

MINUTES OF 41st RESEARCH ADVISORY COMMITTEE MEETING CMER&TI, LAHDOIGARH

The 41st RAC meeting of CMERTI, Lahdoigarh was held on 24th January 2023 under the new chairmanship of Dr. B. C. Deka, Vice Chancellor, Assam Agricultural University, Jorhat. The list of members and participants for the meeting is appended as Annexure – I.

Welcome address by the Director, CMER&TI and felicitation

Dr. Kasthala Mary Vijaya Kumari, Director, CMER&TI welcomed Dr. B. C. Deka, Vice Chancellor, Assam Agricultural University, Jorhat and Chairman of Research Advisory Committee of CMER&TI, Prof. L. K. Hazarika, Academic Registrar, AWU, Jorhat; Bidyut Kumar Sarmah, Director, DBT-AAU Centre, AAU, Jorhat; Prof. P K Neog, Director-EEI, NE Region; Dr. B.K. Singh, Rtd. Director, CSB; Sh. Ajit K Pathak & Sh. Bidasagar Kutum, Deputy Directors of Sericulture, Govt. of Assam; Mr. Robin Bharali, Member, Sivasagar, (Rearer Representative); Mr. Kaustav Borbora, Member, Jorhat (Reeler Representative); Dr. B. N. Sarkar, Scientist–D & Head, Muga Silkworm Seed Organization, CSB and all other invitees, scientists from the main Institute and its nested units. Dr. B. T. Srinivas, Director (Tech); Dr. S. Manthira Moorty, Scientist-D & Head RCS, CSB, Dr. Prashanth Sangannavar, Scientist-C, RCS joined the meeting online through a Webex link. The meeting started as per the set agenda.

Inaugural address by the Chairman, RAC

Dr. B. C. Deka, Chairman, RAC, in his inaugural address, welcomed all the members of the RAC. He expressed happiness about the achievements of the Institute and expressed his interest in taking forward the Institute's Research spectrum for the betterment of the Sericulture industry. He insisted the scientists to work towards making India, Aatmanirbhar and focus more on doubling the farmers' income through technological intervention and knowledge sharing platforms.

R&D highlights of the Institute by Director, CMERTI

Dr. K. M. Vijaya Kumari, Director, briefly presented the major R&D achievements of the Institute since its inception. She gave an overall picture of the CMER&TI main Institute, nested units and their mode of working. Major achievements from the concluded, new and ongoing projects were presented. Technologies taken for OST/OFT, research publications, recognitions to scientists were highlighted. She emphasized on the need of cooperation from state DOSs for the commercialization of technologies in North Eastern states.

AGENDA NO 1: CONFIRMATION OF LAST RAC MEETING MINUTES

The minutes of the previous meeting was circulated to all the members. Since, no comments were received from the members, the committee confirmed the minutes of 40th RAC Meeting.

AGENDA NO 2: FOLLOW UP ACTION ON THE GENERAL RECOMMENDATION/ DECISIONS OF THE LAST RAC MEETING

Dr. Aftab A. Shabnam, Scientist-D, PMCE presented the follow up action on general recommendations / decisions of the last RAC meeting.

AGENDA NO 3: FOLLOW UP ACTION TAKEN ON THE PROJECT SPECIFIC RECOMMENDATION/ DECISIONS OF THE LAST RAC MEETING

As previously decided, the project specific recommendations/decisions were presented by the respective scientists while presenting the progress of their projects.

AGENDA NO 4: REVIEW ON CONCLUDED PROJECTS

| # | DETAILS | |
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| 1 | Project code and title: | APR-05008-SI Standardization of Rearing and Grainage Technologies of <i>Antheraea frithi</i> Moore |
| A | Investigators involved | L. Somen Singh, PI, S. Subharani Devi, CI |
| B | Project period : | October 2019 – September 2022 |
| C | Objectives: | To standardize the rearing and grainage technologies to suit for commercial adoption |
| D | Progress achieved: | During 2 nd crop (summer) grainage 80% emergence of moths and 50% natural coupling were obtained inside the bamboo basket covered with black cloth. Recorded 76-80 % hatching when the moths were allowed for 14 hrs of coupling. Chawki rearing in indoor condition followed by outdoor rearing by feeding <i>L.dealbata</i> , <i>Q.serrata</i> and <i>Q.griffithi</i> leaves recorded higher cocoon yield of 40 cocoons per dfl in <i>L.dealbata</i> fed worms. |
| E | Utility of outcome / Future course of action | Studied the emergence behavior and natural coupling % of moths. Studied rearing performance of <i>A. frithi</i> on different food plants. |
| F | Budget and expenditure | Rs. 12.85 lakhs and 7.33 lakhs |
| 41 st | RAC Suggestions | <ol style="list-style-type: none"> 1. Budget is underutilised. 2. Develop <i>ex-situ</i> conservation site in the Institute premises or nearby surrounding areas and continue to maintain the population as a regular program. 3. Adopt a suitable strategy to multiply the existing stock for raising large population. 4. Identify the <i>in-situ</i> conservation sites in consultation with state DoS for conservation of <i>A. frithi</i>. 5. The findings/conclusions should be supported with statistically analysed data in the final report of the project. |
| 2 | Project code and title: | APR-05010-SI Evaluation of Eri Silkworm Races suitable for different agro-climatic conditions of Manipur. |
| A | Investigators involved | Y. Debaraj (PI) and L.Somen Singh (CI) |
| B | Project period : | October 2019 – September 2022 |
| C | Objectives: | To identify the best performing eri silkworm race in different agro-climatic conditions of Manipur. |
| D | Progress achieved: | Seed cocoons of different strains and ecoraces are under preservation for next crop rearing along with food plants. The spring crop rearing data revealed that the highest ERR was recorded in Borduar (81%) which is at par with C2 (80.64 %) at low altitude. Among the strains, highest ERR was recorded in Greenish Blue Plain (80.45%) followed by yellow plain (78.51%) in low altitude. Whereas at high altitude, highest ERR was recorded in C2 (78.29%) followed by Borduar (76.52%). Among the strains, highest ERR was recorded in yellow plain (77.34%). |
| E | Utility of outcome / Future course of action | Eri food plants and seed cocoons are being maintained for next crop rearing. Studied rearing performance of eri silkworm eco-races, strains and breeds are preserved under normal condition. |
| F | Budget and expenditure | Rs. 11.80 lakhs and 6.459 lakhs |
| 41 st | RAC Suggestions | Borduar and C2 identified as better performing across the seasons at different |

