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लाहदोईगढ़ Lahdoigarh-785700, जोरहाट, Jorhat, असम, Assam

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डॉ के.गिरिधर Dr. K. Giridhar
निदेशक, के.मू.ए.अ. व प्र.सं Director, CMER&TI
केन्द्रीय रेशम बोर्ड Central Silk Board
लाहदोईगढ़ Lahdoigarh-785700
जोरहाट,असम Jorhat, Assam
दूरभाष Phone: (91) 0375-2335513/2335124
फैक्स Fax: (91) 0376-2335528
वैबसाइट website: www.cmerti.res.in

सम्पादक Edited by:
डॉ राजेश कुमार Dr. Rajesh Kumar, Scientist C
डॉ उरमीमला हजारिका Dr. Urmimala Hazarika, Scientist C
श्री बी चौधुरी, Shri B. Choudhury, Scientist D

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Cover photographs:
Left to Right row – 1. Muga first instar, 2. Eri first instar, 3. Women harvested C2 breed eri cocoons
Left to Right second row – 1. Muga eggs, 2. Muga cocoons, 3. Eri C2 breed cocoons

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प्रस्तावना

भारत का पूर्वोत्तर क्षेत्र विविध वनस्पति तथा जीव-जन्तुओं का प्राकृतिक निवास स्थान है। इस क्षेत्र में विद्यमान सेरीजिनियस् कीटों तथा इसके खाद्य पौधो के लिए उपयुक्त व सहायक पर्यावरण होने के कारण यह क्षेत्र इसका प्राकृतिक भूमि है। इस क्षेत्र में वाणिज्यिक रूप से दोहन रेशम अर्थात शहतूत, मूगा,एरी तथा ओक तसर के अतिरिक्त वाणिज्यिक रूपसे अदोहन सेरीजिनियस् कीटों अर्थात *Attacus atlas*, *Samia canningie*, *Cricula trifenestrata*, आदि पर्याप्त रूप से उपलब्ध हैं।

एरी रेशम शलभ का मूल वास स्थान असम की ब्रह्मपुत्र घाटी है। एरी रेशमकीट से उत्पादित रेशम वाणिज्यिक रूप से विश्व में तृतीय सबसे अहम रेशम है जो शहतूत तथा चीनी तसर के क्रम के बाद आता है। देश में पूर्वोत्तर भारत द्वारा एरी कता हुआ कोसा और कता रेशम का कुल परिमाण के ९८ प्रतिशत उत्पादित करता है। इन उत्पादन के अतिरिक्त, उत्तर प्रदेश, आन्ध्र प्रदेश, तामिलनाडू और उड़िसा में एरी संवर्धन होता है। एरी रेशम के उत्पादन तथा इसकी मांग दिन प्रतिदिन वृद्धि हो रही है। इसका उत्पादन वर्ष २०१४-१५ के दौरान ४६०० मे्र.टन तक हो गया है। मूगा रेशम पूर्वोत्तर क्षेत्र में पाया जाने वाला एक विशेष रेशम है जो सुनहरे रंग का उत्कृष्ट रेशम उत्पादन करता है। मूगा रेशम उत्पादन का उत्पादन में धीरे-धीरे वृद्धि हो रही है तथा वर्ष २०१४-१५ के दौरान मूगा रेशम १५८ मे्र.टन उत्पादन हुआ है, बताया जाता है कि रेशम उत्पादन में अब तक यह सबसे अधिक उत्पादन है। मूगा रेशम उत्पादन को निश्चित जीवीय तथा अजैव समस्या का सामना करना पड़ा है जिससे इसके संभावीय कच्चा रेशम उत्पादन में भारी बाधित हो रहा है। इसके अतिरिक्त विश्वव्यापी गरमी के साथ-साथ मौसम का बदलाव और मूगा उद्योग में विद्यमान पर्यावरनीय प्रदूषण को नकारा नहीं किया जा सकता।

केन्द्रीय रेशम बोर्ड के अधीन केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान ने बुनियादी तथा अनुप्रयोग अनुसंधान, विकासात्मक व विस्तार गतिविधियों से संबंधित आदेशात्मक कार्य किया है जो देश के मूगा व एरी उद्योग के विकास में मदद मिलें। रेशमकीट कीटपालन प्रबंधन, खाद्य पौधा सुधार व प्रबंधन, विकसित प्रजनन, पीड़क व रोग प्रबंधन आदि की दिशा में कृषकों की अनुकूल प्रौद्योगिकी के विकास पर तथा कृषकों की सहभागिता को व्यापक रूप से प्रसारण का अभियान तथा राज्यिक रेशमत्पादन विभाग के साथ सुसमन्वय स्थापित करने पर प्रयास पर यह संस्थान केन्द्रित रहा है।

मुझे यह नोट करते हुए बेहद खुशी हो रही है कि संस्थान द्वारा वर्ष २०१४-१५ के दौरान महत्वपूर्ण गतिविधियां इसका लक्ष्य पूरा कर सका है। संस्थान द्वारा अधिक उत्पादन करने वाला एरी रेशमकीट प्रजनन सी-२ विकसित किया गया जिसका अनुमोदन संकर प्राधिकरण समिति, केन्द्रीय रेशम बोर्ड ने किया है तथा एरी कृषक स्तर पर व्यापक रूप से ग्रहण किया है। केन्द्रीय रेशम बोर्ड को "इनवेटिव यूज ऑफ जी.आई.एस. टेक्नोलॉजी इन ई-गवन्च" नामक परियोजना के कार्यान्वयन पर राष्ट्रीय पुरस्कार से सम्मानित किया गया है। यह संस्थान इस परियोजना के कार्यान्वयन में प्रमुख दावेदार रहा है। इस संस्थान ने असम के जोरहाट,गोलाघाट और शिवसागर जिले में २० एस.एच.जी. के साथ मॉडल एरी विलेज विकसित किया गया जिसमें उत्तरवर्ती व पूर्ववर्ती के कोसा के दोनों क्षेत्रों में तथा एरी रेशम के उत्पादन डिजाइन तथा विविध व प्राकृतिक रंगन की प्रौद्यिगिकी के जरिए महिला सशक्तिकरण, अतिरिक्त आय और रोजगार का सृजन करने पर केन्द्रित रहा है। दाधरा एस.एच.जी. और देउघरिया एस.एच.जी. को एरी कोसा उत्पादन पर राज्यिक स्तर पर प्रथम व द्वितीय पुरस्कार प्राप्त हुआ है। संस्थान ने बारहमासी खाद्य पौधा एलाईन्टस के उत्कृष्ट जीवप्ररूप की पहचान व मूल्यांकन, बहुप्रजनन वृद्धि के लिए वन्य मूगा रेशम कीट का मूंल्यांकन तथा कवच भार, पीड़क व रोग की पूर्वसूचना व पूर्वचेतावनी की प्रणाली का विकास, मूगा रेशमकीट जननद्रव्य स्वस्थाने संरक्षण, एरंड का एकीकृत पोषक प्रबंधन पैकेज तथा मूगा तथा एरी के रेशमकीट बीज को लम्बी अवधि के लिए परिरक्षण आदि पर अध्ययन भी किया है। संस्थान ने वैज्ञानिक,तकनीकी और प्रशासनिक की श्रमशक्ति पर जोर देते हुए एन.ए.ए.आर.एम. हैदराबाद तथा एन.ई.आई.एल.आई.टी. ,जोरहाट जैसे बाह्यिक संस्थानों के जरिए प्रशिक्षण आयोजित किया गया है। इसके अतिरिक्त,संस्थान के वैज्ञानिकों को अन्य जाने-माने राष्ट्रीय संस्थानों में प्रतिनियुक्त किया गया है। कृषकों के घर-घर में प्रशिक्षण तथा प्रौद्योगिकी स्थानातंरण पर अधिक भरोसामन्द व्यवस्था की गई तथा संस्थान ने सेरी मॉडल विलीज, कृषकों प्रक्षेत्र स्कूल, असम, मेघालय, नगालैंड, पश्चिम

बंगाल तथा उत्तर प्रदेश के भारी संख्या में कृषकों को शामिल करते हुए मूगा व एरी पर क्लस्टर प्रोमोशन प्रोगम जैसे कई कार्यक्रमों का आयोजन किया। विविध प्रशिक्षण कार्यक्रम के तहत ५००० से अधिक कृषकों, रेशम उत्पादन विभाग के कर्मचारियों, बीमा तथा गैर सरकारी संगठनों के अधिकारी व कर्मचारियों को प्रशिक्षण प्रदान किया गया। संस्थान तथा इसके अधीनस्थ इकाईयों में प्रौद्योगिकी जागरूकता कार्यक्रम, रेशम कृषि मेला, प्रक्षेत्र दिवस, प्रदर्शनियां, समूह चर्चा-परिचर्चा, फ्रन्टलाईन प्रदर्शनियां आदि आयोजित किए गए। संस्थान ने सेरीजिनस् इन्सेक्ट रिपोसिटोरी की स्थापना कर इसके बुनियादी सूविधाएं को भी मजबूत बनाया है तथा इस प्रकार की स्थापना पूर्वोत्तर भारत में पहली है।

मुझे प्रो. बलिन कुमार कंवर, उपकुलपति, नगालैंड विश्वविद्याल तथा अध्यक्ष, अनुसंधान सलाहकार समिति (अर.ए.सी.),केमूएअवप्रस,लाहदोईगढ तथा अनुसंधान सलाहकार समिति के सभी सदस्यों को अनुसंधान व विकास के सभी अग्रणी क्षेत्रों में और मूगा व एरी उद्योग में विद्यमान समस्यों का हल करने में उनके द्वारा दिए गए मूल्यवान व अहम मार्गदर्शन तथा सुझाव के प्रति कृतज्ञता व्यकत करने में खुशी हो रही है।

मैं केन्द्रीय रेशम बोर्ड, बेंगलूरू के सक्षम प्राधिकारी को संगठन के लक्ष्य को पूरा करने के संबंध में अनुसंधान व विकास की गतिविधियां के निष्पादन में सतत सहयोग प्रदान करने के लिए धन्यवाद ज्ञापित करता हूं तथा मैं उत्तर-पूर्वी क्षेत्र के रेशम उत्पादन के विभागों को विकासात्मक व विस्तार सूचनाओं के आदान-प्रदान के कार्यक्रमों को प्रभावी से कार्यान्वयन किए जाने के लिए निष्टापूर्वक प्रशंसा करता हूं। मैं सभी सहयोगी संस्थानों तथा निधि प्रदान करने वाले अभिकरणों यथा डिब्रुगड़ विश्वविद्यालय,गुवाहाटी विश्वविद्यालय, उत्तर-पूर्वी विज्ञान तथा प्रौद्योगिकी संस्थान,जोरहाट, आई. आई. टी., खरगपुर, आई.ए.आर.ई., नई दिल्ली, असम कृषि विश्वविद्यालय,जोरहाट, विज्ञान तथा प्रौद्योगिकी विभाग,भारत सरकार तथा जैव-प्रौद्योगिकी विभाग, भारत सरकार को निष्टापूर्वक प्रशंसा करता हूं जिनके सहयोग से देश में एक अग्रणी अनुसंधान व विकास संस्थान के रूप में सक्षम बनाया है। अन्त में, मैं उन कृषकों को अत्यधिक धन्यवाद व कृतज्ञता व्यक्त करता हूं जिन्होंने मूगा व एरी के दोनों क्षेत्रों में विस्तार तथा अनुसंधानीय सेवाए में सामना कर रही चेतवानी के विरूद्ध लड़ाई करने में जरूरतमन्द तथा उपयोगी सहयोग किया है।

डॉ के.गिरिधर
निदेशक

FOREWORD

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*, *Cricula trifenestrata*, etc.

Brahmaputra river valley of Assam is considered as original home of cultivated eri silkmoth. 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 amount of eri cut cocoons and spun 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 4600 MT during 2014-15. 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 158 MT during 2014-15 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.

The Central Muga Eri Research and Training Institute under Central Silk Board is the leading institute mandated to carry out basic as well 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.

I am happy to note the institute could fulfill its goal in a remarkable extent during 2014-15. 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. 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 stakeholder in implementing the project. The institute has developed model eri villages with 20 SHGs 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. Dadhara SHG and Deogharia SHG received State Level 1st and 2nd Prize, respectively in eri cocoon production. 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, etc. The institute emphasized on capacity building of Scientific, Technical and Administrative manpower and conducted training through external institutes such as NAARM, Hyderabad and NEILIT, Jorhat besides deputing the scientists to other renowned national institutes. More thrust was given on training and transfer of technologies to the doorsteps of farmers and institute implemented programmes such Seri-Model Village, Farmers' Field Schools, 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 numbers of technology awareness programme, Reshom Krishi mela, field days, exhibition, group discussions, frontline demonstration, etc. The institute also strengthened its infrastructural facilities by establishing 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, IARI, New Delhi, Assam Agricultural University, Jorhat, 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 to the farmers for 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. K. Giridhar
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, Government 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

- To act as an apex Research Institute for providing R&D support for muga and eri culture.
- To conduct basic, strategic and applied research to increase production and productivity of silkworms and their host plants.
- To conduct socio-economic research for assessing sustainability of newly developed technologies.
- To percolate the research findings to the end users through extension and training mechanism.

B. HUMAN RESOURCES

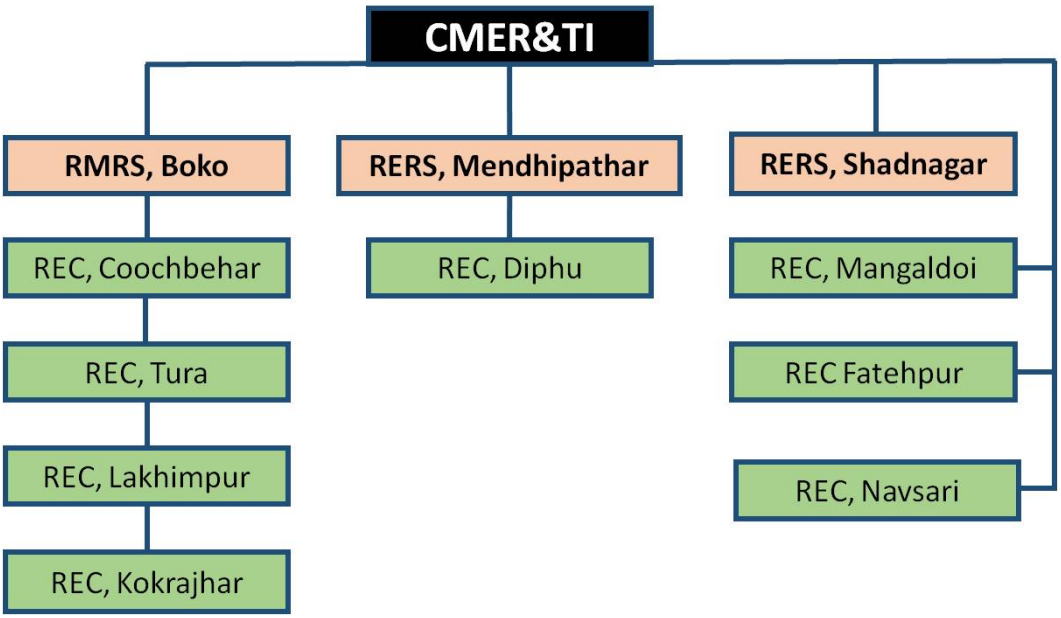
Scientists	27
Technical staff	57
Administrative Staff	57
Supporting Staff	37
Total Staff	**178**

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.

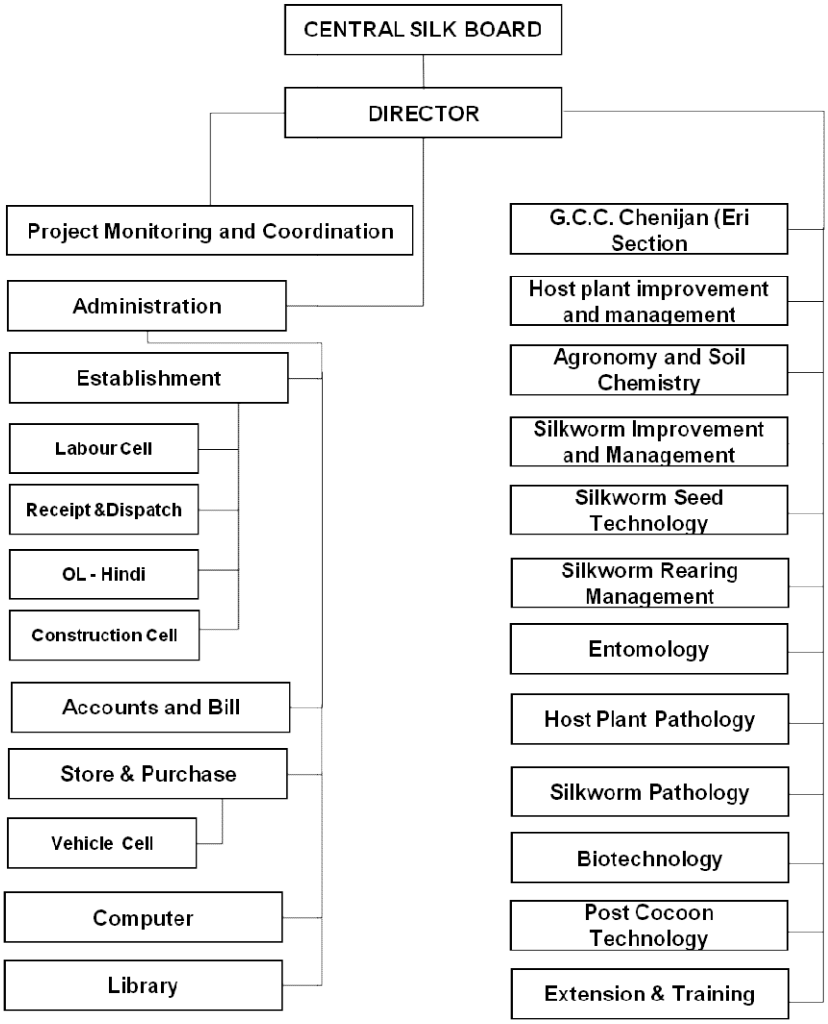
The administrative activities are carried out by ten sections *viz.,* Establishment, Accounts & Bill, Stores and Purchase, Library, Vehicle, Construction, Labour, Computer, Hindi and Receipt & Dispatch.

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 2015)

I. MAIN INSTITUTE

1.	Dr. K. Giridhar	Director	
2.	Shri B. Choudhury	Scientist – D	
3.	Shri Z.M.S. Khan	Scientist – D	Upto 18.06.2014
4.	Shri P.K. Handique	Scientist – D	
5.	Shri D. Goswami	Scientist – D	
6.	Mrs. Ranuma Das	Scientist – D	
7.	Dr. R. Das	Scientist – D	
8.	Dr. N.I. Singh	Scientist – D	

9.	Shri G. Rajkhowa	Scientist – D	
10.	Shri D. Mech	Scientist – D	
11.	Dr. K. Neog	Scientist – D	
12.	Dr. N. J. Dhar	Scientist – C	Retd. on 30.04.2014
13.	Mrs. M.D. Senapati	Scientist – C	
14.	Dr. M.C. Sarmah	Scientist – C	
15.	Dr. Urmimala Hazarika	Scientist – C	
16.	Dr. B.N. Sarkar	Scientist – C	
17.	Dr. M. Chutia	Scientist – C	On EOL for DST Overseas Post Doctoral Fellowship in University of Leicester, UK w.e.f. 01.01.2015 for One Year
18.	Dr. D.K. Gogoi	Scientist – C	
19.	Dr. Rajesh Kumar	Scientist – C	On EOL for Guest Faculty at Univ. of Tokyo, Japan w.e.f. 01.05.2015 to 30.09.2015
20.	Dr. S. A. Ahmed	Scientist – C	

II. RMRS, BOKO

01	Dr. S. Paliwal	Scientist – D	Since 16.07.2014
02	Shri A.K. Gogoi	Scientist – D	
03	Dr. G. P. Singh	Scientist – D	Upto 31.05.2014
04	Shri L. Sonowal	Scientist – B	

III. RERS, MENDIPATHAR

01	Shri P.N. Borgohain	Scientist – C	
02	Dr. H. Barman	Scientist – B	

IV. RERS, SHADNAGAR

01	Dr. T. Ravi Verma	Scientist – D	
02	Dr. C. Srinivas	Scientist – D	Upto 31.05.2014

V. REC, LAKHIMPUR

01	Shri S. Saikia	Scientist – D	

VI. REC, COOCHBEHAR

01	Shri S. N. Bagchii	Scientist – D	
02	Dr. N. Biswas	Scientist – D	

VII. REC, TURA

01	Dr. J.C.D. Phukan	Scientist – C	Retd. on 31.12.2014

VIII. REC, KOKRAJHAR

01	Mr. J. Hazarika	TA

IX. REC, MANGALDOI

01	Shri B. Basumatari	Scientist – C

X. REC, FATEHPUR

01	Dr. A.U. Khan	Scientist – D

XI. REC, Diphu

01	Mr. D. Khonikar	TA

XII. REC, NAVSARI

01	Mrs. Hemlataben Patel	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, Andra 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, Mangaldoi, Assam
- Research Extension Centre, Fatehpur, Uttar Pradesh

वर्ष 2014-15 के कार्य की मुख्य उपलब्धिया

केन्द्रीय मूगा और इरी अनुसंधान एवं प्रशिक्षण संस्थान, लहदोईगढ़, जोरहाट अनुसंधान एव इसकी इकाई आर एम आर एस (बोको) आर ई आर एस (शादनगर एव मेंदीपथर) आर ई सी (लखीमपुर, कूचबिहार, तुरा, दिफू, मंगलदोई, कोकराझार और फतेहपुर) जो कि मूगा एव इरी उद्योगों के विकास मे सहायता प्रदान करता है।

अनुसंधान के क्षेत्र में प्रमुख उपलब्धियों
सी एम ई आर & टी आई, लहदोईगढ़
आर एम आर एस, बोको
आर ई आर एस, शादनगर
आर ई आर एस, मेंदीपथर
प्रौद्योगिकी मान्यता / प्रदर्शन / लोकप्रिय कार्यक्रमों में उपलब्धियां
प्रचार / प्रशिक्षण और विस्तार कार्यक्रमों में उपलब्धियां
भूमि उपयोग कार्यक्रमों में उपलब्धि
बुनियादी ढांचे के विकास में उपलब्धि

वर्ष 2014-15 में किए गए अनुसंधान का मुख्यांश

केन्द्रो मूगा तथा एरी क्षेत्रों के विकास के लिए में केन्द्रीय मूगा एरी अनुसंधान व प्रशिक्षण संस्थान,लाहदोईगढ़, जोरहाट से जुड़े क्षेत्रीय मूगा अनुसंधान केन्द्र, बोको, क्षेत्रीय एरी अनुसंधान केन्द्र, शादनगर, क्षेत्रीय एरी अनुसंधान केन्द्र के अतिरिक्त लखीमपुर, कुचबिहार, तुरा, डिफु, मंगलदोई,कोकराझार तथा फतेहपुर स्थित अनुसंधान विस्तार संस्थान केन्द्रों द्वारा अनुसंधान व विकास में सहयोग प्रदान कर रहा है।

क॰ अनुसंधान में प्रमुख उपलब्धियां:

वर्ष 2014-15 के दौरान विभिध वर्गीकरण अनुसंधान परियोजनाएं अर्थात पर्यावरणी चुनौती तथा विश्वव्यापी गरमी, कठोर व उबाऊ काम का घटाव, महिला अनुकूल प्रौद्योगिकियां, निवेश लागत की कटौती, पारिस्थितिक अनुकूल, तथा प्राकृतिक व जैविक रसायन से तैयारी कृषिक्षेत्र से संबंधित 9 केरेबो निधि से प्रदत्त 9, डी बी टी की निधि से प्रदत्त 4 तथा डी एस टी निधि से प्रदत्त 5 परियोजनाएं संस्थान तथा इसके अधीनस्थ इकाइयों में कार्यान्वियत की जा रही हैं। इन परियोजनाएं में से 4 परियोजनाएं समाप्ति हो गई, पिछले वर्ष से 10 परियोजनाएं चल रही हैं तथा 4 परियोजनाएं शुरूवात की गई है। इसके अतिरिक्त संस्थान में कृषक स्तर पर 4 नियमित कार्यक्रमों, 10 प्रौद्योगिकी स्थानातंरण के कार्यक्रमों, 2 समापन/ प्रक्षेत्र जांच तथा 2 प्रमुख अध्ययन का कार्य सम्पन्न चुका है।

CMER&TI, Lahdoigarh

- तीन जैवउर्वरक संभावनीय वैक्टिरयल पृथककरण किया गया अर्थात सेयूडोमोनस् एरूजिनोसा स्ट्रेन माज PIA03, बैसिलूस फ्रमूस स्ट्रेन माज PSB12 तथा एन्ट्रोमोबैक्टर एसपी. एस एस के 4 स्ट्रेन केएजेड ए जेडबी 05 को एरंड मृदा नमूने से पहचान की गई है।
- एरी रेशमकीट कीटपालन को जीवित रखने के लिए एलियन्ठास ग्रेन्डिस एक उपयुक्त विकसित खाद्य पौधा है।
- लक्षित लक्षण अर्थात अधिक उत्तरजीविता (50 प्रतिशत से ज्यादा ई आर आर) तथा अधिक कवच भार (0.50 *ग्रा.*) के दिशात्मक चयन किए जाने के बाद मूगा रेशमकीट के अधिक प्रजनन उत्पादन के लिए सिब युग्मन तथा परवर्ती पीड़ी (F14-F18) में चयनित वंशक्रम का अन्तःप्रजनन किया गया।
- भ्रूण पृथकरण विधि का मानकित कर मूगा रेशमकीट अण्डों की विभिन्न विकासात्मक अवस्थों के लिए भ्रूण संचित्र (चार्ट) की तैयारी की गयी। यह परिलक्षित हुआ कि मूगा रेशमकीट के अण्डे को 7 ^{0}C के तापमान में 15 दिन तक संरक्षित कर उससे > 85 % अण्डजोत्पति की जा सकती है।
- मूगा रेशमकीट आन्त सूक्ष्मवनस्पतिजातों को अकारिकी अनुकूलन तथा जैव-रासायनिक के रूप में चरित्र वर्णन किया गया। इन में से संभाव्य आन्त-जीवाणु MGB-05 तथा MGB-11 जिन्हे बैसिलस स्ट्रोस्फेरिकूस तथा बैसिलस सेरियूस के रूप में अलग-अलग से पहचान की गयी
- निदान प्रणाली को विकास के लिए मूगा पारिस्थिततिक तंत्र से 400 कीटों का नमूना संग्रह कर उन्हें इन्सेक्ट रिपोसिटोरी में संरक्षण किया गया तथा इसके उदाहरण सहित । 120 नमूने का प्रस्तुत किया गया है।
- मूगा रेशमकीट के रोगी मृत शरीर से जीवाणु रोगजनक को पृथक कर के बाद चार जीवानुओं को मूगा रेशमकीट रोगजनक के रूप में पहचान की गई है।

- मूगा रेशमकीट को चुनौती देनेवाले हेमोलीम्फ कवक से प्रतिकवक का पृथकीकरण और चरित्र वर्णन किया जा रहै है।
- मणिपुर तथा बीटीसी,असम में एरी C2 की प्राधिकरणोत्तर जांच करने पर औसत अण्डजनन क्षमता में प्रति रो मु च के विपरीत 320 संख्या दर्ज किया गया, प्रति रो,मु.च. के विपरीत कोसा उत्पादन 238 संख्या तथा 79 %. ओसतन ईआरआर दर्ज किया गया। बी टी सी, असम में प्रति रो.मु.च. के विपरीत 355 संख्या, प्रति रो.मु.च. से 252 संख्या कोसा उत्पादन के साथ 81 %. औसत ईआरआर का दर्ज किया गया। रेशम आदर्श ग्राम के कृषकों को 20000 से अधिक एरी C2 नस्ल वितरित किया गया।
- संस्थानीय बायोटेक हब परियोजना के तहत "मूगा पारिस्थितिक तंत्र के रोगाणु और कीटों की बुनियादी निदान प्रविधि" पर संस्थान में दिनांक 16 से 18 मार्च 2015 तक तीन दिवसीय कार्यशाला आयोजित की गयी। केन्द्रीय महाविद्यालय के तीन छात्रों ने बायोटेक हब की सुविधा का उपयोग कर मूगा खाद्य पौधा के जैव-रासायन अध्ययन पर अपनी इंट्रनशीप प्रजेक्ट पूरी की। पश्चिम बंगाल विश्वविद्यालय तथा स्कूल छोत्रों के लिए तीन प्रदर्शनी कार्यक्रम पूरा किया गया।
- केसारू के अधिक उत्पादन करने वाले जीन प्ररूप नामतः HF 008 और HF 005 को संभाव्य पर्ण उपज 27.57 मी टी प्रति हेक्टर प्रति वर्ष के साथ पहचान की गई। HF 008 और HF 005 द्वारा बेंचमार्क पौधारोपन (सभी उन्नत व विकसित अनुप्रयोग अपनाकर परंपारिक एसोसियसनस्) में 25 मी टी पर्ण उपज के विपरीत 10.28 % तथा 6.68 % पर्ण उपज अलग-अलग से रिकार्ड दर्ज किया गया है।
- डी एस टी द्वारा प्रदत्त निधि की परियोजना " Sustainable Rural livelihood", के तहत एरी धागा कताई , उत्पादन डिजाईन, एरी शिल्क का डायिंग तथा उत्पादन विकास पर प्रशिक्षण कार्यक्रमों आयोजन किए गए। हिताधिकारियो को एरी रेशम आधारित उपक्रम के लिए एच डी एफ सी बैंक लीं. तथा स्टेट बैंक ऑफ इन्डिया के साथ बैंक/क्रेडिट से जुड़ते हुए सुविधा उपलब्ध कराया गाय ।
- रेशमकीट समुपयोजन तथा लक्षण वर्णन कार्यक्रम के तहत पूर्वोत्तर के छः राज्यो यथा अरूणाचल प्रदेश, असम,मेघालय,नगालैंड,मणिपुर तथा मिजोराम से 200 से अधिक वन्य सेरीसिगेनोस कीटों के नमूने संग्रह किए गए, जिनमें से 41 नमूने Saturniidae and *Bombycidae* के है और इन्हें पहचान की गई। आगे सन्दर्भ के लिए सभी नमूने संरक्षण किए गए है।
- अर्न्तकक्ष अवस्था में मूगा रेशमकीट के परिस्थिति -अनुकूलन के लिए एक प्रजाति को 14 पीड़ियों के लिए लगातार कीटपालन किया जाने पर पूरे अर्न्तकक्ष कीटपालन के तहत विभिन्न ऋतुओं में 15-45 % ई आर आर रिकार्ड दर्ज किया गया।
- मूगा खाद्य पौधा तथा रेशमकीट के पीड़क तथा रोग की पूर्वसूचना व पूर्वचेतावनी की प्रणाली विकसित किया गया है। इस वर्ष में पीड़क तथा रोग से संबंधित जानकारी **मोबाइल एस एम एस** से 44160 कृषकों को जुड़े गए है। पूर्वसूचना व पूर्वचेतावनी का कैलेंडर भी संस्थान के वेबसाइट में नियमित रूप से अद्यतन किया गया है।
- अहरूवा तथा कठिया फसल 2014 के दौरान मूगा रेशमकीट डिम्बक के कीटपालन में "पर्ण पृष्ट रोगाणु (एल एस एम)" का परीक्षण किया गया। अहरूवा फसल के दौरान कीटपालन निष्पादन में अहरूवा तथा कठिया फसलों में उपचार और नियंत्रण के बीच कोई भिन्नता परिलक्षित नहीं हुआ जबकि कटिया फसल में उपचार में 47.5 % ईआरआर और नियंत्रण में 43.3 % ईआरआर विद्यमान हुआ।
- संस्थान के अनुसंधान सलाहकार तथा अनुसंधान सलाहकार समिति द्वारा दस नयी अनुसंधान परियोजना प्रस्तावें अनुमोदित किया गया है।

