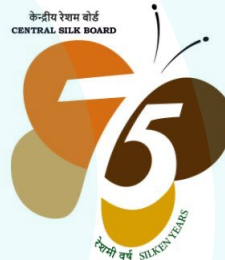




वार्षिक प्रतिवेदन ANNUAL REPORT 2023-24



केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
CENTRAL SERICULTURAL RESEARCH & TRAINING
INSTITUTE

केंद्रीय रेशम बोर्ड Central Silk Board

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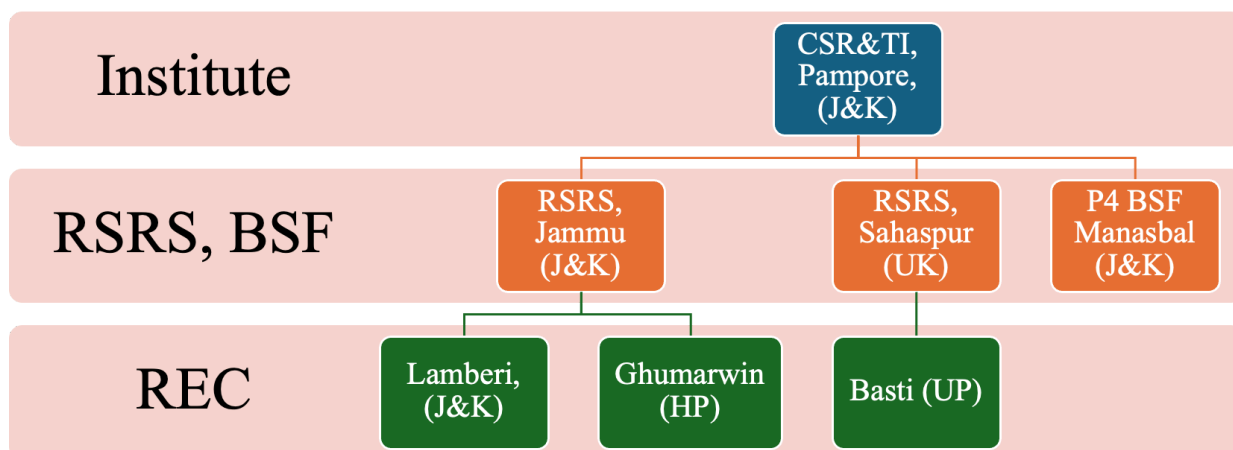


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ORGANIZATIONAL NETWORK



Regional Sericultural Research Station, Sahaspur



Regional Sericultural Research Station, Jammu



Krishi Mela at P4 BSF Manasbal



Krishi Mela at Jammu



Krishi Mela at Sahaspur, Dehradun



**Silk Day at CSR&TI,
Pampore**



**Dr. Sardar Singh, I/C RSRs,
Sahaspur as resource person in
Faculty Development Program
organised by University of
Delhi.**



46th RAC meeting



**M.Sc Sericulture students of Babasaheb
Bhimrao Ambedkar Central University,
Lucknow on study tour to RSRs Jammu**



**Students from the Central University of Kashmir
on exposure visit to CSR&TI, Pampore**



**B.Sc. Ag. students from Graphic Era Hill
University, Dehradun and Himalayan Institute of
Technology, Dehradun attending 30-day
intensive bivoltine training**



Sh. P Sivakumar, Member Secretary, Central Silk Board visit to CSR&TI, Pampore



Sh. Sunil Kumar Verma, Special Secretary & Director, Resham Development Department, Uttar Pradesh, visit to CSR&TI, Pampore



Dr. Sardar Singh, I/C RSRS Sahaspur briefing Lt. Gen. Gurmit Singh, Governor of Uttarakhand at Rajbhavan, Uttarakhand

सं.No. 30



वार्षिक अनुसंधान एवं
प्रशासनिक प्रतिवेदन
**ANNUAL RESEARCH &
ADMINISTRATIVE REPORT**
2023-24

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान,
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केन्द्रीय रेशम बोर्ड, वस्त्र मंत्रालय-भारत सरकार
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Central Sericultural Research & Training Institute, Pampore