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| | | altitudes in Manipur should be tested under OST to confirm the findings. |
| 3 | Project code and title: | AIT-05011-EF - Molecular investigation into the lignocellulolytic system of a few wild silkmoths of North East India |
| A | Investigators involved | Arun Kumar KP (PI), Rajal Debnath (CI) |
| B | Project period : | Sept 2019-Sept 2022 |
| C | Objectives: | <ol style="list-style-type: none"> 1. Impact of host plant range on the microbial community in <i>Antheraea assamensis</i> Helfer and <i>Samiaricini Donovan</i> 2. Ligno-cellulose degradation by the gut microbes associated with <i>Antheraea assamensis</i> and <i>Samia ricini Donovan</i> 3. Molecular characterization of the lingo-cellulolytic biomass degrading enzyme 4. Developing microbial pathogen resistance through induction of immunity in silkworm via manipulation of gut microbiome |
| D | Progress achieved: | <ul style="list-style-type: none"> • Analyses of bacterial whole genome sequences completed. • Rearing of 4 different strains viz. Kokrajhar, Borduar, Titabor and C2 breed of Eri silkworms was carried out in 3 different host plants viz. Castor, Kesseru and Borpat for metagenomic DNA isolation. Metagenomic DNA has been isolated from gut of Kokrajhar and Borduar ecorace and sent for sequencing. • A total of 250 bacteria were subjected to isolation. Qualitative screenings of gut bacterial isolates based on substrate utilization were tested by modified Congo red plate assay method. Further to identify the 81 positive isolates, 16S rRNA gene sequencing analysis was performed which revealed 3 phyla, 13 families and 22 genera. <i>Paenibacillus xylanilyticus</i> (SB6) was found to be the most promising strain and was selected for further study. • The optimization of the fermentative conditions for maximum extracellular xylanase enzyme activity was carried out using one factor-at-a-time (OFAT) approach and the optimum pH, temperature and incubation time. The maximum extracellular xylanase activity was recorded as pH 11, 32 °C and 72 h respectively. • Bacterial interaction and lignocellulosic material utilization were verified using Scanning Electron Microscope and Fourier-Transform infrared spectroscopy analysis. |
| E | Utility of outcome / Future course of action | <ul style="list-style-type: none"> • The knowledge generated in the project needs to be applied in muga and eri culture in Northeast India. • The role of <i>Wolbachia</i> in the behavior of muga has to be studied. • The bacterial isolate showing high lingo-cellulolytic or xylanase activity needs to be further studied through cloning of concerned genes and using in industrial applications. |
| F | Budget and expenditure | Budget: 46.32 lakhs, Expenditure: 18.26lakhs |
| | 41st RAC Suggestions | <ol style="list-style-type: none"> 1. The outcome of the project is having commercial utility but not for the Sericulture purpose. Hence it is recommended that the collaborating Institute may explore the possibility of industrial applications of <i>Wolbachia</i> and <i>Paenibacillus xylanilyticus</i>. 2. Submit the concluded report within 15 days. |
| 4 | Project code and title: | AIT-05016-MI- Integrating genomic and transcriptomics resources for functional insight into the biology of muga silkworm <i>Antheraea assamensis</i> |
| A | Investigators involved | Arun Kumar K.P - PI |
| B | Project period | 2 Years (1/1/2021 to 31/12/2022) |
| C | Objectives | <ol style="list-style-type: none"> 1. Development of web accessible database ‘Vanya silkbases’ to host the muga sequence data, initially within CSB and later for public access. 2. Refining of assembly and annotation of the whole genome and transcriptome sequence data. 3. Identification and validation of functional genes associated with insect |

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| | | behaviour, silk quality and immunity. |
| D Progress achieved | | <ol style="list-style-type: none"> 1. Development of 'Vanya Silkbase' is completed. 2. Refining of assembly and annotation of whole genome and transcriptome sequence data is completed. 3. SNPs identified in both wild type and cultivar muga genome. 4. Experimental infection of muga silkworm is completed and tissues collected for gene regulation analysis. 5. 20 genes were selected for validation and their semi quantitative validation is being carried out. |
| E Utility of outcome / Future course of action | | <ul style="list-style-type: none"> • Vanya Silkbase, a virtual resource centre for genomics and transcriptomics studies of wild silkworms is developed. This will be useful in comparative genomics of Vanya silkworms & sequence similarity search against all the hosted genomes. • Vanya Silkbase is incorporated with gene expression data of <i>A. assamensis</i> in different tissues and genome viewer helps to visualize the genome and transcriptomes. • Assembly of <i>Anthereae assamensis</i> genome is refined and annotated. This resource can be used in studying genes involved in breeding characteristics and insect behaviour. • Around 0.5M SNPs detected in both Wild type and cultivar muga genome. The same can be utilized in Marker Assisted Breeding. • A homolog of gene linked to pupal hibernation has been identified in muga genome. It needs to be studied further to functionally annotate it through wet lab experiments. |
| F Budget and expenditure | | Budget – 41.68 Lacs & Expenditure – 17.83 Lacs |
| 41st RAC Suggestions | | Since the baseline data on muga genome is developed. It is suggested to propose a larger programme for functional annotation studies. |

AGENDA NO. 5: CONCEPT NOTES OF NEW RESEARCH PROJECTS FOR PPROVAL:

NIL

AGENDA NO. 6: REVIEW OF THE PROGRESS OF ON-GOING PROJECTS

| # | DETAILS | |
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| 1 | Project code and title: | MOE05004-EF : Adoption of improved sustainable technologies of Muga culture for elevation of cocoon production in the tribal belt of Assam |
| A | Investigators involved | Vijay N, (PI), DK Gogoi, (CI, upto July 2021), D. Mech, (CI), SAS Rahaman, (CI), Dr K. Sathyanarayana, (CI) |
| B | Project period : | Aug 2019-July 2022 (Extended upto Feb. 2023) |
| C | Objectives: | <ol style="list-style-type: none"> 1. To promote adoption of improved Muga rearing technologies among tribal rearers through sustainable NGO-rearer linkages facilitated by CMER&TI, Lahdoigarh. 2. To improve the socio-economic status of tribal population by enhancing cocoon production through improved muga culture |
| D | Progress achieved: | <ul style="list-style-type: none"> • Arrangement of exposure visit for 80 farmers from Lakhimpur and Dhemaji area to P3 unit MESSO Narayanpur • Conducted Awareness program and distribution of Lahdoi& Foot sprayer for control of Muscardine disease. |
| E | Specific outcome: | <ul style="list-style-type: none"> • Increase in average knowledge level and overall adoption compared to benchmark survey. • Increase in avg. cocoon production from 35 to 52 cocoons per dfl • Rise in average income generation from Rs. 25025/- to Rs. 44963/- |
| F | Budget and expenditure : | Budget: 25.51 L, Expenditure: 16.92 L |
| 41st RAC Suggestions | | Continue the project as per milestones and conclude within the extended period. |