क्षे मू अ के , बोको

- मूगा रेशमकीटों जीवप्ररूप संसाधनों के संरक्षण के संबंध में जी सी सी डमलगिरि, पश्चिम गारो हिल्स्, मेघालय में सस्थाने अवस्था में इसके आठ वन्य जीवप्ररूप संसाधनों को अनुरक्षण किया जा रहा है।

- सोम के S3 तथा S6 आकृति प्ररूपों को रोग सहिष्णुता के रूप में पहचान की गई तथा प्रक्षेत्र में आपूर्ति किए जाने के उद्देश्य से इसे बड़े पैमाने में बहुगुणित कर इस वर्ष के दौरान मूगा के आकृति प्ररूपों की 21000 नवोदभिद पौधे उगाए गए हैं।

क्षे ए अ के , शादनगर

- रैन-फेड सेमि-एरिड कन्डिशनस् के तहत वाणिज्यिक व बार-बार उगने वाले केस्टर जीनप्ररूपों के विविध संभाव्य प्रजातियों को मूल्यांकन करने के लिए पैरामीटिर संवृद्धि,, शरीरक्रिया विज्ञान पैरामीटिरस्, सेमोएसाय, जैव आमापन के आधार पर आठ केस्टर जीवप्ररूपों को मूल्यांकित करने पर केस्टर जीनप्ररूपों अर्थात CSP-106, CSP–105 तथा CSP–103 द्वारा रेशम अनुपात तथा अन्य वाणिज्यिक लक्षण संबंधी उच्चतर मूल्य प्रदर्शित किया गया।
- आन्ध्र प्रदेश की सेमि-एरिड कन्डिशनस् की पारि प्रजाति को अभिन्नता दर्शाने के लिए एरी रेशम कीट के 10 समूह (accessions) को विभिन्न मौसमों में कीटपालन व पुनः उत्पादन निष्पादन पर ध्यान देते हुए मूल्यांकित किया गया। उपर्युक्त समूह के E-201 और E- 206 ने बहुमुखी कीटपालन तथा पुनःउत्पादन ट्रिट्स् के मामले में सर्वोच्च दर्शाया।

क्षे ए अ के, मेन्दिपथार

- संस्थान की अनुसंधान समिति तथा अनुसंधान सलाहकार समिति द्वारा "एरी संवर्धन में विकसित व प्रौद्योगिकी तथा कुशल विकास के अंगीकरण के जरिए कृषकों के सामाजिक -आर्थिक उन्नयन" नामक परियोजना की सिफारिश की गई है।

A. प्रौद्योगिकरण वैधताकरण/प्रदर्शनी/लोकप्रियकरण कार्यक्रमों में उपलब्धि

के मू ए अ व प्र सं, लाहदोईगढ़

- *चतुवा* (मार्च -अप्रैल, 2014),आहरूवा (जुलाई- अगस्त, 2014) तथा कटिया फसल (अक्टूबर-नवम्बर, 2014)
  के दौरान किशोर हॉर्मोन अनुरूप "मेटोप्रेन " (0.1 µg प्रति मिग्रा) को कृषकों के प्रक्षेत्रों के मूगा रेशम कीट पर छिड़काव किया तथा पाया गया कि नियंत्रण के मुकाबले उपचार में 10-25 % अंडजनन क्षमता में वृद्धि का आकड़ा दर्शाया है।
- *चतुवा* (मार्च -अप्रैल, 2014),आहरूवा (जुलाई- अगस्त, 2014) तथा कटिया फसल (अक्टूबर-नवम्बर, 2014)
  के दौरान कृषकों के प्रक्षेत्रों के सोम पौधे की चयनित पत्ति पर Insect stimulants छिड़काव किए जाने पर
  नियंत्रण के विपरीत 24-66 % ईआर आर वृद्धि हुई है जो आकड़ा दर्शाता है।
- *चतुवा* (मार्च -अप्रैल, 2014),आहरूवा (जुलाई- अगस्त, 2014) तथा कटिया फसल (अक्टूबर-नवम्बर, 2014) के दौरान कृषकों के प्रक्षेत्रों में मूगा सोम पोधे की पत्ति पर टेर्मिनिया चेबुला के आधारित प्रतिपादन "मूगा हील" छिड़काव करने पर ई आर आर में 15-30 % वृद्धि हुई तथा फूलेचरी (रेशमं कीट रोग) आकान्त का 15-20 % प्रतिशत कम होने का दर्शाया गया है।
- मूगा रेशमकीट के रोगानुशान रोग प्रबंधन के लिए असम तथा मेघालय के 200 से अधिक कृषकों के विभिन्न क्षेत्रों में प्रदर्शनी कार्यक्रमों आयोजित किए गए तथा 79 कृषकों से प्राप्त फीड बैक में

दर्शाया कि नियंत्रण की तुलना में प्रति रो मु च के विपरीत 11 से लेकर 22 कोसा में बढ़ोत्तरी हुई।

- मूगा पारिप्रजाति में उजी मक्खी नियंत्रण के लिए ध्यान आकर्षित करने तथा मार भगाने का उपाय विकास करना।
- मूगा उत्पादन करनेवाले कृषकों के बीच जैव-तीव्र कृषि प्रौद्योगिकी का लोकप्रियकरण किए जाने के उद्देश्य से 90 कृषकों को अपनाने के लिए पहचान की गई है। हरा खाद फसल (धानिचा) बीज बोनना, हरा खाद फसल समाविष्ट करना, इन्टर कोर्पस् (black gram/ sesame) बीज बोनने से संबंधित जागरूकता तथा प्रदर्शनी कार्यक्रम आयोजित किए गए। वर्मीकमोस्ट आदि का प्रयोग अपनाए गए कृषकों के प्रक्षेत्रों में किया गया। वर्मीकमोस्ट प्रयोग पर प्रशिक्षण भी आयोजित किया गया जिसमें 181 कृषकों ने भाग लिया ।
- मूगा और एरी के क्लास्टरों में मूगा व एरी के प्रत्येक क्षेत्रों में तीन-तीन फार्मस् फिल्ड स्कूलस् (कृषक प्रक्षेत्र स्कूलस्) की स्थपना की गई। प्रति फार्मस् फिल्ड स्कूलस् केन्द्रों से बैंचमार्क संबंधी सूचनाएं संग्रहित किया गया। प्रति संबंधित यूनिट/वैज्ञानिकों को लैपटप, एल सी डी प्रोजेक्टर, वाइट बोर्ड, प्रोजेक्टर स्क्रीनस्,पोस्टर,पमफ्लेटों आदि आपूर्तित किए गए। सभी फार्मस् फिल्ड स्कूलस् के प्रमुख कृषकों की पहचान कर प्रति मूगा फार्मस् फिल्ड स्कूलस् को रू 17000/- की दर से और प्रति एरी फार्मस् फिल्ड स्कूलस् को रू 10700 की दर से प्रमुख कृषकों की मदद व सहायता के संबंध में उक्त राशि की निधि प्रदान की गई और उन प्रमुख कृषकों के प्रक्षेत्रों में प्रौद्योगिकी जागरूकता कार्यक्रम, प्रशिक्षण व प्रदर्शिनी कार्यक्रमों आयोजित किए गए।
- सेरी मॉडल विलीज स एरी तथा मूगा तहत के (वी एम एस)ंवर्धन में व्यापक रूप से नवीनतम प्रौद्योगिकी अपनाने के लिए भिन्न विलीज मॉडल सेरी मूगा गया। किया पालन रेशमकीट में ऋतुओं तथा मौसमों भिन्न-अपनाना प्रौद्योगिकी पर जाने किए कार्यान्वयन के (.वी.एम.एस)(छंताई/शाखा कर्तन, हरा खाद का प्रयोग रेशमकीटों तथा पौधे भोज्य,में पाए गए पीड़क तथा रोग नियंत्रण का प्रबंधन, रोग मुक्त चकत्ते आदि में बेंचमार्क अंगीकरण स्तर गया। पाया परिणाम आशाजनक तथा अधिक विपरीत के (पर्टियल)बीज फसल में कोसा उत्पादन कोसा 38 से 33/रोकोसा 63 से 49 में फसल वाणिज्यिक तथा .च.मु./रो के संवृद्धि की .च.मु. सांथ बेंचमार्क के विपरीत 15.3 % से 28.6 % सुधार परिलक्षित हुआ है। जहां तक एरी एस में .वी.एम. प्रजनन विकसित ,करने रोगमुक्त को गृह कीटपालन) प्रौद्योगिकियां(C2), प्लेटफर्म रियारिंग आदि के (गया पाया अधिक में तुलना की अपनाने लेवल बेंचमार्क वह ,है मामला का अपनानेहै। बेंचमार्क की वृद्धि 7.5 kg/100 रो सहित .च.मु.31.9 % सुधार से बढ़कर कोसा भार उत्पादन 9.9 कि.ग्रा./100 रो हुआ .च.मु.। कोसे की कोटी भी सुधार हुआ है तथा निजी व्यापारी को रू बिक्री पर ग्राम किलो प्रति से दर की 500.00 जबकि है लगी होने वृद्धि आय इससे करएस पूर्व के जाने किये कार्यान्वयन के .वी.एम.इसकी कीमत केवल रू रही। ग्राम किलो प्रति 250.00

B. प्रकाशन/प्रशिक्षण तथा विस्तार कार्यक्रमों में उपलब्धियां

- संस्थान ने एन.ए.ए.आर.एम., हाइद्राबाद द्वारा संचालित "विस्तार प्रणली प्रबंधन" और "परियोजना, मॉनिटरिंग व मूल्यांकन और प्रौद्योगिकी प्रबंधन",एन.आई.ई.एल.आई.टी. द्वारा संचालित बुनियादी कम्प्यूटर ज्ञान का प्रयोग, आयकर गणना आदि पर प्रशिक्षण आयोजित किया। इसके अतिरिक्त, संस्थान के वैज्ञानिकों ने आई.एम.टी.आर.गोवा में आयोजित मैनिजिरीयल इफेक्टिव्नेस इन्हान्समेन्ट प्रोगम तथा एस.बी.आर.एल., बेंगलूरू में आयोजित रेशमकीट रोगों में पी.सी.आर.आधारित रोग का पता लगाने पर प्रशिक्षण कार्यक्रम, नई दिल्ली में आयोजित नेशनल कॉन्फरन्स ऑफ वुमन अचीवरस् ऑन् सेरीकाल्चर, बेंगलूरू में आयोजित रेशम उत्पादन व रेशम उद्योग पर अन्तर्राष्ट्रीय कांग्रेस तथा गुवाहाटी में बौद्धिक सम्पदा अधिकार पर आयोजित कार्यशाला में भाग लिया।

- संस्थानीय बायोटेक हब परियोजना के तहत संस्थान द्वारा "मूगा पारिस्थितिक तंत्र के रोगाणु तथा कीटों की मूल निदान प्रविधि" पर कार्यशाला दिनांक 16 से 19 मार्च 2015 तक आजोजित किया गया।
- संस्थान द्वारा न्यूज लेटर के 4 अंक, वर्ष 2013-14 की वार्षिक रिपोर्ट, 20 लीफलेटस/बुलेटिन तथा 9 पूस्तकें/मैन्युयल आदि प्रकाशित किए गए। इसके अलावा, संस्थान के वैज्ञानिकों ने प्रख्यात जर्नल में 15 शोध संबंधी लेखें तथा सेमिनर/कॉनफरन्स/कार्यशाला में 15 शोध संबंधी लेखें प्रकाशित किया।
- संस्थान द्वारा विभिन्न प्रौद्योगिकियां पर प्रशिक्षण कार्यक्रम किया गया जिसमें 3877 हिताधिकारियों को प्रशिक्षण प्रदान किया गया। इन में से आई.एस.डी.एस. के तहत मूगा व एरी रेशमकीट कीटपालन तथा कोसोत्तर की गतिविधियों पर 191 को प्रशिक्षित किया गया। प्रौद्योगिकी जनप्रियकरण कार्यक्रमों के तहत 170 कृषकों को एरी C2 प्रजनन कीटपालन तथा 181 कृषकों को बायोइन्टेसिव फार्मिंग प्रविधि पर प्रशिक्षित किया गया। डी.एस.टी. प्रत्यायोजित परियोजना के तहत संस्थान द्वारा एरी धागा कताई, एरी उत्पादन डिजाइन, रंगाई तथा उत्पादन विकास पर 235 व्यक्तियों को प्रशिक्षण प्रदान किया गया। संस्थान द्वारा सेरी मॉडल विलीज के तहत 662 कृषकों को प्रशिक्षित किया गया। इसके अतिरिक्त, संस्थान ने बीमा के संबंध में कार्यक्रम का आयोजन कर 14 व्यक्तियों को प्रशिक्षित किया गया। संस्थान ने वर्ष के दौरान कुल मिलाकर 5330 हिताधिकारियों को प्रशिक्षित किया गया।
- कृषि विकास केन्द्रों के समन्वय में संस्थान ने मूगा संवर्धन का एकीकृत प्रौद्योगिकी पैकेज, एरी संवर्धन का एकीकृत प्रौद्योगिकी पैकेज, बीनी मशीन, मूगा सिल्क प्लस, मूगा कोकन ड्रयार तथा रोग पूर्वसूचना आदि पर 46 फ्रन्ट लाइन प्रौद्योगिकी प्रदर्शनी कार्यक्रमों का आयोजन किया
- इसके अतिरिक्त, 8 कृषिमेलाए, 45 प्रौद्योगिकी जागरूकता कार्यक्रमों, 13 प्रदर्शनियांए तथा 43 प्रक्षेत्र दिवस आयोजित किए गए तथा कृषकों से तत्संबंधी फीडबैक संग्रहित किए गए ।

C. भूमि उपयोग के कार्यक्रमों में उपलब्धियां

- संस्थान में भूमि उपयोग के कार्यक्रमों में किए गए निष्पादन निम्नप्रकार दिया गया है
- 38100 सोम/स्वालु नवोदोभिद पौधे/पौधे उगाए गए (जिनमें से केमूएअवप्रस में 9000, क्षेमूअके,बोको में 21000, अ.वि.के.,लखीमपुर में 3000 तथा अ.वि.के.कुचबिहार में 5100 उगाए गए) तथा 23080 सोम नवोदभिद पौधे आपूर्तित किए गए (क्षेमूअके,बोको से 15850 और 3 अनुसंधान विस्तार केन्द्रों से 7230 आपूर्तित किए गए)
- 15000 केसारू नवोदभिद पौधे उगाए गए (केमूएअवप्रस में 10000 तथा क्षेएअके,मेन्दिपथार में 5000 उगाए गए) तथा 26 कि.ग्रा.केस्टर बीज आपूर्तित किए गए (क्षेएअके, मेन्दिपथार से 21 कि.ग्रा. तथा अ.वि.के.,डिफू से 5 कि.ग्रा. आपूर्तित किए) तथा 12150 केसारू नवोदभिद पौधे आपूर्तित किए गए (केमूएअवप्रस से 6000 तथा क्षेएअके, मेन्दिपथार से 6150 केसारू नवोदभिद पौधे आपूर्तित किए गए)
- वाणिज्यिक रूप से 7312 मूगा रो.मु.च. कीटपालन किया गया (केमूएअवप्रस में 3140, क्षेमूअके,बोको में 2660 तथा अनुसंधान विस्तार केन्द्रों में 1512 कीटपालन किया गया) तथा बीज फसल के रूप में 6870 रो.मु.च. कीटपालन किया गया (केमूएअवप्रस में 3353, क्षेमूअके, बोको में 1612 तथा अनुसंधान विस्तार केन्द्रों में 1905 कीटपालन किया गया) और इससे वाणिज्यिक कोसा 116917 तथा बीज कोसा 107828 उत्पादित किया गया।
- 1461एरी रो.मु.च. कीटपालन किए गए (केमूएअवप्रस में 381,क्षेएअके,मेन्दिपथार में 485, क्षेएअके, शादनगर में 300, अ.वि.के., मंगलदोई में 200 तथा अ.वि.के. डिफु में 95

रो.मु.च. की कीट पालन किए गए) तथा इससे 132.1 कि.ग्रा. एरी कोसा उत्पादित किया गया।

- 42942 मूगा रो.मु.च. उत्पादित कर मागं के अनुसार 37658 मूगा रो.मु.च. आपूर्तित किए गए उसी प्रकार 11380 एरी रो.मु.च. उत्पादित कर मागं के अनुसार 14355 एरी रो.मु.च. आपूर्तित किए गए।

D. बुनियादी विकास में उपलब्धि

- संस्थान में इन्सेक्ट रिपोसिटोरी की स्थापना कर बायोडिवरसिटी बोर्ड के साथ समन्वय स्थापित करने का प्रयास किया गया।
- मूगा बीजागार भवन निर्माणार्थ के.लो.नि.वि. को आदेश दिया गया है।
- विडीओ कॉनफरन्स कक्ष की स्थापना हो चुकी है ।
- एन.के.एन. इन्टरनेट कॉनेक्टेशन के लिए कम्प्यूटर व अन्य सहायक उपसाधनों प्राप्त कर लिया गया है।
- संस्थान के परिसर में सी.सी.टी.वी. संस्थापित किया गया है।
- डिजीतल ई.पी.बी.एक्स. स्थापित किया गया है ।

E. अन्य विषय

नवम्बर 2014 के दौरान संस्थान को आई.एस.ओ. **9001:2008** प्रमाण पत्र मिला ।

नवम्बर 2014 के दौरान क्षे.मू.अ.के.,बोको को आई.एस.ओ. **9001:2008** प्रमाण पत्र मिला ।

HIGHLIGHTS OF ACHIEVEMENTS

The Central Muga and Eri Research & Training Institute, Lahdoigarh, Jorhat in a network of RMRS, Boko, RERS, Shadnagar, RERS, Mendipathar and RECs located at Lakhimpur, Coochbehar, Tura, Diphu, Mangaldoi, Kokrajhar and Fatehpur provides R& D support in muga and eri sectors for the development of the industries.

F. Major achievements in research:

During 2014-15, 9 CSB funded, 4 DBT funded and 5 DST funded research projects under different categorization *viz*., Environmental challenges and global warming, Drudgery reduction and women friendly technologies, Input cost reduction, Eco-friendly & organic farming were undertaken at the institute and its regional stations, out of which 4 projects were concluded, 10 projects to be continued from previous year and 4 were newly initiated. Moreover, 4 regular programmes, 10 ToT programmes, 2 validation / field trials and 2 pilot studies were conducted at the institute as well as at farmers' level. A brief highlight of the research works done during the year is presented below:

CMER&TI, Lahdoigarh

- Three biofertilizer potential bacterial isolates viz. *Pseudomonas aeruginosa* strain MAJ PIA03, *Bacillus firmus* strain MAJ PSB12 and *Achromobacter sp.* SSK4 strain KAZ AZB05 have been identified from the castor rhizosphere soil samples.

- *Ailanthus grandis* was found suitable evaluated for sustainable eri silkworm rearing.

- For developing high yielding breed of muga silkworm, sib mating and inbreeding of the selected lines in subsequent generations (F14-F18) were done followed by directional selection of the targeted characters *viz*. higher survivability (more than 50 % ERR) and higher shell weight (0.50 g).

- Embryo isolation technique was standardized and embryo chart was prepared for different developmental stages of muga silkworm eggs. It was also observed that muga silkworm eggs can be preserved up to 15 days at 7 ^{0}C with > 85 % hatching.

- Muga silkworm gut-microflora were morphologically and biochemically characterized. Two most potential gut-bacteria MGB-05 and MGB-11 were identified as *Bacillus stratosphericus* and *Bacillus cerius,* respectively.

- Collected more than 400 insect specimens from muga ecosystem for developing diagnostic keys and preserved in the insect repository. Illustrated diagnostics have been prepared for 120 species.

- Isolated bacterial pathogens from diseased cadavers of muga silkworm and four bacteria have been identified as muga silkworm pathogens.

- Isolation and characterization of anti-fungal peptides from the haemolymph of fungal challenged muga silkworm is under progress.

- Post authorization trial of eri C2 breed was conducted in Manipur and BTC, Assam. In Manipur, average fecundity recorded was 320 nos. per dfl, cocoon yield per dfl was 238 nos. with an average ERR of 79 %. In case of BTC, Assam, fecundity recorded was 355 nos. per dfl, cocoon yield per dfl was 252 nos. with an average ERR of 81 %. More than 20000 eri C2 breed were distributed to farmers under SMV.

- Under Institutional Biotech Hub project, one workshop on "Basic diagnostic techniques of microbes and insects of muga ecosystem" was organized on 16th-18th March 2015. Three students of Jorhat Kendriya Mahavidyalaya completed their Internship project on biochemical study of muga host plant by using the Biotech hub facility. Three demonstration programmes were conducted for students of West Bengal University and School students..

- Two high yielding genotypes of kesseru namely, HF 008 and HF 005 have been identified with potential leaf yield of 27.57 MT per ha per year and 26.72 MT per ha per year, respectively. The HF 008 and HF005 showed gain in leaf yield by 10.28 % and 6.68 % respectively over 25 MT leaf yield in benchmark plantation (traditional accessions adopting all improved practices).

- Under a DST funded project on "Sustainable Rural livelihood", Training programmes were organized on eri spinning, product design, dyeing of eri silk and product development. The beneficiaries were bank/credit linked with HDFC Bank Ltd. and State Bank of India for setting up the eri silk based enterprises.

- Under silkworm exploration and characterization programme, more than 200 specimens of wild sericigenous insects were collected from six states of North East India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur and Mizoram). 41 species were identified belonging to Saturniidae and *Bombycidae*. All the specimens have been preserved for future references.

- For acclimatization of muga silkworm under indoor conditions, same stock was reared continuously for 14 generations and 15-45 % ERR was recorded in different seasons under complete indoor rearing.

- Forecasting and forewarning system for pests and diseases of muga host plants and silkworm have been developed. During the year, more than 44160 farmers were covered by mobile SMS for forewarning of pests and disease incidence. The forecasting and forewarning calendars are also uploaded in the institute's website on regular basis.

- Trial of "Leaf Surface Microbes (LSM)" was conducted in rearing of muga silkworm larvae during *Aherua* and *kotia* crops, 2014. During *Aherua* crop, no difference was observed between treatment and control in case of rearing performances. During *kotia* crop, 47.5 % ERR was obtained under treatment against 43.3 % ERR in control.

- Ten new research project proposals have been approved by RC & RAC of the institute.

RMRS, Boko

- For conservation of genetic resources of muga silkworm, eight wild genetic resources are being maintained under e*x-situ* condition at GCC, Damalgre, West Garo Hills, Meghalaya.

- S3 and S6 morphotypes of som have been identified as disease tolerant and multiplied in large scale for supply to the field. 21000 saplings of S3 and S6 morphotypes of som were raised during the year.

RERS, Shadnagar

- To evaluate the varietal potential of commercial and perennial castor genotypes under rain-fed semi-arid conditions, eight castor genotypes were evaluated based on growth parameters, physiological parameters, chemoassay and bioassay. The castor genotypes CSP-106, CSP–105 and CSP–103 exhibited higher values for Silk Ratio and other commercial characters.

- To identify eco-races suitable to semi-arid conditions of Andhra Pradesh, 10 accessions of eri silkworm were evaluated in respect of rearing & reproductive performances during different seasons. Accessions, E-201 and E- 206 showed superiority in case of multiple rearing and reproductive traits respectively.

RERS, Mendipathar

- One new research project proposal on "Socio-economic upliftment of farmers through adoption of improved technologies and skill development in eri culture" has been approved by RC & RAC of the institute.

G. Achievements in Technology Validation / Demonstration / Popularization programmes

CMER&TI, Lahdoigarh

- Juvenile hormone analogue "Methoprene" (0.1 µg per ml) was sprayed to muga silkworm at farmers' fields during *Chotua* (March-April, 2014), *Aherua* (July - August, 2014) and *Kotia* crop (October- November, 2014). Data indicated 10-25 % enhancement of fecundity in treated moths compared to control.

- Insect stimulants were sprayed on the leaves of selected som plants at farmers' fields during *Chotua* (March-April, 2014), *Aherua* (July-August, 2014) and *Kotia* crop (October- November, 2014). Data indicated enhancement of ERR by 24-66 % over control.

- *Terminelia chebula* based formulation "Muga Heal" was sprayed on the leaves of selected som plants at farmers' fields during Chotua (March-April, 2014), *Aherua* (July-August, 2014) and *Kotia* crop (October- November, 2014). Data indicated enhancement of ERR by 15-30 % and reduction of flacherie disease incidence by 15-20 %.

- For disinfection and disease management in muga silkworm, demonstration programmes were conducted in different areas covering more than 200 farmers of Assam and Meghalaya. Feedback data collected from 79 farmers have shown gain in cocoon yield of the treated lot ranging from 11 to 22 cocoons per g dfl over that of control.

- For development of attractant and repellent for controlling uzifly in muga ecosystem, different trials are being conducted.

- For popularization of bio-intensive farming techniques among the muga growers, 90 farmers were identified for adoption. Awareness programmes and demonstrations were organized on sowing of green manure crops (dhaincha), incorporation of green manure crops, sowing of inter crops (black gram/ sesame), application of vermicompost etc. were conducted at adopted farmers fields. Training programmes on vermicomposting were also organized where 181 farmers participated.

- Farmers Field Schools in muga and eri sectors were established in three muga and three eri clusters. Benchmark information of each FFS centre were

collected. Laptop, LCD projector, white board, projector screens, Poster, pamphlets, etc were supplied to each concerned units/ scientists of the main institute. Lead farmers were identified for all FFS. Fund @ Rs. 17000/- to each muga FFS and (@ Rs. 10700 to each eri FFS were released to lead farmers for assistance. Technology awareness programme, training and demonstration programmes were organized at the field of lead farmers.

- For dissemination of technologies in muga and eri culture, silkworm rearing were conducted in different seasons at farmer's fields under Seri Model Village (SMV)s. On implementation of muga SMVs, adoption of technologies (pruning/pollarding, green manuring, pest and diseases management of host plants as well as silkworms, dfls, etc) are found high and encouraging against benchmark adoption level (partial). Cocoon production enhanced from 33 to 38 cocoons /dfl in seed crop and from 49 to 63 cocoons/dfls in commercial crop with 15.3 % and 28.6 % improvement respectively over benchmark. In case of eri SMVs, adoption of technologies (disinfection of rearing house & appliances, improved breeds (C2), platform rearing, etc) are found high against benchmark level of adoption. Cocoon shell production enhanced up to 9.9 kg/100 dfls from the benchmark of 7.5 kg/100 dfl with 31.9 % improvement. The cocoon quality has also improved and income generation is increased through sale the cocoon to private traders from @ Rs. 550/- per kg against Rs. 250/- per kg before implementation of SMV.

H. Achievements in Publicity/ Training and Extension programmes

- Institute organized training on "Extension System Management" and "Planning, Monitoring & Evaluation and Technology Management" by NAARM, Hyderabad, Basic computer applications by NIELIT, Income Tax calculation etc. Further, scientists of the institute participated in the training on Managerial Effectiveness Enhancement programme at IMTR Goa, PCR based detection of silkworm diseases at SBRL Bangalore, National conference of women achievers on sericulture at New Delhi, International Congress on Sericulture & silk industry at Bangalore and Workshop on Intellectual Property Rights at Guwahati.