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नवाचार एवं विकास का वर्ष



वर्ष 2023-24 केरेउअवप्रसं, पाम्पोर के लिए एक महत्वपूर्ण उपलब्धियों का वर्ष रहा, क्योंकि हमने रेशम उत्पादन के क्षेत्र में वैज्ञानिक अनुसंधान और तकनीकी उन्नति के लिए अपनी अटूट प्रतिबद्धता जारी रखी। यह वार्षिक रिपोर्ट हमारे वैज्ञानिकों और तकनीकी सहायकों की समर्पित टीम द्वारा की गई विविध गतिविधियों को समाहित करती है।

हमारे शोध प्रयास सामान्य रूप से रेशम उत्पादन उद्योग और विशेष रूप से उत्तर भारत में आने वाली महत्वपूर्ण चुनौतियों का समाधान करने पर केंद्रित थे। क्षेत्र की अनुसंधान एवं विकास की जरूरत को ध्यान में रखते हुए, संस्थान ने दो शोध परियोजनाएं शुरू कीं, जिनका लक्ष्य जलाभावसह शहतूत की किस्मों और समशीतोष्ण क्षेत्रों के लिए अनुकूलित क्षेत्र-विशिष्ट संकर की पहचान करना है। इसके साथ ही, विविध विषयों पर ध्यान केंद्रित करते हुए यह संस्थान वर्तमान में चल रही पाँच शोध परियोजनाओं को आगे बढ़ा रहा है, जिसमें दैहिक शहतूत संकर का विकास, पात्रे उत्परिवर्तन के माध्यम से बेहतर शहतूत की किस्मों का निर्माण, उपोष्णकटिबंधीय क्षेत्रों के लिए बेहतर उत्पादकता और गुणवत्ता के साथ उच्च उपज देने वाली शहतूत किस्मों को बढ़ाना, तथा उज्बेकिस्तान के साथ शहतूत और रेशमकीट आनुवंशिक संसाधनों के आदान-प्रदान के लिए अंतर्राष्ट्रीय सहयोग शामिल है।

संस्थान ने रेशमकीट संकर की पहचान पर केंद्रित दो शोध परियोजनाओं को सफलतापूर्वक पूरा किया, जिसमें एक मौसम-विशिष्ट और तीन पोषक-आनुवांशिक रेशमकीट संकर शामिल हैं। इसके अतिरिक्त, रेशम उत्पादन का विस्तार करने के उद्देश्य से एक परियोजना कारगिल (लद्दाख) में सफलतापूर्वक शुरू किया गया। इसके अतिरिक्त, भारत के उत्तर-पश्चिमी क्षेत्रों में संस्थान द्वारा विकसित प्रौद्योगिकियों के हस्तांतरण को सुविधाजनक बनाने के लिए कई घटकों को एकीकृत करते हुए एक व्यापक परियोजना पूरी की गई।

संस्थान, उत्तराखंड और जम्मू-कश्मीर में कैरिजवे में भारतीय राष्ट्रीय राजमार्ग प्राधिकरण द्वारा वित्त पोषित एक परियोजना को लागू कर रहा है जिसका उद्देश्य रेशम उत्पादन आधारित आजीविका के साथ-साथ हरित आवरण बनाना है। इसके अलावा, संस्थान सहयोगी परियोजनाओं में भी सक्रिय रहा है, जिसने दो सहयोगी परियोजनाओं की शुरुआत की है, छह अन्य पर प्रगति जारी है, और केरेबो के अन्य संस्थानों के साथ सहयोग देते हुये एक परियोजना को पूरा किया है। संस्थान हमारे अन्य अनुसंधान एवं विकास संस्थानों के साथ मिलकर काम कर रहा है और संबंधित सहयोगी संस्थानों के साथ 07 सहयोगी परियोजनाओं को लागू कर रहा है।