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| 2. | Project code and title: | PIB-05005-SI: Genetic enhancement of Castor (<i>Ricinus Communis L.</i>) germplasm as a source material for development of productive perennial varieties |
| A | Investigators involved | Aftab A Shabnam (PI); DK Jigysu (CI), Somen Singh (CI) |
| B | Project period : | Oct. 2019 to Sept. 2022 (Extension sought upto March 2023) |
| C | Objectives: | 1. Genetic enhancement of castor germplasm. 2. Development of pre-bred intermediate castor with perennial characteristics. |
| D | Progress achieved: | <ul style="list-style-type: none"> • Processing & labelling of F₂& F₃ seeds from 1st& 2nd crossing lots. • Land preparation for sowing F₂& F₃ seeds from 1st& 2nd crossing lots. • Seed morpho-metric analysis of the left out accession has been completed and data will be presented. • F₁ and F₂ generation plants are being regularly monitored for more selections. Data recorded on morpho-metric traits of selected plants. • Plantation of F₁ and F₂ generation plantations at GCC, Chenijan was maintained as per recommended package of practices. • 05 more perennial source accessions were collected from Tawang, Ar. Pradesh, Majuli area of Assam, Agartala (Tripura) and Manipur. • Data generated under the project has been compiled and statistically analysed. However, F₂ generation data of 17 potential cross combinations is yet to be recorded for which project period extension has been sought. • As suggested by 59th and 60th RC, the Castor Descriptor cum catalogue was published and officially released during Vanya Symposium held in Oct. 2022 at Ranchi. |
| E | Specific outcome: | <ul style="list-style-type: none"> • Selection of intermediate perennial castor hybrid in F₂ generation of 1st crossing and mass selection lot and raising F₃ generation of these hybrids is expected to attain a level of homogeneity. These hybrids have to be selfed upto F₇ generation for attaining the homogeneity. • Harvesting of pure F₂ & F₃ seeds from 1st& 2nd crossing lots will help in selection of perennial traits. • Characterization of castor germplasm will help in identifying the potential castor accessions for inclusion in future breeding programmes. |
| F | Budget and expenditure : | Budget: Rs. 13.30 lakh Expenditure till December, 2022: 8.74973 Lakhs |
| 41st RAC Suggestions | | Conclude this phase of the project by March 2023 and propose 2 nd phase of the project for attaining homogeneity in the selected lines. |
| 3. | Project code and title: | AIB- 05006-SI: Breeding of muga silkworms for improved silk quality and disease tolerance |
| A | Investigators involved | Arun Kumar K.P. (PI), Mahesh D.S. (CI) and Manjunath R.N. (CI) |
| B | Project period : | October,2019 to September,2022 (Requested for extension till Sep 2023) |
| C | Objectives: | 1. Selection of better parents by field collection of muga silkworm samples. 2. Classical breeding studies to select better lines for muga silkworms. 3. Mass production for limited trials. |
| D | Progress achieved: | <ol style="list-style-type: none"> 1. The wild samples were collected from Jorhat and pupal hibernation during summer was observed in grainage and the DNA was isolated individually from selected males and females. 2. GBS based large scale genotyping revealed that the wild muga, irrespective of place of collection was highly heterozygous in nature. Very little heterozygosity was observed in the cultivated stock, which probably is the reason behind reduced yield after several inbreeding cycles in the cultivated stock. 3. Genome wide association studies (GWAS) using the generated data is ongoing. |

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| | | 4. DFLs of selected line (BP1) and wild muga stock are being reared. |
| E | Specific outcome: | 1. Observation of summer hibernation in wild muga. 2. Almost ten times lower heterozygosity observed in cultivated stock compared to wild muga. 3. Loss of heterozygosity is a possible reason behind loss of vigor in cultivated muga. 4. One promising muga line has been selected after several rounds of directional selection and rearing. This line is now being stabilized. 5. Both Muga and Wild muga DFLs are being reared based on their cocoon characteristics and fecundity for better muga lines |
| F | Budget and expenditure : | Budget: 18.32 lakhs, Expenditure: 8.96 lakhs |
| 41st RAC Suggestions | | It is suggested to propose 2 nd phase of the project after conclusion of this phase for taking forward the project outcomes. |
| 4. Project code and title: APR 05007 SI: Standardization of chawki rearing practices for Eri silkworm, <i>Samia ricini</i> (Donovan) | | |
| A | Investigators involved | Mahesh D S (PI); Arun Kumar (CI); Subadas Singh (CI) |
| B | Project period : | 3 years (October, 2019 – September, 2022) (Extended up to March 2023) |
| C | Objectives: | a) Establishment and management of eri host plant garden for eri chawki rearing. b) Design and fabrication of Eri silkworm chawki rearing equipment. c) Development of new rearing method and ideal environment for eri chawki rearing. |
| D | Progress achieved: | -Completed the fabrication of a model eri chawki rearing house of 5000 DFLs capacity for demonstration and supply of chawki purpose. -Conducted eri chawki rearing of 5000 DFLs in the model eri chawki rearing house to calculate the economics from brushing to distribution stages of Borduar race. Conducted a field testing and demonstration of eri chawki rearing at Bhadresar, Gujarat under FST programme. The chawki batch is certified and distributed for late age rearing. Recorded observations on rearing performance of chawki reared batch distributed to Jaljori and Borpathar region of Golaghat districts. -The maintenance of model eri chawki castor garden is being continued. The castor field preparations for conducting 5000 DFLs of C2 breed eri chawki rearing in the coming season is underway |
| E | Specific outcome: | -A model eri chawki rearing house of 5000 DFLs capacity in CMER&TI for both demonstration and supply purpose. - Popularization of Eri chawki rearing in non-traditional areas. -Economics of commercial chawki rearing practices for Borduar race. - Demonstration of eri chawki rearing of 5000 DFLs at the institute. |
| F | Budget and expenditure : | Total budget is 18.15 Lakhs and expenditure is 16.85 Lakhs |
| 41st RAC Suggestions | | Provide chawki rearing technology details along with its economics to AAU for popularization through KVKs in Dhemaji district of Assam. |
| 5. Project code and title: AIB-05009-SI: Isolation of thermo-tolerant line(s) of Oak tasar silkworm <i>Antheraea proylei</i> J. | | |
| A | Investigators involved | Y. Debaraj (PI); S. Subharani Devi (CI); R. Debnath (CI) |
| B | Project period : | October 2019- September 2022 (Extended upto March 2023) |
| C | Objectives: | 1. To isolate thermo-tolerant line of oak tasar silkworm, <i>Antheraea proylei</i> 2. Characterization of Heat shock protein gene in thermo-tolerant line. |

