C (2 hrs.) >25°C (2 hrs.) to avoid cold injury. Preserved eggs release time is cool hours of the day and eggs should be incubating in the room temperature especially at 25 °C (1± °C) and 75 - 80 % RH.

A productive interaction session with the participant was also hold during the programme. After successful completion the programme, Dr. L. Pauchou, Scientist-C of REC, Aizawl concluded the programme with vote of thanks to the participants.

As such, all the technologies listed below were demonstrated to the field during the year

A Muga culture

- Pruning/pollarding of host plants
- Input application to the host plants and green manuring
- Pest and disease management of host plants
- Disinfection of rearing fields
- Early stage rearing of muga silkworm
- Prophylactic measures against pest and diseases of muga silkworms
- Improved mountage for spinning of cocoons.

B. Eri culture

- Agronomical practices of castor
- Agronomical practices of kesseru
- Disinfection of rearing appliances and rearing house
- Improved eri silkworm breed (C2)
- Early stage rearing of eri silkworm
- Wooden split type collapsible mountage
- Platform rearing techniques of eri silkworms.

C. Eri PCT

- Sorting, boiling and drying of cocoon
- Motorized Eri Spinning Machine



Field Days

A "Field Day" was organized on 26.11.2016 at Dickshow in Sivasagar district to sensitize Muga and Eri farmers of the Dickshow, Namti, Charing, Borahibari, Belimukhia, Mourabazar and Anguri areas about the recent developments on improved technologies in

the field of muga and eri cultures. Around 50 farmers were attended in the event from different localities although the farmers were busy in harvesting of rice crops in field.

The programme was inaugurated by Dr. K. Neog, Sc-D in presence of two DoS staff deputed by the Asstt. Director of Sericulture, Govt. of Assam, Sivasagar district as the ADS was out of station.

At the onset of Field Day, Dr. K. Neog welcomed all the participants and described briefly about the objectives of organizing such programme and also about the technologies developed by CMERTI, Lahdoigarh. Dr. D. Jigyashu, Sc-B, Sri Prasanta Gogoi, SD and Sri Ratan Gogoi, SD also addressed the gathering and urged the farmers to take the opportunity of such programmes organized by CMERTI, Lahdoigarh from time-to-time to get acquainted with the modern methodologies of muga and eri silkworm rearing.

This was followed by a Technical session which was presided over by Sri Prasanta Gogoi, Seri Demonstrator, Borahibari circle. The first deliberation was given by Dr. K. Neog who discussed on techniques on nursery raising, host plant management of muga silkworm particularly package of practices of som plant cultivation, improved morphotypes of som, S-3 and S-6, clonal propagation, preparation of vermicompost, disinfection of rearing field, chawki muga silkworm rearing, pre brushing care, post brushing care, newly developed muga and eri breeds, moutages, etc. Sri Ratan Gogoi, SD very lucidly delivered lecture on selection of muga seed cocoons, grainage operations, and importance of detection of pebrine by microscopic method at moth stage. Sri Prasanta Gogoi briefed about the disinfection technology for rearing field and muga silkworm for controlling of diseases & pests. He also briefed about the initiatives taken by the government for boosting muga and eri production in the state and stressed on the active participation of the farmers in implementing such schemes. Dr. Jigyashu described about the different diseases and pests of muga silkworm and host plants, their control measures, package of practices for disinfection of rearing field, grainage hall, use of Lahdoi, sodium hypochlorite, etc. He also made the farmers aware about "The Silk Portal" launched by CSB and explained how to get benefit out of it.



At the end of the session, interaction was held with the farmers regarding the practical field problems faced by them during different stages particularly seed coon selection, brushing, rearing, mounting, harvesting, grainage and diseases of muga silkworm. All the queries raised by the farmers were clarified by the scientists and the DoS staff and the farmers expressed happiness upon it.

After the Technical session, practical demonstrations were conducted in the Som field of Sri Nripen Borgohain, a progressive farmer of the area, who is having 6 bigha of som plantation out of which 1 bigha was utilized for chawki rearing of the last Katia crop. Methods of disinfection of the rearing field with bleaching powder and lime, pruning of som plants, bamboo box type moutage, harvesting of cocoons and



selection of good seed cocoons were practically demonstrated to the farmers.

As such, Field Day Programmes were organized at different Muga and Eri growing areas where result demonstration of proven technologies in Muga and Eri were conducted. Adoption of new technologies such as disinfection, feeding techniques, rearing of improved breed (C2), platform rearing, using of improved mountage etc. for quality cocoon production for socio-economic up-liftment of the farmers are analysed in the events. Further, success stories of last crops are analysed and root cause analysis of problems faced by farmers were conducted. During 2016-17, 19 Field Days programme were organised at the institute and nested units.

RERS, Mendipathar Technology Awareness Meet

On 6th August' 2016; a Technology Awareness Meet on Eri culture was organized by RERS, Mendipathar at the premises of "Dintarini Puthibharal Sangha" Madang, Goalpara; Assam. A total of 75 nos of (Male=10, Female=65) Eri farmers of the area participated in the Awareness Meet. Besides, 08 other dignitaries from different organizations including officials from Department of Sericulture, Govt. of Assam were also present in the Awareness Meet.



In his introductory speech, Sri C.K. Bora, Technical Assistant, RERS, Mendipathar apprised about the aim and object of the Awareness Meet. Welcoming the gathering, Sri P.N. Borgohain, Scientist-C, gave a brief account on the importance of Eri culture and need based scientific technologies involve in Eri culture starting from method of systematic plantation of Eri host plants, improved method of silkworm rearing and Post Cocoon Technology. He viewed that it is the need of the hour to accept scientific technologies to enhance production of cocoon in large scale making the culture commercially viable and remunerative. Speaking as a special guest, Smt. Shamila Kachari, President Madang Gram Panchayat, Goalpara called upon the farmer to involve in the activities more seriously uplifting the economic status of the women society. She appealed to the farmers to accept this traditional culture in a scientific way and as a source of family income. Sri Ajit Das, a social activist of Madang Gram Panchayat, Goalpara urged the farmers to accept Eri culture as a source of family income generating self-employment.

On the occasion, Smt. Kanan Medhi, Field Officer, Department of State Sericulture, Goalpara: Assam requested the farmers to take up Eri culture, the age-old traditional heritage of Assam, in a commercial way involving more sincerely and actively by generating more income. Sri Dhruba Lochan Das, a social worker of Madang area focused on the various problems of the farmers in taking up Eri culture in large scale. Sri Milan Rabha, a progressive farmer, Madang, expressed that Eri culture is an economically supportive culture for the poor farmers and an easy means of family income. However, our poor farmers are unable to afford to construct even a small rearing house & collect rearing appliances. He opined that Eri culture needs no capital & high technology; it is less time and labour intensive too.



In his presidential speech, Sri Paramananda Rabha, Village Head, Madang expressed that about 95% of the women of Goalpara district are involve in Eri culture but they

are yet to adopt Ericulture in a commercial way due to lack of systematic plantation of Eri food plants and separate rearing house, required appliances etc. Farmer needs Govt. support to earn their livelihood through this culture.

A good no. of Eri farmers viz. Smt. Damayanti Das, Smt. Amiya Kachari, Smt. Jitumoni Kachari took active participation during interaction session.

Another Technology Awareness Meet on Ericulture was organized on 29th Nov'2016 by RERS, Mendipathar; Meghalaya at Budlung, Goalpara; Assam with a view to create awareness among farmers towards adoption of scientific technologies in Eri rearing. In the meeting arranged on the occasion a total of 75 nos. of (Male=28, Female=47) local Eri farmers actively participated in the programme. Besides, 15 other dignitaries from Department of Sericulture, Govt. of Assam, SHG and officials from NGO's were also present on the occasion.

The program was commenced with the welcome address by Sri C.K Borah, Technical Assistant, RERS, Mendipathar. Meeting organized on this occasion was presided over by Sri Mahat Basumatary, a retired High School Teacher & a social worker of Kayasthapara, Goalpara; Assam. In his key note address, Sri P.N. Borgohain, Scientist-C, RERS, Mendipathar gave a brief account on the present status of Ericulture in Assam followed by various scientific technologies associated in the culture to increase production quantitatively & qualitatively. He threw a light on the systematic plantation of primary Eri host plants i.e Castor & Kesseru so that leaf should be available at farmer's field to take up maximum crops annually by a farmer. He put more stress on conducting rearing scientifically in large scale making Ericulture more remunerative. In her speech, Smt. Uparani Basumatary, a progressive rearer urged the concerned Govt. Departments to support the poor farmers providing rearing house & appliances through new schemes.