संस्थान आनुवंशिक संसाधनों की विविध श्रेणी के संरक्षण के लिए प्रतिबद्ध है, जिसमें दुनिया भर से शहतूत की किस्मों और रेशमकीट की नस्लें शामिल हैं, जिन्हें उनके मूल समशीतोष्ण रूपों में संरक्षित किया गया है। वर्तमान में, केरेउअवप्रसं, पंपोर में 80 शहतूत और 111 द्विप्रज रेशमकीट जननद्रव्य एक्सेसन हैं। सहसपुर इकाई में 82 शहतूत और 49 रेशमकीट जननद्रव्य एक्सेसन हैं, जबकि क्षेत्र.उ.अनु.के, जम्मू में 18 शहतूत और 55 रेशमकीट एक्सेसन हैं। इसके अतिरिक्त, मानसबल में पी4 बेसिक सीड फार्म (बीएसएफ) में 141 शहतूत और 13 रेशमकीट जननद्रव्य एक्सेसन हैं। ये संग्रह अनुसंधान को आगे बढ़ाने और पूरे क्षेत्र में रेशम उत्पादन के विकास का समर्थन करने में महत्वपूर्ण भूमिका निभाते हैं। इसके अलावा, एआईसीईएम चरण IV मूल्यांकन के हिस्से के रूप में, उत्तर-

पश्चिम भारत में हमारे चार परीक्षण स्थलों पर परीक्षण किए जा रहे हैं, जिसमें पीपीआर-1 सहित तीन परीक्षण प्रविष्टियाँ हैं, जो एआईसीईएम के लिए संस्थान की पहली परीक्षण प्रविष्टि है।

हमारे संस्थान के समर्पित कर्मचारी अनुसंधान एवं विकास गतिविधियों से आगे बढ़कर व्यापक प्रचार प्रसार और प्रशिक्षण कार्यक्रमों के माध्यम से महत्वपूर्ण प्रभाव डाल रहे हैं। 78 विस्तार पहलों के माध्यम से, हम 4,221 लाभार्थियों तक पहुँचे, रेशम उत्पादन गतिविधियों को मजबूत करने के लिए ज्ञान और सर्वोत्तम प्रथाओं को साझा किया। प्रशिक्षण के क्षेत्र में, हमारे संस्थान ने क्षमता निर्माण प्रशिक्षण (सीबीटी) कार्यक्रमों के माध्यम से 1,082 लाभार्थियों को सशक्त बनाया और एक्सपोजर यात्राओं के माध्यम से अतिरिक्त 814 व्यक्तियों को मूल्यवान शिक्षण अनुभव प्रदान किया, जिससे रेशम उत्पादन की क्षमता की गहरी समझ को बढ़ावा मिला।

हमारे संस्थान के समर्पित वैज्ञानिकों ने 20 शोध और समीक्षा लेख, 14 सार, 6 पुस्तकें या अध्याय, साथ ही कई लोकप्रिय लेख और पुस्तिकाएँ प्रकाशित करके उल्लेखनीय योगदान दिया। इन प्रकाशनों को लाभार्थियों और व्यापक अनुसंधान समुदाय दोनों को शामिल करने के लिए डिज़ाइन किया गया था, जिससे रेशम उत्पादन में मूल्यवान ज्ञान और प्रगति का प्रसार सुनिश्चित हो सके।

मुझे आशा है कि प्रस्तुत सामग्री पाठकों की रुचि को वार्षिक रिपोर्ट के अध्ययन में रुचि लाएगी जिसमें संस्थान की गतिविधियों पर प्रकाश डाला गया है, जो हिमालय की ऊँचाइयों पर बसे लोगों की सेवा करता है, तथा जिसका लक्ष्य रेशम उत्पादन क्षेत्र में एक उज्ज्वल और आशाजनक भविष्य का निर्माण करना है।

(डॉ. सरदार सिंह)
निदेशक

A Year of Innovation and Progress



The year 2023-24 marked a significant milestone for CSR&TI, Pampore as we continued our unwavering commitment to scientific research and technological advancement in the field of sericulture. This annual report encapsulates the diverse range of activities undertaken by our dedicated team of scientists, and technicians.

Our research endeavors focused on addressing critical challenges faced by the sericulture industry in general and North India in particular. Keeping in consideration R&D need of the region, the institute initiated two research projects targeting the identification of drought-tolerant mulberry varieties and region-specific hybrids tailored for temperate regions. Simultaneously, it is advancing five ongoing research projects focusing on diverse themes, including the development of somatic mulberry hybrids, creating superior mulberry varieties through in vitro mutagenesis, enhancing high-yielding mulberry varieties with improved productivity and quality for subtropical regions, and an international collaboration to exchange mulberry and silkworm genetic resources with Uzbekistan.