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| D | Progress achieved: | Seed cocoons of thermal stress induced and control lots of 5th generation <i>A. proylei</i> , RTRS-1 and C27 are under preservation for continuing the generation. Protein profiling studies of heat induced cocoons of <i>A. proylei</i> , RTRS-1 and C27 showed six major proteins bands which are having high molecular weight to be expressed differentially (increased or decrease) after heat was induced at different temperature. These proteins were further identified by amino acid sequencing as HSP 19.9, 21, 60 and 90 which increase or decrease depending on temperature regimes. Preparation for experimental work on DNA isolation and SCAR marker development in Dept. of Biotechnology, Manipur University. Presented a paper entitled "Differential expression of heat shock proteins in temperate tasar silkworm, <i>Antheraea proylei</i> Jolly (Saturniidae: Lepidoptera) in the ISC congress held at Romania. |
| E | Specific outcome: | Seed cocoons of heat tolerant population under preservation for maintaining the generation. Conducted protein profiling studies and sequencing studies for detection of heat shock proteins. |
| F | Budget and expenditure : | Rs. 21.90 lakhs and 6.652 lakhs |
| 41st RAC Suggestions | | <ol style="list-style-type: none"> 1. Repeat the SDS PAGE analysis for bringing in more clarity. 2. Dr. Arun Kumar to provide the necessary technical support in conducting the experiments. 3. Since the work proposed under the project is not yet completed, the committee recommends 6 more months extension for drawing meaningful conclusions. |
| 6. | Project code and title: | AIB-05012-SI: Inter and intra-specific hybridization for improvement of eri silkworm, <i>Samia ricini</i> Donovan |
| A | Investigators involved | Reeta Luikham (PI), Aftab A. Shabnam (CI). |
| B | Project period : | 4 years (March, 2020 – February, 2024) |
| C | Objectives: | To develop improved cross breeds/hybrids of Eri silkworm with higher fecundity and silk yield for commercial exploitation. |
| D | Progress achieved: | Continued selection of pureline strains based on larval colour and markings of the population was achieved in F9 generation. Crossing of pureline parents including top as well as low ranking strains was done in 10x10 diallel fashion. Crossed F1 seed were harvested and kept for producing F2 seed. Analysis of GCA and SCA is completed. Selfed F4 generation of Wild eri <i>S. canningi</i> completed. Selfed F5 generation rearing is under progress. |
| E | Specific outcome: | Selection of pureline parental stock for utilization in actual breeding programme. |
| F | Budget and expenditure : | Budget: Rs. 23.15 lakhs & Expenditure: 10.91 lakhs |
| 41st RAC Suggestions | | Continue the project as per milestones |
| 7. | Project code and title: | AIB 5013 SI: Impact of elevated CO₂ and temperature on muga silkworm and its primary host plant |
| A | Investigators involved | D. K. Jigyasu (PI, w.e.f. 01.08.2022), Amit Kumar (PI up to 31.07.2022 & Co-PI w.e.f. 01.08.2022); Aftab Ahmad Shabnam (CI); G. Subramanyam, (CI up to 26.07.2021) |
| B | Project period : | March 2020 to Feb 2023 |

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| C | Objectives: | <ol style="list-style-type: none"> 1. To assess the influence of elevated CO₂ and temperature on growth and yield attributes of primary host plant (Som). 2. To assess the impact of elevated CO₂ and temperature on muga seedcrop production, cocoon characteristics and fecundity. 3. To design strategies for adoption in muga silk worm rearing under the changing environmental scenario in Assam. |
| D | Progress achieved: | <ul style="list-style-type: none"> • Imposing treatment of elevated CO₂ at 550 ppm concentration and elevated temperature (ambient +1.5 °C) on Som plants was started in August 2022 after the installation of OTCs. • The treatments are presently going on as per plan and constant monitoring and data recording is in progress. • The 1st seed crop rearing will be initiated after 06 months of treatment i.e. in January-February 2023. • Biochemical analysis of selected Som plants was completed before initiation of treatment. • The project is running two and half years behind the schedule due to delay in installation of OTCs. Project extension for 02 years has been sought for completing the set milestones to achieve the objectives. |
| E | Specific outcome: | Exposure of Som plants to eCO ₂ and varied temperature regimes to assess the impact on plant growth, biochemical attributes and feeding behavior of muga silkworm. |
| F | Budget and expenditure : | Budget: Rs. 44.72 lakh Expenditure till Dec, 2022: 32.21687 Lakh |
| 41st RAC Suggestions | | <ol style="list-style-type: none"> 1. Continue the work as per milestones 2. Delay in procurement of OTCs has led to delayed start of the project activities. Hence, 2 years extension of the project period is recommended. |
| 8 | Project code and title: | ARP-05015-SI: Development of chemical based control measures for management of pebrine disease in Muga silkworm, <i>Antheraea assamensis</i> Helfer |
| A | Investigators involved | Arun Kumar K.P (PI) |
| B | Project period : | Jan 2021 – Dec 2023 |
| C | Objectives: | <ul style="list-style-type: none"> • Effect of different chemical disinfectants and antifungal substances on survivability and infectivity of microsporidian spores • Efficacy analysis and field application of chemical disinfectants suitable for management of pebrine disease. |
| D | Progress achieved: | <ul style="list-style-type: none"> • Motility assay and germination assay carried out with 7 chemical agents against <i>Nosema assamensis</i> • Field trial is being carried out with the selected chemical agents that showed reduced spore activity. • Shortlisted additional chemical agents for testing on Nosema spores in vitro and selection for further analysis. |
| E | Specific outcome: | <ul style="list-style-type: none"> • Motility assay and Germination assay on 4 chemical agents and 3 herbal agents were carried out. • Of which 5% Mancozeb 75 and 3% Nirmool were able to decrease spore activity. • Field trial with the 5% Mancozeb, 3% Nirmool, 0.2% NaOCl is being carried out. • Lethality observed in 5% Mancozeb75, 5th instar larvae are under rearing in the later treatments. |
| F | Budget and expenditure : | Budget: 19.92 lakhs & Expenditure: 7.72 lakhs |
| 41st RAC Suggestions | | Continue the work as per milestones |