Speaking on the occasion, Sri Jogen Khakhlari, a progressive sericulturist, Budlung area (Golpara) called upon the farmers to take up Eri rearing commercially to up-lift their economic status through family income. Sri Bhupen Sharma, Field Officer, Budlung Circle, State Sericulture Department, Goalpara requested the farmers to involve more actively in Eri rearing to increase their production and gain self-employment. In his speech, Sri Gulok Patgigiri, retired Head Teacher, Harapara Primary School viewed that Ericulture is certainly a profitable source of family income and farmers should come forward to take up this culture as a source of income & self employment. Sri Manjit Das & Smt. Kanan Medhi, Field Officer, Department of State Sericulture, Dhanubhanga and Madang, Goalpara also spoke on the occasion.

During interaction session, a good no. of farmers viz. Sri Koren Rabha, Sonalipur; Sri Satish Kachari, Sri Ajit Basumatary, Smt. Rakhima Musahari, Smt. Monika Roy, Bakarapara and Sri Jogen Khakhlari, Budlung; Galpara actively interact with the scientist about their various technical problems.

In his presidential address, Sri Mahat Basumatary called upon the farmers to involve more actively in Ericulture to up-lift rural economy through quality production and by generating self-employment.

Field Day

On 23rd August' 2016; a Field Day on Ericulture was organized at Damra, Dudhnoi, Goalpara; Assam by RERS, Mendipathar; Meghalaya with a view to exchange ideas & views among the farmers towards adoption of scientific technologies on Ericulture. A total of 75 nos. of (Male=07, Female=68) Eri farmers of Dudhnoi area of Goalpara district took active

participation in the programme. Besides, 08 other dignitaries from various private agencies including State Govt. Officials were also present in the Field Day.

Initiating the programme, Sri Pattan Bora, Technical Assistant, RERS, Mendipathar, welcomed the gathering and gave a brief introduction about the Field Day. Addressing the gathering, Sri P.N. Borgohain, Scientist-C focused on the key points relating to commercialization & development of Eri culture in NE region and also scientific technologies involve in it. He put emphasis on acceptance of scientific technologies by the farmers to enhance their production making Eri culture more profitable. Speaking on the occasion, Sri Prafulla Rabha, a social activist, Balachar, Goalpara (Assam) called upon the farmers to conduct Eri rearing in large scale as a source of family income. He also added that farmers should have a systematic plantation of Eri host plants i.e. Kesseru so that leaf should be available at farmer's field to conduct at least 4-6 crops annually. In his speech, Sri Mansur Ali, Field Officer, Rangjuli Circle, Department of State Sericulture, Goalpara urged the rearers to involve more actively in this economically viable culture uplifting their economic status & thereby generating self-employment. Speaking on the occasion, Sri Mukul Das, Inspector, Handloom & Weaving, Dudhnoi, Govt. of Assam requested the farmers to work sincerely for quality production making the culture more remunerative. Sri Juren Rabha, a progressive farmer, opined that to conduct Eri rearing in a scientific way, farmers should have a systematic plantation to obtain sufficient leaf, a rearing house and also rearing appliances. Sri Ajit Rabha, Field Officer, Department of State Sericulture requested the farmers to conduct large scale rearing to fetch more benefit.



In her presidential speech, Smt. Helen Rabha Basumatari, a social worker, Dudhnoi, Goalpara commented that Eri culture is a very good & supportive culture for all the literate as well as illiterate poor people of the society through which particularly women may find a ways & means of self-employment.

Lastly, a good no. of farmer viz. Smt. Purnima Basumatari, Smt. Junaki Raba and Smt. Rani Basumatari etc. actively participated in the programme.



Another, Field Day on Eri culture was organized on 8th Nov'2016 by RERS, Mendipathar; Meghalaya at Piplibari, Goalpara; Assam with a view to disseminate the scientific technologies to the farmers. A total of 75 nos. of (Male=50, Female=25) Eri farmers of the area took active participation in the programme. Besides, 10 other dignitaries from various private agencies, educational institute including State Govt. Officials of Department of Sericulture were also present in the Field Day.

At the very onset of the program, Sri Ratan Borah, Technical Assistant, RERS, Mendipathar, welcomed the gathering and gave a brief introduction about organization of the Field Day. On the occasion, a meeting was organized presided by Sri Prafulla kalita, a social activist of Rangjuli, Goalpara; Assam. In his key note address, Sri P.N. Borgohain, Scientist-C, RERS, Mendipathar focused on the various scientific technologies for augmentation of their product quantitatively & qualitatively from commercial point of view. He added that

farmers should have a systematic plantation of Eri host plants i.e. Kesseru so that leaf should be available at farmer's field to conduct at least 4-6 crops annually.

He called upon the farmers to accept scientific technologies for large scale production making Ericulture economically viable & profitable. Speaking on the occasion, Sri Rabin Boro, a progressive sericulturist, Goalpara (Assam) urged the farmers to take up Eri rearing in a commercial way supporting their family income and self-employment. He viewed that it is the need of the hour to accept such a cottage industry like Ericulture as a source income. Sri Mansur Ali, Field Officer, Rangjuli Circle, State Sericulture Department, Goalpara requested the farmers to involve more actively to increase their production making the culture economically viable & uplifting their economic status. In her speech, Smt. Nish Kumari Boro, Head Teacher, Piplibari Primary School, Rangjuli, opined that Ericulture is definitely a profitable source of earning and farmers should come forward to take up this culture as a source of income & self employment. Sri Bijit Kumar Nath, Field Officer, Department of Sericulture, Piplibari, Goalpara requested the farmers to involve sincerely to the sericultural activities by adopting scientific technology making the culture more remunerative. Smt. Minakshi Daimari, Teacher, Piplibari Anganbadi Kendra was also spoke on the occasion.

In the interaction session, a good no. of farmer viz. Sri Deepok Kumar Boro, Smt. Rumila Boro, Smt. Madhabi Rabha, Sri Gobinda Sharma etc. were actively interact with the scientist about their technical problems.

In his presidential address, Sri Prafulla Kalita viewed that Ericulture is a very good & supportive culture for the poor people of the society particularly for the women to up-lift their economic status by generating self-employment.

Group Discussion

As projected in the Annual Action Plan of REERS, Mendipathar for the year '2016-17, a total of 9 nos. of Group Discussion events were organized under Transfer of Technology (TOT) Programme to find out the acute field problems normally faced by the Eri farmers. Through this program farmers are getting a common open platform to interact directly with the Scientist /Technical persons in solving their problems faced during silkworm rearing and raising of systematic plantation of Eri host plants. The prime importance of this program is to up-lift the rearing condition of the rearer towards production of cocoon qualitatively and quantitatively through adoption of improved technology making the culture commercially viable.

Under this program, a total of 225 nos. of Eri farmers of Goalpara (100 nos.) and Kamrup (125 nos.) districts of Assam were covered under this TOT program. Group Discussion program was found to be an important medium towards dissemination of scientific knowledge to the stakeholders. The farmers had a common consensus that such efforts like organization of group discussion events are quite beneficial for the farmers to gather various informations in their door steps and to solve their problems through exchange of ideas with the resource persons directly coming in contact with them.

Details of Group Discussion events conducted during the year 2016-17 are as given below:

Date	Date/venue of the Event	Participant (No.)
05-08-2016	Nayapara, Goalpara, Assam.	25 Nos.
08-08-2016	Damra, Dudhnoi, Assam.	25 Nos.
09-08-2016	Julapara, Goalpara, Assam.	25 Nos.

22-08-2016	Chukunia, Kamrup, Assam.	25 No.s.
24-08-2016	Bhutarguri, Kamrup, Assam.	25 No.s.
07-11-2016	Jarapara, Kamrup	25 No.s.
09-11-2016	Batarhat, Kamrup	25 No.s.
28-11-2016	Paneri, Kamrup	25 no.s.
30-11-2016	Dhanubhanga, Goalpara	25 No.s.

As such, the Annual Target for organization Group Discussion of RERS, Mendipathar for the year 2016-17 has been fully achieved against target.