- The institute organized workshop on "Basic diagnostic techniques of microbes and insects of muga ecosystem" on 16th-18th March 2015 under Institutional Biotech Hub project.

- The institute published 4 issues of newsletters, Annual Report for 2013-14, 20 nos. of leaflets/bulletins and 9 nos. of books / manuals. Besides, the scientists of the institute published 15 research articles in reputed journals and 15

research articles in the proceedings of various seminar/conference/workshop etc.

- The institute organized training programmes on different technologies and trained 3877 nos. of beneficiaries. Under ISDS, 191 trainees were trained on muga and eri silkworm rearing as well as post cocoon activities. Under technology popularization programmes, 170 farmers were trained on eri C2 breed rearing and 181 farmers were trained on biointensive farming techniques. Under a DST sponsored project, the institute trained 235 persons on eri spinning, eri product designing, dyeing and product development. Under SMVs, the institute trained 662 farmers. Further the institute organized training programme for insurance and trained 14 persons. Altogether, the institute trained 5330 beneficiaries during the year.

- Institute conducted 46 nos. of Front line technology demonstration programmes in coordination with KVKs on Integrated technology package of muga culture, Integrated technology package of eri culture, BANI machine, Muga Silk Plus, Muga Cocoon dryer and Disease Forewarning.

- Besides, 8 Krishi melas, 45 Technology Awareness programmes, 13 Exhibitions and 43 Field days were conducted and accordingly feedbacks were collected from the farmers.

I. Achievement in land utilization programmes

- The institute conducted land utilization programmes as per given below:

- Raised 38100 som / soalu seedling /sapling (9000 at CMER&TI, 21000 at RMRS, Boko, 3000 at REC, Lakhimpur and 5100 at REC, Coochbehar) and supplied 23080 nos. of som seedlings (15850 from RMRS and 7230 from 3 RECs).

- Raised 15000 kesseru seedling (10000 at CMER&TI and 5000 at RERS, Mendipathar) and supplied 26 kg castor seeds (21 kg from RERS, Mendipathar & 5 kg from REC, Diphu) and 12150 nos. kesseru seedlings (6000 from CMER&TI and 6150 from RERS, Mendipathar).

- Reared 7312 muga dfls as commercial (3140 at CMER&TI, 2660 at RMRS and 1512 at RECs) and 6870 dfls (3353 at CMER&TI, 1612 at RMRS, and 1905 at RECs) as seed crops. Thereby produced 116917 commercial cocoons and 107828 seed cocoons.

- ❖ Reared 1461 eri dfls (381 at CMER&TI, 485 at RERS, Mendipathar, 300 at RERS, Shadnagar, 200 at REC, mongaldoi and 95 at REC, Diphu) and thereby produced 132.1 kg eri cocoons.

- ❖ Produced 42942 muga dfls, supplied 37658 muga dfls as per demand, produced 11380 eri dfls and supplied 14355 eri dfls as per demand.

J. Achievement in infrastructure development

- ❖ Insect Repository is established at the institute and tried to maintain in coordination with the Biodiversity Board.
- ❖ Orders have been placed with CPWD for muga grainage building.
- ❖ Video conference room has been established
- ❖ For NKN internet connection, computer and other accessories have been procured
- ❖ CCTV has been installed in the campus
- ❖ Digital EPBX has been installed

K. Others

- ❖ Renewed ISO 9001: 2008 certificate for the institute during November, 2014.
- ❖ Received ISO 9001: 2008 certificate for RMRS, Boko during December, 2014

FINANCIAL TARGET AND EXPENDITURE

(Rupees in lakhs)

Particulars	Consolidated Provisions							
	Estimated budget				Actual expenditure			
	Recurring GIA - 31	Capital Assets GAI – 35	Salary GIA-36	**Total**	Recur-ring GIA - 31	Capital Assets GAI - 35	Salary GIA-36	**Total**
Non- Plan	-	-	1039.00	**1039.00**	-	-	965.24	**965.24**
Normal Plan NE	508.40	200.00	-	**708.40**	436.49	138.50	-	**574.99**
Plan	00.61	00.16	-	**0.77**	0.55	0.18	-	**0.73**
Total	**509.01**	**200.16**	**1039.00**	**1748.17**	**437.04**	**138.68**	**965.24**	**1540.96**

Research Advisory Committee of CMER&TI, Lahdoigarh

Chairman

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

Members

Dr. N. Muraleedharan
Director, Tocklai Tea Research Institute, Jorhat - 785008
Prof. D.K. Jha
Head, Dept. of Botany, Gauhati University, Guwahati
Dr. T.C. Bora
Scientist-G & Head,
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-781 004, Assam
Director of Sericulture
Govt. of Nagaland, Kohima
Director of Sericulture
BTAD, Bodoland Territorial Council, Kokrajhar, Assam.
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, Central Silk Board,
Dargah Road, Near Sijubari Mazar,
Hatigaon, Guwahati-781 038
Joint Secretary (Tech)
Regional Office, Central Silk Board,

Dargah Road, Near Sijubari Mazar, Hatigaon, Guwahati-781 038
Conservator of Forests
Jorhat, Assam
Sri Hema Gogoi
Muga Farmer, Bogorijeng, P.O. Pulibor, Golaghat, Assam.
Smt. Lakhimai Lahon
Eri Farmer, Borholla Grant, Titabar, Assam

Member Convener

Director, CMER&TI, Lahdoigarh, Jorhat.

ACHIEVEMENT OF THE RESULT FRAMEWORK DOCUMENT

Objectives	Actions	Success Indicator	Unit	Target	Achivement
Conduct scientific, technical and economic research to enhance production, productivity and quality of Indian silk.	Research Projects-coded by CO	Total on- going Projects	No.	15	18+4*[a]
		Projects Concluded	No.	4	5[a]
		Projects Initiated	No.	3	3[a]
		No of technologies/ innovations developed	No	2	4[a]
		New technologies for field testing	No	2	4[a]
		Equipment / machinery newly developed for sericulture mechanisation	No	1	1[a]
	Evaluation of improved varieties of muga and eri host plants and its disseminating to field	Progress of the research projects based on the pre-determined milestones	%	100	105[a]
		High yielding / new host plant varieties evaluated	No.	2	3[a]
	Developing improved breeds suitable to tropical regions and its dissemination to field	Progress of the research projects based on the pre-determined milestones	%	100	100[a]
		Improved breeds developed	No.	1	1[a]
	Improvement in the productivity and quality of muga and eri silkworms	Progress of the research projects based on the pre-determined milestones	%	100	117.24[a]
		Productivity improvement	%	12	15.22[b]
	Integrated Pest and Disease Management and its dissemination to field	Progress of the research projects based on the pre-determined milestones	%	100	100[a]
		Technologies / solutions developed	No.	2	2[a]
Commercialization of products and Technologies	Sericulture technologies including chemical taken up for commercialisatio	Technologies commercialised/popularized	No.	14	18[b]
		No. of technologies patented	No.	2	0[a]

	n /patenting				
Transfer of Technology	Institute Village Linked Programme	No. of villages to be covered	No	7	7[b]
		No. of farmers adopted	No	650	662[b]
		Expected muga raw silk output	Kg	3300	488.3[a]
		Expected eri raw silk output	Kg	2600	2401[a]
	Large scale trial of C2 breeds	No. of dfls proposed for large scale trial	Nos.	2750	22920[a]
	Cluster promotion programme	No. of clusters organised/monitored	No.	18	20[b]
		No. of farmers covered	No.	1880*	1880[b]
		Muga raw silk output	MT	12	0.44[a]
		Eri raw silk output	MT	17	2.96[a]
	New plantation with improved varieties/	Popularisation of improved host plant varieties among the farmers	Acres	150	434[a]
	Adoption of Technology	No. of farmers covered	No	6000	9629[a]
		No. of technologies demonstrated	No	10	17[b]
	Krishi Melas	No. of programmes conducted	No	8	8[a]
		No. of farmers covered	No	3000	3045[a]
		Post programme follow up	%	70	77.5[c]
Capacity Building among the stake holders	Skill Development	Beneficiaries trained under skill development programme [ISDS etc]	No	210	191[a]
		Beneficiaries trained under structured programmes, need based programme etc.	No	160	5787[a]
		Beneficiaries placed in silk sector after training	No	210	312[a]
Organic Linkages CSS and CDP	Establish Organic Linkages between R&D and CDP in States	Quality disinfecting materials and other crop protection measures-door to door disinfection	%	100	100[c]
		Input for development of Kissan Nurseries in Muga & Eri	No	4	8[a]
		Mobile Testing for muga and eri farmers for disease and pest infestation	No.	50	110[a]
Revenue Generation	Generation of funds as per XII	Revenue generation	Rs. in	30	28.40[a]

	Plan guidelines		lakh		
Strengthening institutional framework to support ongoing research and related programmes	Utilization of existing land holdings	Effective utilization of cultivable land for assigned mandates	Acres	45	81.75[a]
	Utilization of service buildings (laboratory, rearing house, grainages, staff quarters, hostels, guest house etc)	Extent of utilization of facilities for the core purpose of assigned mandates	%	100	100[c]
	Optimum utilization of manpower	Utilization of scientific manpower for research activities	%	100	100[c]
	Utilisation of Grants	Expenditure under Central Sector Schemes	Rs. In Crore	7.06	5.7221[a]
Maintenance of breeders stock	Production & supply of nucleus seeds to basic seed farms of CSB & States for further multiplication	Dfls production and supply	Number of dfls	3200	9472[a]
Publication of R&D innovations and package of practices for knowledge dissemination	Facilitating the scientists and the technologists to publish innovations and package of practices for wider use	Publication of research articles by the Institute (first author)	Number	40	36[a]
		Printing and circulation of books/ manuals by the Institute (only one claimant)	Number	3	6[a]
		Printing and publication of extension manuals	Number	2	2[a]
		Publication of technical bulletins / leaflets	Number	12	17[a]
Disease forecasting & forewarning	Identify the disease occurrence in advance & forewarn the beneficiaries with remedial measures	Instances where such activities were undertaken	Number	11	13[a]
Improvement in Post	To undertake programmes for	Machineries and technologies	Number	3	3[a]

Cocoon Technology	improving the post cocoon technologies of muga and eri silkworm cocoons	demonstrated in the field			
		Stakeholders covered for field testing	Number	25	28[a]
Collaborative Research Programmes with other R&D organizations in India and abroad	Identifying potential R&D institutes in India and abroad and undertakes collaborative research programmes for the benefit of both the countries	Projects taken up for collaborative research	No.	2	2[b]
Efficient functioning of RFD system	Timely submission of draft RFD for 2014-15	On time submission	Date	22nd April 2014	22 April 2014
	Timely submission of results of 2014-15	On time submission	Date	1-May-15	-
Administrative Reform	Implement mitigating strategies for reducing potential risk of corruption	% of implementation	%	100	100
	Implement ISO 9001 as per the approved action plan.	Target date for implementation of ISO 9001 at Institute	Date	Dec 31st 2013	November 2013
		Action Plan for implementation of ISO 9001 at RMRS Boko	Date	Aug 31st 2014	Aug 31st 2014
	Identify, design and implement major innovations	Implementation of identified innovations	Date	May 1st 2014	April 1st 2014
Improving internal efficiency / responsive-ness / service delivery of the	Implementation of Sevottam	Independent audit of implementation of Citizen's charter	%	100	100
		Independent audit of implementation of public grievances redressal	%	100	100

organization		system.			
Ensuring compliance of the Financial Accountability Framework	Timely submission of ATNs on Audit paras of AG & Internal Audit	Percentage of ATNs submitted within due date (4 months) from date of presentation of report	%	100	100
	Timely submission of ATRs to AG & CSB, HQ.	Percentage of ATRs submitted within due date (6 months) from date of presentation of report	%	100	100
	Early disposal of pending ATNs on Audit paras of AG reports.	Percentage of outstanding ATNs disposed off during the year	%	100	100
	Early disposal of pending ATRs on AG reports.	Percentage of outstanding ATRs disposed off during the year	%	100	100

a, cumulative total of all the quarter; b, highest among the quarters; c, average of all quarters; * Target revised by DOS for the Programme

The overall RFD percentage was 93% for the financial year 2014-15.

LIST OF THE R&D PROJECTS

Sl. No.	Project code	Title of the project	Duration	Scientists involved
CONCLUDED PROJECTS				
1	AIE 5854	Exploration, collection, characterization and cataloguing of wild sericigenous insects available in North East India	Oct., 2011 – Sept., 2014	R. Kumar, G. Rajkhowa
2	PIE 5853	Collection, characterization, evaluation and conservation of perennial host plants for eri silkworm rearing	Oct., 2011- Sept., 2014	M.C. Sarmah, S.A. Ahmed, B.N. Sarkar, M. Chutia, K. Neog
3	APR-5858	Eri silkworm, S*amia ricini* (Donovan) rearing and cocoon production in relation to host plant castor genotypes (*Ricinus communis* L) raised under rain-fed conditions in semi-arid region	Nov., 2011- Oct., 2014	C. Srinivas, T. Ravivarma
4	AIB-5857	Evaluation and identification of eco-race(s) of eri, S*amia ricini* (Donovan) suitable to semi- arid conditions of Andhra Pradesh	Nov., 2011 – Oct., 2014	T. Ravivarma
5	MOE - 5863	Sustainable rural livelihood: adoption and refinement of improved technologies of eri culture in Brahmaputra Valley of Assam	Dec., 2012- March, 2015	C. Dash, K. Das
ONGOING PROJECTS				
1		Establishment of Institutional Biotech Hub (Phase-II)	Dec. 2010 – Nov., 2015	M. Chutia, R. Das
2	APS - 5856	Development of egg preservation schedule in muga silkworm, *Antheraea assamensis* Helfer	April, 2011 - June, 2015	D. Goswami, N.I Singh, M.D. Senapati
3	ARC-5864	Studies on the insect fauna associated with muga ecosystem in North East India with emphasis on the illustrated diagnostics	August, 2012 - July, 2015	R. Kumar, G. Rajkhowa
4	AIP-5861	Molecular approaches in characterization and utilization of gut microflora from muga silkworm	June, 2012 – Oct. 2015	D.K. Gogoi, R. Kumar

		Antheraea assamensis for enhancing productivity of muga culture in North Eastern India (In collaboration with IARI, New Delhi)		
5	PRP-5862	Screening of microbial flora (potential bio-fertilizer) of castor rhizosphere and development of INM package in ericulture (DST-FTYS, New Delhi)	July, 2012 – June., 2015	D.K. Gogoi
6	AIB - 5851	Development of high yielding muga silkworm breed through population improvement	Feb., 2011 – Dec., 2015	N.I. Singh, D. Goswami
7	ARP-5867	Characterization, transmission and cyto-pathology of infectious flacherie and cytoplasmic polyhedrosis virus in muga silkworm *Antheraea assamensis* Helfer	July, 2013 – June, 2016	M. Chutia, R. Kumar
8	APR-5865	Etiology of bacterial diseases and molecular characterization of the pathogens of muga silkworm in NE India	March, 2013-Feb., 2016	M. Chutia, R. Das
9	APR-5866	Sustainable eri silkworm rearing: evaluation of *Ailanthus* species	March, 2013 - Feb., 2016	S.A. Ahmed, M.C. Sarmah, P.K. Handique, B.N. Sarkar
10	ARP-5868	Isolation and characterization of antifungal peptides from Muga Silkworm *Antheraea assamensis* Helfer	May, 2014 – June 2017	K. Neog, B. G. Unni, A. K. Ghosh, S. C. Kundu
11	AIB-5879	Development of suitable combinations/hybrids of eri silkworm with sustainable performance for commercial exploitation	November, 2014 - October, 2017	B.N. Sarkar, M.C. Sarmah, S.A. Ahmed
12	PIN-5871	Development of Bio-intensive Module for Organic Muga Silk Production	January 2015- December 2016	Maitry Daimari and S. A. Ahmed
13	AIB-5869	Popularization of new eri breed C2 at farmers' field	October 2014- September 2015	S.A. Ahmed

REGULAR PROGRAMMES				
1	CMERTI-RP1	Hardening of micro- propagated plantlets of muga host plant, *Persea bombycina* Kost.	Oct., 2011-onward	K. Neog, D.K. Gogoi
2	CMERTI-RP2	Induction of Indoor rearing technique for *Antheraea assamensis* Helfer through field trials.	Oct., 2011 onward	K. Neog
3	CMERTI-RP3	Conservation of *Antheraea assamensis* Helfer (Phase - II)	April, 2012 onwards	N.I. Singh and A.K. Gogoi
4	CMERTI-RP4	Forecasting and forwarning for pest and disease of muga host plants and silkworm	Jan. 2014 onwards	R. Das
PILOT STUDIES				
1	PS-1	Propagation and multiplication of foliar disease tolerant S3 and S6 morphotypes of som food plant of muga silkworm rearing in Lower Assam	April 2013 - March 2016	A.K. Gogoi, R. Das
2	PS-2	Studies on the efficacy of toxic baits and barriers for control of ants	April 2014 - March 2015	G. Rajkhowa and R. Kumar
3	PS-3	Trial of “Leaf Surface Microbes (LSM)” collected from CTR&TI, Ranchi	April 2014 - March 2015	D.K.Gogoi, N.I. Singh
4	PS-4	Trial of “Sericilin” collected from CST&RI, Berhampore	April 2014 - March 2015	R. Das
ToT PROGRAMMES				
1	ToT-1	Development of repository for insect fauna of seri-ecosystem and wild silk moths of NE India	April 2014 - March 2015	R. Kumar, G. Rajkhowa
2	ToT-2	Technology demonstration - Enhancement of fecundity through application of endocrine hormone analogues of muga silkworm at farmers level	April 2014 - March 2015	K. Neog
3	ToT-3	Transfer of technology from lab to field : disinfection and disease management in muga silkworm	April 2014 - March 2015	N.I. Singh
4	ToT-4	Technology Demonstration and Validation: Enhancement of feeding efficiency of through	April 2014 - March 2015	K. Neog

		application of insect stimulants of muga silkworm at farmers level		
5	ToT-5	Establishment of farmers field school in eri and muga sector	April 2014 - March 2015	D. Mech
6	ToT-7	Institute village linkage programme for dissemination of technologi8es to the farmers field in muga and eri culture	April 2014 - March 2015	D. Mech
7	ToT-8	Popularization of biointesive farming techniques among the muga frowers of Assam	April 2014 - March 2015	U. Hazarika
8	ToT-9	*Terminalia chebula* based bioformulation “Muga Heal” for healthy larvae and production of quality silk fibre by muga silkworm	April 2014 - March 2015	K. Neog
9	ToT-10	Training programmes of scientists / staff for the year 2014-15	April 2014 - March 2015	Training Section
10	ToT-11	Tansfer of technology programme of CMERTI, Lahdoigarh and its nested units under R&D during 2014-15	April 2014 - March 2015	D. Mech
11	ToT-12	Development of attractant and repellent for controlling uzifly in muga ecosystem	April 2014 - March 2015	R. Kumar, G. Rajkhowa

CONCLUDED PROJECTS

Project code: ARE 5854
Project Title: Exploration, collection, characterization of wild sericigenous insects available in North East India

Project Period:	Oct. 2011 – Sept. 2014
Funding agency:	Central Silk Board, Bangalore
Total budget allocation:	Rs. 29.0 Lakhs
Project Investigators:	Rajesh Kumar, Principal investigator Girin Rajkhowa, Co- investigator

Objectives

1. Exploration, collection, host range, documentation and morphological characterization of wild sericigenous insects in N.E. India in *ex-situ* habitats
2. Development of computerized database for wild sericigenous insects in N.E. India

Highlights of achievements

More than 200 specimens were collected from six states of North East India (Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur and Mizoram) and 41 species were identified belong to Saturniidae (31 species) and 9 species (Bombycidae). The identification is validated through taxonomic treated male genitalia of all sericigenous moths. Two new sub-species have been described of genus *Loepa* from Nagaland and Arunachal Pradesh. One new report of *Antheraea* sp. is reported from Nagaland. All illustration including morphological features, external genitalic characters along with field photographs and description of illustrated characters have been completed. Color photographic plates are being prepared along with description, which will be published soon. According to conservation point of view, the species are to be recorded from the places, which can be explored and documented for future references. All the specimens have to be preserved for future references, so that other scientists can quote and refer for identification of species from voucher collection. All silk moths along with cocoons and plant's leaf from where it was collected have been preserved at Insect Repository, CMERTI, Lahdoigarh. This will be utilized for correct identification of silk moth species of North East India. There were many misidentifications among *A. compta, A. pernyi, A. helferi, A. royali, A. frithii, A. mylitta* and *A. andamana* (*platessa*) (new record), which have been corrected through illustration of genitalic structure. According to genitalic structure of *A. assamensis*, it is found that this species does not match with any other species of genus *Antheraea*, because of it special characters of labidae in valvae of male genitalia. In evolutionary stage, *A. assamensis* is the oldest species among all species of *Antheraea*. A further study may be conducted for DNA barcoding for the species. *Antheraea compta, Attacus atlas, Cricula trifenstrata* have

been reared for continuing the generation, but *Antheraea compta* cocoons are under diapauses and *Attacus atlas* only one generation was successful. North Eastern region is one of the biodiversity hotspots for flora and fauna among 34 biodiversity hotspots of world.

Methodology

The adults of Lepidoptera were collected from Oct. 2011 – Sept. 2014 during night with the help of light traps (200 watt mercury vapour light) and some collections were also made by hanging a makeshift source of light (200 watt mercury vapour light) on a white sheet or white washed wall. The collected insects were sacrificed by using tetra benzene. These were stretched, pinned, labelled, identified, preserved in the wooden collection boxes at Entomology Laboratory, CMERTI, Lahdoigarh**.** Eggs and larvae were also collected from forest and only few reared in the rearing chamber. The specimens collected from various localities were processed as per methodology discussed by workers such as Lindquist (1956), Zimmerman (1978), Landry and Landry (1994). For studying the wing venation the standard techniques given by Zimmerman (1978) and for genitalia Robinson (1976) had been followed.

All the specimens were deposited at Entomology Laboratory, CMERTI, Lahdoigarh. During the course of present study, dissections of the male and female genitalia have been made as per methodology given by Kumar and Ramamurthy (2010).

As per procedure, the male abdomen was detached from the insect (moth) body with the help of forceps by exerting a pressure on the thorax dorsally and raising the abdomen upward simultaneously. Before this, the abdomen was wetted by applying 100 % per cent ethanol. Then it was shifted to 10 % potassium hydroxide (KOH) solution and boiled in beaker at electric hot plate for 10 min. After boiling, the abdomen transferred to glacial acetic acid in petridish for cleaning. After cleaning in acetic acid, the abdomen shifted to ethanol for taking photographs by using a 5.0 digital camera attached with RSMr 10 stereoscopic zoom microscope and finalized in plates (prepared in 300 pixels/inch) species wise using Adobe photoshop 7.0, ACDSee 9 Photo Manager.

Result

Twenty nine species of wild silk moths have been collected from Manipur, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland and Assam states of North East India (Table 1, 2). All twenty nine species' name were updated from LEPINDEX and in one species, there was confusion according to LEPINDEX for the species *Samia pryeri*, but Dr. Ian Kitching, Lepidoptera Leader, NHM, London informed that this is still in *Samia ricini,* by mistake it was entered in the LEPINDEX database.

In India, still researcher using names *viz*., *Samia cynthia ricini* / *Samia cynthia* / *Philosamia ricini* / *Philosamia cynthia ricini*, which are incorrect and the correct valid name is *Samia ricini* for domesticated species and *Samia canningi* for wild species in

India. Wild species *Samia canningi* is considered as wild progenitor of *Samia ricini*. Both the species have peculiar characters in size, color, wing venation and genitalic features. According to recent survey, only three species are found in North Eastern India *viz*., *Samia ricini*, *Samia canningi* and *Samia kohlii*. The species, *Samia cynthia* was not found in North Eastern States.

During study, complexity was faced to identify the *Antheraea pernyi, A. compta, A. frithii* and *A. roylei*. But, now it is clarified with the help of male genitalic features. The labide of each species have different shape and size, which is used for clarification of *Antheraea* spp.

Among all six states, highest number of species (28) was recorded from Arunachal Pradesh state (Table 2). Some areas of Arunachal Pradesh are still unexplored. The details of all the species presented through illustrated genitalic atlas and other morphological feature, which are part of classical taxonomy.

Table 1. Localities surveyed in four states of North Eastern India

S. No.	States	Location of collection
1	Arunachal Pradesh	Pashighat and adjoining forest areas
2	Assam	BTC, Lakhimpur, Tejpur, Tinisukia, Jorhat, Golaghat, Kaziranga forest areas, Dibrugarh
3	Manipur	Imphal, Urkhul
4	Meghalaya	Barapani, Shillong, Mawflong, Nongpoh (Khasi Hills); Tura, Damalgiri, Silsela, Balpakram National Park, Bagmara, Kanai, Dalu (Garo Hills),
5	Mizoram	Aizawl and adjoining forest areas
6.	Nagaland	Mokockchung, Zuniboto districts and adjoining forest areas

Table 2. Distribution list of all collected species

S. No.	Scientific Name	AP	As	Man	Meg	Miz	Nag
Family Saturniidae							
1.	*Actias selene* Hübner, 1806	+	+	+	+	+	+
2.	*Antheraea assamensis* Helfer, 1837	+	+	+	+	+	+
3.	*Antheraea compta* Rothschild, 1899	+	+	+	-	+	+
4.	*Antheraea frithi* Moore, 1858	+	+	+	-	+	+
5.	*Antheraea mylitta* Drury, 1773	-	+	-	+	-	+
6.	*Antheraea pernyi* Guérin-Meneville, 1855	+	-	+	+	-	
7.	*Antheraea roylei* Moore, 1858	+	-	+	-	-	+

8.	*Antheraea helferi* Moore, 1858	+	-	+	-	-	+
9.	*Antehraea andamana* Moore, 1877	-	-	-	-	-	+
10	*Archaeoattacus edwardsii* White, 1859	+	-	+	+	+	+
11	*Archaeoattacus staudingeri* Rothschild, 1895	+	-	+	+	+	+
12	*Argema maenas* Doubleday, 1847	+	-	+	+	+	+
13	*Argema sinensis* Walker, 1855	+	-	-	-	-	-
14	*Attacus atlas* Linnaeus, 1758	+	+	+	+	+	+
15	*Cricula andrei* Jordan, 1909	+	-	-	+	+	-
16	*Cricula trifenestrata* Helfer, 1837	+	+	+	+	-	
17	*Loepa katinka* Westwood, 1848	+		+	+	-	+
18	*Loepa megacore* Jordan, 1911	+	-	-	-	-	-
19	*Loepa sikkima* Moore, 1865	+	-	-	-	-	-
20	*Loepa* subsp. nov.	-	-	-	-	-	+
21	*Loepa* subsp. nov.	+	-	-	-	-	-
22	*Loepa miranda* Moore, 1865	-	-	-	+	-	-
23	*Rhodinia newara* moo, 1872	+	-	-	+	-	-
24	*Salasa tonkiniana* Le Moult, 1933	+	-	-	-	+	-
25	*Samia canningii* Hutton, 1860	+	+	+	+	+	+
26	*Samia kohlli*	+	-	+	-	-	-
27	*Samia ricini* Boisduval, 1854	+	+	+	+	+	+
28	*Satrunia pyretorum* Westwood, 1847	+	-	-	-	-	-
29	*Saturnia simlaensis* Westwood, 1847	+	-	+	-	-	-
30	*Saturnia thibeta* Westwood	+	-	+	-	-	-
31	*Saturnia* sp.	+	-	+	-	-	-
Family Bombycidae							
32	*Andraca* sp.	+	-	-	+	-	-
33	*Bombyx mori* Linnaeus, 1758	+	+	+	+	+	+
34	*Bombyx incomposita* van Eecke, 1929	+	-	-	+	-	-
35	*Norasuma javanica* Moore, 1872	+	-	-	+	-	-
36	*Gunda ochracea* Walker, 1862	+	-	-	+	-	-
37	*Gunda* sp.	+	-	-	+	-	-
38	*Ocinara bifurcula* Dierl, 1978	+	-	-	+	-	-
39	*Triuncina religiosae* Helfer, 1837	+	+	+	+	+	+
40	*Triuncina* sp.	+	-	-	+	-	-
41	*Trilocha varians* walk, 1855	+	+	+	+	+	+

Abb: AP-Arunachal Pradesh, As-Assam, Man-Manipur, Meg-Meghalaya, Miz-Mizoram and Nag-Nagaland

Discussion

All the species have been collected from Arunachal Pradesh, Nagaland, Assam, Manipur and Meghalaya. The species' entire name updated from LEPINDEX and in one species, there is confusion according to LEPINDEX, the name is *Samia pryeri*, but Dr. Ian Kitching, Lepidoptera Leader, NHM, London informed that this is still in *Samia ricini*. Now, it is clarified and corrected in LEPINDEX database, which is approved by ICZN for current name of the species of order Lepidoptera.

In India, still researcher using names *Samia cynthia ricini* / *Samia cynthia* / *Philosamia ricini* / *Philosamia cynthia ricini*, which are incorrect and the correct name is *Samia ricini* for domesticated species and *Samia canningi* for wild species. Both the species have peculiar characters in size, color, wing venation and genitalic features. According to recent survey, only three species are found in North Eastern India *viz*., *Samia ricini*, *Samia canningi* and *Samia kohlii*. During study, complexity was faced to identify the *Antheraea pernyi, A. compta, A. frithii* and *A. roylei*. But, now it is clarified with the help of male genitalic features. In all these species the labide of each species have different shape and size, which is used for identification of *Antheraea* spp.