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| 9. | Project code and title: | CFC-5017-MI: Exploration and adoption of novel solvent based muga cocoon cooking technology for increasing its reelability and raw silk quality |
| A | Investigators involved (PI & Co-I's) | Manjunath R. N (PI), D K Gogoi, RSRS, Khoraput (CI), Rajiv Munshi, RSTRS Khanapara (CI) |
| B | Project period : | March 2021 – Feb 2023 |
| C | Objectives: | <ol style="list-style-type: none"> 1. To study the efficacy of enzymatic and non-enzymatic (chemical) approaches in muga cocoon cooking/softening. 2. To develop a new solvent based cocoon cooking technique to improve the reelability & raw silk quality in muga cocoons dried under different techniques 3. To carry out large scale Multi-location trials at CSB and DoS reeling units for validating the efficacy of the newly developed cooking method. 4. To create awareness among the reeling beneficiaries to adopt/popularize the new solvent based muga cocoon cooking technique for efficient reeling and quality raw silk production. |
| D | Progress achieved: | <p><u>Enzymatic approach</u> Isolation of bacteria from different potential sites and screening of those bacterial isolates for lipolytic and proteolytic activity has done. One of the bacterial isolates has shown positive result for lipase activity and another four bacterial isolates have shown positive result for proteolytic activity. Effect of temperature, time & pH on enzyme activity were studied and optimized suitably for degumming of muga cocoons.</p> <p><u>Non-enzymatic approach</u> Field trials of new formulation developed under the project were continued in coordination with concerned DoS at Guwahati/Kamrup, Dhemaji & Lakhimpur districts for validation covering around 150 reelers and their feedbacks recorded. Tensile properties of Silk obtained from new cooking technique were studied and compared with traditional soda based cooking method. The loss of strength and luster due to soda based treatments on muga silk were ascertained with documented results and it was evidenced that new formulation is capable of addressing those issues by reducing the strength loss and better retention of luster.</p> |
| E | Specific outcome: | <ul style="list-style-type: none"> • Protocols for pre-treatment (cooking) of cocoons were developed and optimised for better reelability & recovery %, reduced strength loss and improved luster retention along with the ease of cooking technique. • The findings indicate the potential and positive impact of the new formulation in muga reeling sector that adds up to the quality and quantity of the muga raw silk production. • The findings were validated on fields and the efficacy/utility of the formulation was popularised among the reelers/farmers. |
| F | Budget and expenditure: | Budget: Rs. 18.23 lakh Expenditure: 8.51 Lakh (Dec '22) |
| | 41st RAC Suggestions | <ol style="list-style-type: none"> 1. It is suggested to commercialize the technology by licensing for its percolation in the field. 2. Continue the work as per milestones. |
| 10. | Project code and title: | APR-05018-MI: Effect of various host plants separately and in combination on Rearing and grainage performance of Muga silkworm, <i>Antheraea assamensis</i> Helfer |
| A | Investigators involved | DK Jigyasu (PI w.e.f. 1 st July, 2022), Kh. Subadas Singh (PI up to 30 th June, 2022), S. A. S. Rahman (CI), Vikram Kumar (CI), D. Mech (CI, w.e.f. Nov., 2022) |
| B | Project period : | March 2021 – Feb 2024 |
| C | Objectives: | <ol style="list-style-type: none"> 1. To study the effect of various host plants separately and in combination on rearing performance of muga silkworm. |

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| | | 2. To study the effect of various host plants separately and in combination on grainage performance of muga silkworm. |
| D | Progress achieved: | Experimental rearing of muga silkworm on different host plants Viz., Som (<i>Persea bombycina</i>), Soalu (<i>Litsea monopetala</i>), Dighloti (<i>Litsea salicifolia</i>) and Mejankori (<i>Litsea cubeba</i>) is conducted in Jethua and Kotia commercial crops. Grainage performance of both solo and combination rearing was recorded. Results show that Som host plant exhibited better performance in terms of short larval duration and larval weight as compared to other food plants. Jarua seed crop (Dec-Jan) rearing is in progress and early Chatua (Feb-March) rearing is also initiated. |
| E | Specific outcome: | Assessment of Muga silkworm rearing on different host plants in Jethua and Kotia commercial crops. |
| F | Budget and expenditure: | Budget: Rs. 15.42 lakh (CMER&TI: 7.62 lakh), Total Expenditure till December, 2022: 3.52 Lakh |
| | 41st RAC Suggestions | Continue the work as per milestones. |
| 11. Project code and title: MFM-5019-MI Development of Honeycomb Mountages and Harvesting Technology for Muga Cocoon Production with Improved Uniformity and Raw Silk Recovery. | | |
| A | Investigators involved | Manjunath R. N (PI), Mahesh D.S (CI) L Guha, MSSO (CI) |
| B | Project period : | March 2021 – Feb 2023 |
| C | Objectives: | 1. Fabrication of honeycomb mountages and suitable harvesting technology for uniform Muga cocoon production. 2. Impact assessment of honeycomb mountages on cocoon production, cocoon characteristics and reeling performances. 3. To conduct on-station feasibility trials of the mountages at CSB/DoS units for prototype test verification. |
| D | Progress achieved: | Continuous trials on the newly developed mountages were carried out to foresee the quality of cocoon construction and reeling parameters in comparison to all the traditional methods. Based on the suitability and manufacturing feasibility, Large scale Fabrication of Mountages using potential constructional materials was undertaken along with fine required tuning for easy harvesting. |
| E | Specific outcome: | Reelability and Raw silk recovery% in cocoons produced from honeycomb mountages were studied in comparison to traditional mounting techniques and about 8-10% of positive increment in reelability and recovery% was observed in the resulting cocoons. A new type of mountage with a possibility to produce uniform cocoon production can be expected. |
| F | Budget and expenditure: | Budget: Rs. 10.63 lakh Expenditure: 4.42 Lakh |
| | 41st RAC Suggestions | Complete the trial of developed honey comb mountages and present the statistically analyzed data in next meeting. |
| 12. Project code and title: APS-05020-MI - Commercial egg production technology for ericulture | | |
| A | Investigators involved (PI & Co-I's) | Mahesh D S, (PI), Lalith Natarajan, , EBSF, Topatoli, (Co-PI), Arunkumar K P, (CI) |
| B | Project period : | February 2022 to January 2024 |
| C | Objectives: | a. Standardization and selection of suitable egg laying device for commercial loose egg production in eri. b. Synchronization of hatching and subsequent rearing. c. Popularization of loose egg production in Ericulture. |
| D | Progress achieved: | <ul style="list-style-type: none"> Shortlisted the suitable egg laying device for large scale trials. Large scale trials are being conducted for commercial loose egg production by using selected device at CMER&TI & EBSF, Topatoli. All the grainage techniques for the shortlisted egg laying device are being |