REC, Lakhimpur

Technology awareness Programmes

Two Awareness Meets on Integrated Technology Package of Muga culture was organized at Telahi Banto, Lakhimpur on 20.09.2016 and Malipur of Biswanath Chariali on 09.11.2016. More than 100 muga farmers in each programme along with DoS staffs of respective districts were participated in the events. In both the programme, Sri D. Mech, Scientist –D of REC, Lakhimpur highlighted the recent technology of muga culture developed at CMERTI, Lahdoigarh. He then presented power point on details about the improved technologies of host plant raising and management, silkworm seed production, early and late stage silkworm rearing, pest and disease management of muga host plant and silkworm, improved cocoon spinning devices, post rearing management of field, etc using the multi media projector. Shri Mech also informed the farmers that to success the crops in different seasons, the farmers should have advance planning of rearing so as to produce quality foliage through pruning of host plants for early and late stage silkworm and also to get silkworm seed on time. He requested the farmers to adopt the improved technologies for better production of cocoons as well as better income generation through muga culture.

Field Days

In view of demonstrate result of improved technologies of muga culture, REC, Lakhimpur had organized two Field days on 13.12.2016 at Deolia Gaon, Ghilamora and on 14.12.2016 at Dhakuakhana, Lakhimpur as per the Action Plan of the unit. About 100 muga farmers at Deolia Gaon and 150 muga farmers at Dhakuakhana along with the officers and staffs of DoS were participated. The Field days on 13.12.2016 at Ghilamora, Lakhimpur was organized based on the satisfactory crops harvested by the progressive farmers Shri Jogot Dutta of Deolia gaon. Adopting the improved technologies, he could harvest more than 30000 reeling cocoons from 450 layings @ 67 cocoons/laying in late Kotia crop 2016. Similarly, Field day on 14.12.2016 at Dhakuakhana was organized to show and demonstrate the result of improved technologies adoption at the Dhakuakhana state sericulture farm where about 55000 cocoons was harvested from 900 dfls @ 61 cocoons per dfl during late Kotia crop 2016.

In both the programme, Shri D. Mech, Scientist –D of REC, Lakhimpur also demonstrated the recent technology of muga culture viz., host plant raising and management, silkworm seed production, early and late stage silkworm rearing, pest and disease management of muga host plant and silkworm, improved cocoon spinning devices, post rearing management of field, etc. through multimedia projector. He also informed the farmers that to success the crops in different seasons, the farmers should have quality foliage through pruning of host plants for early and late stage silkworm and also to get

silkworm seed on time. He stressed on quality seed and feed for success of muga silkworm rearing. In both the day, the farmers were actively interacted with the scientist on various issues specially the incidence of uzi fly, non hatching of silkworm eggs, non availability of seeds on time, etc. and necessary suggestions were provided to the farmers for overcoming the problems.

Group Discussion

Group discussion with the farmers and DoS staffs were held on different issues like problems of Bhadia seed crop rearing and remedial measures, plantation management, adoption of suitable crop protection measures during summer, late Katia crop and winter crop, etc. Total 5 nos Group discussions were held in different muga potential areas of Lakhimpur district.

Training Activities

A total of 3571 beneficiaries were trained on different sericulture technologies under different Training Programmes. Organized Farmers skill training programmes of 6 days duration covering 480 farmers, Farmers skill training of 3 days duration covering 100 farmers including Technical Orientation Programme for 24 farmers under CSS-CBT and conducted Orientation training to 16 SOs/SAs. Further, the institute organized training for the beneficiaries under SMVs & FFS, Farmers Training Programme sponsored by DOS-UP, Refresher Training Programme to RSP and Foundation Training to CSB Young Scientists.



Under Institutional Biotech Hub project, one workshop on "Diversity, exploration, Taxonomy and management: Advanced tools and techniques for Lepidopteran insects" were organized two demonstrations and one awareness programme was conducted and 225 nos. of students from nearby School and Colleges participated.



Training programme under SMV Dadhora

Two batches of 2 days Integrated Eri training programme was organized at Dadhora under SMV, Dadhora, Golaghat w.e.f 27th October, 2016 to 28th October, 2016 and at Danichapori village of SMV, Dadhora on 2nd and 3rd December, 2016. 101 (50+51) farmers were trained in different aspects of ericulture as per fixed programme.

On the onset of training programme of each batch registration of trainees was done. Training kit comprising of note book and pen with folder supplied to them. Pre training assessment was done prior to commencement of training programme. In the training programme the following topics were covered.

- ❖ Eri silk industry, its potentiality and scope of development.



- ❖ Improved eri silkworm breed/race and improved rearing technology.
- ❖ Different types of eri host plants and improved method of cultivation and maintenance.
- ❖ Different type of disinfectants and disinfection of rearing, grainage house and appliances.
- ❖ Egg incubation, brushing care and early stage rearing.
- ❖ Product diversification, byproduct utilization in eri culture and economics.
- ❖ Improved eri seed production technology

At end of training post training assessment was done and feed of farmers were taken to assess the training programme.

Training for muga and eri seed producers at RMRS, Boko

A training programme was held at RMRS, Boko in coordination with CMER & TI, Lahdoigarh, Jorhat and the trainees were selected both from Muga and Eri sector in the surrounding villages of Boko. The theme of the training was "Training for registered seed and cocoon producers of Eri and Muga silk under central seed act 2006" and 45 participants attended the programme.

The training began with an inaugural function chaired by Dr. S. Paliwala, Scientist- D, RMRS, Boko. This was attended by Dr. T. James Keisa, Scientist- C and Dr. S.A. Ahmed, Scientist- C from Lagdoigarh. In the beginning, Dr. H. Barman, Scientist- C, RERS, Mendipather delivered welcome address and briefly explaining activities undergoing at the unit. Dr. S.A. Ahmed, Scientist- C from CMER & TI, Lahdoigarh explained the aims and objectives of the training. Dr. T. James Keisa, Scientist-C from same institute, elaborately explained the needs of such training that will help the cocoon and seed producers both in Eri and Muga sector. Dr.Paliwal asked the trainees to take the benefits as the training that would be carried out by experienced resource persons from Central Silk Board.

Training was run as per scheduled agenda prepared by CMER & TI, Lahdoigarh by entrusted resource persons of Central Silk Board.

Following resource persons imparted the training as per subject topic fixed.

1. Dr. S. Paliwal, Scientist – D, RMRS, Boko
2. Dr.GirinRajkhowa, Ex- Scientist, CSB
3. S. N. Bagchi, Scientist – D, REC, Coochbehar
4. Dr.T James Keisa, Scientist- C, CMER & TI
5. Dr. H. Barman, Scientist- C, RERS, Mendipather
6. Dr. S. Ahmed, Scientist- C, CMER & TI

The training was concluded as per schedule and all the liabilities were paid to each and every participating trainees.

Extension Communication Programmes conducted (Rs. In lakh)

#	Programme	Target for the year		Achievement	
		Phy	Fin	Phy	Fin
1	Workshop/ seminar				
	OMER&TI, Lahdoigarh	1	2.50	1	2.00
2	Organization of Krishimela= 4 (Unit cost Rs. 1.00 lakh)				
	OMER&TI, Lahdoigarh	1	3.00	1	3.00
	RMRS, Boko	1	1.00	1	1.00
	REC, Lakhimpur	1	1.00	1	1.00
	REC, Kokrajhar	1	1.00	1	1.00
	REC, Fatehpur	-	-	1	1.00
	Total	4	6.00	5	7.00
3	Technology Awareness Programme -20 nos (Unit cost Rs. 0.20 lakh)				
	OMER&TI, Lahdoigarh	4	0.60	5	0.248
	RMRS, Boko	2	0.30	1	0.150
	RE RS, Mendipathar	2	0.30	2	0.300
	RE RS, Shadnagar	2	0.30	1	-
	REC, Tura	2	0.30	2	0.300
	REC, Coochbehar	2	0.30	3	0.300
	REC, Lakhimpur	2	0.30	2	0.300
	REC, Fatehpur	2	0.30	2	0.300
	REC, Kokrajhar	2	0.30	2	0.300
	REC, Diphu	1	0.15	1	0.150
	REC, Balijan	1	0.15	1	0.150
	Total	22	3.30	22	2.498
4	Field day (Unit cost Rs. 0.20 lakh)				
	OMER&TI, Lahdoigarh	2	0.30	5	0.240
	RMRS, Boko	2	0.30	2	0.300
	RE RS, Mendipathar	2	0.30	2	0.300
	RE RS, Shadnagar	2	0.30	2	-
	REC, Tura	1	0.15	1	0.150
	REC, Coochbehar	2	0.30	4	0.300
	REC, Lakhimpur	2	0.30	3	0.300
	REC, Fatehpur	1	0.15	1	0.150
	REC, Kokrajhar	2	0.30	2	0.300
	REC, Diphu	1	0.15	1	0.150
	REC, Balijan	1	0.15	0	-
	Total	18	2.70	23	2.190
5	Group Discussion =70 nos (Unit cost Rs. 0.01 lakh)				
	OMER&TI, Lahdoigarh	10	0.10	10	0.10
	RMRS, Boko	10	0.10	10	0.10
	RE RS, Mendipathar	9	0.09	9	0.09
	RE RS, Shadnagar	6	0.06	5	-
	REC, Tura	5	0.05	5	0.05
	REC, Coochbehar	5	0.05	6	0.05
	REC, Lakhimpur	5	0.05	5	0.04
	REC, Fatehpur	5	0.05	5	0.05