Project code: PIE 5853
Project Title: Collection, characterization, evaluation and conservation of perennial host plants for eri silkworm rearing

Project Period:	Oct., 2011- Sept., 2014
Funding agency:	Central Silk Board, Bangalore
Total budget allocation:	Rs. 10.04 Lakhs
Project Investigators:	M.C. Sarmah, Principal investigator-I S.A. Ahmed, Principal investigator-II B.N. Sarkar, Co- investigator M. Chutia, Co- investigator K. Neog, Co- investigator

Objective

1. To characterize different genotypes of Kesseru and *Ailanthus* and to evaluate suitable high yielding genotype (s) of kesseru based on better agronomical traits, nutrition value and palatability to eri silkworm.

Highlights of achievements

Ten accession of have been identified *viz*., HF 001, HF 002, HF 001, HF 003, HF 004, HF 005, HF 006, HF 007, HF 008, HF 009 and HF 010 and maintained in the germplasm bank. Characterization was done based on descriptor. Passport data of all

accessions were maintained. Analysis of foliar chemical constituents of identified 10 genotypes of kesseru and bioassay was done during the year. Analysis of chemical constituents of foliage of different genotypes reveals highest carbohydrate 25.69 % in HF 009 and lowest in HF 003 (13.18 %). Similarly highest soluble protein content 1058(mg/100g) recorded in HF001 and lowest in HF 008 (513.72 mg/100g). Again, highest soluble sugar recorded in HF 002 (44.19 %) and lowest in HF007 (13.07 %). Crude fibre content recorded highest in HF 005 (7.55 %) and lowest in HF 008 (2.1 %). Phenol content was highest in HF007 (70.86 %) and lowest in HF 005 (14.21 (mg / 100 g). Tannin content was highest in HF006 2.850 % and lowest in HF 008 (0.390 %). During autumn crop, highest cocoon wt. 3.20 and shell wt 0.40 g in HF 008 were recorded. During winter crop, highest shell weight 0.35 g and larval weight 6.78 g in HF 008 followed by 0.34 g and 6.63 g in HF 005 were recorded. During summer crop, highest shell weights 0.45 g in HF 008 followed by 0.38 g shell weight in HF 005 were recorded. In growth parameter study reveals that HF 008 showed 10.28 % higher leaf yield than benchmark with improved package and 37.85 % than benchmark of traditional practice. Similarly, HF 005 showed 6.68 % higher leaf yield than benchmark with improved package and 33.60 % than benchmark of traditional practice. Hence, there is an average 35.73 % improvement in leaf yield than benchmark of traditional practice in both kesseru accessions.

Methodology

Sub Project-I.
EXP: 001

- Before morphological characterization all genotypes of Kesseru available at germplasm bank was labeled based on distinct morphological distinction through visual observation.
- Morphological characterization of different genotype(s) of Kesseru based on following descriptors following standard method of the institute (Chakravorty, 2006).
- Identification of key morphological character of each selected genotype of Kesseru.

EXP: 002
Observation: For evaluation programme on growth and yield attributing characters following parameters was recorded from 5 years old plants.

A. Major growth parameter like plant height, girth size, leaf size, leaf yield/plant (kg), leaf moisture content and leaf moisture retention capacity were recoded following standard method.
B. Studies of pests and diseases.
   Season wise recording of disease & pest incidence were recorded through regular monitoring in plantation site.

Chemoassay of different kesseru genotypes to ascertain nutritional status

Total soluble protein was determined by using the method of Lowry *et al* (1951). The extracted soluble protein has been subjected to SDA–PAGE for its qualitative estimation (Sadasivam and Manickam, 2005). The total carbohydrate was determined by following Anthrone method (Sadasivam and Manickam, 2005). The total soluble sugar was determined by using Anthrone method. (Yem and Willis, 1954). The crude fibre content of leaf samples was determined by the method of AOAC (1970). The method described by Malik and Singh (1980) was employed to determine total phenol content in the fresh kesseru leaves. Tannins in the leaf sample were estimated following the Folin-Dennis method. For the quantitative estimation of total free amino acids the method described by Sadasivam and Manickam, 2005 was followed.

Bioassay of high yielding kesseru genotype (s)

Eri silkworm rearing using selected genotypes of kesseru was conducted following standard methodology of the institute. Rearing was carried out maintaining 3 replications and 150 worms were kept per replication. Rearing data was recorded like Larval wt.(g) at 5th instar full grown worm, Larval duration (days), Cocoon wt.(g), Shell wt.(g), SR % and ERR %.

Sub Project-II. EXP: 001
Collection, Conservation and characterization of different *Ailanthus* species

- Collection of different species of *Ailanthus* available at germplasm banks/Forests in different parts of India preferably in the form of seedlings/sapling and seeds adopting standard method.
- Review of Literature, selection of hotspots/germplasm centre, preparation of schedule of visits based on flowering seasons, covering of selected plants with nets,collection of seeds, germination of seeds in the nursery at Chenijan Farm of CMERTI.
- Morphological characterization & identification of different species of *Ailanthus* was carried out considering the standard descriptor for eri and muga host plant available at the institute (Chakravorty, 2006).
- *Ex-situ* conservation of different species made at Germplasm Bank at Chenijan farm of CMER&TI, Lahdoigarh.

Result

Sub Project-I

Morphological variations

Identified 10 accessions of kesseru *viz*., HF 001, HF 002, HF 001, HF 003, HF 004, HF 005, HF 006, HF 007, HF 008, HF 009 and HF 010 and maintained in the

germplasm bank. Characterization was done based on descriptor. Passport data of all accessions were maintained.

Pest infestation

Kesseru plants are less susceptible to diseases and pests attack. However, attack of termite is found in most of the region. A beetle, which is nocturnal in habit, sometimes damages young leaves of kesseru plants. A Pyralid Lepidopteran pest (leaf roller) has been recorded infesting kesseru with 100 % loss of foliage. A new pest of Brown Bug, *Agonoscellis nubila* Fab. (Hemiptera: Pentatomidae) on kesseru recorded during summer. Although earlier record revealed that Kesseru is less susceptible to disease and pest, except occurrence of termite and a nocturnal beetle (Sarmah, 2004).

Foliar chemical analysis:

Analysis of foliar chemical constituents of identified 10 genotypes of kesseru and bioassay was done during the year. Analysis of chemical constituents of foliage of different genotypes reveals highest carbohydrate 25.69 % in HF 009 and lowest in HF 003 (13.18 %). Similarly highest soluble protein content 1058(mg/100g) recorded in HF001 and lowest in HF 008 (513.72 mg/100g). Again, highest soluble sugar recorded in HF 002 (44.19 %) and lowest in HF007 (13.07%). Crude fibre content recorded highest in HF 005 (7.55 %) and lowest in HF 008 (2.1 %). Phenol content was highest in HF007 (70.86 %) and lowest in HF 005 (14.21 (mg/100g). Tannin content was highest in HF006 2.850 % and lowest in HF 008 (0.390 %) (Table-1)

Bioassay of kesseru

During winter crop, highest shell weight 0.35 g and larval weight 6.78 g in HF 008 followed by 0.34 g and 6.63 g in HF 005 were recorded. During summer crop, highest shell weights 0.45 g in HF 008 followed by 0.38 g shell weight in HF 005 was recorded (Table 2 – 4).

Leaf biomass production

In growth parameter study, reveals that HF 008 showed 10.28 % higher leaf yield than benchmark with improved package and 37.85 % than benchmark of traditional practice. Similarly, HF 005 showed 6.68 % higher leaf yield than benchmark with improved package and 33.60 % than benchmark of traditional practice. Hence, there is average 35.73 % improvement in leaf yield than benchmark of traditional practice in both kesseru accessions (Table 5). Highest leaf size (14.2 cm x 8.5 cm) recorded in HF 010 and lowest in HF 005 (6.6 cm x 2.6 cm). Moisture content was highest recorded in HF 010 (71.66 %) and lowest in HF 009 (59.66 %). Moisture retention capacity was highest recorded in HF 010 (55.17 %) and lowest in HF 007 (52.38 %).

Sub-Project-II

Survey and collection

Existing *Ailanthus grandis* accessions were maintained in the germplasm bank. Survey was conducted at different places of North East. India like Kimin area of Arunachal Pradesh, Tingrai, Barekuri area of Tinsukia district, Diphu area of Karbi Anglong district, Kokrajhar of BTC area, Rangpara of Sonitpur district of Assam including certain area of Odisha and Tamil Nadu. *Ailanthus excelsa* and *Ailanthus grandis* accessions collected from Arunachal Pradesh were conserved in the germplasm bank of the institute.

Morphological variations

Based on leaf morphological study, four accessions of *Ailanthus grandis i.e.*, AG 001, AG 002, AG 003, AG 004 and five accessions of *A. excelsa i.e.*, AE 001, AE 002, AE 003, AE 004, AE 005 identified. New *Ailanthus* accessions were planted in the germplasm bank maintaining 4 x 4 m spacing. Different growth parameters and biomass production of *Ailanthus grandis* and *A. excelsa* were recorded (Table-6).

Pest infestation

New record of wild silkworm *Attacus atlas* was found infesting *A. excelsa* GPB showing 100 % defoliation of few plants. Wild silkworm *Samia canningie* was found infesting *A. excelsa* GPB. Passport data of *Ailanthus* accessions were maintained.

Table 1. Chemoassay of different kesseru genotypes

Accessions of Kesseru	Carbo-hydrate (%)	Soluble Protein mg/100g)	Soluble sugar %	Crude fibre%	Phenol mg/100g	Tannin %
HF001	17.4	1058.04	22.81	4.8	37.096	1.396
HF002	28.35	852.549	44.199	4.95	16.916	2.861
HF003	13.18	698.824	33.041	7.2	18.549	0.851
HF004	28.35	790.589	36.403	4.45	20.167	1.056
HF005	20.47	574.902	48.952	2.4	14.219	1.087
HF006	14.45	606.275	29.591	5.75	20.366	2.85
HF007	15.34	583.53	13.071	4.4	70.862	0.318
HF008	25.69	1003.92	34.461	2.1	49.883	0.39
HF009	22.86	513.726	39.272	7.55	49.251	0.503
HF010	15.08	603.134	17.477	4.5	69.897	0.349
Mean	20.12	728.55	31.93	4.81	36.72	1.17
St.Deviation	5.87	190.31	11.43	1.75	22.03	0.96
Minimum	13.18	513.73	13.07	2.10	14.22	0.39

Maximum	28.35	1058.04	48.95	7.55	70.86	2.86
C. level(95.0%)	4.20	136.14	8.17	1.25	15.76	0.69

Table 2. Bioassay of kesseru accessions during autumn

Accessions of kesseru	Larval wt.(g)	Larval Duration (days)	Cocoon wt.(g)	Shell wt	SR%	ERR%
HF 001	9.20	21.00	2.85	0.30	10.52	85.66
HF 002	9.40	21.00	2.55	0.30	11.76	87.33
HF 003	8.42	21.00	3.00	0.39	13.00	87.33
HF 004	8.75	21.00	2.75	0.32	11.63	88.33
HF 005	8.20	21.00	3.42	0.35	10.23	87.66
HF 006	7.50	21.00	3.15	0.34	10.79	88.33
HF 007	8.72	21.00	2.32	0.30	12.93	86.66
HF 008	8.50	21.00	3.20	0.40	12.50	88.66
HF 009	9.52	21.00	2.85	0.36	12.63	88.33
HF 010	8.60	21.00	2.90	0.38	13.10	86.66
Mean	8.68	21.00	2.90	0.34	11.91	87.50
SD	0.60	0.00	0.32	0.04	1.09	0.96
Minimum	7.50	21.00	2.32	0.30	10.23	85.66
Maximum	9.52	21.00	3.42	0.40	13.10	88.66
C. Level(95.0%)	0.43	0.00	0.23	0.03	0.78	0.69

Table 3. Bioassay of kesseru accessions during winter

Accessions of kesseru	Larval wt.(g)	Larval Duration (days)	Cocoon wt.(g)	Shell wt	SR%	ERR%
HF 001	6.13	56.00	2.67	0.31	11.61	83.33
HF 002	5.82	56.00	2.63	0.30	11.41	86.11
HF 003	6.08	56.00	2.88	0.31	11.76	86.66
HF 004	5.80	56.00	2.63	0.31	11.66	84.44
HF 005	6.63	56.00	3.07	0.34	10.97	88.88
HF 006	5.87	56.00	2.73	0.31	11.48	82.78
HF 007	6.07	56.00	2.85	0.30	10.53	87.78
HF 008	6.78	56.00	3.17	0.35	11.04	89.44
HF 009	6.17	56.00	2.63	0.30	11.41	86.67
HF 010	5.58	56.00	2.57	0.30	11.67	85.56
Mean	6.09	56.00	2.78	0.31	11.35	86.17
SD	0.37	0.00	0.20	0.02	0.39	2.21

Minimum	5.58	56.00	2.57	0.30	10.53	82.78
Maximum	6.78	56.00	3.17	0.35	11.76	89.44
C.Level(95.0%)	0.27	0.00	0.15	0.01	0.28	1.58

Table 4. Bioassay of kesseru accessions during summer

Accessions of kesseru	Larval wt.(g)	Larval Duration (days)	Cocoon wt.(g)	Shell wt	SR%	ERR%
HF 001	8.80	20.00	2.95	0.30	10.17	85.66
HF 002	8.40	20.00	2.75	0.35	12.73	82.33
HF 003	8.42	20.00	3.00	0.39	13.00	82.33
HF 004	8.70	20.00	2.85	0.32	11.23	85.33
HF 005	8.20	20.00	3.45	0.38	11.01	82.66
HF 006	7.50	20.00	3.20	0.34	10.63	85.33
HF 007	8.72	20.00	2.60	0.30	11.54	82.66
HF 008	8.50	20.00	3.50	0.45	12.86	85.66
HF 009	8.45	20.00	3.35	0.35	10.45	82.66
HF 010	8.70	20.00	3.00	0.30	10.00	82.33
Mean	8.44	20.00	3.07	0.35	11.36	83.70
SD	0.38	0.00	0.30	0.05	1.14	1.56
Minimum	7.50	20.00	2.60	0.30	10.00	82.33
Maximum	8.80	20.00	3.50	0.45	13.00	85.66
C.Level(95.0%)	0.27	0.00	0.22	0.03	0.81	1.12

Table 5. Season wise leaf biomass production of kesseru genotypes

Accessions	Av. Leaf yield / plant during summer,2013 (kg)	Av. leaf yield/ plant during Autumn,2013 (kg)	Av. leaf yield/ plant during winter,2014 (kg)	Total leaf biomass production /plant/year (kg)	Potential leaf biomass /ha/year (MT)
HF001	3.62	3.43	2.74	9.79	24.475
HF002	3.46	3.41	2.53	9.40	23.500
HF003	3.62	3.39	2.45	9.46	23.650
HF004	3.53	3.51	2.38	9.42	23.550
HF005	4.27	3.92	2.50	10.69	26.725

HF006	3.39	3.40	2.39	9.18	22.950
HF007	3.57	3.52	2.32	9.41	23.525
HF008	4.40	4.05	2.58	11.03	27.575
HF009	3.46	3.34	2.27	9.07	22.675
HF010	3.50	3.45	2.28	9.23	23.075
Benchmark (Imp.)	4.50	3.50	2.00	10.00	25.00
Benchmark (Trad.)	3.50	3.00	1.50	8.00	20.00
Mean	3.74	3.49	2.33	9.56	23.89
SD	0.40	0.27	0.32	0.78	1.95
Minimum	3.39	3.00	1.50	8.00	20.00
Maximum	4.50	4.05	2.74	11.03	27.58
Con. Level(95.0%)	0.26	0.17	0.20	0.50	1.24

Table 6. Parameters on growth and biomass production of *Ailanthus* spp.

Parameters	*Ailanthus excelsa* (Borkesseru)	*Ailanthus grandis* (Borpat)
Method of propagation	Seed	Seed
Period of flowering	Feb - March	Dec - Jan
Period of seed collection	May- June	March – April
Period of seed sowing	June - July	April – May
Planting season	Sep-Oct	Aug - Sep
Gestation period (months)	36	48
Germination period (days)	15 – 20 (18.25 ± 0.45)	45 – 55 (52.76 ± 1.02)
Germination (%)	35-45 (41.24 ± 0.89)	80 – 85 (82.21 ± 1.65)
Numbers of seeds per kg	8264 - 12048 (10471 ± 1189)	857 – 1321 (1013 ± 129)
Single seed weight (g)	0.083 - 0.121 (0.096 ± 0.012)	0.757 – 1.166 (0.987 ± 0.112)
Average production of leaf biomass (MT/ha)	27-31 (28.24 ±1.23)	32-38 (33.45 ± 2.45)

Data in the parentheses indicate mean ± standard deviation.

Discussion

Kesseru, *Heteropanax fragrans* is the popular perennial host plant of eri silkworm ranked next to castor. Though genetically variations are exist in different genotype of kesseru earlier no systematic efforts has been made to evaluate suitable genotype with desired characters. During the study ten kesseru accessions were identified and out of that two high yielding kesseru accessions (HF 008 and HF 005) were evaluated. Further, considering variation on leaf morphological study four accessions of *Ailanthus grandis* and five accessions of *A. excelsa* were identified.

Project code: APR-5858
Project Title: Eri silkworm, S*amia ricini* (Donovan) rearing and cocoon production in relation to host plant castor genotypes (*Ricinus communis* L.) raised under rain-fed conditions in semi-arid region

Project Period: Nov., 2011 - Oct., 2014
Funding agency: Central Silk Board, Bangalore
Total budget allocation:

Project Investigators: C. Srinivas, Principal investigator
T. Ravivarma, Co- investigator

Objectives

1. To evaluate the varietal potential of commercial and perennial castor genotypes under rain-fed semi-arid conditions
2. To identify the castor genotypes suitable for eri silkworm rearing

Highlights of Achievments

Eight castor genotypes *viz*., CSP- 001, CSP – 002, CSP – 003, CSH- 103, CSH- 105, CSH- 106, CSPR – 201 and CSPR- 202 were raised during the unfavourable season (January - June) and cropping season (July - December). Observations on seed germination, growth parameters up to 120th days with an interval of 15 days after seed sowing were completed in both the seasons. At the optimum growth period (120 DAS), the genotype CSH-103 showed higher values for no. of leaves/ plant (21), plant height (245.07 cm), no. of branches (2) and leaf yield (9796.08 kg/ha) and it was followed by CSH–106 and CSH–105. The lowest growth parameters were recorded for CSPR–202 with 14 nos. of leaves/ plant, 187.43 cm of plant height and 6047.58 kg leaf yield /ha. The maximum moisture retention capacity was found in CSH103 (81.41 %) followed by CSH-105 (80.81 %). Nutrient analysis for macro & micro nutrients of castor leaf samples collected during both the seasons was

completed. Nutrient analysis revealed variability in leaf nutrient status of genotypes. Leaf macro nutrients (NPK) was found to be high in genotype CSH – 106, CSH-103 and CSH - 105, while micro nutrients Cu, Zn and Mn are found to be in moderate levels. Micro nutrient Cu was found to high in CSH – 106, CSPR – 201 and CSPR – 202 while Zn and Mn are found to be in moderate levels for the same genotypes. Leaf samples have been sent to CSR&TI, Mysore for analysis of crude proteins, fibers, fats, oils and carbohydrates. Bioassay revealed that the higher values for silk ratio (13.05-13.75 %), shell weight (0.234-0.243 g) and ERR (11.70-14.80 kg) in the castor genotypes CSP-106, CSP – 105 and CSP – 103 were recorded. Observations indicated overall superiority of CSH-103 with respect to number of leaves per plant, plant height, Number of branches and leaf yield. However, the maximum moisture retention capacity (69.02 %) was found in CSP003.

Project code: AIB-5857

Project Title: Evaluation and identification of eco-race(s) of eri, S*amia ricini* (Donovan) suitable to semi- arid conditions of Andhra Pradesh

Project Period:	Nov., 2011 – Oct., 2014
Funding agency:	Central Silk Board, Bangalore
Total budget allocation:	Rs. 5.61 Lakhs

Project Investigators: T. Ravivarma, Principal investigator

Objective

1. To evaluate and identify eco-race (s) suitable to semi-arid condition of Andhra Pradesh utilizing castor and tapioca leaf

Highlights of Achievments

Ten popular eri silkworm (*Samia ricini* Donovan) eco-race accessions *viz.*, SRI 025,SRI 001, SRI 013, SRI 010, SRI 014, SRI 012, SRI 005, SRI 021, SRI 022,SRI 027 and Control were collected from Central Muga Eri Research and Training Institute (CMER& TI) Jorhat and evaluated for their rearing and reproductive (grainage) performances during four *viz.*, February-March, April-May (non-crop season), August-September and November-December (regular crop season) periods for two years during 2011-12 and 2012-13 with the primary host plant Castor (*Ricinus communis* Lin.) and Tapioca (*Manihot esculenta* Crantz and *M. utilissima* Phol). Each of the accessions was reared in three replications with 200 worms retained after III moult per replication. The mixed commercial population obtained from ESSPCs was treated as control. The general rearing technology advocated by Jayaprakash, (2005) was followed in RBD design. The performance of the ten accessions was evaluated along with control for fourteen traits *viz.*, fecundity, hatching percentage, total larval duration,

V instar duration, effective rate of rearing for 10000 larvae by number and by weight, cocoon weight, cocoon shell weight cocoon shell percentage, good cocoon %, male and female moth emergence %, pairs % and layings recovery %. The data was analyzed statistically for period wise performance, overall performance, performance during regular crop and non-crop seasons to identify the suitable accession(s).

Statistical methods followed

The data was statistically analyzed (ANOVA) and relative ranking was assigned by following Multiple Trait Evaluation Index method (Mano *et al*., 1993). The eco-race with highest average evaluation index value (EI) was identified as promising and considered suitable for its exploitation in semi-arid conditions of Andhra Pradesh.

Analysis of variance

The data pertaining to the rearing performance of the eco-races were analyzed using ANOVA

Multiple Trait Evaluation Index Method

Evaluation index values for the traits (positive) under study were calculated as per the following formula advocated by Mano *et al*., 1994.

$$\text{Evaluation Index} = \frac{A - B}{C} \times 10 + 50$$

Where,

A = Value obtained for a trait in a breed
B = Mean value of a trait of all the breeds
C = Standard Deviation of a trait of all the breeds
10 =Standard unit
50 = Fixed value

Evaluation index values for the traits (negative) such as 5th age larval duration and total larval duration for which the lower values are considered as advantageous were calculated as per the following formula recommended by Goel *et al*., (2008).

$$\text{Evaluation Index} = \frac{(A - B)}{C} \times (-10) + 50$$

Individual evaluation index values trait-wise and accession wise were computed and average index values over eight traits under study were obtained. The average index value fixed for the selection of a genotype was above 50 and the strain showing higher average index value above 50 was considered to possess greater economic value over multiple traits and the strain with highest average index value is ranked first and so on.

Result

Evaluation of rearing and reproductive performance

The morphological characteristics of larvae and cocoon of the ten eco-race accessions evaluated are presented in Table 1. A perusal of the morphological characters present that the larvae comprised of plain, spotted, and zebra with yellow or greenish blue colour types. The cocoons of the accessions SRI 025, SRI 001, SRI 010, SRI 012, SRI 005, SRI 021, SRI 022, and SRI 027 were white in colour while the accessions SRI 013 and SRI 014 were of pink coloured cocoons. The rearing and reproductive performances season-wise (February - March, April - May, August - September, November - December), overall (2011-12 & 2012-13 covering four seasons) and regular (August-September & November-December) crop season and non-season (February-March & April-May) for two years during 2011-12 and 2012-13 with the host plants Castor) and Tapioca are evaluated and discussed as hereunder.

Table 1: Morphological characteristics of genotypes of eri silkworm, *Samia ricini*

S.No	Accession No	Larval body colour	Cocoon colour
1	SRI 025	Plain Yellow	White
2	SRI 001	Plain & Zebra on yellow and Blue	White
3	SRI 013	Plain & Zebra on yellow and Blue	White & Brick red
4	SRI 010	Plain & Zebra on yellow and Blue	White
5	SRI 014	Plain yellow and blue	Brick red
6	SRI 012	Plain & spotted on yellow and blue	White
7	SRI 005	Plain blue	White
8	SRI 021	Plain yellow	White
9	SRI 022	Plain yellow	White
10	SRI 027	Plain yellow	White
11	Control	Plain,Zebra&Spotted on yellow and blue	white

Discussion

Eri silk (4237 MT) characterized for its good thermal property and blending characters holds promise constituting about 60.49 % of the total 'vanya' raw silk production (7004 MT) in the country. Considering the potentiality for eri silk production and as a supplementary income generating avocation to the rural poor, ericulture is taken to non-traditional states including Andhra Pradesh and Telangana where dry and up-land plantations of the major food plants of eri silkworm, *Samia ricini* Donovan *i.e.,* castor (*Ricinus communis* Linn.) and tapioca (*Manihot esculenta* Crantz., & *M.*

utilissima Phol) are cultivated exclusively for seed and tuber production by utilizing 30 % leaf for eri silkworm rearing without affecting seed and tuber production (Jayaprakash *et al*., 2006). Despite immense potential for the development of ericulture in Andhra Pradesh and Telangana (Ramalakshmi, 2012), the expected productivity could not be achieved owing to various factors including lack of eri silkworm genotypes suitable to sub-tropical conditions of Andhra Pradesh and Telangana. Despite of the availability of extensive information on the performance of different eri silkworm eco-races/strains on different host plants (Bindroo *et al*., 2007) and characterization of eri silkworms (Chakravorty *et al*., 2008) in north eastern zone, information is largely limited to the preference of host plants under south Indian conditions that established the superiority of castor followed by tapioca (Sanappa, 1997). However, in the absence of region specific eri genotypes suitable to sub-tropical conditions in Andhra Pradesh and Telangana, evaluation of the rearing performance of ten eri eco-races fed with both castor and tapioca leaf during the regular crop season (September to December) and non-crop season was made for identification of promising genotype suitable to sub-tropical conditions of Andhra Pradesh and Telangana areas for increased productivity and crop sustainability.

Among the four periods of the year *i.e*., February-March, April-May, August-September and November-December, the rearing performance of the eri silkworm eco-races fed with castor and tapioca leaves indicated the best performance during November-December period while the lowest during April-May period which can be attributed to the most favourable conditions during regular crop season and harsh conditions during non-crop season respectively. The poor performance during non-crop season *i.e.,* during February-March and April-May period could be attributed to non-availability of quality leaf of both castor and tapioca and unfavourable conditions especially the harsh climate during April-May period. Since, castor and tapioca plantations are cultivated during August to January (regular crop season), the leaf is available for utilization of eri silkworm rearing taking advantage of congenial climatic conditions eri cocoon crops could be taken up during crop season only. About 2 – 3 crops with 100 – 125 dfls per batch/acre could be taken up for obtaining sustainable and optimal cocoon yields as it was endorsed that removal of foliage of 25 % after 90-120 days or 50-75 % after 60-120 days of sowing of Aruna variety of castor not affecting the seed yield. The present study also corroborates the view of successful eri silkworm cocoon crops during regular crop season.

Among the eri silkworm eco-races evaluated, SRI-025 has recorded better performance over others in all the 4 periods evaluated with castor and tapioca. Further, ANOVA indicated the differential performance among the traits of 10 eco-races evaluated suggesting the differences in their genetic make-up. The Evaluation Indices analyzed also confirm the superiority of SRI-025 followed by SRI-012 with the host plants, castor and tapioca.

Accordingly, the eri silkworm eco-race SRI-025 that ranked first both with castor and tapioca is adjudicated as the best performing genotype and could be considered for commercial exploitation during crop season *i.e*., September – January under sub-tropical conditions of Andhra Pradesh and Telangana regions with castor and tapioca as well for increased and sustainable cocoon yields.

As a follow-up, limited field trails with the identified eco-race, SRI-025 was conducted during 2014 in Mahabubnagar and East Godavari districts with ten farmers both with tapioca and castor and recorded an average cocoon yield of 45 kg/100 dfls compared to the cocoon yield of 32 kg/100 dfls in control.

Project code: MOE - 5863
Project Title: Sustainable rural livelihood: adoption and refinement of improved technologies of eri culture in Brahmaputra Valley of Assam

Project Period:	Dec., 2012-March, 2015
Funding agency:	SoRF, DST, New Delhi
Total budget allocation:	Rs. 11.49 Lakhs
Project Investigators:	C. Dash, Principal investigator B. Choudhury, Institutional Guide

Objectives

1. To enhance the productivity in ericulture through adoption of improved technologies and to assess adoption, refinement and validation of the improved technologies at farmers level
2. To develop new products and diversify the eri culture to improve income and employment generation

Highlight of achievements

Socio-economic survey was conducted in different places. Twenty SHGs were formed covering 405 beneficiaries. 20 eri spinning machines, 90 plastic mountages and 90 bamboo platform rearing equipments and other critical inputs were distributed among the beneficiaries. Technology demonstrations, training /skill development programmes etc. were conducted. 4400 dfls of improved eri silkworm breed/race were distributed to farmers. Eri cocoon production enhanced from 7.20 to 12.85 kg per 100 dfls and yarn productivity up to 205 gm per 8 hours.

Survey was also conducted to assess the market price of eri cocoon, yarn and fabrics, etc. in the farmers' fields. Bamboo platform rearing equipments has been

refined by fitting with net to control uzi fly. Two training programmes on eri spinning covering 75 farmers conducted. Training programme was conducted on product design and dyeing of eri silk for 10 lead farmers in collaboration with DOS, Nagaland at Dimapur. Further, large scale training programmes were organized covering more than 150 women farmers on dyeing and product development and diversification of eri silk. The beneficiaries of the project are bank/credit linked with HDFC Bank Ltd. and State Bank of India for setting up the eri silk based enterprises.