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| | | <p>standardized.</p> <ul style="list-style-type: none"> Standardization of early emerged male moth preservation and seed preservation techniques for commercial egg production is being carried out. Uniformity in hatching achieved for single day laid eggs and synchronization of two/three days laid eggs by using black boxing technique is being standardized |
| E | Specific outcome: | <ul style="list-style-type: none"> Suitable egg laying device for large scale trials. Uniformity in hatching. |
| F | Budget and expenditure: | Total budget: 14.65 Lakhs, Expenditure: 5.14 Lakhs |
| 41st | RAC Suggestions | Continue the work as per milestones |
| 13. | Project code and title: | APS-05021-EF: Studies on population diversity and role of host plant volatile cues for enhancing egg laying in temperate tasar (Vanya) silk moths <i>Antheraea proylei</i>. |
| A | Investigators involved | S Subharani Devi (PI), Y. Debaraj (CI), K MVijaya Kumari (PI) |
| B | Project period : | Oct 2021- Sep 2024 |
| C | Objectives: | <ul style="list-style-type: none"> To survey and establish population diversity of oak tasar silk moths across NER. To establish potent food plants (Host) for oak tasar silk moths, <i>A. proylei</i> for egg production. To isolate and evaluate highly suitable host plant volatiles to activate/increase egg laying in oak tasar silk moth. To standardize the synthetic oviposition stimulant blends to enhance egg production in oak tasar silk moths and establishing the efficacy of developed technology. To evaluate the synthetic volatile blend in large scale at oak tasar seed production centers. |
| D | Progress achieved: | Surveyed and collected <i>Antheraea proylei</i> cocoons from Nagaland, Mizoram, Assam and Meghalaya and samples sent to Manipur University for molecular studies. Collected <i>Antheraea frithi</i> cocoons and moths from Manipur and Arunachal Pradesh. Collected <i>Antheraea mylitta</i> cocoons and moths from Assam and Arunachal Pradesh. Study on egg laying potential of <i>Antheraea proylei</i> moths on different food plants viz. <i>Quercus serrata</i> , <i>Quercus griffithi</i> , <i>L. dealbata</i> , <i>Q. incana</i> and <i>Q. semicarpifolia</i> showed highest fecundity with <i>Q. serrata</i> leaves and branches |
| E | Specific outcome: | Collected different life stages of oak tasar silk moth from different areas of NER. Studied the egg laying potential of <i>A. proylei</i> on leaves and branch of different oak plants viz. <i>Q. serrata</i> , <i>Q. griffithi</i> , <i>L. dealbata</i> , <i>Q. incana</i> and <i>Q. semicarpifolia</i> . |
| F | Budget and expenditure: | Rs.122.49 lakhs & Rs. 5.817 lakhs |
| 41st | RAC Suggestions | Continue the work as per milestones |
| 14. | Project code and title: | MOE-05022-MI: Evaluation and popularization of improved technologies developed in the field of Muga, Eri and Oak sector for Northeastern India (OST/OFT of CMER&TI) |
| A | Investigators involved (PI & Co-I's) | D K Jigyasu, CMERTI (PI), Sri Suraj Pal, REC-Fatehpur (CI), James T Keisa, CMERTI (CI), Y Debaraj, RSRS-Imphal (CI), L Somen Singh, RSRS-Imphal (CI), Sri. B N Choudhury, RSRS-Boko (CI), Sri SAS Rahman, RSRS-Boko (CI), Dr D. Mech, REC-Lakhimpur (CI), Aftab A Shabnam, CMERTI (CI), S. Subharani Devi, RSRS-Imphal (CI), Arun Kumar KP, CMERTI (CI), Amit Kumar, CMERTI (CI), Kh. Subadas Singh, CMERTI (CI), Dr Vijay. N, CMERTI (CI), Mahesh D S, CMERTI (CI), Manjunath R N, CMERTI (CI), Mr. Abhishek Singh, MESSO (CI) |
| B | Project period : | February 2022 to January 2024 |

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| C | Objectives: | <ul style="list-style-type: none"> • To popularize various technologies in different stages developed by the Institute • To further create awareness for technological intervention among the farmers and beneficiaries • To increase the overall cocoon production. |
| D | Progress achieved: | <ul style="list-style-type: none"> • The validation of IPM technology for control of uzi fly in oak tasar culture is conducted in 2nd crop, Aug-Sep 2022. Percentage of uzi infestation recorded was 6-9 % with IPM against 16-20 % in control. • The OST for validation of use of Biopesticides for control of insect pest infesting <i>Q. serrata</i> is conducted in 2nd crop, Aug-Sep 2022. Recorded 70-75 % reduction of pest infestation on 14th day after application of Bioneem. • Multi-location trials of muga breeds CMR-1 and CMR-2 is conducted in May-June season this at 6 locations. The findings of trials were presented in HAC meeting in November, 2022. And another round of multi location trial is going on at six locations. • Multi-location trials of Eri breeds/ cross breeds was conducted in last commercial crop and another round of multi-location trial will be conducted in next crop on at 10 locations. • 3690 Muga seed cocoons were preserved for 42 days preservation schedule in the cold storage. Total of 3143 (85.18%) moths were emergence in which 252 (6.83%) moths found healthy and 2891 (78.35%) found cripple. Emerged moths are weak, unhealthy and wings are not properly spread therefore, cold storage preservation practice could not use for coupling purpose. It is also observed that moths are unable to lay eggs and the eggs are also depressed and unfertilized. The un-emerged cocoons were recorded 547 (14.82%). • Trial for validation of muga silkworm egg treatment for uniform hatching and higher survivability of young larvae could not completed as DFSL were not supplied by MESSO on time. • Rearing management of muga silkworm in cooler region during summer trial could not be completed as DFSL were not timely supplied by MESSO. • Trial of formulated volatiles application for enhancing egg laying capacity of muga and eri is going on at Institute level. • 6900 Kesseru (HF-008 & HF-005) seedlings were distributed to 69 Eri farmers. • 5085 Borpat seedlings were distributed to 37 farmers in Sivasagar, Mariani, Jorhat area of Assam and Dimapur area of Nagaland. • 230 Som seedlings were distributed to 2 farmers. • The integrated practices & Modern Technology for Muga Silkworm Seed production was conducted at 8 farmers field in Charideo, Sivsagar and Lakhimpur district during September and 15.3% increase in fecundity was recorded over the normal practice. The increase in cocoon production is yet to be completed. • Trail of LED light trap to control muga insect pests was conducted in upper, lower and middle Assam areas with 10 farmers at each location. It decreases pest infestation 20-30% to both muga silkworm as well as its host plants. • The use of PET bottles for uzi trap in muga silkworm rearing can not recommended for uzi fly control in muga rearing field. However, some other different attractant can be used in the PET trap for uzi fly trap. This device can be used to trap wasps. • Rearing performance of C27 breed showed 21-25 cocoons per dfl as against 15-20 cocoons per dfl in <i>A. proylei</i> (control) during 2nd crop. • Percentage of uzi infestation recorded was 10 –12% with PET bottle uzi trap as against 16-20 % in control. • Rearing performance of 0.2 % Sodium hypochlorite treated lot recorded 20 - 26 cocoons per dfl as against 15-20 cocoons per dfl in control during 2nd |