	REC, Kokrajhar	5	0.05	5	0.05
	REC, Diphu	5	0.05	5	0.05
	REC, Balijan	5	0.05	3	0.03
	Total	70	0.70	68	0.61

PLAN FOR LAND USE AND RESOURCE CONSERVATION

Sl No.	Programme	Target for the year		Achievement	
		Phy	Fin	Phy	Fin
A	Raising of seedlings/ sapling (nos)				
I	Som / Soalu seedling				
1	CMER&TI, Lahdoigarh	20000	50000	30350	-
2	RMRS, Boko	20000	50000	105000	-
3	REC, Lakhimpur	5000	12500	6000	0.002
4	REC, Coochbehar	5000	12500	6000	-
5	REC, Tura	5000	12500	-	-
6	REC, Kokrajhar	5000	12500	5000	-
	Total	60000	150000	152350	0.002
B	Kesseru seedlings				
1	CMER&TI, Lahdoigarh	20000	50000	20000	-
2	RE RS, Mendipathar	20000	50000	20000	-
3	REC, Kokrajhar	5000	12500	-	-
4	REC, Diphu	5000	12500	5000	-
5	REC, Balijan	5000	12500	-	-
	Total	55000	137500	45000	-
C	Supply of Som seedlings				
I	Som / Soalu seedling @ Rs.3/- per seedling				
1	CMER&TI, Lahdoigarh	10000	-	17250	-
2	RMRS, Boko	20000	-	41433	-
3	REC, Lakhimpur	5000	-	3100	-
4	REC, Coochbehar	5000	-	3500	-
	Total	40000	-	65283	-
D	Supply of Kesseru seedling				
1	CMER&TI, Lahdoigarh	8000	-	1500	-
2	RE RS, Mendipathar	10000	-	1750	-
	Total	18000	-	3250	-
E	Dfls brushing				
I	Muga Commercial crop (Cost @ Rs. 10/- per dfl)				
1	CMER&TI, Lahdoigarh	3000	30000	3185	-
2	RMRS, Boko	2500	25000	1094	-
3	REC, Lakhimpur	500	5000	769	0.018
4	REC, Coochbehar	500	5000	350	0.008
5	REC, Kokrajhar	400	4000	296	-
6	REC, Balijan	-	-	330	-
	Total	6900	69000	6024	0.026
F	Muga Seed crop (Cost @ Rs. 10/- per dfl)				
1	CMER&TI, Lahdoigarh	1700	17000	4522	-
2	RMRS, Boko	700	7000	1982	-
3	REC, Tura	600	6000	965	-

4	REC, Lakhimpur	400	4000	597	-
5	REC, Coochbehar	600	6000	518	-
	Total	4000	40000	8584	-
G	Eri (Cost @ Rs. 5/- per dfl)				
1	CMER&TI, Lahdoigarh	500	2500	300	-
2	RE RS, Mendipathar	500	2500	500	-
3	RE RS Shadnagar	500	2500	10	-
4	REC, Diphu	200	1000	200	-
5	REC Fatehpur	200	1000	-	-
6	REC, Kokrajhar	200	1000	50	-
	Total	2100	10500	1060	-
H	Muga Commercial cocoon production (@ 60 cocoons/dfl)				
1	CMER&TI, Lahdoigarh	180000	-	7620	-
2	RMRS, Boko	150000	-	6100	-
3	REC, Lakhimpur	30000	-	10703	-
4	REC, Coochbehar	60000	-	1651	-
5	REC, Kokrajhar	24000	-	-	-
	Total	444000	-	26074	-
I	Muga Seed cocoon production @ 40 cocoons/ dfl				
1	CMER&TI, Lahdoigarh	68000	-	46471	-
2	RMRS, Boko	28000	-	35479	-
3	REC, Tura	24000	-	21254	-
4	REC, Lakhimpur	16000	-	17854	-
5	REC, Coochbehar	24000	-	4725	-
	Total	136000	0	125783	-
J	Eri cocoon production @ 10.0 kg shell /100 dfl				
1	CMER&TI, Lahdoigarh	50	-	23.00	-
2	RE RS, Mendipathar	50	-	23.33	-
3	RE RS Shadnagar	50	-	6.22	-
4	REC, Diphu	20	-	14.29	-
5	REC Fatehpur	20	-	-	-
6	REC, Kokrajhar	20	-	4.00	-
	Total	210	0	70.84	-
K	Muga dfls production from 60% of cocoons generated from seed crop @ Cocoon : dfl is 3:1 (g)				
1	CMER&TI, Lahdoigarh	13600	-	1977	-
2	RMRS, Boko	7000	-	460	-
3	REC, Tura	4000	-	3650	-
4	REC, Lakhimpur	2400	-	1876	-
5	REC, Coochbehar	4000	-	883	0.026
	Total	31000	0	8846	0.026
L	Eri dfl production @ Cocoon : dfl is 3 :1 (Nos)				
1	CMER&TI, Lahdoigarh	12000	-	4940	-
2	RE RS, Mendipathar	12000	-	9651	-
3	RE RS Shadnagar	8000	-	600	-
4	REC, Diphu	6000	-	4650	-
	Total	38000	0	19841	-
M	Muga dfls supply @ Rs.10/- per dfl (g)				
1	CMER&TI, Lahdoigarh	13600	-	449	-

2	RMRS, Boko	7000	-	-	-
3	REC, Tura	4000	-	3410	-
4	REC, Lakhimpur	2400	-	1141	-
5	REC, Coochbehar	4000	-	765	-
	Total	31000		5765	-
N	Eri dfls supply				
1	CMER&TI, Lahdoigarh	11500	-	5170	-
2	RE RS, Mendipathar	11500	-	9151	-
3	RE RS Shadnagar	7500	-	450	-
4	REC, Diphu	5800	-	4550	-
	Total	36300	0	19321	-

Training / Human Resource Development (2016-17)

Sl. No.	Training/ Programme	Unit cost (Rs. In lakh)	Target for the year		Achievement	
			Physical	Financial (Rs. In lakh)	Physical	Financial (Rs. In lakh)
A	Capacity Building & Training under R&D Sector					
I	Farmers Skill Training at CMER&TI, Lahdoigarh					
1	10 days duration	0.055	100	5.50	55	1.440
2	5 days duration	0.030	100	3.00	679	19.540
3	3 days duration	0.020	100	2.00	106	1.250
4	6 days duration	-	-	-	60	2.086
II	Exposure visit of farmers & Extn. agents					
1	CMER&TI, Lahdoigarh	0.025	60	1.50	180	3.68
2	RMRS, Boko	0.025	30	0.75	-	-
3	REC, Coochbehar	0.025	30	0.75	-	-
	RE RS, Mendipathar	0.025	30	0.75	-	-
III	Technology orientation programme (student, NGO, DOS and CSB staffs)					
1	CMER&TI, Lahdoigarh	0.035	175	6.125	101	3.18
2	RMRS, Boko	0.035	25	0.875	-	-
B	Skill Training & Enterprise Development Programme					
1	Management Development Programme at CMER&TI, Lahdoigarh	0.250	2	0.50	2	0.52
2	Training impact assessment at CMER&TI, Lahdoigarh	-	-	2.00	400	1.80
C	Sericulture Resource Centre (SRC)	3.500	4	14.00	1277	13.755
D	Information, Education & Communication (IEC) at CMER&TI, lahdoigarh					
1	Leaflet/s/pamphlets/ booklets on muga and eri technologies	1.000	-	1.00	-	0.10
2	Production of video/short films on muga/eri technology	1.000	-	1.00	-	-
E	Training programme for Extension Staffs, DOS.				1835	15.595

	Nagaland under NERTPS				
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Training activities during 2016-17

#	Training Programmes	No. of trainees
1	Farmer Skill Training	897
2	Exposure Visits (Lead Farmers)	180
3	Tech Orientation Programme for CS/DOS/NGO officials & students	101
4	Management Development Programme for Scientists	2
5	Training under Sericulture Resource Centres	1277
6	Training for Extension Staffs, DOS, Nagaland under NERTPS	14
7	Farmers Skill Trainings sponsored by DOS UP	100
8	Staff Training Programme under NERTPS sponsored by BTC, Kokrajhar	15
9	Training for Technical Officers sponsored by DOS, Assam	21
10	Refresher Training for RSPs under Central Seed Act	145
11	Awareness Training on Central Seed Act 2006	651
12	Training under Seri- Model Village Programme under CSB	669
13	Training under Sw aach Reshom Gram Programme under CSB	163
	Total	4235

The Institute and its nested units organised 4 Vanya Resham Krishimela, 24 Technology Awareness Programme, 21 Field Days and 76 Group Discussions during 2016-17.