ONGOING R&D PROJECTS

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

Duration: April 2014 – Nov., 2015
Funding agency: DBT, New Delhi

Project investigators: M. Chutia, Principal Investigator
R. Das, Co-investigator

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 national workshop on “Basic diagnostic techniques of microbes and insects of muga ecosystem “has been organised on 16th -18th March 2015 at CMER&TI, Lahdoigarh, Jorhat, Assam. Dr B. Barthakur, Head, Deptt. Of Mycology and Microbiology,TER ,Jorhat visited the the Biotech Hub and deliver the lecture to 44 nos of student during the workshop on “Beneficiary Microbes of Insect”.
- Three college students utilised the Biotech hub laboratory for the completion of graduate level internship project
- One research scholar from Kharagpur IIT visited the biotech hubs and utilized the laboratory facility.
- Four demonstration programme were conducted during the period from 2014-15.
- Electrophoresis and Online UPS was purchased.
- Three undergraduate students from Central College, Jorhat, pursuing their internship project on Biochemical analysis of food plants of muga silkworm.

Sl No.	Demonstration/Teaching	School/College/Institute
1	Demonstration of the usefulness and application of different sophisticated instruments of Pathology Section was given to the school students	Nakachari Junior College, Jorhat & 105 nos students.
2	Demonstration and awareness programme was organized in Pathology section for the school students to motivate the gathering knowledge on Muga silkworm with reference to disease incidence which is the endemic to Assam as well as North Eastern region.	AAU, Jorhat & 22 nos students.
3	Teaching on preparing minor school project on the life cycle of Muga silkworm	KVK, ONGC, Cinnamara, Jorhat & 7 nos visitors.
4	demonstration programme on microbes which is responsible to infect in muga cultivation as well as their physical nature	North Bengal University & 29 visitors

Project code: APS - 5856
Project title: Development of egg preservation schedule in muga silkworm, *Antheraea assamensis* Helfer

Project period: April 2011 - June 2015
Funding agency: Central Silk Board, Bangalore
Total budget allocation: Rs. 7.96 Lakhs

Project Investigator: D. Goswami, Principal investigator
N.I Singh, Co-investigator
M.D. Senapati, Co-investigator

Objective

1. To develop suitable technology for short and long term preservation of eggs of muga silkworm.

Highlights of achievements

The different developmental stages of the muga silkworm eggs at the different ages (24 to 168 hr with 12 hr interval) identified and prepared the embryonic chart for future reference. The longest embryonic stage/Hei-B stage of muga silkworm has been

detected between 68 -72 hr old embryo. The same experiment has also been repeated to observe the seasonal effect.

Eggs of different embryonic ages (24 to 72 hr) and eggs of mix embryonic ages (24 to 72 hr) were preserved at low temperature (7 °C) for different duration *viz*., 10 days to 80 days with an interval of 10 days and studied the effect on hatchability. It was observed that 36 h to 48 h old embryos can be preserved at low temperature for 20 days without any adverse effects on hatching while eggs of mix embryonic ages (24 to 72 hr) can be preserved for 15 days with average hatching of 85 % against 86.50 % of control. Thereafter, the hatching declined and after 20 days of preservation only 66.00 % hatching could be obtained. The hatching further declined to 42 % in 23 days of preservation lot and thereafter the hatching further declined with the increasing duration of preservation. Fully developed death embryo was observed after 30-40 days of preservation.

Project Code: AIE - 5864

Project title: Studies on the insect fauna associated with muga-ecosystem in North East India with emphasis on the illustrated diagnostics

Project Period:	August, 2012 - July, 2015.
Funding Agency:	DST, New Delhi
Total Budget Allocation:	Rs. 19.25 Lakhs
Project Investigators:	Rajesh Kumar, Principal investigator Girin Rajkhowa, Co-investigator

Objectives

1. Exploration, collection and preservation of insect fauna associated with Muga-ecosystem in North East India.
2. Identification, morphological characterization and documentation.
3. Development of computerized diagnostic tools and inventorization of insect fauna

Highlights of achievements

Insect pests and predators were collected from the following localities of muga ecosystem: Boko, Guwahati, Dibrugarh, Tinisukia, Jorhat, Golaghat, Sivasagar districts of Assam; Tura, Dhamalgiri of Meghalaya; Aizawl, Mizoram; Roing, Pashighat, Arunachal Pradesh.

- Total Number of photographs: field photos 397 of larvae, pupae, adults and damage symptoms have been taken.

- More than three hundred Microscopic photographs have been taken for developing field and identification diagnostic keys.
- Life cycle completed : 25
- 41 butterflies species collected and identified (among them 3 are minor pests) – seasonal occurrence reported and prepared illustrated diagnostic keys.
- 12 species of natural enemies, coccinellids (Coleoptera: Coccinellidae) has been reported.
- Database has been developed in MS-Excel for preserved insects, which is linked with habitus photograph of insect and location details along with photographs taken by GPS.
- Database entry has been made for 970 specimens
- 156 species have been identified
- Other specimens identified upto family and genus level
- A sucking pest, *Pyrops candalaris* (Fulgoridae : Hemiptera) – first report feeding on soalu (Litsea monoptetala) –manuscript accepted in Munis Entomology and Zoology
- Three parasite have been observed belongs to genus *Brachymeria*. Upto species level is under process.
- Tortricid, geometrid and noctuid caterpillar collected and reared in laboratory and identification is in under process.
- First report of *Radhica elisabethae* (Lepidoptera: Lasiocampidae) feeding on som plantations from India (Meghalaya and Nagaland) in muga ecosystem.
- Uzifly available in muga ecosystem is redescribed and found it is not the same as reported and published i.e. *Exorista bombycis, Exorista sorbilanse* and *Blepharipa zebina*, but it belongs to other species. That's why the control measures following for reported species are not sufficient to control the available species in muga ecosystem. As a result, during winter season muga crop loss upto 90 % due to uzifly infestation. The uzifly identification is under process with the help of national and international Dipteran taxonomist. For controlling this pest, a separate project will be submitted.

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Project Code: AIP - 5861

Project title: Molecular approaches in characterization and utilization of gut microflora from muga silkworm *Antheraea assamensis* for enhancing productivity of muga culture in North Eastern India (in collaboration with IARI, New Delhi)

Project Period:	June 2012 – Oct. 2015
Funding Agency:	DBT, New Delhi
Total Budget allocation:	Rs. 30.73 Lakhs (IARI, New Delhi: 26.55 lakh:

Total: 57.28 lakhs)

Project Investigators: D.K. Gogoi, Principal Investigator
R. Kumar, Co- investigator

Objectives

1. Enumeration of gut microbial diversity in different morphotypes and accessions of muga silkworm *A. assamensis.*
2. Characterization of gut microbial isolates using 16s rRNA probes and culture dependent techniques.
3. Evaluation of positive influence of consortium of gut microbial isolates on the growth, development and economic parameters of *A. assamensis.*
4. Assessing the antagonistic activity of gut microbial isolates against entomopathogens of *A. assamensis*.

Highlights of achievements

Quantitative cellulase assay of gut-bacteria of *A. assamensis*:

Cellulase activity was assayed using dinitrosalisic acid (DNS) reagent by estimation of reducing sugars released from solubilised in 0.05 M phosphate buffer at pH 8. Crude enzyme was added to 0.5 ml of 1 % CMC in 0.05 M phosphate buffer and incubated at 50 °C for 30 min. Reaction was stopped by addition of 1.5ml of DNS reagent and boiled at 100^0C in water bath for 10 min. Sugars liberated were determined by measuring absorbance at 540 nm. Calibration curve was prepared from different serial concentration of glucose. Cellulase production was estimated by using glucose calibration curve. Cellulase activity is expressed as the quantity of enzyme, which is required to release 1µmol of glucose per minute under standard assay conditions.

Quantitative lipase assay of gut-bacteria of *A. assamensis*

Quantitative lipase assay of gut-bacteria of *A. assamensis* was done as per the standard method of Winkler & Stuckman, (1979). The pure culture of lipase producing gut-bacteria were inoculated into the culture broth with the composition (g), peptone 0.2, $NH_4H_2PO_4$ 0.1, NaCl 0.25, $MgSO_4.7H_2O$ 0.04, $Cacl_2.2H_2O$ 0.04, olive oil 2 ml, Tween-80 1/2 drops, distilled water 100ml and pH 7.

Each of the assays was performed in triplicate and one unit (IU) of lipase activity was defined as micromole(s) of *p*-nitrophenol release by hydrolysis of *p*-NPP by one ml of enzyme at 45 °C under assay condition.

Screening of gut-bacteria for antimicrobial activity

The muga silkworm gut-microflora were screened for their antagonistic properties against three pathogenic microorganisms: *Escherichia coli*, *Bacillus subtilis* and *Pseudomonas aeruginosa*. The gut-bacteria were cultured on Nutrient broth medium and the culture filtrate was used for antibacterial bioassay by Agar well

diffusion method. Zone of inhibition (mm) was recorded by measuring the clear zone produced around agar well/cup.

As per the objective of the project, *In-vitro* quantitative screening of the isolates has been performed for cellulolytic and lipolytic activity. It has been reflected from the result that some bacterial isolates have got promising enzymatic activity for further evaluation as probiotic for *A. assamensis* to enhance productivity. Among the isolates, MGB011 showed highest cellulolytic activity whereas MGB14 has got maximum lipolytic activity. Isolate no. MGB05 exhibited highest antimicrobial activity against some entomo-pathogens *viz*., *B. subtilis, E. coli* and *P. aerugionsa* in agar well diffusion assay.

Table.1: Antimicrobial activity of muga silkworm gut-bacteria against pathogenic microorganisms.

Isolate No	**Inhibition Zone Diameter (mm)**		
	E. coli	***B. subtilis***	***P. aeruginosa***
MG01	27	30	-
MG03	-	15	-
MG05	17	40	19
MG06	-	-	30
MG07	-	25	-
MG09	-	24	-
MG12	15	20	-
MGS3	30	25	-

The two most potential gut-bacteria selected through qualitative and quantitative screening were identified by polyphasic approach towards the formulation of probiotic consortium. Based on morphological and biochemical characterization followed 16S rRNA gene homology analaysis, two potential gut-bacteria of *A. assamensis* were identified as follows:

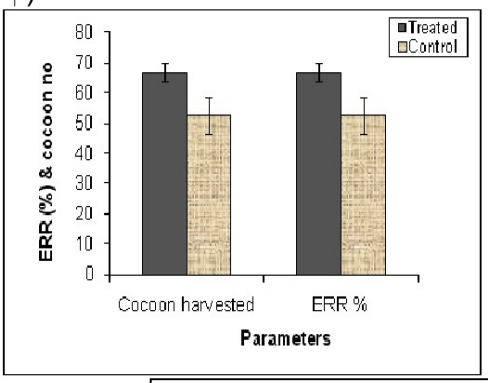
Isolate	**Closely related strain**	**Identified as**
MGB05	*Bacillus stratosphericus* strain SH (Accession No.: C172055.1)	*Bacillus stratosphericus* strain MGB05
MGB011	*Bacillus cereus* strain 55-3 (Accession no.: KM187654.1)	*Bacillus cereus* strain MGB011

First field trial rearing of *A. assamensis* was performed with the treatment of selected gut-bacteria and various rearing cum cocoon economical parameters were recorded. Results revealed that the average larval weight, cocoon weight, shell weight and SR % and ERR % has been increased in the gut-bacteria treated samples in comparison to the control (untreated silkworms).

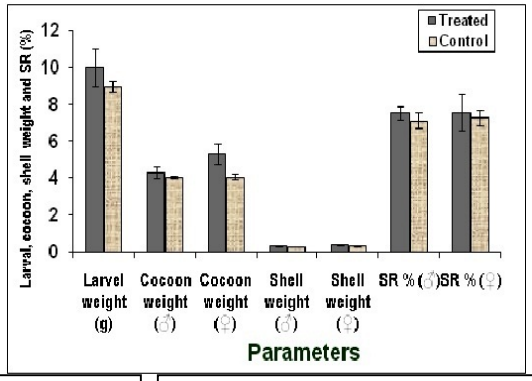
Treatment of beneficial gut-bacteria on *A. assamensis* rearing:

Altogether 300 nos. of 2nd instar *A. assamensis* larvae were taken and reared on *Persea bombycina* (host) plants in 3 replications (100 each on different plants). Simultaneously, 100 worms were also reared as control without treatment. Consortium of 3 gut-bacteria broth culture with a microbial load 10^8 cfu was sprayed on *P. bombycina* leaf during 3rd instar of rearing. Relevant rearing data were recorded during the growing period of the larvae. The following silkworm rearing and cocoon parameter were recorded after the completion of rearing:-

Number of worms brushed, larval weight (matured silkworm), number of cocoon harvested, ERR %, average cocoon weight (♂ &♀), average shell weight (♂ &♀) and SR % (♂ & ♀) etc.



Rearing and cocoon parameters of field trial



Nos. of cocoon harvested and ERR% during field trial

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e average larval weight was recorded higher (10 gm) in the *A. assamensis* treated with beneficial gut-bacteria combinations (MGB011 + MGB05 + MGB14) then the control (8.97 gm). As such, average cocoon weight (♂4.3 g and ♀5.34 g), shell weight (♂0.32 g and ♀0.40 g) and silk ratio (♂7.52 % and ♀7.53 %) were also found higher in the treated silkworms in comparison to the control i.e. in untreated silkworm rearing. The effective rate of rearing (ERR) was calculated; where it was recorded higher (67 %) in the *A. assamensis* silkworms treated with beneficial gut-bacteria combinations then the control (52.67 %). The first field trial results revealed that the ERR % of *A. assamensis* has been increased by 27.2 % against the control. Accordingly, the average larval weight (10.3 %), cocoon weight (♂5.9 % & ♀14.35 %), shell weight (♂10.34 % and ♀17.34 %) and SR % (♂5.62 % and ♀3.43 %) also increased in the treated in comparison to the untreated silkworms.

Project Code: PRP - 5862

Project title: Screening of microbial flora (potential bio-fertilizer) of Castor rhizosphere and development of INM package in ericulture (DST-FTYS, New Delhi)

Project Period:	July 2012 to June, 2015
Funding Agency:	DST, New Delhi
Total Budget allocation:	Rs.18.80 Lakhs
Project Investigator:	D. K. Gogoi, Principal investigator

Objectives

1. Benchmark survey for biofertilizer potential microorganisms and analysis of soil biological properties of experimental virgin plot.
2. Isolation, selection and identification of potential strains and formulation of biofertilizer package with different treatment combinations in RBD for field trial.
3. Study of various growth parameters of the growing castor plant in specific time period.

Highlights of achievements

PGPR activity test

The plant growth promoting activity of the isolated castor rhizobacteria was carried out as per available standard methodologies. Indole acetic acid (IAA) produced by the isolates was estimated by using tryptophan as per the method of *Wohler* (1997) and further modification by *Marques* et al., (2010). Production of gibberellic acid (GA_3) was determined by the method of *Paleg*, (1965). The concentration of IAA and GA_3 produced by the isolates were calculated by calibrating with standard curve prepared by using graded concentrations of IAA and GA_3 (Hi-media Ltd.) and expressed as mg/l.

Result

Most of the isolates taken under consideration were found to be positive against IAA, GA_3 and ACC deaminase activity test. Among the PSB isolates MAJ PSB12 showed maximum IAA (24.60 mg/l), GA_3 (3.921 mg/l) and ACC deaminase (0.015 µg/10ml/min.) activity, that has been followed by MAJ PSB05 for IAA (21.19 mg/l), KAZ PSB01 for GA_3 (3.417 mg/l) and MAJ PSB11 for ACC deaminase (0.011 µg/10ml/min) activity. Similarly, among the *Achromobacter/Azotobacter* isolates highest PGPR activity for the above three parameters were found in KAZ AZB05 (27.87 mg/l, 7.0 mg/l and 0.027 µg/10ml/min., respectively). Besides, promising results was observed in isolate no. KAZ AZB03 for IAA (22.58 mg/l), KAZ AZB01 for GA_3 (3.30 mg/l) and KAZ AZB02 & MAJ AZB02 for ACC deaminase (0.005 µg/10ml/min.) activity. Highest amount of IAA (26.51 mg/l), GA_3 (5.990 mg/l) and ACC deaminase (0.011

µg/10ml/min.) was produced by KAZ AZP01 among the *Azospirillum* isolates. Subsequent activity was recorded in KAZ AZP03 for IAA (18.50 mg/l) and GA_3 (4.07 mg/l) production whereas KAZ AZP02 for ACC deaminase (0.010 µg/10ml/min) activity. Out of 8 *Pseudomonas* isolates, MAJ PIA03 showed highest IAA (27.84 mg/l), GA_3 (8.21 mg/l) and ACC deaminase activity (0.014 µg/10ml/min.) that has been followed by MAJ PIA07 for IAA (22.49 mg/l) & GA_3 (5.88 mg/l) and MAJ PIA01 for ACC deaminase (0.011 µg/10ml/min) activity (Fig. 1).

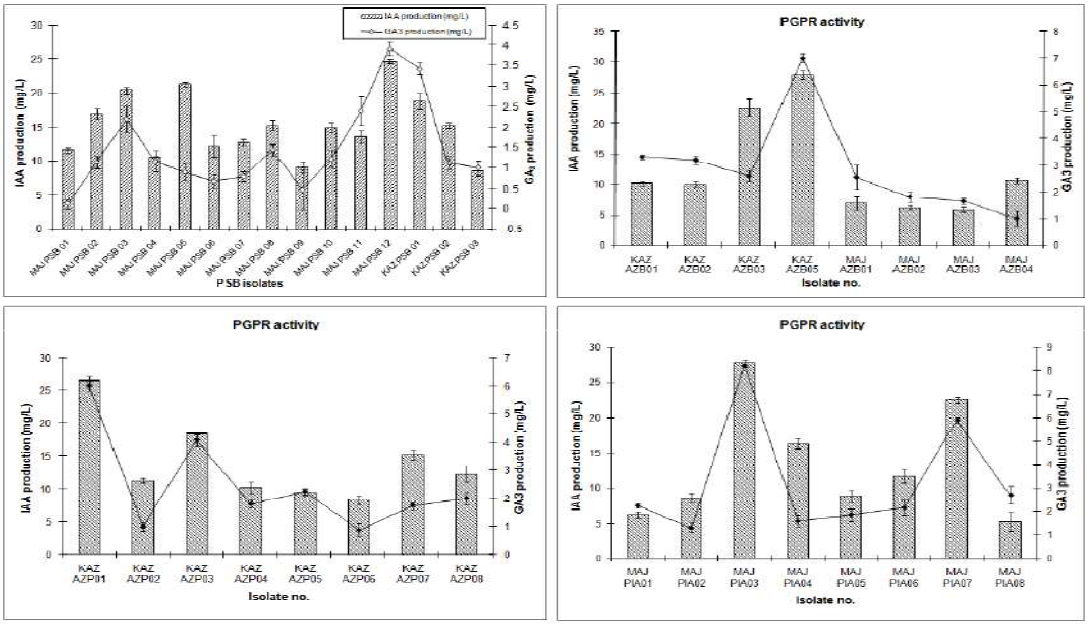

Fig. 1. Productions of IAA, GA_3 (mg/L) and ACC deaminase by *Azospirillum* sp, *Azotobacter* sp, *Pseudomonas* sp. and PSB isolates

Selection of the potential isolates

On the basis of quantitative efficacy, antimicrobial assay and PGPR tests, four isolates (MAJ PSB12, MAJ PIA03, KAZ AZP01 and KAZ AZB05) have been selected for preparation of mass culture and further molecular characterization.

Molecular identification

Molecular identification of the most potential isolates was carried out by 16S rDNA sequencing and homology. Isolation of DNA's was done by standard methodology of *Marmur*, (1961) and by using Genomic DNA extraction kit manufactured by SRL Pvt. Ltd., Mumbai (India). The DNA purity and quantity were checked by spectrophotometer at 260 and 280 nm. The partial sequencing of the 16S rDNA genes were carried out through the courtesy of DNA sequencing service, Merck Millipore (Bangalore GeNei^{TM}), Bangalore, India by using the same primer.

The partial 16S rDNA gene sequence homology was analyzed through online BLAST programme by aligning to the closest phylogeny with known taxonomic information available at NCBI nucleotide database. A phylogenetic tree was constructed by the Neighbour Joining method (*Saitou and Nie*, 1987) using CLUSTLW. The identified gene sequences were submitted to NCBI GenBank and accession number was obtained for further reference.

Three selected bacteria were identified by 16S rDNA homology study as follows:

KAZ AZB05: *Achromobacter sp*. KAZ AZB05 (Fig. 2)
KAZ AZP01: Under progress
MAJ PSB12: *Bacillus firmus* MAJ PSB12 (Fig. 3)
MAJ PIA03: *Pseudomonas aeruginosa* MAJ PIA03
(Fig. 4)

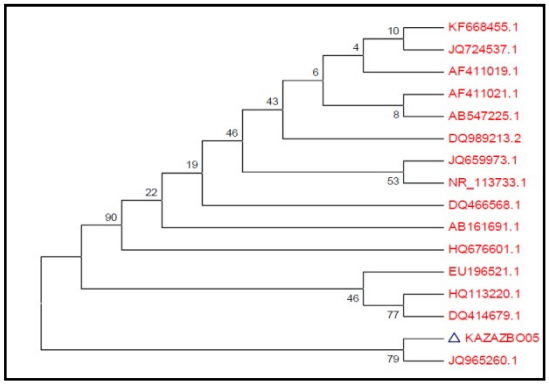

Fig.2: Phylogenetic tree of isolate no. KAZ AZB05

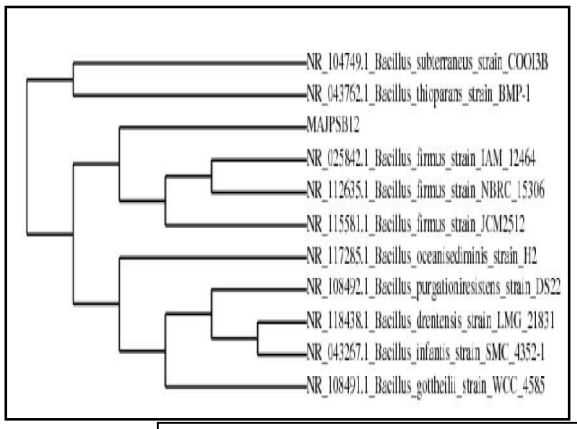

Fig. 3: Phylogenetic tree of isolate no. MAJ PSB12

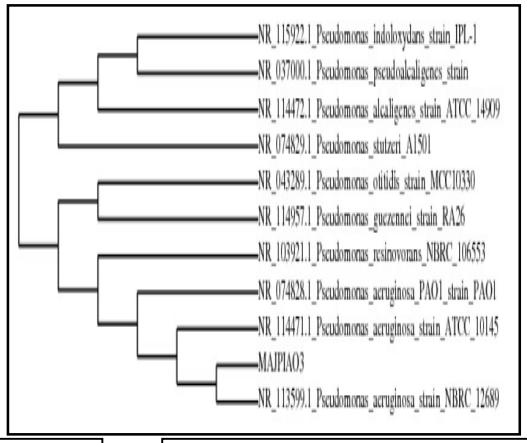

Fig.4: Phylogenetic tree of isolate no. KAZ AZB05

Field trial

Field trial of biofertilizer formulation has been carried out in RBD (Randomized block design) and with different treatment combinations. Preparation of land for castor cultivation and routine cultural operation has been carried out at different time interval. Castor seeds of NBR-1 variety were sown along with the different treatment

combinations in triplicates and regular observations were made during the growth of the plants.

Mass culture of the microorganisms for biofertilizer formulation and field trial has been done by shake flask culture method in respective liquid culture media. Formulation of the microbial culture has been prepared in carrier material, as in vermicompost or organic manure (cow-dung etc.) and inert material (e.g. Charcoal) in 1:1 ratio with final microbial load 10^8 cfu.

Treatment combinations:

The different treatment combinations are as follows:

T_1: Control (Cow dung + FYM i.e., Urea-25g + SSP-25g + MOP-3g)
T_2: Organic manure (Cow dung 500g per plant)
T_3: *KAZ AZP 01* inoculum (N_2- fixer)
T_4: *KAZ AZB 05* inoculum (N_2- fixer)
T_5: MAJ PSB 12 strain (Phosphate solubilizer)
T_6: MAJ PIA 03 inoculum (PGPR)
T_7: KAZ AZP 01 inoculum + *KAZ AZB 05* inoculum + *Bacillus firmus* MAJ PSB 12 strain + *MAJ PIA 03* inoculum (Combination)
T_8: 20 % FYM (5g+5g+0.6g) + T_7
T_9: 50 % FYM (12.5g + 12.5g + 1.5g) + T_7
T_{10}: 70 % FYM (17.5g + 17.5g + 2.1g) + T_7

Analysis of growth parameter and post microbial status of the experimental plots is in progress.

Agronomical parameterS considered for record are:

a) Nos. of leaves per plant
b) Leaf weight (fresh)
c) Stem base diameter
d) Root length
e) Root biomass
f) Plant length
g) Leaf biomass
h) Leaf moisture content
i) Percentage of biomass per leaf increase over control

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Project Code: AIB - 5851
Project title: Development of high yielding muga silkworm breed through population improvement

Project Period: Feb. 2011 – Dec. 2015
Funding Agency: Central Silk Board, Bangalore

Total Budget Allocation: Rs. 7.65 Lakhs

Project Investigators: N.I. Singh, Principal Investigator
D. Goswami, Co-investigator
A.K. Sahu, Co-investigator

Objective

1. To develop new breed of muga silkworm with high survivability and high shell weight suitable in the different climatic conditions of North East India.

Highlights of achievements

Out of the eight Accessions of muga silkworm germplasm, two Accessions *viz.,* Aa-SD and Aa-TM have been identified as superior parents based on the rearing performances and other genetic parameters for evolution of superior breeds with high shell weight and high survivability. Two breeding plans were initiated to evolve high yielding breeds by utilizing these parents hybridization and backcrossing followed by selection of high yielding breeds in the subsequent generations.

Two breeds, CMR-1 and CMR-2 were selected and the rearing performances of these selected breeds were analyzed. During Chatua crop, CMR-1 has shown improvement of 8.57 % in fecundity, 17.78 % in ERR, 16.66 % in female shell weight and 27.5 % in male shell over that of control. During Chatua crop, CMR-2 has shown improvement of 7.14 % in fecundity, 10.37 % in ERR, 12.96 % in female shell weight and 20.0 % in male shell over that of control during this season.

During Jethua crop, breed CMR-1 were shown improvement of 6.25 % in fecundity, 6.20 % in hatching, 19.94 % in ERR, 14.28 % in female shell weight and 17.77 % in male shell weight over the control. The breed has shown improvement of 3.03 % in fecundity, 10.45 % in hatching, 5.74 % in ERR, 14.28 % in female shell weight and 13.33 % in male shell weight over the control during this season.

During Aherua crop, the breed (CMR-1) has shown improvement of 15.87 % in ERR, 14.28 % in female shell weight and 17.7 % in male shell weight over the control. In CMR-2, it has shown improvement of 13.91% in ERR, 12.5 % in female shell weight and 15.55 % in male shell weight over the control.

During bhodia crop, the breed (CMR-1) has shown improvement of 13.64 % in ERR, 18.10 % in female shell weight and 18.18 % in male shell weight over the control during this crop. In CMR-2, it has shown improvement of 12.28 % in ERR, 14.54 % in female shell weight and 20.45 % in male shell weight over the control.

During Kotia crop, 50 selected dfls of CMR-1(18th generation), were reared along with 50 dfls of control. It has shown improvement of 14.28 % in fecundity, 31.34 % in cocoon yield and 7.61 % in ERR over that of control. During this season, CMR-2

has shown improvement of 2.85 % in fecundity, 6.16 % in hatching, 11.94 % in cocoon yield and 2.88 % in ERR, respectively over that of control.

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:	Rs.26.35 Lakhs
Project investigators:	M. Chutia, Principal investigator 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

Disease survey for collection of infected larvae of muga silkworm was conducted in four districtS of Assam *viz*., Sivasagar, Jorhat, Dibrugarh, Golaghat.

Observation under microscope of collected samples

The diseased cadavers of muga silkworm were collected and are preserved under low temperature. The samples were surface sterilized. After sterilization, the silkworms were dissected to collect the gut contents from midgut portion. A thin smear was prepared on a slide and it was observed under microscope. Cytoplasmic polyhedrosis viruses (crystal like inclusion bodies or polyhedral) structures were observed in infected cells of midgut epithelium, which was verified / identified through electron microscopy.

Isolation of OB's

Diseased larvae were collected from the farms and were kept at – 20 °C until the isolation of OBs. For the isolation of OBs, the larvae were treated with 0.1 % Sodium-do decyl Sulphate solution (SDS) for overnight and kept at 4 °C. The SDS

treated larvae were crushed and filterd. The OB's were pelleted by centrifugation. The pellet was resuspended in 0.5 % SDS and centrifugation. Resuspension was repeated in 0.3 M NaCl. The OB's were finally resuspended in distilled water. The OB's were then purified by sucrose gradient centrifugation.

Isolation of viral RNA/DNA

Isolation of viral DNA/RNA from the diseased cadavers of the muga silkworm by following methods.

1) Viral RNA/DNA was isolated by using Viral RNA/DNA mini kit.
2) Viral RNA was also isolated by Trizol's method.

Characterization of infectious flacherie and cytoplasmic polyhedrosis virus

After isolation, the samples were run on agarose gel for detecting the presence of RNA / DNA. Proper bands on agarose gel were not visualized. Hence the process is further repeated and continued.