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| | | crop. |
| E | Specific outcome: | Awareness and popularization of technologies in muga, eri and oak tasar. |
| F | Budget and expenditure: | Budget: Rs. 36.02 lakh (Rs. 17.98 lakh for OST) + (Rs. 18.04 lakh for OFT) Expenditure till December, 2022: 3.47 Lakh |
| | 41st RAC Suggestions | 1. The data obtained by the trials should be compared with the actual results reported in the respective projects in order to validate the technology/outcome for future take up. 2. The trial of Eri incubation device is not conducted and the concerned scientist should ensure the timely conduction of the trial. 3. To utilize the budget allocated in the project effectively. 4. Continue the work as per milestones |
| Collaborative projects with other institute as CI | | |
| 15. | Project code and title: | BPS-01013-CN- Utilization and diversification of silkworm pupae products for human & animal consumption and composting. |
| A | Investigators involved | PI: Mahesh DS, CI: James Kiesa, |
| B | Project period : | September 2020 – August 2022 (Extended up to March 2023) |
| C | Objectives: | ➤ To evaluate nutrients and bioactive compounds in silkworm pupae of Eri and Muga. ➤ To characterize proteome of Eri and Muga silkworm pupae. |
| D | Progress achieved: | -The proteomics studies by using samples of pre-pupae and matured pupae (fresh whole pupae, dried pupae, cuticle and flesh) reared on different host plants of eri silkworms being carried out at IIT, Guwahati -The eri pupal samples viz., fresh pupae, dried pupae, cuticle, inner bio-soft descent) are prepared for the analysis of complete biochemical and structural components by using advanced instruments viz, XPS and FE-SEM. -The shelf life studies for the eri pre pupae and matured pupae and preparation of the food products for human consumption are under progress at CFTRI, Mysore. -Standardized the de-cuticle procedure for both eri and muga pupae by using different techniques. |
| E | Specific outcome: | -Technique to de-cuticle both eri and muga pupae. -Protein content of eri pre pupae, matured pupae and muga pupae. |
| F | Budget and expenditure : | Budget: 11.88 Lakhs Expenditure: 9.23 Lakhs |
| | 41st RAC Suggestions | Continue the work as per milestones |

AGENDA NO. 7: R&D HIGHLIGHTS OF THE INSTITUTE July 2022 – Dec 2023.

Director of the Institute presented the R&D highlights of the institute in the beginning of the meeting. Chairman and members appreciated the progress made by the Institute.

AGENDA NO. 8: TRANSFER OF TECHNOLOGY (TOTs) PROGRAMMES

1. The progress of ToTs was presented in the ongoing project MOE05022MI.
2. It was suggested to complete the target as envisaged in the action plan for the year 2022-23.

AGENDA NO. 9: EXTENSION COMMUNICATION PROGRAMMES

Progress of extension activities was presented by Dr. D. Mech, Scientist-D. It was suggested to maintain the data base of the stakeholders covered under various extension communication programmes and complete the left over target as per annual action plan 2022-23.

AGENDA NO. 10: CAPACITY BUILDING & TRAINING PROGRAMMES

Progress under capacity building and trainings was presented by Sh. Bitupan Das, Scientist-D. Progress achieved so far was appreciated and it was advised to make necessary efforts to achieve the leftover annual target for the year 2022-23.

AGENDA NO. 11: ANY OTHER POINTS

1. As per the 67th RCC suggestion, Dr. Aftab A. Shabnam, Scientist-D, PMCE presented the major challenges and opportunities in Muga, Eri and Oak Tasar culture. Strategy, resources needed, time plan and likely benefits were discussed. The chairman suggested to incorporate the suggestions of the committee and communicate these challenges and opportunities to RAC members for any further expert comments.
2. Mandate of the Institute was also discussed and it was suggested that the present mandate of the Institute is apt and presently needs no amendment.


AGENDA NO. 12: CONCLUDING REMARKS FROM RAC CHAIRMAN & MEMBERS

1. **Sh. Robin Bharali** expressed that Lahdoi (a formulation for control of muscardine) is effective and has given good results in field. However, the farmers are reluctant to use this formulation. Hence, maximum demonstration programmes should be conducted by CSB and DOS for effective management of uzi fly infestation and muga silkworm diseases. He suggested that local administration should come up with a strategy to regulate the application of pesticides/chemicals in tea gardens near to muga fields.
2. **Sh. Kaustav Borbora** expressed that scientists need to work on quantification of carbon foot print of Muga and Eri silk. Since, the same is important for augmenting international silk trade.
3. **Sh. Ajit Kumar Pathak** expressed satisfaction on the outcome of the research projects. However, he suggested that more focus should be laid on taking the outcome of the research projects to the field. He further suggested, rescheduling of crops in view of changing climatic conditions and preparation of comprehensive package of practice for sericulture activities and its wide circulation.
4. **Sh. Bidya Sagar Kutum** expressed that the infrastructure with DOS, Assam is very poor hence constant support from CSB is required. He emphasized that special strategy is required to be drawn for success of muga summer crop.
5. **Dr. B.K. Singh** advised the scientists to effectively utilize the budget allocated under the projects. He suggested to work for developing season specific breeds in Eri silkworm and expressed the hope that improved breeds in Muga will be developed in 02-03 years time. He suggested collaborating with AAU for utilizing their expertise and infrastructure towards development of sericulture industry. He further suggested to pacify the work on pupae preservation and its by-products for value addition.
6. **Prof. P. K. Neog** appreciated the efforts of Scientists and expressed his satisfaction in seeing the progress of the research projects being drifted from fundamental to applied levels. He pointed out few important technologies developed by the Institute which have positively impacted the muga and eri culture. He suggested concentrating more on vegetative propagation techniques for

producing true to type improved host plant saplings. Focus should also be laid on eri pupae preservation and transportation techniques for its consumption and value addition in eri culture.