IMPACT OF TRAINING – A FEW CASE STUDIES

Multiple farming - success story

India ranks second worldwide in farm output. Agriculture plays a vital role in India's economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Agriculture, along with fisheries and forestry, is one of the largest contributors to the Gross Domestic Product (GDP). As per estimates by the Central Statistics Office (CSO), the share of agriculture and allied sectors (including agriculture, livestock, forestry and fishery) was 15.35 per cent of the Gross Value Added (GVA) during 2015-16 at 2011-12 prices. Agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India. But, it is unfortunate that in present days the young generations are looking forward for white coloured job showing reluctance towards agriculture. In this juncture, complete devotion in agriculture practices along with eri culture by rural based women is praise worthy.



Mrs. Nirmali Kachari and Mrs Rita Gogoi two educated women of an interior Karalibari village 7 km away from Titabar town of Jorhat district took training on pre cocoon activities of eri culture organized by Central Silk Board with full of hope and expectations. After attending training programme conducted by CMER&TI, Lahdoigarh on improved technologies like improved platform rearing, disinfection of rearing room and appliances, utilization of high yielding eri silkworm breed (C2) and agronomical practices of eri food plant kesseru the farmers achieved incredible success, which is noteworthy.

Guidance of marketing of eri cocoon and pupa also provided to farmers for better income generation. To observe their post training activities a field survey was conducted. It was surprised that both the poor women took challenge to change their economic condition by engaging themselves in multifarious activities. They expressed that the CMER&TI training has great influence for eye opening and expansion of their day to day activities.



Mrs. Nirmali Kachari a higher secondary passed aged 36 year involved herself in different activities like, ericulture, paddy cultivation, vegetables cultivation, tea cultivation, diary etc. different activities in integrated way is definitely praise worthy. Similarly, other women Mrs. Rita Gogoi aged 35 years also engaged in similar type of activities including fishery, piggery, tailoring etc.

Table: Different source of Income generation of Mrs. Nirmali Kachari

Activities	Pre training		Post training	
	Quantity	Income generation	Quantity	Income generation
Paddy cultivation	4 bigha	25000.00	4 bigha	25000.00
Tea cultivation	2 bigha	50000.00	4 bigha	90000.00

Eri culture	5-10 dfls/crop 4-5 crops/year		10-20 dfls/crop 4-5 crops/year	
Cut cocoon	8000 nos.	1000.00	15000 Nos	2000.00
Yarn	3 kg	3600.00	5 kg	6000.00
Fabric	L/S	5000.00	L/S	9000.00
Diary	30 litre	14400.00	30 litre	14400.00
Weaving	L/S	4000.00	L/S	6000.00
Vegetable	L/S	8000.00	L/S	10000.00
Poultry farm	Nil	0	L/S	3000.00
Total		111000.00		165400.00

To know the present activities a questionnaire has been prepared and required information were collected. Mrs Nirmali Kachari's family has 4 bighas of land for paddy cultivation, 4 bigha for tea cultivation and 1 bigha high land around their home stead for vegetable crop cultivation. Eri food plants lesseru and castor are available in scattered form around home stead.

Similarly, relevant data of Mrs. Rita Gogoi's family has also collected. She has 6 bighas of land for paddy cultivation, 2.5 bigha for tea cultivation and 1 bigha high land around their home stead for vegetable crop cultivation. The farmer has 0.25 acres of mix variety of local castor around home stead. The activities and income generation pattern pre and post training period are evaluated as follows.

Table: Different source of Income generation of Mrs. Rita Gogoi

Activities	Quantity	Income generation	Quantity	Income generation
	Pretraining		Post training	
Paddy cultivation	6 bigha	30000.00	6 bigha	30000.00
Tea cultivation	2 bigha	50000.00	2.5 bigha	70000.00
Eri culture	5-10 dfls/crop 4-5 crops/year		10-20 dfls/crop 4-5 crops/year	
Cut cocoon	7000 nos.	1000.00	10000 Nos	1500.00
Yarn	3 kg	3500.00	5 kg	6000.00
Fabric	L/S	6000.00	L/S	10000.00
Diary	30 litre	14400.00	30 litre	14400.00
Weaving	L/S	4000.00	L/S	6000.00
Poultry farm	Nil	0	L/S	3000.00
Piggery	0	0	L/S	11000.00
Tailoring	Nil	0	L/S	2000.00
Fishery	Nil	0	L/S	5000.00
Total		108900.00		158900.00

Thus it was observed that ISDS training has a positive impact on rural economy as well as skill development of rural poor particularly women folk through self employment generation and enhancement of income generation.

Punya Daimari: A boom of success in ericulture

Mrs. Punya Daimari is a progressive eri rearer of Bhurasuburi gaon of Udalguri, BTC, Assam. Mrs Daimari was selected as lead farmer of “Minao” Farmers Field School, Udalguri under Central Muga Eri Research and Training Institute, Lahdoigath, Jorhat, Assam.

Mrs. Punya Daimari's home is located in an interior place of Udalguri district of BTC, Assam and 10 km away from Udalguri town. Mrs. Punya Daimari is an educated woman and took numbers of training on pre and post cocoon activities of eri culture organized by different departments including CMER&TI, Central Silk Board. She expressed that the trainings have great influence for eye opening and expansion of her day to day activities of eri culture. Mrs. Daimari has both castor and lesseru plantation. She involved herself in different eri culture activities like, large scale rearing of eridfls in all every rearing season of the year, selling of eri pupa in the local market, spinning of yarn, weaving *etc.* She reared successfully C2 breed of eri silkworm in large scale using both castor as well as tapioca leaves. She use to rear around 400 dfls per year and harvested about 40 kg cocoons and got sale proceed up to Rs.28,000/- and produced pupa worth of around Rs.60,000/-. Besides, she earned income through selling of yarn as well as fabric produced by her. Mrs. Punya Daimari has got several awards from State as well as National level for her successful performance in sericulture. It is noteworthy to mention that recently she got Chief Minister's Best Community Action Award for Development, 2014 at Guwahati, Assam and Women Achiever Award in Sericulture, 2014 by Ministry of Textiles, Govt. of India, New Delhi.

As a lead farmer, Mrs. Punya Daimari's role is very positive and dynamic. In the Farmers Field School, she took all efforts for percolation of all the improved technologies of eri culture among the fellow eri farmers of the village.