Histopathology

Histopathology study of diseased cadavers of silkworm were undertaken to observe the gut infection. Cytoplasmic polyhedrosis viruses (crystal like inclusion bodies or polyhedral) structures were observed in infected cells of midgut epithelium, which will be clarified with the help of electron microscopy.

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 sample and Isolation of bacteria:

Diseased cadavers of muga silkworm were collected from different parts of N.E India like Nangpoh (Megalaya), Boko (Kamrup), Lakhimpur & Bahgarh (Sivasagar).The samples were surface sterilized with 0.1 % mercuric chloride solution and washed thrice with distilled water. After sterilization, silkworms were dissected to collect the contents from surface of foregut, midgut, and hindgut. Serial dilution was carried out from which 10^{-5}, 10^{-6} dilutions were plated on nutrient agar plates and the plates were incubated for 24 hr at 37 °C.

1) The Diseased cadavers of muga silkworm were collected and the samples were surface sterilized with 0.1 % mercuric chloride solution and washed thrice with distilled water.
2) After sterilization the silkworms were dissected to collect the contents from surface of foregut, midgut, and hindgut.
3) Serial dilution was carried out from which 10^{-5}, 10^{-6} dilutions were plated on nutrient agar plates and the plates were incubated for 24 hr at 37 °C.
4) The various 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

Pathogenicity test of the bacterial isolates:

The isolated pathogens are used for pathogenecity test in laboratory based on artificial environment viz. moisture, humidity, temperature, etc. Isolated Bacterial pathogens are injected and also feeded to healthy larvae to observe the disease intensity by following Koch's Postulates.

After performing pathogenicity test, 3 Nos. of bacteria were found to be pathogenic and are named as Patho-1, Patho-2, and Patho-3, respectively.

Project code: APR - 5866
Project title: Sustainable eri silkworm rearing: evaluation of *Ailanthus* species

Project period:	March 2013 - Feb. 2016
Funding Agency:	DST, New Delhi
Total project cost:	Rs. 18.74 Lakhs
Project investigators:	SA Ahmed, Principal Investigator M.C. Sarmah, 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: ARP-5868

Project title: Isolation and characterization of antifungal peptides from Muga Silkworm *Antheraea assamensis* Helfer

Project period:	May, 2014 – June 2017
Funding Agency:	DBT, New Delhi
Total project cost:	Rs.78.28 Lakhs
Project investigators:	Kartik Neog, Principal Investigator B. G. Unni, Principal investigator (NEIST, Jorhat) Ananta K. Ghosh, Principal investigator (IIT, Karagpur) S. C. Kundu, Co-investigator (IIT, Karagpur)

Objectives

1. Isolation and purification of antifungal peptides from the haemolymph of fungal challenged muga silkworms *Anthereae 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

Highlights of achievements

A. Rearing and treatment of Muga *(Antheraea assamensis* Helfer) with fungal species*:*

The Muga cocoons were collected from different locations and disease free layings (dfls) were successfully produced. The hatched larvae were reared on *Persea bombycina* the host plant of Muga till it reaches the 5th instar. The fungal species of *Aspergillus* and *Candida* were injected to the 5th instar larvae and subsequently released to the host plant and the haemolymph from the fungus treated larvae was collected during different interval after injection.

The haemolymph is analyzed for detection of antifungal peptides. Collection of haemolymph from control and fungal challenged larvae: A cut was made in the third abdominal leg of both control and fungal challenged larva and haemolymph was collected in chilled condition. After collection it is centrifuged immediately at 5,000 rpm at 4 °C for 5 minutes and stored at -20 °C for further use.

B. Experimental procedure followed:

1) Pouring of separating gel:

The gel plates were mixed assembled using two clean glass plates and spacers and locked to the casting stand. The separating solution (15 % slurry) was prepared by mixing of 30 % acrylamide, of 1M Tris (pH 8.8) and ml of distilled water. To above mixture 10 % of ammonium persulfate and TEMED were added. The mixture was gently swirled to mix and poured in the chamber between the glass plates. Distilled water was layered on the top of the gel and left to polymerize.

2) **Pouring of Stacking gel** :

After polymerization, layer of water was poured off completely and stacking gel slurry was prepared by adding of 30 % bisacrylamide, of 1 M Tris buffer (pH 6.8) and of water. To this of 10 % ammonium persulfate and of TEMED was added. The slurry was mixed gently and poured on the top of the separating gel. A teflon comb inserted into the layer of stacking gel and was allowed to polymerize for minutes at room temperature.

A) Sample preparation : An aliquot of haemolymph isolated from fungal challenged and control larva was diluted at 1:1ratio (v/v) with distilled water. Then to this diluted sample SDS sample buffer was added in (1:1) ratio (v/v).It was mixed gently by tapping the eppendroff and centrifuged at 5,000 rpm for 5 min at 4 °C. After polymerization of the gel Teflon combs were removed gently and wells formed were filed with SDS electrophoretic buffer. To the buffered filled wells samples were loaded with micropipettes.

B) Running the gel : The power supply was connected to the cell and run at 20 -30 mA of current until tracking dye (Bromophenol Blue) enters the separating gel. After the

tracking dye reached the bottom of the separating gel, the power supply was disconnected.

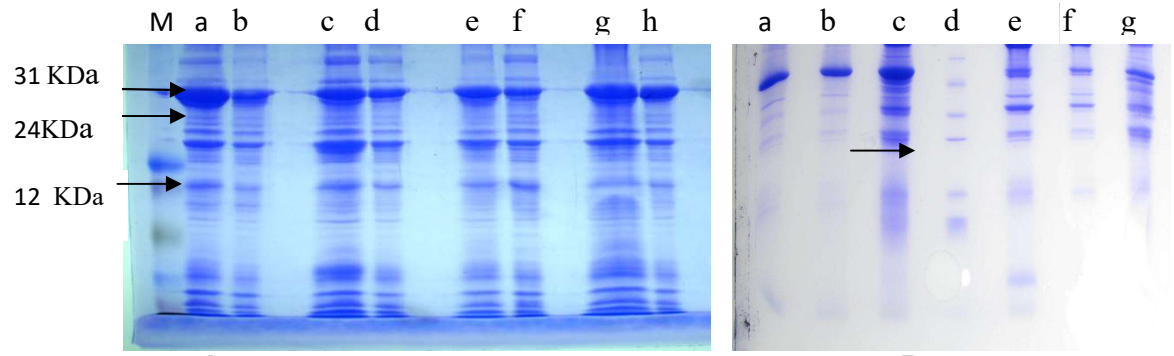
C) Disassembling the gel : The buffer from the upper buffer chamber was poured off and the plates were removed gently. The gel was exposed and was carefully transferred to shaker

D) Commassie blue staining and destaining : The gel was dipped in fixing solution for hours and agitated gently on a shaker. The gel was dipped in commassie blue stain for 3 hours. The destaining solution was changed frequently until the background of the gel was colorless. The proteins of the haemolymph were seen as blue bands.

Summary

Fifth instar muga silkworm larvae, *Antheraea assamensis* were injected with 2 x 10^6 spores of *Aspergillus niger, or Beauveria bassiana, or Penicillium citrinum* or *Candida albicans* cells through third abdominal leg, and after 24 hr, 48 hr and 9 days (in case of Candida injection) of injection, haemolymph was collected. After removal of hemocytes through centrifugation, protein content was estimated and analyzed by SDS-PAGE. SDS-PAGE analysis showed induction of some protein bands of low molecular weight after fungal injection. These low molecular weight proteins were extracted from the hemolymh using methanol:acetic acid:water (90 : 1 : 9). After evaporation of methanol and freeze drying, samples was used for antimicrobial assay in a microtiter plate and pour plate method. Both the methods showed anti-fungal and anti-bacterial activity of extracted haemolymph sample. Further analysis of extracted protein sample through reverse phase HPLC showed different peaks indicating presence of more than twenty different proteins/ peptides in the extracted sample. Proteins in each peak need to be analyzed further for their anti-microbial activity, molecular size, amino acid sequence and mode of action.

(a) Induction of antimicrobial peptides / protein production : After injection of microbes into the fifth instar *A. assamensis* larvae and analysis of their protein profile showed that after 24r of injection few extra protein / peptide bands of approximately 12 kDa were produced and appeared in the gel (Fig .1 A: lane c, e and g). Similarly after 9 days of *Candida* injection some extra proteins bands appeared in gel (Fig. 1 B lane c).



A B

Fig. 1. (A) Assay of haemolymph by SDS-PAGE. Lane M, Protein Mol. Wt. marker; lane a: PBS injected, lane b, PBS injected 48 h; lane c, *A. niger* injected 24 hr; lane d, *A. niger* injected 48 h; lane e, *B .basania* injected 24h ; lane f, *B. basania* 48h; lane g, *P. citrinum* injected 24 hr; lane h, *P. citrinum* injected 48 hr (B) lane a, *C. albicans* after 15 days injection; lane b, *C. albicans* after 12 days injection; lane c, *C. albicans* after 9 days injection; lane d, marker; lane e, control after 15 days of PBS injection, lane f, control after 12 days of PBS injection; lane g, control after 9 days of PBS injection.

(b) Anti-fungal activity assay of induced haemolymph: Anti-fungal activity assay of solvent extracted haemolymph in microtiter plate using *A. niger* as test microorganism showed that 20 ug of induced haemolymph extract inhibited the growth of this microbes very effectively (Fig 2, bar C,D,F) very similar to flucanazole (bar B). Although uninduced haemolymph also inhibited fungal growth (bar E) but was less than induced sample. No fungal growth inhibition was observed with extracted solvent being used as negative control (bar G).

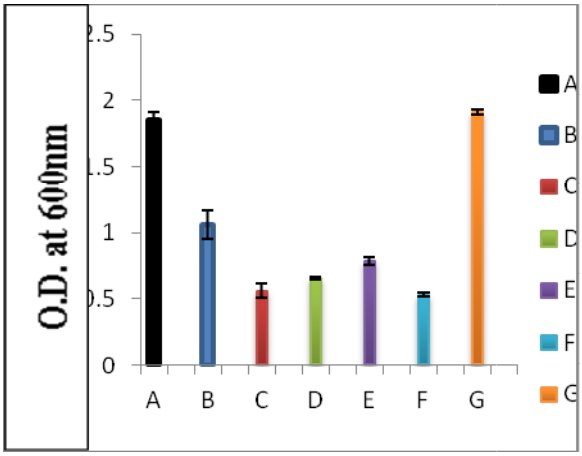


Fig. 2. A

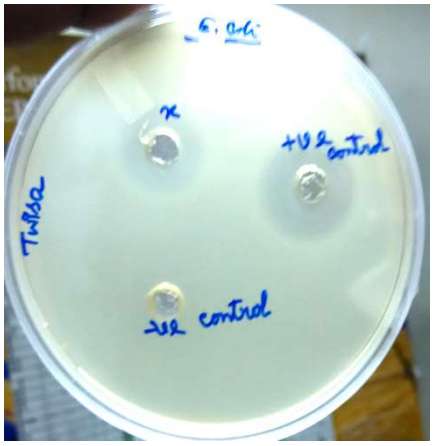


Fig. 2. B

Fig 2. A: Bar diagram of antifugal activity assay in microtiter plate. Bar A, Control growth of A. niger fungal spore ; bar B, in presence of 20 ug of flucanazole; bar C, *A. niger* induced haemolymph extract (20 ug); bar D, *B bassina* induced haemolymph extract (20 ug) ; Bar F, *P. citrinum* induced haemolymph extract (20 ug), bar E, PBS injected haemolymph extract (20 ug), bar G, only Solvant extract (negative control). Fig. 2. B, antibacterial activity assay by plate method using *E. coli* as test microorganism. Well x, *A. niger* induced haemolymph extract (20 ug); Well +ve control, contains ampicillin, - Ve control (extracted solvent processed in the same way as sample).

Anti microbial activity assay of solvent extracted haemolymph by pour plate method showed results similar to microtiter plate assay, 20 ug of extracted haemolymph from injected silkworm larvae showed a clear zone of inhibition of bacterial growth surrounding the well (containing extracted protein sample) (Fig. 2B) as was observed for ampicillin containing well (used as positive control). But no inhibition was observed around the well containing extracted solvent (prepared in the same way as sample). Similar types of growth inhibitions were also observed when the assay was done using *C. albicans* as test microorganism.

(c) HPLC analysis of solvent extracted haemolymph proteins: Several protein peaks were obtained when solvent extracted haemolymph proteins were separated through HPLC using C18 column (Fig. 3)

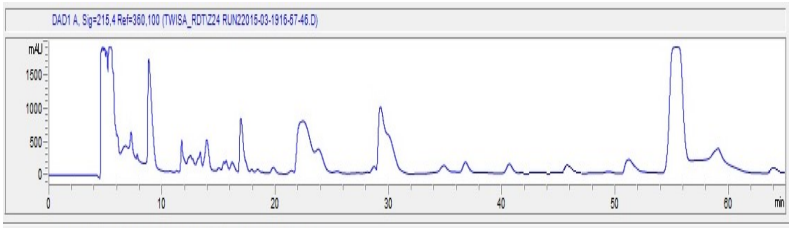


Fig. 3: HPLC profile of solvent extracted haemolymph proteins

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:	CSB, Bangalore
Total Budget Allocation:	Rs. 3.80 Lakhs
Project Investigators:	B.N. Sarkar, Principal investigator (I)
	M.C. Sarmah, Principal investigator (II)
	S.A. Ahmed Co-investigator

Highlights of achievements

Isolation of the eri silkworm strain – YP, YS, YZ, GBP, GBS and GBZ were done and rearing upto 3nd generation completed. The grainage were conducted and dfls preserved for next rearing. The strains of 5th instar eri silkworm larvae were isolated based on distinct body marking and colour on visual observation for cross breed development.

Project Code: PIN-5871
Project title: Development of Bio-intensive Module for Organic Muga Silk Production

Project Period:	January 2015 – December 2015
Funding Agency:	Societal Research Fellow (SoRF), DST, New Delhi
Total Budget Allocation:	Rs. 3.256 Lakhs
Project Investigators:	Maitry Daimari, Principal investigator S.A. Ahmed, Institutional Guide

Objectives

1. Identification of reliable and actual factors of muga production decline through field survey.
2. Identification of strategies to alleviate the field problems of muga silk production and productivity.
3. Development of bio-intensive organic silk production module to overcome large scale dependence of inorganic inputs in muga eco-system and to reduce mortality of muga

Highlights of achievements

Data for muga silkworm rearing at farmers' level were collected during the period of January to March 2015. The present study emphasizes the results according to survey in Jorhat, Sivasagar and Dibrugarh districts. The study reveals that muga culture provides the farmers an additional income of rupees approximately 20000-30000 per year. Out of 132 farmers field surveyed 55 % (73) belongs to Ahom, 41 % (54) belongs to tribal communities and the remaining is from Chutia, Koch, Scheduled Caste and Kalita communities of Assam. The rearers are found to be practising mostly traditional practices for rearing of silkworm and post cocoon activities such as selection of seed, traditional appliances made up of bamboo, paddy straw, hang all the equipments used in rearing above their kitchen fire for disinfection, kill the silk worm by sundry etc. It was also found that rearers of Jorhat are well acquainted with reeling, weaving of Muga fabrics and they also act as commercial reeler and weaver. Most of the rearers from other districts sale their cocoons soon after harvesting and some of them use as seed cocoons.

Farmers reported that one of the major challenges of farmers during Chotua (Feb – March, 2015) crop is uzi fly, which caused crop damage up to 60-70 % at 3rd instar larval stage.

However, the farmers faced a major problem of muga silkworm mortality up to 85 % during Aherua (Jun-Jul) and Bhodia (Aug-Sep) crops during 2012 to 2014, which might be due to indiscriminate pesticides application in nearby tea gardens, environmental pollution, adverse climatic conditions and disease incidence.

Project Code: AIB 5869
Project title: Popularization of new eri breed C2 at farmers' field

Project Period: October, 2014 - September, 2015
Funding Agency: CSB, Bangalore
Total Budget Allocation: Rs. Lakhs

Project Investigators: S.A. Ahmed, Principal investigator

Objectives

1. To popularize the new eri silkworm breed C2 in the farmers' level for enhancement of eri silk production.
2. To ensure continuous production and supply of seeds of eri silkworm C2 breed through farmers' participatory method

Highlights of achievements

Conducted awareness programme at Koliapani, Tinsukia, Amsoi (Morigaon) and Danichapori under Dadhara SMV covered 400 farmers. Four batches of training were organized and covered 120 farmers at Dhansripar (Dimapur), Makum (Tinsukia), Danichapori (Golaghat), Dhanubhanga (Goalpara) and Nagaland in eri host plant management and improved rearing techniques. One technology demonstration programme on C2 breed rearing was also organized. More than 20000 eri C2 breed were distributed to farmers under SMV. Farmers' groups have been identified for producing large quantity of eri C2 breed. Training on seed production will be organized during April, 2015.

REGULAR PROGRAMMES

Project title: Hardening of micro- propagated plantlets of muga host plant, *Persea bombycina* Kost.

Project period: Oct., 2011 onward
Funding agency: Central Silk Board, Bangalore

Project Investigators: K. Neog, Principal investigator
D.K. Gogoi, Co- investigator

Objective

1. Establishment of micro-propagated plantlets of desirable genotypes of muga host plant, *Persea bombycina* Kost in soil

Highlights of achievements

Standardization of MS and Woody plant media for multiplication of Som varieties S3, S6 and Godadhar is under progress. A new hormone, Thiazuron is being tried which is giving encouraging results.

Project title: Induction of Indoor rearing technique for *Antheraea assamensis* Helfer through field trials.

Project period: Oct., 2011 onward
Funding agency: Central Silk Board, Bangalore

Project Investigator: K. Neog, Principal investigator

Objectives

1. Development of a comprehensive package for rearing muga silkworm under indoor conditions for its early larval instars.
2. Domestication of muga silkworm through complete indoor rearing

Highlights of achievements

Indoor rearing up to 2nd instar: 45 dfls were first brushed indoor with 72 % hatching. Up to 2nd instar 95 % survivability was observed, after which the worms were reared outdoor under nylon nets till spinning. 500 worms were utilized for experimental poses, and a total of 720 good cocoons were harvested. 430 cocoons are kept for grainage.

Complete Indoor rearing for domestication: 5 dfls of 14th generations of the same stock were brushed in this month with 72 % hatching. 78 nos. of good cocoons were obtained. 37 cocoons are kept for continuation of the next generation.

Average 5th instar male larval weight in outdoor was 6.712 g and female larval weight was 8.569 g; whereas in case of complete indoor rearing, male and female larval weight was 6.176 g and 8.515 g, respectively.

Average male cocoon weight under outdoor condition was recorded to be 3.847 g while it was 5.293 g for female cocoons. In case of complete indoor rearing, male and female cocoon weight was 4.121 g and 5.418 g, respectively.

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Project title: Conservation of *Antheraea assamensis* Helfer (Phase - II)

Project Period: April 2012 onwards
Funding Agency: Central Silk Board, Bangalore

Project Investigator: N.I. Singh, Principal investigator
D. Goswami, Co-Investigator
A.K. Gogoi, Co-Investigator
R. Kumar, Co-Investigator

Objectives

1. Survey and collection of wild genetic resources of muga silkworm
2. Characterization and maintenance of genetic resources.

Highlights of achievements

Ex-situ muga silkworm germplasm conservation of 6 GPB accessions was conducted at CMER&TI, Lahdoigarh and GCC, Damalgre during each 6 crop seasons of the year. In each crop, grainage of 150 seed cocoons of each of the 6 muga germplasm stocks were conducted and prepared of 50 dfls of each of the 6 stocks. Rearing of 20 dfls each of the 6 germplasm accessions were conducted during each crops. The average rearing performances of the GPB accessions are presented below in Table 1.

Table 1. Rearing performance of the GPB accescions

Accessions	Fecundity	Hatching %	No. of cocoon /dfl	ERR %
Aa-SD	145	62.06	52	57.77
Aa-GA	135	62.22	38	45.28

Aa-TM	150	60.00	45	50.00
Aa-DL	140	57.85	40	49.38
Aa-Blue	138	63.04	42	48.27
Aa-001	135	57.77	36	46.15

Project title: Forecasting and forwarning for pests and disease of muga host plants and silkworm

Project Period: January, 2014 onwards
Funding Agency: Central Silk Board, Bangalore

Project Investigator: R. Das, Principal investigator

Objective

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

Highlights of achievements

Fungal disease in muga silkworm was recorded during December – January with more than 10 %. Bacterial disease was recorded throughout the year and found maximum (10 %) during June-July and December. Viral disease was also recorded during Feb-March, June –Aug and Nov-Dec, in Lower Assam. Uzi infestation was recorded more than 60 % in all the locations.

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*f) and grey blight disease (*Pestalotiopsis desiminata*). In soalu brown blight (*Colletotrichum gloeosporioides*) and grey blight (*Pestalotiopsis thea*) are major diseases.

The major pest were recorded stem borer (*Zeuzera indica*) and leaf gall (*Aspondylia* sp & *Pauropsylla beesoni*) on som and soalu. Uzi flies (*Exorista sorbillanse / Blepharipa zebina*) are the major pest of muga silkworm.

The flacherie (*Bacillus thurimgensis*) and muscardine (*Beauveria bassiana*) disease are major disease of muga silkworm.

The diseases and pest cause a huge loss (10-43 %). Accordingly on the basis of data recorded during the period forewarning calendar was developed. It is reported

that leaf spot disease of som was observed from May to November but diseases intensity was more than 10 PDI during July – August while in case of soalu, it was recorded more than 10 % during July-August. Red rust was recorded with less than 10 PDI in som and soalu. Anthracnose disease was recorded in som from May to December with more than 10 % PDI during August-September. Similarly, grey blight disease was recorded highest (more than 10 %) during – September and September-October in som and soalu, respectively.

PILOT STUDIES

Programme: Propagation and multiplication of foliar disease tolerant S3 and S6 morphotypes of som food plant of muga silkworm rearing in Lower Assam

Project Period: April 2014 - March 2015
Project Investigators: A.K. Gogoi, Principal investigator
R. Das, Principal investigator

Highlights of achievements

To increase population of S3 and S6 morphotypes of som at field level for muga silkworm rearing, multiplication of S3 and S6 saplings through cuttings is under progress. So far, 4000 saplings of S3 and S6 morphotypes of som were raised by CMER&TI, and 21000 saplings by RMRS, Boko.

Programme: Studies on the efficacy of toxic baits and barriers for control of ants

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigators: G. Rajkhowa, Principal investigator
Rajesh Kumar, Co-Investigator

Highlights of achievements

Different types of baits and barriers of ants have been prepared for evaluation of the suitable one for controlling ant predation on early stage muga silkworm. Toxic baits & barriers made of molasses and honey mixed with non-volatile stomach poisons

have been found effective in controlling ant attack. The efficacy of baits is assessed based on the no. of ants visiting the baits and the no. of ants become inactive after visiting the baits. Red ants (*O.smaragdina*). Fire ant, *Solenopsis* sp., Carpentar ant (*C.compressus*), Iron ant (*T.rufonigra*) have been identified as major predaceous ants and causes up to 30 % loss of larvae during rearing. Effort is on to develop readymade product of toxic bait & barriers for on-farm trial and field trial for recommendation of the products

Programme: Trial of "Leaf Surface Microbes (LSM)" collected from CTR&TI, Ranchi

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigators: D.K.Gogoi, Principal investigator
N.I. Singh, Co-Investigator

Highlights of achievements

Rearing of 600 muga silkworm larvae was conducted at the institute with LSM treatment in three replications (200 each) during *Aherua* crop, 2014 as per the suggestion of CTR&TI, Ranchi. Rearing of 600 muga silkworm larvae was also conducted as control for comparison. Rearing performances was recorded and found that there is no difference between treatment and control. The study was repeated during *kotia* crop, 2014 where 900 muga silkworm larvae was reared withILSM treatment in three replications (300 each) against 900 larvae in control for comparison. 47.5 % ERR was obtained under treatment against 43.3 % ERR in control.

Programme: Trial of "Sericilin" collected from CST&RI, Berhampore

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: R. Das, Principal investigator

Highlights of achievements

Sericilin" was tested against muscardine disease of muga silkworm during November- December crop along with 2 treatments *i.e* "Lahdoi" and control taking 3000 muga silkworm. But muscardine was not observed in all the treatments even in control

also. The next trial of Sericilin with 1000 muga larvae will be conducted during November- December crop, 2015.

ToT PROGRAMMES

Programme: Development of repository for insect fauna of seri-ecosystem and wild silk moths of NE India

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigators: R. Kumar, Principal investigator
G. RAjkhowa, Co-Investigator

Highlights of achievements

Insect Repository was established during March, 2015. AC has been installed. Supply order has been placed for De-humidifier. All the insects and wild silk moths collected from muga ecosystem will be preserved in insect repository for voucher collection. All the specimens of wild muga silkworm, utilized for development of new breed, eri silkworm races *viz*., C2 breed with their specimens and cocoons, different specimens of eri races like yellow plain, yellow with black spots, green plain and green with black spots, their adults have been preserved in Insect Repository. All pests and predators available in muga and eri ecosystems are also being preserved. All the specimens are labelled properly and date of identification along with other information (specimen number, collection date, collected by, identified by, if it is reared date of rearing and emergence date from cocoon etc.) are entered in excel database. All identified and preserved specimens will help in identification of other collected specimens for postgraduate and Ph.D. students, scientists working in sericulture and agriculture.

Insect repository has been developed at Entomology Section, CMERTI, Central Silk Board, Lahdoigarh.

- Mobile racking system has been installed for preservation of sericigenous insects and insect fauna in seri-ecosystems.
- As per RCC (Research Coordination Committee) comments, the Member Secretary of Assam Biodiversity Board, Mr. A.K. Johri (IFS), Additional Principal Chief Conservator of Forest (Biodiversity & Climate change) visited the Insect Repository and muga rearing field.
- All the preserved and identified specimens were displayed during Member Secretary, Assam State Biodiversity Board, Assam visit and he informed

that this is the first insect repository in Assam for preserving sericigenous insects and insect fauna of seriecostyem.

- Training was organized for Graduate, postgraduate, Ph.D. students and research scholars for identification of insects under DBT Biotech hub.
- Database of identified specimens is under progress.
- Research review committee visited the insect repository.
- Time to time, visitors come from different organizations, school and colleges for seeing the insect biodiversity of silk moths available in North East India.
- It is one achievement of Central Silk Board organization.
- All the specimens are well preserved and maintained.
- Sericulture College (Assam Agricultural University) students are coming for identification and photography of insects.

Regular field visit is going on for collection of insect pests, predators, parasites and wild silk moths to enrich the insect repository.

Programme: Technology demonstration - Enhancement of fecundity through Application of Endocrine Hormone Analogues of Muga Silkworm at Farmers Level

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: K. Neog, Principal investigator

Highlights of achievements

Juvenile hormone analogue JH – III analogue “Methoprene” at recommended dose (0.1 µg per ml was sprayed to muga silkworm at farmers’ fields at Jorhat, Sivasagar, Golaghat and Dibrugarh districts. The same was sprayed on muga silkworms in the fields of 7 farmers during *Chotua* crop (March-April, 2014) followed by 31 farmers during *Aherua* crop (July – August, 2014) and 56 farmers during *Kotia* crop (October- November, 2014). The treated larvae were separately reared under nylon nets and the cocoons obtained were kept for grainage along with control. The grainage was conducted and fecundity of female moths was recorded. Analysis of data indicated 10-25 % enhancement of fecundity in treated moths compared to control.

Programme: Transfer of technology from lab to field : disinfection and disease management in muga silkworm

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: N.I. Singh, Principal investigator
D. Goswami, Co-Investigator
A.K. Gogoi, Co-Investigator
S. Paliwal, Co-Investigator

Highlights of achievements

Disinfection and maintenance of hygienic condition during rearing are essential factors for preventing occurrence of diseases. Sodium hypochlorite acts as a leave surface disinfectant. It has been found effective in controlling bacterial, viral and fungal diseases and it disinfects the same way as chlorine does. Similarly, chemical formulation (2 % tri sodium ortho phosphate, 1 % urea and 0.5 % acts as an effective agent to control the diseases of muga silkworms.

The field disinfection programme has been taken up to disinfect the farmers' rearing field by spray of 0.01 % of Sodium hypochlorite solution and TSP mixture covering the different districts of Assam and Meghalaya. NaOCl solution (0.01 %) in clean water was sprayed with the help of the foot sprayer/Power sprayer on the foliages once before 4-5 days of rearing, then once each during 2^{nd}, 3^{rd} , 4^{th} and 5^{th} instars on the body of the larvae along with the foliages during the rearing. The silkworm larvae were fed with the treated leaves. After completion of the rearing feedback data from the farmers were collected and compared the date with the control/benchmark data.

Similarly, the chemical formulation (2 % tri sodium ortho phosphate, 1 % urea and 0.5 % slaked lime in water) was sprayed on the foliages and the ground one week before the rearing followed by spraying once during second instar and once during 4^{th} instar.

Thirty two demonstration programmes have been conducted covering farmers from Jorhat, Sivasagar, Dibrugarh, Tinsukia, Kamrup, Goalpara, Darrang, Chirang and Kokrajarh of Assam and Tura of Meghalaya. More than 400 farmers have been covered under the demonstration.

Feedback data collected from 280 farmers have shown gain in cocoon yield of the treated lot ranging from 8 to 15 cocoons per gm dfl over that of control among the different farmers (Annexure-I). The result evinced that the chemical disinfectant helped in reducing the mortality of the silkworm due to diseases. The technology has been included for demonstration and adoption at the farmers' fields under SMV and FMS.