7. **Prof. L. K. Hazarika** appreciated the fruitful discussions on R&D aspects held during the meeting and opined to have a policy based discussions in order to revive the sector from the clutches of global climatic changes and surrounding agricultural practices. Further he advised to take necessary steps towards strengthening of ASRs along with field level demonstrations of previously developed technologies like Lahdoi etc. He appreciated the concept of Honeycomb mountages and further advised to take up the identified degumming enzyme for commercial exploitation and industrial application. He suggested looking into the development of integrated package for uzi control in terms of mechanical and biological control along with complete SOPs. Further, he suggested working on developing diapause lines in muga silkworm to skip the unfavorable season.
8. **Dr. Prashanth S., RCS, CSB** suggested formulating new projects especially from those Scientists who presently have no ongoing projects and advised to timely submit the final report of the concluded projects in RMIS-10 format. Projects should be taken forward as per milestones ensuring timely completion of proposed works and effective utilization of budget. All the technologies should be enlisted and disseminated strictly through ECPs and feedback should be statistically analyzed and documented.
9. **Dr. B.C. Deka**, The Chairman in his concluding remarks suggested having a brainstorming session on Muga and Eri inviting representatives from DOSs and the experts in the field. A policy paper may be prepared in coordination with state DoSs for ready reference to the Govt. to adopt measures for the development of Muga and Eri sector. The same needs to be aggressively pursued for strict implementation and execution to benefit the silk sector of NER. He further suggested enlisting the previous and present technologies and bringing them to the stage of commercialization and popularization.

The meeting was ended with vote of thanks by Dr. Manjunath R.N., Scientist-C, PMCE Division, CMER&TI, Lahdoigarh.


(Dr. B. C. Deka)
Chairman-RAC

**LIST OF PARTICIPANTS OF THE 41st RESEARCH ADVISORY COMMITTEE MEETING OF
CMER&TI, LAHDOIGARH HELD ON 24th JANUARY, 2023**

| # | Name & Designation |
|---|---|
| Members/Chairman | |
| 1. | <u>Chairman</u> Dr. B C Deka , Vice Chancellor, Assam Agricultural University, Jorhat, |
| 2. | Prof. L.K. Hazarika , Retd. Professor & Head of Entomology, AAU & Academic Registrar, Assam Women University, Jorhat (Assam) |
| 3. | Bidyut Kumar Sarmah , Director, DBT-AAU Centre & ICAR-National Professor Assam Agricultural University, Jorhat - 785 103 (Assam) |
| 4. | B.K. Singh , Rtd. Director (CMER&TI, Lahdoigarh) Tarun Nagar, Bye lane-5, House No. 8, Dispur, Guwahati-781005 (Assam) |
| 5. | Dr. B.T. Srinivasa , Director (Tech), Central Silk Board, Bangalore (<i>Attended through virtual mode</i>) |
| 6. | Sh. Ajit Pathak & Sh. Bidya Sagar Kutum , Deputy Director of Sericulture, Govt. of Assam |
| 7. | Sri Robin Bharali , Rearer, Representative Sericulture Farmer, Sivasagar-785640 |
| 8. | Sh. Kaustav Borbora , Reeler Representative, Silk Culture, Jorhat-785 101 (Assam) |
| 9. | Dr. B. N Sarkar , Scientist-D, MESSO, CSB, Guwahati - 781 002 (Assam) |
| 10. | Dr. M. Moorthy , Scientist-D, RCS, Central Silk Board, Bangalore (<i>Attended through virtual mode</i>) |
| 11. | Dr. Prashanth Sangannavar , Scientist-C, RCS, Central Silk Board, Bangalore (<i>Attended through virtual mode</i>) |
| 12. | Dr. K. M. Vijaya Kumari ; Director, CMER&TI, Lahdoigarh |
| Scientists | |
| 13. | Sh. Suraj Pal , Scientist-D, EREC, Fatehpur, Uttar Pradesh |
| 14. | Dr. Yumnam Debaraj , Scientist-D, RSRS, Imphal |
| 15. | Dr. Reeta Luikham , Scientist-D, CMER&TI, Lahdoigarh |
| 16. | Dr. D. Mech , Scientist-D, REC, Lakhimpur |
| 17. | Sh. S A S Rahman , Scientist-D, RSRS, Boko |
| 18. | Dr. Laishram Somen Singh , Scientist-D, RSRS, Imphal |
| 19. | Dr. T. James Keisa , Scientist-D, CMER&TI, Lahdoigarh |
| 20. | Dr. Aftab A. Shabnam , Scientist-D, CMER&TI, Lahdoigarh |
| 21. | Sh. Bitupan Das , Scientist-D, CMER&TI, Lahdoigarh |
| 22. | Dr. Sinam Subharani Devi , Scientist-D, RSRS, Imphal |
| 23. | Dr. Arun Kumar K.P. , Scientist-C, CMER&TI, Lahdoigarh |
| 24. | Dr. D.K. Jigyasu , Scientist-C, CMER&TI, Lahdoigarh |
| 25. | Dr. K. Subadas Singh , Scientist-C, CMER&TI, Lahdoigarh |
| 26. | Dr. Vijay N. , Scientist-C, CMER&TI, Lahdoigarh |
| 27. | Dr. Mahesh D.S. , Scientist-C, CMER&TI, Lahdoigarh |
| 28. | Dr. Manjunath R.N. , Scientist-C(R&S), CMER&TI, Lahdoigarh |
| 29. | Dr. Om Prakash Patidar , Scientist-B, CMER&TI, Lahdoigarh |
| Invitees | |
| 30. | Dr. D K Gogoi , Scientist-D, RSRS Khoraput |
| Technical staff/Research Fellows | |
| 31. | Smt. Nilima D. Bhuyan, STA |
| 32. | Sh. Simanta Saikia, SFA |
| 33. | Ms. Padmini Baruah, SRF |
| 34. | Sh. Kalpajyoti Gogoi, JRF |
| 35. | Ms. Lukumoni Borah, JRF |
| 36. | Ms. Krondashree Duarah, JRF |
| 37. | Sh. Jyoti Ranjan Mishra, JRF |
| 38. | Sh. Dibya Jyoti Hazarika, PA |
| 39. | Ms. Priyanka Sahu, PA |
| 40. | Ms. Wahengam Sapana Devi, PA |
| 41. | Ms. Raisa Begum, PA |
| 42. | Sh. Debajani Nath, PA |
| 43. | Ms. Priya Boro, PA |