Farmers Field School, Udalguri, BTC, Assam



RESEARCH PUBLICATIONS (2016 -17)

Research articles

1. A Borgohain, R Das, D Bora, R Samanta, M Chutia (2016) *Lysinibacillus sphaericus* infection in muga silkworm (*Antheraea assamensis* Helfer, Lepidoptera: Saturniidae): a new report. *Sericologia*, 56(3): 170-177.
2. AK Das, B Khanikor, K Neog (2016) Biology of *Cotesia dictyoplocae* Watanabe (Hymenoptera: Braconidae) a parasitoid of *Antheraea assamensis* Helfer. *Journal of Entomology and Zoology Studies*, 4 (2): 236-240.
3. BN Sarkar, MC Sarmah, BK Singh (2016) Yield and yield contributing traits in eri silkworm, *Samia ricini* (Donovan) in different combinations, *International Journal of Ecology and Ecosolution*, 3(4), 45-49.
4. D Bhuyam, MC Sarmah, K Dutta (2017) A study on the seasonal variation of the post cocoon parameters of eri silkworm *Samia ricini* (Donovan) reared on Kesseru *Heteropenexfrangance* (Roxb.) Seem. *Biological Science*, 6(1).
5. D Mech, R Kumar, NI Singh, D Goswami, R Das, K Giridhar (2016) Impact of Front Line Demonstration on Muga Cocoon Yield at Farmers' Level in Assam, India. *Asian Journal of Agricultural Extension, Economics & Sociology*, 8(2): 1-8, 2016
6. D Mech, SC Das, M Ahmed (2016) Adoption of improved technology among the muga farmers in Golaghat district of Assam. *International Journal of Innovative Research and Advanced Studies*, 3(3): 79-83.
7. D Mech, SC Das, M Ahmed (2016) Factors influencing knowledge level of muga farmers about improved technologies. *Imperial Journal of Interdisciplinary Research*, 2(8): 1513-1518.
8. DK Gogoi, SP Sandilya, PM Bhuyan, P Dutta, K Neog, LSK Singh, TC Bora (2016) Effect of submerged culture parameters on growth and antimicrobial activity of *Paenibacillus lautus* RRT AY-2, against some pathogens of *Antheraea assamensis* Helfer. *Sericologia*, 56(2): 103-116.
9. G Subrahmanyam, JP Shen, YR Liu, G Archana, LM Zhang (2016) Effect of long-term industrial waste effluent pollution on soil enzyme activities and bacterial community composition. *Environmental Monitoring and Assessment*, 188: 1-13.
10. H Chetia, D Kabiraj, S Sharma, S Das, PV Mosahari, P Sharma, K Neog, M Deka, P Jayaprakash, U Bora (2017) *De novo* transcriptome analysis of the muga silkworm, *Antheraea assamensis* (Helfer). *Gene*, 611: 54-65.
11. J Deuri, PK Barua, MC Sarmah (2017) Effect of food plants on rearing performance and cocoon quality of Eri silkworm (*Samia ricini* Donovan). *World Journal of Agricultural Sciences*, 12 (6): 431-436.
12. J Deuri, PK Barua, MC Sarmah, SA Ahmed (2017) Biochemical attributes of the Castor and Tapioca leaves, the promising food plants of Eri silkworm (*Samia ricini* Donovan). *Net Journal of Agricultural Sciences* (Accepted).
13. JY Nale, M Chutia, P Carr, PT Hickenbotham, MR Clokie (2016) 'Get in early': biofilm and wax moth (*Galleria mellonella*) models reveal new insights into the therapeutic potential of *Clostridium difficile* bacteriophages. *Frontiers in Microbiology* (<http://dx.doi.org/10.3389/fmicb.2016.01383>).
14. L Reeta, T Shantibala, TJ Keisa, T Victor, K Chaoba (2016) Characterization of wild sericigenous insects diversity of Manipur: Mean for conservation. *Sericologia*, 50(1): 54 – 66.
15. M Chutia (2017) Silkmoth biodiversity a paradise of NE India. *NE Bioline*, 2016, 2:35-37.

16. M Volf, P Pyszko, T Abe, M Libra, N Kotásková, M Šigut, R Kumar, O Kaman, PT Butterill, J Šipoš, H Abe, H Fukushima, P Drozd, N Kamata, M Murakami, V Novotny (2017) Phylogenetic composition of host plant communities drives plant-insect food web structure. *Journal of Animal Ecology* (Accepted).
17. PA Sangannavar, IS Katageri, MP Jadhav, HM Vamadevaiah (2016) In planta genetic transformation in cotton (*G. hirsutum* L.). *Journal of Farm Science*, 29 (3): 318-321.
18. R Das, K Das (2016) Effect of abiotic factors on infestation of uzifly, (*Exorista sorbillans* wiedemann) in different instar muga silkworm, *Antheraea assamensis*. *MunisEntomology and Zoology*, 11 (1), 87-89.
19. R Debnath, A Yadav, VK Gupta, BP Singh, PJ Handique, R Saikia (2016) Rhizospheric bacterial community of endemic *Rhododendron arboreum* Sm. Sp. delavayi along Eastern Himalayan slope in Tawang. *Frontiers in Plant Science*, 7:1345. doi:10.3389/fpls.2016.01345
20. R Kumar, P Chutia, M Ahmed, G Rajkhowa, NI Singh (2016) Checklist of wild silk moths of North East India (Lepidoptera: Saturniidae, Bombycidae). *Munis Entomology & Zoology*, 11 (2): 508-514.
21. Ranjana Das, K Das (2016) Effect of abiotic factors on infestation of uzifly, (*Exorista sorbillans* wiedemann) in different instar muga silkworm, *Antheraea assamensis*. *MunisEntomology & Zoology*, 11(1): 87-89.
22. S Gandotra, PM Bhuyan, DK Gogoi, A Kumar, S Subramanian (2016) Screening of nutritionally important gut bacteria from the Lepidopteran insects through qualitative enzyme assays. *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.* (DOI 10.1007/s40011-016-0762-7).
23. S Subharani, RS Chaudhuri, TJ Keisa, LB Devi, AK Sinha. (2016) Seasonal incidence and intensity of parasitization of uzi fly on *Antheraea proylei* under climatic zones of Manipur. *Sericologia*, 56(4): 229-234.
24. SP Sandilya, P Dutta, PM Bhuyan, R Debnath, A Changmai, K Neog, DK Gogoi (2017) *Aeromonas caviae* CSB04, a causal organism of bacterial flacherie in Muga silkworm (*Antheraea assamensis* Helfer). *Current Science*, 112(1): 32-34.
25. SP Sandilya, P Dutta, PM Bhuyan, R Debnath, A Changmai, K Neog, DK Gogoi (2017) *Aeromonas caviae* CSB04, a causal organism of bacterial flacherie in Muga silkworm (*Antheraea assamensis* Helfer). *Current Science*, 112(1): 32-34.
26. SP Sandilya, PM Bhuyan, DK Gogoi, D Kardong (2016) Phosphate solubilization and plant growth promotion ability of rhizobacteria of *Ricinus communis* growing in Assam, India. *Proceedingm of National Academy of Science (India), Section B: Biological Science*, DOI: 10.1007/s40011-016-0833-9.
27. SP Sandilya, PM Bhuyan, N Vijay, D Kardong, DK Gogoi (2017) Impact of *Pseudomonas aeruginosa* MAJ PIA03 on growth and phytonutrients of castor, a primary host-plant of *Samia ricini*. *J. Soil Sci and Plant of Nutrition* (accepted)
28. YM Sinram, A Charterjee, MS Ranjini, A Poojari, A Nagarajan, NB Ramachandra, U Nongthomba (2016) A newly evolved *Drosophila cytorace-9* shows trade off between longevity and immune response. *Infection, Genetics and Evolution*, 44: 1-7.

Papers presented in the conference/seminars

1. K Das, Ranjana Das, D Goswami, M Chutia, G Subrahmanyam and BK Singh (2017) Enhancement of rural economy through technological interventions for sustainable Muga culture in upper Brahmaputra valley of Assam. In: Abstract book of the National