Programme: Technology Demonstration and Validation: Enhancement of feeding efficiency of through Application of Insect Stimulants of Muga Silkworm at Farmers Level

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: K. Neog, Principal investigator

Highlights of achievements

Insect stimulants (*viz.,* Beta-sitosterol, Myricetin, Caryophyllene, Decyl aldehyde, Dodecyl aldehyde and gallic acid), were sprayed at recommended doses on the leaves of selected som plants at farmers' fields at Jorhat, Sivasagar, Golaghat and Dibrugarh districts. The chemicals were sprayed on trees of 7 farmers during *Chotua* crop (March-April, 2014) followed by 31 farmers during *Aherua* crop (July – August, 2014) and 56 farmers during *Kotia* crop (October- November, 2014). The treated larvae were separately reared under nylon nets and the cocoons obtained were kept for grainage along with control. The grainage was conducted and fecundity of female moths was recorded. Analysis of data indicated enhancement of ERR by 24-66 % over control.

Programme: Establishment of farmers field schools for Eri and Muga sector

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore
Project Investigator: D. Mech, Principal investigator

Highlights of achievements

Identified of locations and Lead farmers

In view of demonstration and quick acceptance the latest technologies of muga and eri culture among the farmers in different potential pockets, 6 Farmers Field Schools (FFS) (3 in muga and 3 in eri) were established under CMER&TI, Lahdoigarh during 2014-15. Three (3) muga cluster and three (3) eri cluster/villages along with a lead farmers for establishment of FFS were identified in consultation with respective DOS officers as below.

Sl. No	Name of FFS	Name of the identified Cluster/Villages	Name and address of the identified lead farmers
1	Muga FFS	Hatibandha Borbam Muga cluster, Dibrugarh	Sri Nandi Gogoi, Hatibandha Borbam Village, Dibrugarh
2	-do-	Hollowgaon Muga cluster, Chapakhowa, Tinsukia	Sri Debajit Dutta, Hollowgaon, Chapakhowa, Tinsukia
3	-do-	Modarguri Neogghuligaon, Muga cluster, Lakhimpur	Sri Hem Baruah, Gual Gaon, Gobindpur, Lakhimpur
4	Eri FFS	Jaljori Gaon, Eri cluster Golaghat	Smt. Susila Saikia, Jaljori, Borpathar, Golaghat
5	-do-	Mainao Eri cluster, Udalguri, BTC	Smt. Punya Daimari, Udalguri
6	-do-	Sonathi, Eri cluster, Baksa, BTC	Sri Deepjyoti Rabha, Kachabari, Baksa

Mode of implementation:

- Benchmark information like socio- economic status, constraints, technology adoption pattern and production and productivity, income generation, etc through personal contact method were collected from identified locations of each FFS centre.
- To strengthen the concerned units/ institute/RECs Laptop, LCD projector, white board, projector screens, technological poster, pamphlets, etc were arranged to purchase and supplied to each concerned units/ scientists of the main institute.
- Identified lead farmers were provided assistance for maintaining farms, conduct rearing and other incidental expenses.
- The identified lead farmers were trained on all the improved technologies, their benefit, etc at his door steps for effective guidance and practical training to the fellow farmers in the identified FFS.

- On completion of the formal training, the lead farmers provided on-job practical training to the fellow farmers in the village as a part of his ongoing sericulture activities without affecting his routine works.
- Technology awareness programme, demonstration programme and Field days were also organized at the field of all lead farmers of the FFSs at regular intervals
- Regular visit for monitoring the activities and to provide guidelines for different activities to the lead farmers/farmers was continued.
- Performances of silkworm rearing conducted by the farmers covered under each FFSs were collected regularly.
- Collected data were analyzed and compared with the benchmark data to assess the impact of FFS

List of the technologies identified for demonstration and trained to the lead farmers of FFS

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 silk worms
- Improved mountage for spinning of cocoons.

B. Eri culture

- Raising of high yielding castor variety
- Agronomical practices of kesseru
- Disinfection of rearing appliances and rearing house
- Improved eri silkworm breed (C2)
- Early stage rearing of eri silkworm
- Platform rearing techniques of eri silkworms.

Outcome of FFS

- About 225 muga farmers and 300 eri farmers were imparted on farm training on latest technologies at the field of lead farmers. They were also provided on-job practical training by the identified lead farmers.
- All the above farmers are become aware about the latest technologies of muga and eri culture and many of the farmers (67 %) adopting in the latest technologies in their field activities.

- The field of lead farmers become a knowledge centre to provide best available technology for up grading the cultivation practice and getting higher yield.
- Adopting the latest technologies by the farmers, average cocoon yield has increased from 50 to 62 cocoons in muga commercial crop and 8.5 kg to 10.2 kg eri cocoon shell per 100 dfls.
- Average estimated income of has increased from Rs.22500/- to 27000/- per crop in muga culture and Rs. 7500/- to Rs.10500/- per crop in eri culture.

Programme: Seri Model Villages programme for dissemination of technologies to the farmers field in muga and eri culture

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: D. Mech, Principal investigator

Highlights of achievements

Two seed crops (Aug-Sep 2014 and Feb.-March, 2015 crops) and one commercial crop during Oct-Nov 2014 were conducted by the farmers covered under muga SMVs. Similarly, three commercial crops during Jul-Aug 2014, Oct-Nov 2014 and Feb.-March, 2015 have been conducted by the farmers covered under eri SMVs. 20 eri spinning machines were supplied to the beneficiaries of PCT SMVs . Procurement of 13 eri spinning machines is under process.

Impact on implementation of SMVs

Muga SMV

- Adoption of technologies especially pruning/pollarding of host plants, green manuring, pest and diseases management of host plants as well as silkworms, dfls, etc are found high and encouraging against benchmark adoption level (partial) among the farmers covered under each muga SMV.
- Level of cocoon production enhanced from 33 to 38 cocoons /dfl in seed crop with 15.3 % improvement over benchmark. Similarly, cocoon production is enhanced from 49 to 63 cocoons/dfls in commercial crop with 28.6 % improvement over benchmark.

Improvement of cocoon production also resulting more income generation among the farmers.

Eri SMV

- Adoption of technologies like disinfection of rearing house and rearing appliances, improved silkworm breeds (C2), platform rearing, etc are found high among the farmers of eri SMV against benchmark level of adoption.
- The farmers were motivated towards commercialization of ericulture and as a means of livelihood security.
- Level of cocoon shell production is enhanced up to 9.9 kg/100 dfls from the benchmark of 7.5 kg/100 dfl with 31.9 % improvement. The cocoon quality has also improved and income generation is increased through sale the cocoon to private traders from @ Rs. 550/- per kg against Rs. 250/- per kg before implementation of SMV.

PCT SMV

- The beneficiaries of five (5) Self Help Group (SHG) covered under the SMV were provided 20 eri spinning machines @ 4 machines per SHG on 28.01.2015 and they were provided training on eri spinning. Procurement of another 13 machines is also under process for providing to the beneficiaries forming some other SHG under the SMV.
- Since, supply of machines are in progress, impact assessment of SMV (improvement eri raw silk production, quality of eri silk and income generation, etc) will be made after a certain period of providing all the assistance.

With a view to enhance muga and eri raw silk production through disseminating the integrated technology package and providing need based critical inputs to the farmers in the potential muga and eri producing pockets, CMER&TI, Lahdoigarh is implementing 3 muga and 3 Eri IVLP (new term is Seri Model Villages) covering 100 beneficiaries in each village and one PCT IVLP covering 62 beneficiaries during 2014-15. In order to implement the SMVs smoothly and effectively, a scientist was identified as Nodel Officer for each SMV and all the Nodal Officers were coordinated by a scientists as Coordinator of SMV. Director of the institute reviewed the progress of different activities and impact of the programme at regular interval. Name of the Seri Model Villages and Nodal Officers are shown below.

#	Name of the Seri Model Village/District	Number of beneficiaries covered	Name of the Nodal Officer	Coordinator
1	Khowang Muga Seri Model Village,	100	Sri D.Goswami	

	Dibrugarh			
2	Chinatoli & Borpathar Muga Seri Model Village, Golaghat	100	Dr. (Mrs) R. Das	Shri D. Mech, Scientist – D CMER&TI, Lahdoigarh
3	Baida Langurpara Muga Seri Model Village Goalpara	100	Sri A. K. Gogoi	
4	Dadhara Eri Seri Model Village, Golaghat	100	Dr. M.C.Sarmah	
5	Tamulichiga Eri Seri Model Village, Sivsagar	100	Dr. B.N. Sarkar	
6	Barekuri Eri Seri Model Village, Tinsukia	100	Sri S.A.Ahmed	
7	Borhula PCT Seri Model Village, Jorhat	62	Dr. D.K.Gogoi	

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Programme: Popularization of biointesive farming techniques among the muga frowers of Assam

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: U. Hazarika, Principal investigator

Highlights of achievements

- Survey was conducted in Jorhat, Golaghat, Sivasagar, Dibrugarh and Goalpara districts of Assam and Coochbehar district of West Bengal for collection of information on muga culture as a whole in the locality and identification of farmers for the programme.
- Benchmark data were collected from 140 farmers covering Dibrugarh, Sivasagar, Jorhat, Golaghat, Coochbehar and Goalpara districts.
- Awareness programmes on “Biointensive farming techniques” were organized at six locations *viz.,* Coochbehar (W.B.) on 19th June, Goalpara (Kamrup) on 30th June, Cinatoli (Golaghat) on 2nd July, Charaideo (Sivasagar) on 8th September, Barhoiting (Sivasagar) on 8th

September, 2014 and Khowang (Dibrugarh) on 13th February, 2015. In the programmes, the lead farmers & DoS staff were provided basic information about the proposed strategies towards improvement of leaf quality, soil health and overall production per unit area. 227 persons including 192 farmers participated in the awareness programmes.

- Out of 140 farmers from whom benchmark data was collected, 90 farmers covering Dibrugarh, Sivasagar, Jorhat, Golaghat, Goalpara and Coochbehar districts were selected for adoption based on availability of systematic som plantation and interest of the farmers.
- Demonstrations on sowing of green manure crop (dhaincha), incorporation of green manure crop and sowing of inter crops (black gram / green gram / sesame), application of vermicompost, harvesting of vermicompost etc. were conducted at adopted farmers fields.
- Training programmes on vermicomposting were organized at six locations of adopted farmers fields *viz.,* Bonai NaPamua Gaon of Jorhat district on 26th September, Cinatoli of Golaghat district on 28th October, Naharani, Khowang of Dibrugarh district on 7th November, Sukafanagar, Charaideo and Chapori gaon, Barhoiting of Sivasagar district on 11th November, 2014 and Dolakharia of Golaghat district on 10th February, 2015. 203 participants including 181 farmers attended the training programmes.
- Field days were organized at selected farmer's field *viz.,* Kordoiguri, Khowang of Dibrugarh on 13th February, Nagaon, Barhoiting of Sivasagar on 17th February and Cinatoli of Golaghat district on 21st February, 2015. 139 persons including 123 farmers participated in the field day programmes.
- Data was collected on initial knowledge of the farmers about the techniques, production of muga cocoons, plantation area, dfl capacity, income per farmer etc. from benchmark survey. After popularization of the technologies, feedback information indicating the acceptance or non-acceptance of the techniques, importance of different programmes etc. were collected from the farmers in individual or in group.

Programme: *Terminalia chebula* based bioformulation "Muga Heal" for healthy larvae and production of quality silk fibre by muga silkworm

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: K. Neog, Principal investigator

Highlights of achievements

Terminelia chebula based formulation "Muga Heal" was sprayed at recommended doses on the leaves of selected som plants at farmers' fields at Jorhat, Sivasagar, Golaghat and Dibrugarh districts. The bio-formulations was sprayed on trees of 7 farmers during *Chotua* crop (March-April, 2014) followed by 31 farmers during *Aherua* crop (July – August, 2014) and 56 farmers during *Kotia* crop (October-November, 2014). The treated larvae were separately reared under nylon nets and the cocoons obtained were kept for grainage along with control. The grainage was conducted and fecundity of female moths was recorded. Analysis of data indicated enhancement of ERR by 15-30 % and 15-20 % reduction of incidence of flacherie disease.

Programme: Training programmes of scientists / staff for the year 2014-15

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigator: N.I. Singh, Principal investigator

Highlights of achievements

In order to improve the working efficiency in their field of work, training was imparted to staffs and scientist of the institute and nested units with the approval from central office and the achievements are detailed below.

- One Scientists and one technical staff have undergone training on R&D aspects at SSTL, CSB, Kodathi.
- 35 staffs (technical and administrative) of CMER&TI, Lahodoigarh, RMRS, Boko and RERS, Mendipathar have undergone training on" Basic Computer Application (BCA)" at National Institute of Electronics and Information Technology (NIELIT), Guwahati and Jorhat.
- All the Scientists of the Institute, Regional Stations and RECs have been imparted training by Resource Persons of National Academy of Agriculture Research Management (NAARM), Hyderabad at this Institute in two batches on
    a. "Extension System Management" during 23rd to 27th February, 2015 (20 scientists).

b. "Priority Setting, Monitoring and evaluation and Technology Management" during 9th to 13th March, 2015 (20 scientists).

Programme: Development of attractant and repellent for controlling uzifly in muga ecosystem

Project Period: April 2014 - March 2015
Funding Agency: Central Silk Board, Bangalore

Project Investigators: R. Kumar, Principal investigator
G. Rajkhowa, Co-Investigator

Highlights of achievements

Phagostimulants and glue have been procured for development of uzitrap. Trial has been conducted during December, 2014 by uzitrap collected from CSRTI, Mysore. Neem oil and *Vitex negundo* is also being tried. Different types of color traps with specialized glue for insect trap is also being tried for controlling uzifly in muga silkworm rearing field. Some phagostimulants was sprayed on trap for attracting the insects. Daily data are being taken for insect attracted in traps. Literatures for pheromones to control uzifly have been collected from *Pherobase*, which is maintaining the data of pheromones of insects. Chemicals listed in *Pherobase* (attractant and repellent) for uzifly as attractant and repellent is also being tried.

IMPORTANT EVENTS

Vanya Reshom Krishimela at the main institute

Vanya Reshom Krishimela of CMER&TI, Lahdoigarh for 2014-15 was organized at Titabar, Jorhat, Assam on 29th January 2015. Total 763 muga and eri farmers from different districts of Assam *viz*., Jorhat, Golaghat, Sivasagar, Dibrugarh, etc and Nagaland state were participated in the Krishimela. An exhibition was also arranged on the occasion and different technologies on pre and post cocoon sector devolved at the institute were displayed. Several entrepreneurs, SHGs participated in the exhibition and displayed their diversified products.

In the inaugural session, Dr. K. Giridhar, Director, CMER&TI, Lahdoigarh welcomed all the participants of *Krishimela*. He highlighted the achievements of R & D and extension activities carried out by the institute. He told about successful Hybrid Authorization Programme of improved eri C2 breed and planning for its large scale trial at state farms and farmers' level. He spoke on different need based training programme organized by the institute under various developmental schemes including Integrated Skill Development Scheme (ISDS), BEP, etc. He further explained about demonstration programme of the institute being conducted with the farmers. He further informed that with the view of effective transfer of technology to the farmers field, the institute is implementing various extension programe like Asdarshgram (IVLP), Farmers Field School, Cluster Promotion Programme, Technology Awareness Programme, Demonstration of technologies, etc in different potential areas of muga and eri culture in North Eastern region in India. He requested all the farmers to be attentive during presentation and demonstration of technology, more interaction with the scientists for updating their knowledge during Krishimela.

Ms. Keerthi Jally, IAS, In-charge, SDO (Civil),Titabor, Dr L.K.Hazarika, Professor & Head, Department of Entomology and DEAN, College of Sericulture and Dr D.P. Khanikar, Professor, Department of Sericulture, Assam Agricultural University, Jorhat, Shri Prabin Das, Joint Director of Sericulture, Upper Assam, Jorhat, Shri Mohendra Borah, Principal, Sericulture Training Institute, Titabor, Assam were participated and delivered lecturer for encouragement of muga and eri farmers.

During the Krishimela, 6 (Six) technology pamphlets viz. muga host plant cultivation and management, improved muga silk worm rearing technology, improved muga silkworm seed technology, intercropping, organic farming, eri C2 breed in Assamese language, a booklet on Indigenous Traditional Practices of Muga Culture and CMER&TI New Letter, December 2014 issue in Hindi language were released.

In the Technical Session, package muga silkworm rearing technology, muga silkworm seed technology, organic muga silk peoduction, Eri C2 breed and its rearing technology, different extension programmes/ schemes being implemented by the

institutes, Silk Portal, etc were presented and demonstrated through Power Point by the scientists of the institute. After demonstration of technologies, a fruitful interaction session between scientists of the institute and participant farmers was held. Various problems being faced by the farmers were discussed and necessary remedial measures were suggested during the session. Some of views expressed by the farmers during the interaction are cited below.

The progressive farmers Sri Padmeswar Bora, Chinatoli, Golaghat, Sri Benu Phukon Na-pathar, Dibrugarh, Smt Lakhima Lahon, Titabor, Sri Hemo Gogoi, Bogorijeng, Golaght, Smt Tileswari Baruah, Borholla, Smt Putali Gogoi, Titabar, Jorhat, Sri Shiba Konwar, Charaideo, Sivsagar and many other farmers interacts with the scientists and expressed that participating the krishimela they have enriched knowledge of muga and eri culture.

Feedback from the participants of Vanya Reshom Krishimela was also collected for evaluation of the programme.

Research Advisory Committee meetings

The 28th RAC meeting was convened under the chairmanship of Prof. B. Konwar, VC, Nagaland University on 23rd September, 2014. Dr. N. Muralidharan, Director, TRI, Toklai; Dr. T.C. Bora, Scientist G, and Head of Biotechnology Division of NEIST, Jorhat; Prof. S.K. Dutta, Department of Entomology, AAU, Jorhat; Prof. D.K. Jaha, Head of Botany Department, Gauhati University, Guwahati; Dr. Kailash Chandra, Additional Director, Zoological Survey of India, Kolkata; Shri G. Simte, Director Sericulture, Manipur; Smt. Lakhimai Lahon, eri farmer and Shri Amol Bhattacharjjee, Scientist-D attended the meeting as members.

DBT sponsored national workshop-cum-training programme

A three-days DBT sponsored national workshop-cum-training programme on "Basic diagnostic techniques of microbes and insects of muga ecosystem "has been organised on 16th -18th March 2015 at CMER&TI, Lahdoigarh, Jorhat, Assam. 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 40 participants attended the event including young faculty members, research scholars and post graduate students from Assam Agricultural University, Jorhat; Gauhati University; Rain Forest Research Institute, Jorhat; J.B. College, Jorhat etc. Dr. T.C. Borah, Tocklai Tea Research Institute, delivered special lectures to the participants during the three days programme.

Dr. K. Giridhar, Director (CMER&TI) in his welcome address informed about the activities of the institute, research areas and facilities together with its mandate areas. CMER&TI is the only institute in the country and in the country doing research and developmental activities in the field of Vanya silk i.e. muga and eri silkworm. He expressed the role of Central Silk Board especially CMER&TI, Lahdoigarh in sericulture sector specially its new technologies which are presently being disseminated to the farmers for higher silk recovery. Mr. B. Choudhury, Scientist D of the institute informed that the main objective of the programme is to motivate young generations and to provide an idea about the recent developments in seri-biotechnology sector and hands on training on basic techniques related to seri-biotechnology. Dr. N.I. Singh, Dr. (Mrs). R. Das, Dr. Rajesh Kumar and Dr. D.K. Gogoi scientists of CMER&TI, Lahdoigarh delivered lectures on different aspects of muga in the workshop.

The participants were also informed about the available facilities at CMER&TI, provision of subsidies to procure reeling machines, procuring good dfls (disease-free laying, eggs) and seedlings of host plants etc. Laboratory experiments and field demonstration and field visit to the participants including the Insect Repository was arranged in each day of the workshop. The trainees were exposed to first-hand experience on modern tools that can be adopted for research programmes.

Extension Officers' Meeting
The 1st, 2nd and 3rd EOM were convened under the chairmanship of Director of the institute on 8-9th May 2014, 7th August 2014 and 23rd December, 2014, respectively to review the activities of different RECs.

ISDS Review meeting
ISDS Review meeting was held on 14th August 2014.

ISO Management Review meeting
The 2nd, 3rd, 4th, 5th and 6th ISO Management Review meeting was held on 26th April 2014, 14th August 2014, 10th November 2014, and 5th February 2015, respectively to discuss the R & D activities of the institute as per guidelines of ISO 9001:2008.

Vigilance Awareness week
Vigilance Awareness week was celebrated from 20th October to 4th November, 2014.

RC Meeting
The 45th and 46th RC meetings were held on 8th August, 2014 and 5th January, 2015, respectively under the chaimmenship of the Director of the Institute to review the progress of R&D projects.

Monthly review meeting
Eight internal monthly review meetings were held at the institute to review the various issues related to R&D and administrative activities of the institute

EXTENSION EVENTS

Technology Awareness Meet

Total of 11(eleven) Technology Awareness Meets were organized in different locations of Assam by CMER&TI, Lahdoigarh with the objective to make aware the farmers about improved technologies of muga and eri culture and their benefit during the year 2014-15. During every Technology Awareness Meet, the improved technologies on both host plant and silkworm rearing were deliberated and explained about the benefits of improved technologies in terms of return and economics to the farmers. A total of 1106 farmers were participated in the above programme. Details of the programme along with relevant photographs are shown below.

Details of Awareness programme

Sl. No	Date	Venue	Sector	Number of participants
1	22.05.2014	Chinatoli, Golaghat	Muga	102
2	10.06.2014	Barekuri, Tinsukia	Eri	116
3	18.07.2014	Bortarani, Tinsukia	Eri	94
4	21.07.2014	Dhanshri, Karbi Anglong	Eri	101
5	22.07.2014	Bagori, Karbi-Anglong	Eri	113
6	13.08.2014	Borhula Titabor, Jorhat	Eri	89
7	19.08.2014	Borbam, Dibrugarh	Muga	96
8	27.08.2014	Kacharigaon, Jorhat	Muga	107
9	23.01.2015	Khowang, Dibrugarh	Muga	88
10	31.01.2015	Jaljori, Golaghat	Muga	100
11	23.02.2015	Chinatoli, Golaghat	Muga	100
Total				**1106**

Field Days

To show the impact of improved technologies and also motivate to adopt the technologies by the farmers, 9 Field Days on muga and eri culture were organized by CMER&TI, Lahdoigarh at different potential pockets of muga and eri growing areas of Assam during the year 2014-15. In every Field day, along with the farmers, DOS staffs of respective localities were participated. Date and venue of Field days along with number of participants are shown below.

Sl. No	Date	Venue	Sector	Number of farmers participated
1	18.06.2014	Dadhara, Golaghat	Eri Culture	33
2	03.09.2014	Jaljori, Golaghat	Eri Culture	56
3	04.09.2014	Sawguri, Golaghat	Eri Culture	59
4	06.09.2014	Tamulisiga	Eri Culture	52
5	16.12.2014	Chinatoli, Golaghat	Muga culture	63
6	18.12.2014	Borpathar, Golaghat	Muga culture	65
7	18.03.2015	Jaljori, Golaghat	Muga culture	60
8	19.03.2015	Naharoni, Dibrugarh	Muga culture	60
9	23.03.2015	Tamulisiga ,Sivsagar	Eri culture	55
Total				503

Exhibitions

To aware and popularize the improved technologies of muga and eri culture, 4 exhibitions in different occasions of different organizations (viz., Farmers day of RARS at Titabor, Krishimela of RSRS, Jorhat in Majuli, Krishimela of KVK, Kaliapani and Krishimela of CMER&TI, Lahdoigarh at Titabor) were organized by CMER&TI, Lahdoigarh during the year 2014-15. 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. In every exhibition, large number of farmers was 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 shown kin interest to take up muga and eri culture newly with the technologies after visit the exhibition stall. Details of the programme location and period are shown below

1. Demonstration of integrated technology package of muga culture

As per Action Plan, 10 demonstration of integrated technology package of muga culture were conducted during the year 2014-15. Following technologies were identified for including in integrated technology package.

- Agronomical practices of muga host plants
- Phytoblighton-an anti blight formulation
- Integrated control of stem borer
- Disinfection in rearing field
- Biological control of uzi fly
- Production of disease free laying (DFL)

- Early stage rearing technology
- Late stage rearing technology
- Lahdoi- an anti muscardine formulation
- Box type bamboo mountage for cocoon spinning

The demonstration programmes were carried out by the respective scientists of CMR&TI, Lahdoigarh in coordination with the scientists of Extension and Training section of the institute at different potential pockets of muga and eri culture in Assam. A total of 412 nos. of farmers have been covered under above demonstration programme.

Sl.No	Venue	No. of farmers participated
1	No Pathar, Khowang, Dibrugarh	69
2	Khowang, Dibrugarh	38
3	Babajia, Titabar, Jorhat	50
4	Charideo, Sapekhati Sivsagar	68
5	Cinatali, Golaghat	53
6	Barhoiting, Sivasagar	21
7	Nitaipukhuri, Sivasagar	23
8	Tinkhang, Dibrugarh	26
9	Jaljori, Golaghat	34
10	Barpathar, Golaghat	30
Total		**412**

2. Demonstration of integrated technology package of eri culture

As per Action Plan, 10 demonstration of integrated technology package of eri culture were conducted during the year 2014-15. Following technologies were identified for including in integrated technology package.

List of Technologies

- Agronomical practices of kesseru
- High yielding castor variety (NBR-1)
- Intercropping of cash crops with Kesseru plantation
- Disinfection
- Platform rearing technology of eri silkworm
- High yielding eri silkworm breed
- Improved mountage

The demonstration programmes were carried out by the respective scientists of CMR&TI, Lahdoigarh in coordination with the scientists of Extension and Training section of the institute at different potential pockets of muga and eri culture in Assam. A total of 305 nos. of farmers have been covered under above demonstration programme.

Sl.No	Venue	No. of Farmers
1	Nagabat Vill, Borhola, Dist. Jorhat.	27
2	Tamulisiga Vill, Dist. Sivasagar	25
3	Bilotia (Sawguri) Vill, Dist. Golaghat.	24
4	Phalegichuk Vill, : Titabar, Dist. Jorhat.	23
5	1No. Bura Gohainkhat, Dist. Golaghat	31
6	Jajari Vill, Dist. Golaghat	32
7	Dakhin Sawguri Vill, Dist. Golaghat.	32
8	Dadhara Vill, Dist. Golaghat	31
9	Sawguri, Golaghat	45
10	Khanamukh, Sivsagar	35
Total		**305**

BENEFICIARY EMPOWERMENT PRPGRAMME

CMER&TI, Lahdoigarh proposed to organize Beneficiary Empowerment Programme for 525 beneficiaries of 7 muga cluster 350 beneficiaries of 5 Eri Cluster Promotion Programme implementing under the institute during 2014-15. Accordingly, CSB, Bangalore has approved the proposal and released a sum of Rs. 43.75 lakh for organizing the training and exposure visit for the beneficiaries covered under different clusters. Details of the BEP and amount released are shown below.

Sl. No.	Cluster	State	Sector	No. of beneficiaries to be trained	Amount Released (Rs. In lakh)
1	Hollowgaon, Chapakhowa, Tinsukia	Assam	Muga pre cocoon	75	3.75
2	Hatibandha	Assam	Muga pre cocoon	75	3.75

	Barbam, Dibrugarh				
3	Modarguri-Neogghuligaon, Lakhimpur	Assam	Muga pre cocoon	75	3.75
4	Sonathi, Baksa	BTC	Muga pre cocoon	75	3.75
5	Watsu Mungdang, Mokokchung	Naagaland	Muga pre cocoon	75	3.75
6	Kawnpui, Kolasib	Mizoram	Muga pre cocoon	75	3.75
7	Khagrabari-Dinahata-Mathabhanga, Coochbehar	West Bengal	Muga pre cocoon	75	3.75
8	Jaljori Gaon,Golaghat	Assam	Eri Pre cocoon	75	3.75
9	Mainao, Udalguri	BTC	Eri Pre cocoon	75	3.75
10	Tseminyu, Khohima	Nagaland	Eri Pre cocoon	75	3.75
11	Aghunato, Zuhenoboto	Nagaland	Eri Pre cocoon	75	3.75
12	Kanpur, Dehat	Uttar Pradesh	Eri Pre cocoon	50	2.50
Total				**875**	**43.75**

Accordingly, the BEP for 450 farmers of 6 muga clusters and 350 farmers of 5 eri clusters were organized in coordination with concerned RECs of CSB and ADS/SS of State Sericulture Department. However, 75 beneficiaries of Sonathi Muga cluster of Baksa, BTC could not be organized due to Code of Conduct of Election imposed by the State Election Commission for General Election of the Bodoland Territorial Council (BTC). The BEP includes both Training and Exposure visit of the farmers. A brief design of Training and Exposure visit organized by the institute is given below.

A. Training Programme

The training programmes were organized at the cluster level in each muga and eri cluster. Based on the need assessed, the programmes include class room training as well as field demonstration on improved technologies and its benefits. Multimedia projector, white board, charts & postersof different technologies, etc were used in the classroom training. Practical demonstrations were organized mainly in farmers' participatory mode to make the training programme effective. An interaction session between the trainees and trainers was held every day in the training programme. In addition to the technological knowledge, economics of muga/eri culture, utilization of products, market opportunities, etc were included in the training programme. The scientists of different disciplines from the institute, RECs and DOS Officers/staffs of the districts were also imparted training classes as resource persons. A training kit

containing with leaflets/pamphlets of all technologies of muga/eri, pen, and note book, etc were provided to each trainees. Different aspects covered under muga and eri BEP programe are as follows.