- seminar on “Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks” organized by CMER&TI, Lahdoigarh and Directorate of Sericulture, BTC at Kokrajhar during 21-22nd February 2017.
2. L Reeta, TJ Keisa, LB Devi (2017) Diversity of Wild Silk Moth of Maripur in North East India: Need for Conservation. *International Conference on Natural Resources Management and Technology Trends (ICNRM-17)* 27th - 29th March 2017. P-17.
 3. M Chutia, G Subrahmanyam, R Das (2017) Phage therapy: a promising tool for treatment of bacterial infection in vanya silkworms. In: Abstract book of the National seminar on “Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks” organized by CMER&TI, Lahdoigarh and Directorate of Sericulture, BTC at Kokrajhar during 21-22nd February 2017.
 4. M Kalita, G Subrahmanyam, M Chutia, Ranjana Das, BK Singh (2017) Isolation and characterization of bio-surfactant producing bacteria from hydrocarbon contaminated soils of Upper Assam. In: Abstract book of the National seminar on “Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks” organized by CMER&TI, Lahdoigarh and Directorate of Sericulture, BTC at Kokrajhar during 21-22nd February 2017.
 5. MC Sarmah, BN Sarkar, SA Ahmed, BK Singh (2017) Integration of technologies for space and time management in eri silkworm rearing. In: Abstract book of National seminar on Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks held at BTC, Kokrajhar on February 21-22, 2017.
 6. MS Ranjini, PA Sangannavar, DK Gogoi, R Kumar, D Goswami (2017) Hormetic effect on *Antheraea assamensis* Helfer. A preliminary study in Kotia crop. Oral Presentation at National Seminar on “Economic insects of NE India: Thrust in recent advances in Vanya Silks” at Kokrajhar BTC, Assam from 21st to 23rd February 2017.
 7. PA Sangannavar, MS Ranjini, Das Ranjana, DK Gogoi (2017) Physico-Chemical diversity of soil: a potential factor influencing production and productivity of Som leaf in muga silkworm rearing areas. Oral Presentation in National Seminar on “Economic insects of NE India: Thrust in recent advances in Vanya Silks” at Kokrajhar BTC, Assam from 21st to 23rd February 2017.
 8. R Debnath, DK Gogoi, K Neog (2017) Insect gut microbiome: Implications in Vanya Silkworm. Paper presented in the National Seminar on “Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks” organized jointly by CMER&TI, CSB, Lahdoigarh and Directorate of Sericulture, BTC, Kokrajhar on 21st and 22nd February 2017.
 9. S Subadas, DK Jigyasu, K Neog (2017) Impact of petroleum crude oil on muga silkworm and its host plants in Assam. In National Seminar on Economic Insects: Thrust on recent advances on Vanya silks” organised by Central Muga Eri Research & Training Institute, Lagdoigarh, 21-22 Feb., 2017.
 10. S Subadas, R Kumar, Ranjini MS (2017) Preliminary study on pebrine (Nosematidae: Fungi) infection in lepidopteran larvae coexisting in muga ecosystem. In “National Seminar on Economic Insects: Thrust on recent advances on Vanya silks” organised by Central Muga Eri Research & Training Institute, Lagdoigarh, 21-22 Feb., 2017.
 11. SP Sandilya, PM Bhuyan, D Kardong, DK Gogoi (2017) Assessment of a promising *Achromobacter* sp. towards plant growth promotion and subsequent development of an INM package in sustainable ericulture. Paper presented in the National Seminar on “Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks” organized jointly by CMER&TI, CSB, Lahdoigarh and Directorate of Sericulture, BTC,

Kokrajhar on 21st and 22nd February 2017.

12. TJ Keisa, R Luikham (2017) Disease incidence during rearing of *Antheraea proylei* J. National Seminar on *Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks*. Feb. 21-22, 2017. P-7.
13. TJ Keisa, R Luikham, BK Singh (2017) Incidence of Diseases during rearing of *Antheraea proylei* J. in the National Seminar on Economic Insects of NE India: Thrust on Recent Advances in Vanya Silks. February 21-22, 2017. Organized by Central Silk Board, CMER & TI, Lahdoigarh and Directorate of Sericulture, Bodoland Territorial Council (BTC) Kokrajhar Assam.

Books

1. BK Singh, M Chutia (2016) Frequently asked questions on Muga and Eri culture. CMER&TI, Central Silk Board, Jorhat, Assam.
2. BK Singh, D Goswami, MC Sarmah, Ranjana Das, SA Ahmed (2016) Muga aru Eri palonor bistarita prujukti koushal (edited book in Assamese). Published by Director, CMER&TI, Lahdoigarh.
3. BK Singh, MC Sarmah, R Das, SA Ahmed (2016) Technology descriptor in Muga and Eri culture (edited book). Published by Director, CMER&TI, Lahdoigarh.
4. M Chutia, R Kumar, BK Singh (2017) Techniques and technologies in Muga and Eri culture. CMER&TI, Central Silk Board, Jorhat (ISBN 978-81-932697-3-2).
5. MC Sarmah, D. Goswami, Ranjana Das (2016) Muga aru Eri palonor prujukti koushal (edited book in Assamese). Published by Director, CMER&TI, Lahdoigarh.
6. SA Ahmed, MC Sarmah, G Subramanyam, BK Singh (2016) Borpat (*Ailanthus grandis* Prain) A paradise tree for sustainable Eri culture. Published by Director, CMER&TI, Lahdoigarh.

Booklets/ leaflets

1. BN Sarkar, MC Sarmah, BK Singh (2016) Eri Silkworm *Samia ricini* Egg preservation technology. Published by Director, CMER&TI.
2. M. Chutia, U Hazarika (2016) Glimpses of CMER&TI. Published by Director, CMER&TI.
3. MC Sarmah (2016) Eri polur khola bandhar unnat jatan (Improved wooden collapsible mountage of eri silkworm) (in Assamese).
4. MD Senapati (2016) Adhunik Padhatire Eri Beez Utpadan. E-Magazine of CMER&TI, 2016 Pg.4, Div-I, Nov.2016
5. MD Senapati (2016) Uhat Padhatire Eri polu palan aru eior orthoniti. Muga aru Eri Silpor Prajuktir Koushol. Published by CMER&TI, Lahdoigarh.
6. MD Senapati (2016) Adhunik Padhatire Eri Polu Palan. The Asomia Khabar, 2016. Published in Assamese daily paper of Assam on 8th August, 2016
7. MD Senapati, AK Hazarika (2017) Standardization of mother moth examination for pebrine detection in samia species for diagnosis of pebrine disease in commercial seed production. The CLARION, 6 (1): 39-43.
8. R Das, M Chutia (2016) Muga khadya brikhyar apakari puk and bemaar thotha lobologia habodhanota (In Assamese). Published by Director, CMER&TI.
9. SA Ahmed, M Chutia (2012) Integrated Pest Management in castor cultivation. Published by Director, CMER&TI.
10. BK Singh, MC Sarmah, R Das, SA Ahmed (2016) Technology Descriptors in muga and Eri culture (English). Published by Director, CMER&TI.

Annual Report / Newsletters

- 1) CMER&TI Annual Report 2015-16.
- 2) CMER&TI Sericultural News: Vol. 18: January-June, 2016 and Vol. 19 July-December, 2016.
- 3) CMER&TI *Hindi Newsletter*: Vol. 5; January-June, 2016 and Vol. 6 July-December, 2017.

Workshop/Training Attended

1. Dr. B.K. Singh, Director and Dr. K Neog, Scientist - D attended a Training Programme on "Root Trainer Technology" at KFRI, Thrissur, Kerala w.e.f. 22nd - 27th May, 2016.
2. Dr. K. Neog, Scientist-D visited the Laboratory of Insect Genetics and Biosciences, Graduate School of Agricultural and Life Sciences, University of Tokyo, Japan in connection with research related training programme on "Genome engineering of the gemline in eri silkworm *Samia ricini*" during 28.02.2017 to 12.03.2017.
3. Dr. M. Chutia attended in the DBT sponsored training programme on "Bio-safety and bio-security for handling and identification of zoonotic pathogens" at ICAR - National Institute of High Security Animal Diseases, Anandnagar, Bhopal during August 3-8, 2016.
4. Dr. Vinodkumar Naik, Scientist-B attended Foundation Course for Faculty of Agricultural Universities at NAAIM Hyderabad w.e.f. 2nd to 31st May 2016.
5. Dr. Prashanth Sangannavar, Dr. K. Subadas Singh and Dr. M.S. Ranjini, Scientist-B undergone a three days training on 'Central Seed Act 2006' from 04.01.2017 to 06.01.2017 at NSSO, Bangalore.

Recruitment / Promotion of Scientists

1. Dr. B.K. Singh, Scientist-D of MSSO, Guwahati joined at Central Muga Eri Research and Training Institute as the Director of the institute on 15th April, 2016.
2. Dr. T. James Keisā joined at Central Muga Eri Research and Training Institute on 8th July, 2016 as Scientist-C.
3. Dr. M. Dela, Scientist-C joined at Regional Muga Research Station, Boko on 29th June, 2016.
4. Sri D. Medh, Scientist-D of CMER&TI, Lahdoigarh has been transferred to REC, Lakhimpur w.e.f. 20th August, 2016.
5. Sri. Nimal Saikia, TA has been transferred from CMER&TI on 30th June, 2016.
6. Shri Roden Lepcha joined at CMER&TI on 19th May, 2016 as Deputy Director (Administration).
7. Sri B. Choudhury, Scientist-D has been transferred from CMER&TI on 31st May, 2016.
8. Dr. N.I. Singh, Sc.-D has been transferred from CMER&TI on 31st May, 2016.
9. Mrs Biju Das, TA has been transferred from CMER&TI on 30th June, 2016.

Retirement from Board Service

Name of the Staff	Station/unit	Date of retirement
1. Dr. A.K. Gogoi, Scientist - D	RMRS, Bokoreti red	31 st July, 2016
2. Sri S. K. Saikia, Scientist - D	REC, Lakhimpur	31 st August, 2016
3. Sri P.N. Buragohain, Scientist - C	RERS, Mendipathar	31 st December, 2016
4. Sri G. Rajkawa, Scientist - D	CMER&TI, Lahdoigarh	31 st July, 2016
5. Sri Sadananda Gogoi, AT	CMER&TI, Lahdoigarh	31 st May, 2016
6. Mr. Abani Das, Asstt. Supdt.	RMRS, Boko	31 st December, 2016
7. Sri A.R. Saikia, Asstt. Technician	CMER&TI, Lahdoigarh	31 st December, 2016
8. Sri L. Pabha, Driver Grade - 1	CMER&TI, Lahdoigarh	31 st December, 2016

राजभाषा हिन्दी की गतिविधियां व उपलब्धियां

वर्ष 2016-2017 के दौरान संस्थान में राजभाषा हिन्दी के कार्यान्वयन से संबंधित विभिन्न गतिविधियां तथा उस पर हुई प्रगति का संक्षिप्त मदवार विवरण।

1. राजभाषा अधिनियम 1963 की धारा 3(3) की स्थिति –

(क) राजभाषा अधिनियम 1963 की धारा 3(3) के अंतर्गत जारी कागजात की कुल संख्या:

(ख) इन में से अंग्रेजी में जारी किए गए कागजात: शून्य।

2. हिन्दी पत्राचार:

क्षेत्र	हिन्दी/द्विभाषी में	केवल अंग्रेजी में	भेजे गए कुल पत्रों की संख्या	हिन्दी/द्विभाषी में भेजे गए पत्रों का प्रतिशत
क	54	10	64	84.37
ख	01	00	01	100
ग	3303	2373	5676	58.19

3. वर्ष के दौरान आयोजित हिन्दी कार्यशाला:

हिन्दी कार्यशाला की संख्या	हिन्दी कार्यशाला में प्रशिक्षित अधिकारी व कर्मचारी की संख्या
4	अधिकारी 69
	कर्मचारी 29

4. वर्ष के दौरान संस्थान में आयोजित राजभाषा कार्यान्वयन समिति बैठक

1. पहली बैठक, दिनांक - 30.06.2016
2. दूसरी बैठक, दिनांक - 23.09.2016
3. तीसरी बैठक, दिनांक - 31.12.2016
4. चौथी बैठक, दिनांक - 30.03.2017

5. हिन्दी दिवस तथा हिन्दी पखवाड़ा का आयोजन:

संस्थान में हिन्दी पखवाड़ा दिनांक 1.09.2016 से दिनांक 09.09.2016 तक तथा दिनांक 14.09.2016 को हिन्दी दिवस आयोजन किया गया। हिन्दी पखवाड़े के दौरान हिन्दी नोटिंग, हिन्दी निबन्ध, हिन्दी ड्राफ्टिंग, हिन्दी प्रश्नोत्तरी, हिन्दी शब्दवली व अनुवाद, हिन्दी टंकन, हिन्दी तत्काल तथा हिन्दी गीत (चतुर्थ वर्ग कर्मचारियों के लिए) आदि की प्रतियोगिताएं की गयीं। इन प्रतियोगिताएं में विजयी प्रतिभागियों को क्रमशः प्रथम, द्वितीय, तृतीय व सान्तना पुरस्कार से पुरस्कृत किया गया।

इसके अतिरिक्त वर्ष 2015-2016 के दौरान मूल रूप में हिन्दी में कार्य करनेवाले संस्थान तथा इसके अधीनस्थ इकाइयों के अधिकारी व कर्मचारी को केन्द्रीय कार्यालय की उदार योजना के तहत प्रोत्साहन पुरस्कार राशि प्रदान की गई।

6. राजभाषा हिन्दी का निरीक्षण:

वर्ष के दौरान संस्थान के निम्नलिखित अधीनस्थ केन्द्र तथा इकाइयों में राजभाषा हिन्दी का निरीक्षण किया गया-

1. क्षेत्रीय मूंगा अनुसंधान केन्द्र, बोको, असम
2. अनुसंधान विस्तार केन्द्र, लखीमपुर, असम
3. अनुसंधान विस्तार केन्द्र, बालिजान, अरुणाचल प्रदेश

7. हिन्दी में प्रकाशन

वर्ष के दौरान निम्नलिखित पत्रिकाएं प्रकाशन किया गया:

1. जनवरी – जून, 2016
2. जूलाई – दिसम्बर, 2016
3. ई-मैगजीन 2016

8. हिन्दी न्यूज लेटर के प्रकाशन में प्रशंसा-पत्र

क्षेत्रीय कार्यान्वयन कार्यालय (पूर्वोत्तर क्षेत्र), गृह मंत्रालय, भारत सरकार, शिलपुखुरी, गुवाहाटी द्वारा “हिन्दी न्यूज लेटर (जूलाई-दिसम्बर, 2016)” के प्रकाशन पर प्रशंसा-पत्र प्रदान किया गया है।

Important activities during the year



Visit of Sri Ranjit Dutta, Hon'ble Minister of Sericulture, Govt. of Assam and Smt. Renukoma Rajkhowa, Local MLA on the occasion of the Establishment Day of the Institute



Exhibition Stand of Central Silk Board at Shillong



Visit of delegates from Japan



Participants (left) and dignitaries (right) in the National Seminar organized by CMERTI, Ladlogerh & Directorate of Sericulture, B.C at Kokrajhar

Important activities during the year



DBT sponsored workshop and training programme at CMERTI, Lakshadweep



Awareness rally and seedling distribution during the World Environment Day 2016



Dignitaries releasing publications during the Vanashakti Krishinela 2017



Students visited the exhibition stall of the institute



UPI Awareness programme



Blood donation camp at the institute

Important activities during the year



Swachh Bharat Abhiyan outreach programmes organized by the institute



Ashturn nearvarinnsilen Muga silkworm



Outreach Camp at School



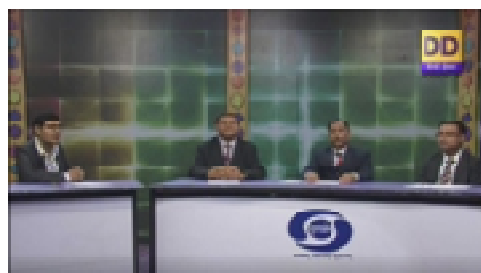
Training programme to the farmers



Training programme to the farmers



Scientist from Japan visited the institute



Scientists in the DD (NE) programme

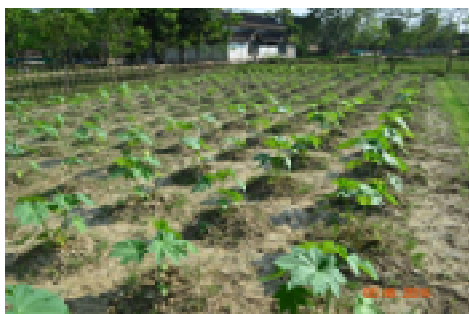
Important activities during the year



Dr B.K. Singh receiving award from Zoological Society of India



Dr K. Neog receiving Best Scientist Award (Non-mulberry) of CSB



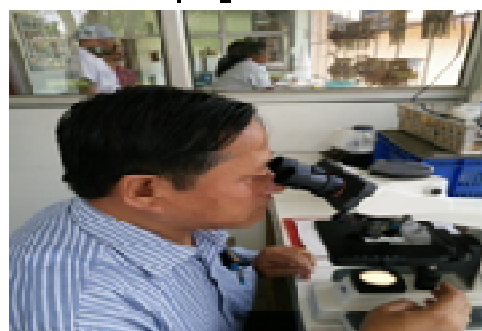
Castor plantation in Field Laboratory Titagarh



Technology demonstration programme



Cold storage facility at the institute



Cold storage facility at the institute



World Health Day 2017



Participants in the Socio Act meeting



केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान

(आई एस ओ 9001: 2015 प्रमाणित संस्थान)

Central Muqa Eri Research and Training Institute

(ISO 9001:2015 Certified Institute)

केन्द्रीय रेशम बोर्ड Central Silk Board

वस्त्र मंत्रालय, भारत सरकार Ministry of Textiles, Govt. of India

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