1. BEP of Muga Clusters

   - Raising and maintenance of muga host plants.
   - Management of pest and disease of muga host plants
   - Early stage rearing of muga silkworm
   - Late stage rearing of muga silkworm
   - Management of pest and disease of muga silkworm
   - Collection of matured worms and their mounting
   - Post-rearing management/disinfection of rearing field etc
   - Stifling and drying of muga cocoons
   - Economics of muga culture
   - Marketing of cocoons, yarns, etc.

2. BEP of Muga Clusters

   - Raising and maintenance of different eri host plants.
   - Disinfection of rearing house and rearing appliances
   - Early and late stage rearing techniques of eri silkworm
   - Management of pest and disease of eri silkworm
   - Collection of matured worms and their mounting
   - Post-rearing management/disinfection of rearing house, appliances, etc
   - Economics of eri culture
   - Marketing of cocoons, yarns, etc.

Post training assessment was made for evaluation of training prgramme at the end of the training programme. During the course of evaluation it was found that the all the farmers was highly satisfied with the training programme and the beneficiaries are found to gain knowledge of different aspects of muga / eri culture after training. They also requested to organized more such training programme for transforming the recent technological knowhow of muga/eri culture.

Exposure Visit

Exposure visit programme for identified beneficiaries were also conducted to CMER&TI, Lahdoigarh, progressive muga/eri farmers and some established Relling & Weaving centre immediately after complete the training programme. Different technologies of muga/eri culture, reeling and spinning, weavings, diversified products of muga and eri at the above centres were shown to the beneficiaries. The beneficiaries also interacted with the scientist at the institute, progressive muga/eri farmers, reeling, spinning and weaving experts during exposure visit.

TRAINING ACTIVITIES

The Central Muga Eri Research & Training Institute has a full fledged training division under which different training programmes were conducted during the year 2014-15. The institute conducted short duration training programme only with the help of state sericulture department, different NGOs and National Rural Livelihood Mission.

#	Activities	Target	Achievement
A.	**Integrated Skill Development Scheme (ISDS) under CMER&TI**		
	CMER&TI, Lahdoigarh	260	191
B	**Refresher course/Capsule training for DOS staff / Farmers**		
	CMER&TI, Lahdoigarh (DOS staff/Farmers)	50	28
C	**Peripatetic training on Muga culture (Farmers)**		
	CMER&TI, Lahdoigarh	800	100
	RMRS, Boko	400	400
D	**Peripatetic training on Eri culture (Farmers)**		
	CMER&TI, Lahdoigarh	800	100
	RERS, Shadnagar	150	71
	RERS, Mendipathar	150	150
	REC, Fatehpur	150	150
	REC, Mongaldoi	150	150
E	**Peripatetic training on Muga PCT (Reelers)**		
	CMER&TI, Lahdoigarh	400	375
F	**Peripatetic training on Eri PCT (Spinners)**		
	CMER&TI, Lahdoigarh	400	300
G	**Farmers training prog. on muga culture**		
	CMER&TI, Lahdoigarh	210	210
	RMRS, Boko	300	336
	REC, Coochbehar	150	167
	REC, Tura	150	150
H	**Farmers training prog. on eri culture**		
	CMER&TI, Lahdoigarh	210	210
	RERS, Mendipathar	180	180
I	**Beneficiary Empower.Prog.on muga culture**		
	CMER&TI, Lahdoigarh	-	450
J	**Beneficiary Emp. Programme on eri culture**		
	CMER&TI, Lahdoigarh	-	350
K	**Training on C2 breed seed production**	-	170
L	**Training on Biointensive Farming Techniques**	-	170
M	**Training on eri spinning, product design, dyeing and product development under Women scientist fellowship scheme.**	-	235
	TOTAL	**4910**	**4643**

Training programme of DOS officers: Trainers Training Programme of DOS officers were conducted from 1st December 2014 to 6th December 2014 where 16 sericulture officers of Arunachal Pradesh and 12 officers of govt. of Meghalaya were attended. The officers were trained on recent development of sericulture technologies so that they can educate the muga and eri farmers of their respective state.

Training programme of Insurance officers: The muga and eri farmers of Northeast are facing losses of crops up to 30 – 80 % due to climatic vagaries reflecting into decrease of raw silk production. It is necessary to secure the silkworm crops and in turn, the raw silk production under the umbrella of an insurance cover to enable them to get compensation for the losses. Considering the immediate needs of beneficiaries of the government and NGOs, the component of crop insurance support has become an important part of CDP. The officers of different insurance companies of Northeast are not at all aware about the rearing and production practices of muga and eri silkworm and as such as per suggestion of CSB, a 2days orientation training was organized at the institute on 25th and 26th November 2014. Altogether, 14 officers of the New India Assurance Corporation Limited, The Oriental Insurance Corporation Limited, the National Insurance Corporation Limited and The United India Insurance Corporation Limited joined in the training programme and successfully attended the 2 days deliberation.

Farmers Training Programme: During the year 2014-15, CSB had set target to train up 210 farmers on muga culture and another 210 farmers on eri culture technologies to boost up muga and eri silk production. The farmers were selected through DOS officers of Tinsukia, Dibrugarh, sivasagar, Jorhat and Lakhimpur including few local NGOs. The farmers were trained in 14 different batches of 30 seat capacity. They were educated with both practical and theoretical classes on muga and eri culture with the help of Audio-visual Aids. After completion of the training, most of the farmers are found engaged in all sericulture activities and able to increase their annual income.

Training Programme under Integrated Skill Development Scheme (ISDS): Central Silk Board had implemented a comprehensive project under Integrated Skill Development Scheme (ISDS) of Ministry of Textiles, Govt. of India through support and assistance from its nine premier R&D institutes. The project was designed to create employability in sericulture sector and meet up the human resource needs of this sector so that Indian silk industry may achieve the envisaged XII plan target of producing 32,000 MT of Raw Silk. CMER&TI, Lahdoigarh was one of the implementing agencies (IA) of ISDS project under Central Silk Board and trained up 191 selected beneficiaries on muga silkworm rearing, muga cocoon reeling, eri silkworm rearing and eri cocoon spinning. The farmers were trained up in 10 different batches with financial assistance of Ministry of Textiles and Central Silk Board.

Peripatetic training: Another training programme was also conducted in farmers' vicinity to create awareness among farmers as well as to educate farmers on muga

and eri culture technologies. Under this programme, 102 farmers were trained on muga culture and 105 farmers on eri culture technologies. Besides, 375 farmers were trained on muga reeling technology and 300 farmers on eri spinning under peripatetic training on PCT.

UNITWISE EXTENSION ACTIVITIES

I. Publicity

#	Activities	Target	Achievement
A.	**Organization of Krishimela**		
	CMER&TI, Lahdoigarh	1	1
	RMRS, Boko	1	1
	RERS, Shadnagar	1	1
	RERS, Mendipathar	1	1
	REC, Tura	1	1
	REC, Lakhimpur	1	1
	REC, Mangaldoi	1	1
	REC, Coochbehar	1	1
B.	**Technology Awareness programme**		
	CMER&TI, Lahdoigarh	4	10
	RMRS, Boko	4	6
	RERS, Mendipathar	3	6
	RERS, Shadnagar	3	3
	REC, Tura	3	3
	REC, Coochbehar	3	4
	REC, Lakhimpur	3	3
	REC, Mangaldoi	3	4
	REC, Kokrajhar	3	3
	REC, Fatehpur	3	3
C.	**Exhibitions**		
	CMER&TI, Lahdoigarh	1	4
	RMRS, Boko	1	4
	RERS, Mendipathar	1	1
	RERS, Shadnagar	1	1
	REC, Tura	1	1
	REC, Coochbehar	1	1
	REC, Lakhimpur	1	-
	REC, Mangaldoi	1	1
D	**Field Day**		
	CMER&TI, Lahdoigarh	5	9
	RMRS, Boko	5	5
	RERS, Mendipathar	3	3
	RERS, Shadnagar	3	3
	REC, Tura	3	5
	REC, Coochbehar	3	6
	REC, Lakhimpur	3	3
	REC, Fatehpur	3	3

	REC, Kokrajhar	3	3
	REC, Mangaldoi	3	3

II. TRANSFER OF TECHNOLOGY

Front line technology demonstration (in coordination with KVK)

#	Activities	Target	Achievement
A.	**Integrated technology package of muga culture**		
	CMER&TI, Lahdoigarh	10	10
	RMRS Boko	6	12
	REC, Tura	6	6
	REC, Coochbehar	6	6
	REC, Lakhimpur	6	6
	REC, Kokrajhar	3	3
	REC, Mangaldoi	3	3
B.	**Integrated technology package of eri culture**		
	CMER&TI, Lahdoigarh	10	10
	RERS, Mendipathar	6	7
	RERS, Shadnagar	6	6
	REC, Kokrajhar	4	4
	REC, Mangaldoi	4	4
	REC, Fatehpur	6	6
C.	**BANI machine**		
	CMER&TI, Lahdoigarh	4	6
D.	**Muga Silk Plus**		
	CMER&TI, Lahdoigarh	4	6
E.	**Muga Cocoon dryer**		
	CMER&TI, Lahdoigarh	2	5
F.	**Disease Forewarning**		
	CMER&TI, Lahdoigarh	4	1
	RMRS Boko	4	-
	REC, Lakhimpur	4	-

III. PLAN FOR LAND USE AND RESOURCE CONSERVATION

#	Activities / Target	Target	Achievement
A.	**Raising of seedlings/ sapling (nos) Som/Soalu seedlings**		
	CMER&TI, Lahdoigarh	5000	6000
	RMRS, Boko	10000	21000
	REC, Lakhimpur	3000	3000
	REC, Coochbehar	5000	5100

B.	**Raising of S3 & S6 saplings**		
	CMER&TI, Lahdoigarh	2000	**3000**
C.	**Raising of Kesseru seedlings**		
	CMER&TI, Lahdoigarh	5000	10000
	RERS, Mendipathar	5000	5000
D	**Supply of Som seedling**		
	CMER&TI, Lahdoigarh	10000	-
	RMRS, Boko	10000	15850
	REC, Tura	2500	3200
	REC, Lakhimpur	3000	830
	REC, Coochbehar	5000	3200
	Supply of castor seeds (kg)		
	RERS, Mendipathar	20	21.0
	REC,Diphu	20	5.0
E	**Supply of keseru seedling**		
	CMER&TI, Lahdoigarh	5000	6000
	RERS, Mendipathar	5000	6150
G	**Silkworm rearing**		
	Muga Commercial rearing		
	CMER&TI, Lahdoigarh (dfls)	2500	3140
	RMRS, Boko	1000	2660
	REC, Lakhimpur	500	342
	REC, Coochbehar	300	770
	REC, Mangaldoi	400	400
	Muga Seed crop rearing(dfls)		
	CMER&TI, Lahdoigarh	2800	3353
	RMRS, Boko	500	1612
	REC, Lakhimpur	500	651
	REC, Tura	600	754
	REC, Coochbehar	600	500
	Eri silkworm rearing (dfls)		
	CMER&TI, Lahdoigarh	300	381
	RERS, Mendipathar	500	485
	RERS, Shadnagar	430	300
	REC, Mangaldoi	200	200
	REC, Diphu	-	95
H.	**Cocoon production**		
	Muga Commercial cocoons (Nos.)		
	CMER&TI, Lahdoigarh	125000	42542
	RMRS, Boko	60000	43047
	REC, Lakhimpur	30000	3812

	REC, Coochbehar	18000	11136
	REC, Mangaldoi	24000	16380
I.	**Muga Seed cocoons (Nos.)**		
	CMER&TI, Lahdoigarh	84000	43391
	RMRS, Boko	20000	21435
	REC, Lakhimpur	20000	15972
	REC, Tura	24000	26777
	REC, Coochbehar	24000	253
	Eri cocoons (kg)		
	CMER&TI, Lahdoigarh	24	24.50
	RERS, Mendipathar	40	27.50
	RERS, Shadnagar	34.4	56.60
	REC, Mangaldoi	16	16.30
	REC, Diphu	-	7.20
J.	**Muga Dfls production (g)**		
	CMER&TI, Lahdoigarh	16800	12603
	RMRS, Boko	4000	21707
	REC, Lakhimpur	3000	905
	REC, Tura	4200	5762
	REC, Coochbehar	2860	1965
K.	**Eri dfls production (g)**		
	CMER&TI, Lahdoigarh	1000	2240
	RERS, Mendipathar	5500	6245
	RERS, Shadnagar	1000	900
	REC, Diphu	-	1995
L.	**Dfl supply**		
	Muga Dfls (g)		
	CMER&TI, Lahdoigarh	11000	12603
	RMRS, Boko	2500	17532
	REC, Lakhimpur	2250	420
	REC, Tura	3600	5253
	REC, Coochbehar	2860	1850
M.	**Eri dfl supply (g)**		
	CMER&TI, Lahdoigarh	700	5945
	RERS, Mendipathar	5000	5740
	RERS, Shadnagar	570	750
	REC, Diphu	-	1920

ACHIEVEMENTS

1) **Developed Insct Repository** for insect fauna of seri-ecosystem and wild silk moths of North East India AT Entomology Section, CMER&TI, Lahdoigarh

2) **Dr. Rajesh Kumar, Scientist C** of CMER&TI received Guest Faculty invitation from Dean, Graduate School of Agricultural and Life Sciences, University of Tokyo, Tokyo, Japan for teaching and conducting research on the topic "Phylogenic constraint between folivolous lepidopterous insects and host plants" w.e.f. 01.05.2014. to 30.09.2014. He conducted rearing of 12000 caterpillars from Forest Canopy of Hokkaido Forest, Tomakomai, Hokkaido and identified 150 species from 18 forest trees and trained 4 students.

3) **Dr. M. Chutia, Sciencist C** of CMER&TI received DBT PDF (Post Doctoral Fellowship) to conduct research in the Medical Science at University of Leciester, London, UK for one year.

4) **Promotion for higher grade**: **Shri S.A. Ahmed of CMER&TI** got promotion to Scientist–C w.e.f. 1st Jan, 2015.

5) **C2 Breed was authorized by HAC of CSB, Barhampur on 14th July 2014**.

6) **Regional Muga Research Station (RMRS)** located at Boko of Kamrup District, a nested regional station under Central Muga Eri Research & Training Institute (CMER&TI), Jorhat of Central Silk Board was assessed by Absolute Quality Certification Pvt. Ltd, New Delhi, for **Quality Management System on December 18, 2014 and awarded ISO 9001 : 2008 certificate** recently This is the first Regional Station under Vanya Sericulture getting ISO Certificate.

7) **Renewal of ISO 9001: 2008 certification for CMER&TI, Lahdoigarh:** The first Surveillance Audit of the institute under ISO 9001 : 2008 was conducted by the Certification Body on 30/10/2014 and renewed the certificate and extended the same up to October, 2015.

RESEARCH PUBLICATIONS
(2014-15)

Research articles/ Book Chapter

1) Ahmed, S.A., Sarkar, C.R., Sarmah, M.C., Ahmed, M. and Singh, N.I. (2015) Rearing Performance and Reproductive Biology of Eri Silkworm, *Samia ricini* (Donovan) Feeding on *Ailanthus* Species and other promising food plants *Advances in Biological Research* 9 (1): 07-14.
2) Bhuyan, P. M. Sandilya, S. P., Gogoi, D. K. Neog, K. and Subramanian, S. (2014). Isolation and characterization of gut-bacteria of Muga Silkworm (*Antheraea assamensis*, Helfer) collected from different localities of Assam. *Sericologia*, 54 (1): 28-35.
3) Bhuyan, P. M. Sandilya, S. P. and Gogoi, D. K. (2014). Exploration of gut microbial diversity of Muga Silkworm, *Antheraea assamensis*, Helfer and their characterization". Paper presented in the National seminar on "*Biodiversity Conservation, Crisis and Sustainable Use"* organized by N.N. Saikia College, Titabor, Assam on 29th and 30th September, 2014.
4) Biswas N., Bagchi S.N., Gogoi A.K., Paliwal S. and Giridhar K. (2014) Studies on the rearing and grainage performance of muga silkworm, *Antheraea assama* during seed crops in Terai region of West Bengal, *Abstracts of 23rd International Congress on Sericulture and Silk Industry*, Bangalore, 24th-27th November 2014, pp. 97.
5) Borgohain, A., Sonowal, J., Chutia, M. and Das, R. (2014) Seasonal occurrence of fungal diversity in castor plant, *Ricinus communis* L. the primary food plant of eri silkworm, *Samia ricini* (Denovan). *International Research Journal of Biological Science*, 3(8):33-39
6) Borgohain, A, Das, K and Chutia, M. (2014) Antibacterial activity of host plant volatiles against the bacterial pathogen of muga silkworm, *Antheraea assamensis* Helfer. In: *Proceedings of the National seminar on Recent Developments in Natural Sciences*, DKD College, Golaghat, Assam, pp153-156.
7) Borgohain, A., Das, R. Chutia, M., Bora, D. S. Samanta, R., Dutta, K. and Sonowal, J. (2014) Characterization of cultural gut microflora in infected larvae of muga silkworm, *Antheraea assamensis* Helfer*. Abstracts of National seminar on* "*Unraveling plant-microbe interactions for supporting plant health*" held on 27-28, 2014 organized by Indian society of mycology and plant pathology & Dept. of Botany, *Gauhati* Unversity, Assam.pp.14.
8) Bhuyan PM, Sandilya SP, Gogoi DK, Neog K, Subramanian S (2014). Isolation and characterization gut-bacteria of muga silkworm, *Antheraea assamensis* Helfer collected from different localities of Assam. *Sericologia,* 54 (1): 28-35.
9) Chutia, B. C., Nath, C., Goswami, L. M. , Goswami, B., Gogoi, L. and Neog , K. (2014) Life history of *Antheraea frithi* Moore on *Terminalia arjuna* (Rosb.)

W & A Syn in North Eastern Region of India. *Proc. Natl Acad Sci, India Biol Sci, DOI* 10.1007/s40011-014-0411.

10) Chutia, P. Kumar, R. and Khanikar D. P. (2014) Host plants relationship in terms of cocon colour and compactness of eri silkworm (*Samia ricini*). *Biological Forum – An International Journal* 6(2): 340-343.
11) Das R, Choudhary B., Sankar M, Giridhar K (2014) Status of muga culture and technology adoption in Assam. Management of Natural resources for Sustainable Development: Challenges and opportunities, p 132-135.
12) Giridhar K. and Neog, K. (2014) Trends and potential of eri and muga culture in North eastern states of India *Indian Silk*, 5 (5-7): 50-55.
13) Goswami, D., Singh N.I., Ahmed, M., Kumar R., Mech D. and Giridhar K. (2015) Impact of integrated chawki rearing technology on cocoon production of muga silkworm, *Antheraea assamensis* Helfer. *Biological Forum*, 7(1): 146-151.
14) Ibotombi Singh N, Goswami D, Ahmed M, Giridhar K (2014) Efficacy of sodium hypochlorite in controlling viral and bacterial diseases in muga silkworm, *Antheraea assamensis* Helfer. *Journal of Applied Biology & Biotechnology*, 2 (02): 012-015
15) Mech, D. Ahmed M. and Kumar, R. (2015) Indigenous technical knowledge associated in muga culture. *Biological Forum – An International Journal*, 7(1): 1-6.
16) Neog, K. Unni, Bala G., Dey, S., Renthlei, CV. Z. Eswara Reddy, S. G. Dutta, P., Sonowal P. and Rajan, R. K. (2014). Studies on the endocrine regulation of reproduction and ultra structure of brain and reproductive organs of muga silkworm *Antheraea assamensis*, Helfer, *World Journal of Pharmacy and Pharmaceutical Sciences*, Volume 3, (1).
17) Sarmah MC, Sarkar BN, Ahmed SA, Giridhar K (2014) Performance of C2 breed of eri silkworm, *Samia ricini* (Donovan) in different food plants. *Entomology and Applied Science* [Accepted].
18) Sarmah M.S., Sarkar S.A., Ahmed S.A. and Giridhar K. (2014) Advances in Research and Technology development in eri culture- A Review, 23rd International Congress on Sericulture and Silk Industry, Bangalore, 24th-27th November 2014, Abstracts, pp 79.
19) Singh G.B, Gogoi A.K. and Giridhar K. (2014) Illustrated manual of muga silkworm management and crop protection, Regional Muga Research Station, Boko, Assam, 24 pp.
20) Sonowal L, Singh GP (2014) Demonstration programme at Bamunigaon, Falafung and Batakuchi, Kamrup Assam. *Indian Silk*, 4: 50.
21) Wankhade, L. N. Barman, H. D. Rai, M. M. Rathos, M. K. (2014) Performance of eri silkworm for commercialization in Vidarbha region, *Maharastra Journal of Advanced Zoology*, 35(1): 26-31.

Research papers in Seminar/Symposium/ conference

1) Babu, M. R. Angadi, B.S. and Raviverma, T. (2014) Enaluation of certainm genotypes of eri silkworm *Samia ricini* (Donovan) fed with castor and tapioca under sub-tropical condition of Andhra Pradesh and Telengana *Abstracts of 23rd International Congress* on *Sericulture and Silk Industry* held on 24th-27th November, 2014 at Bangalore, pp. 78.
2) Das, R. Gogoi, A.K., Chutia M. and Das K. (2014) Emerging disease and pest scenario in muga silkworm, *Antheraea assamensis* under the impact of climate change. *Abstracts of 23rd International Congress on Sericulture and Silk Industry* held on 24th-27th November, 2014 at Bangalore, pp. 81.
3) Kumar, R. Rajkhowa, G., Chutia, P., Chodhury, B. and Giridhar K. (2014) North East Indian wild silk moth (Lepidoptera : Saturniidae) – diversity, distribution and clarification through illustrated genitalic atlas. *Abstracts of 23rd International Congress on Sericulture and Silk Industry*, Bangalore, 24th-27th November 2014, pp 99.
4) Sandilya, S. P., Bhuyan, P. M. and Gogoi, D. K. (2014) Isolation and characterization of promising *Azotobacter sp.* for the development of an INM package in sustainable eri culture". *Paper presented in the National seminar on "Biodiversity Conservation, Crisis and Sustainable Use"* organized by NN Saikia College, Titabor, Assam on 29th and 30th September, 2014.
5) Singh, G .P. and Gogoi, A. K. (2014) Evaluation of morphotypes of som, *Persea bombycina* Kost for the rearing of muga silkworm *Antheraea assamensis* Helfer (Lepidoptera: Saturniidae). *Abstracts of 23rd International Congress on Sericulture and Silk Industry* held on 24th-27th November, 2014 at Bangalore, pp. 96.
6) Vemananda Reddy, G. Rajanna, K. L., Vijaya Kumari, K.M., Angadi, B. S. Sarkar, B. N. and Sarmah, M. C. (2014) Development of preservation techniques for eri silkworm eggs *Samia ricini* (Donovan). *Abstractsof 23rd International Congress on Sericulture and Silk Industry* held on 24th-27th November, 2014 at Bangalore, pp. 94.

Books/ manuals

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10) S A Ahmed, M C Sarmah, B N Sarkar, K. Giridhar and B B Singha (2014) Package of practices for eri silkworm C2 breed.

Technical Notes

1) Gogoi AK, Singh GP, Sahu AK (2014) Technical Awareness camp at Dhanubhanga (Goalpara) and Moirapur (Kamrup) Assam *Indian Silk*, 4: 38.
2) Gogoi AK, Singh GP, Sahu AK (2014) Field Day at Dhakhin pukhuripar Kamrup and Nelli, Morigaon, Assam. *Indian Silk*, 4 : 39-40.
3) Sarmah MC (2014) Golden Muga Silk: An overview of its raw silk production and potentiality. *Silk Mark Vogue*., 6 (24): 24-26.

Leaflets /pamphlets (in Local languages)

1) Salukia eri polur palon padhati (Early stage eri silkworm rearing technology)
2) Eri polur khadya bikhya rupon aru pratipalan (Raising and maintenance of eri host plants).
3) Muga khadya bikhyar mojja khowa pookor neyantran (Control of stem borer of muga host plants)
4) Muga khula hukowa jantra (Muga cocoon drier)
5) Muga Silk Plus
6) Bani Reeling Machine
7) Muga polu palon aru paricharya (Muga silkworm rearing and management)
8) Uzi makhir jaybik neyantran (Biological control of Uzi fly)
9) Muga polu palonr unnat paddhati (Improved rearing technology of muga silkworm)
10) Muga Khydya Bikshya Rupon aru Pratipalan (Raising and maintenance of muga host plants)
11) Muga beej utapdanar unnat koushal (Improved techniques of muga silkworm seed production)
12) Improved mountage for eri culture
13) Eri polur natun unnata jaat – C2 palonor unnata padhatti
14) Reshom Krishi byabasthat Jeibik Sarar prayog (Apllication of Organic manures in sericultural practices.
15) Reshom Krishi Pranalit Mati Parikhar bhumika (Importance of soil analysis in sericultural practices)

16) Antahsashyakaran (Intercropping)
17) Pranalibaddha somanir majat antarbarti sashyar kheti-projonia nidresavali (Intercropping in between systematic som plantation – necessary directions)
18) Jeibik upayere muga khadya brakhyar pratipalan (Muga food plant management through organic means)
19) Keshusar-ek labhjanak byavasai (Vermicomposting – one profitable venture)
20) Eri Polur Natun Unnat jat – C2 Palanar Unnat Padhati

Newsletters

1) CMER&TI 2 ***English Newsletter***: Vol. 15.: January-June, 2014 and Vol. 16 July-December, 2014
2) CMER&TI 2 ***Hindi Newsletter***: Vol. 1; January-June, 2014 and Vol. 2 July-December, 2014

राजभाषा हिन्दी की गतिविधियां

वर्ष २०१४-१५ के दौरान संस्थान में राजभाषा हिन्दी के कार्यान्वयन से संबंधित विभिन्न गतिविधियों का संक्षिप्त विवरण निम्नवत् प्रस्तुत है।

1. **राजभाषा अधिनियम १९६३ को धारा ३(३) को स्थितिः –**
   - ❖ वर्ष के दौरान राजभाषा अधिनियम अधिनियम १९६३ को धारा ३(३) के अंतर्गत जारी कागजात की कुल संख्या : ७४१
   - ❖ इन में से अंग्रेजी में जारी किए गए कागजातः नहीं

2. **हिन्दी पत्राचारः** –

मंत्रालय/विभाग आदि द्वारा भेजे गए कुल पत्रों का व्यौराः -

क्षेत्र	हिन्दी/ द्विभाषी में	केवल अंग्रेजी मे	भेजे गए कुल पत्रों की संख्या	हिन्दी/द्विभाषी में भेजे गए पत्रों का प्रतिशत
क	१२६	५६	८५	६९.२३ %
ख	--	--	--	%
ग	३९६३	२०२३	--	६६.२० %

3. **लिखी गयी टिप्पणियां का व्यौराः -**
   - ❖ वर्ष के दौरान लिखी गई टिप्पणियां की संख्याः १२३९
   - ❖ हिन्दी में लिखी गई टिप्पणियां की संख्याः ५४९
   - ❖ अंग्रेजी में लिखी गई टिप्पणियां की संख्याः ६९०

4. **वर्ष के दौरान आयोजित हिन्दी कार्यशालाः -**

हिन्दी कार्यशाला की संख्या	हिन्दी कार्यशाला में प्रशिक्षित अधिकारी व कर्मचारी की संख्या	
	अधिकारी	कर्मचारी
०४	33	39

5. **वर्ष के दौरान संस्थान में आयोजित चार राजभाषा कार्यान्वयन समिति की बैठकः**
   1. पहली बैठक – दिनांक ३०.०६.२०१४
   2. दूसरी बैठक – दिनांक ०५.०९.२०१४
   3. तीसरी बैठक – दिनांक २९.१२.२०१४
   4. चौथी बैठक - दिनांक २८.०३.२०१५

6. **हिन्दी दिवस तथा हिन्दी पखवाड़ा का आयोजनः**

संस्थान में दिनांक १५.०९.२०१४ को हिन्दी दिवस का आयोजन किया गया तथा दिनांक ०१.०९.२०१४ से दिनांक १२.०९.२०१४ तक हिन्दी पखवाड़ा आयोजित किया गया। इस दौरान हिन्दी नोटिंग, हिन्दी निबन्ध, हिन्दी ड्राफ्टिंग, हिन्दी शब्दवली, हिन्दी प्रश्नोत्तरी, हिन्दी कविता पाठ आदि प्रतियोगिताएं की गयीं। प्रतियोगिता में विजयी प्रतिभागियों को क्रमशः प्रथम, द्वितीय, तृतीय तथा सान्तवना पुरस्कार से पुरस्कृत किया गया।

इसके अतिरिक्त वर्ष २०१३-१४ के दौरान मूल रूप में हिन्दी में किए गए कार्यों अर्थात केन्द्रीय कार्यालय उदार योजना के तहत प्रोत्साहन पुरस्कार राशि संस्थान तथा इसके अधीनस्थ इकाई के ११ अधिकारी व कर्मचारी को प्रदान की गयी।

7. **द्विभाषी में प्रमाण पत्र जारी करना –**

वर्ष के दौरान संस्थान में आयोजित विभिन्न प्रशिक्षण कार्यक्रमों में भागलेने वाले ४५९ पूर्वोत्तर भारत तथा भारत के अन्य राज्यों के प्रशिक्षणार्थियों तथा हिताधिकारियों द्विभाषी में प्रमाण पत्र जारी किए गए।

8. **हिन्दी समाचार पत्र –**

खंड १, जनवरी – जून, २०१४ और खंड २, जुलाई – दिसम्बर, २०१४

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