The institute successfully completed two research projects focused on identifying silkworm hybrids, including one season-specific and three nutri-genetic silkworm hybrids. Additionally, a project aimed at expanding sericulture successfully introduced the practice to Kargil (Ladakh). Additionally, a comprehensive project was completed, integrating multiple components to facilitate the transfer of technologies developed by the institute across the northwestern regions of India.

The institute is implementing a project funded by National Highways Authority of India in the carriageways in Uttarakhand and J&K with the aim of creating green cover along with scope of sericulture based livelihood. Furthermore, the institute has been active in collaborative projects as well, having initiated two collaborative projects, continued progress on six others, and concluded one project as part of its collaboration with other institutes of CSB. Institute is working in close association with our other R&D Institutes and implementing 07 collaborative project with sister concerned Institutes.

The institute is committed to conserving a diverse range of genetic resources, including mulberry varieties and silkworm races from across the globe, preserved in their original temperate forms. Currently, the CSR&TI, Pampore maintains 80 mulberry and 111 bivoltine silkworm germplasm accessions. The Sahaspur unit holds 82 mulberry and 49 silkworm germplasm accessions, while the RSRS Jammu maintains 18 mulberry and 55 silkworm accessions. Additionally, the P4 Basic Seed Farm (BSF) in Manasbal houses 141 mulberry and 13 silkworm germplasm accessions. These collections play a crucial role in advancing research and supporting the growth of sericulture across the region. Further, as part of the AICEM Phase IV evaluation, trials are being conducted at our four test sites in North-West India, with three test entries including PPR-1, the institute's first test entry for AICEM.

Our dedicated institute staff went beyond R&D activities, making a significant impact through extensive outreach and training programs. Through 78 extension initiatives, we reached an impressive 4,221 beneficiaries, sharing knowledge and best practices to strengthen sericulture activities. In the realm of training, our institute empowered 1,082 beneficiaries through Capacity Building Training (CBT) programs and provided valuable learning experiences to an additional 814 individuals through exposure visits, fostering a deeper understanding of sericulture's potential.

Our institute's dedicated scientific staff made notable contributions by publishing 20 research and review articles, 14 abstracts, 6 books or chapters, along with several popular articles and pamphlets. These publications were designed to engage both beneficiaries and the wider research community, ensuring the dissemination of valuable knowledge and advancements in sericulture.

I hope the content presented captures the reader's interest to explore the annual report, which highlights the activities of the institute that serves the population nestled in the heights of the Himalayas, aiming for a bright and promising future in sericulture sector.

(Dr. Sardar Singh)
Director

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, पाम्पोर

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, पंपोर केन्द्रीय रेशम बोर्ड, वस्त्र मंत्रालय, भारत सरकार के प्रमुख संस्थानों में से एक है, जिसे उत्तर भारत में शहतूत रेशम उत्पादन के अनुसंधान एवं विकास का कार्य सौंपा गया है। संस्थान के अंतर्गत दो क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्र, मिरानसाहिब, जम्मू (जम्मू और कश्मीर) एवं सहसपुर, देहरादून (उत्तराखंड), छह अनुसंधान विस्तार केंद्र और एक पी4, मूल बीज फार्म, मानसबल (कश्मीर) आते हैं। संस्थान उत्तर भारत के राज्यों जैसे हिमाचल प्रदेश, उत्तर प्रदेश, उत्तराखंड, पंजाब, जम्मू-कश्मीर और हरियाणा को आवश्यकता आधारित अनुसंधान, विस्तार एवं प्रशिक्षण सहायता प्रदान करता है।

उत्तर भारत के रेशम उद्योग को बढ़ावा देने और पुनर्जीवित करने के प्राथमिक उद्देश्य के साथ, संस्थान ने शहतूत, रेशमकीट सुधार, रेशमकीट फसल प्रबंधन, आदि में कई अनुसंधान परियोजनाओं को लागू किया है जिससे शहतूत रेशम उत्पादन को बढ़ाने के लिए क्षेत्र / मौसम विशिष्ट प्रौद्योगिकियों का विकास किया जा सके। उत्तर भारत में गुणात्मक और मात्रात्मक रूप से रेशम उत्पादन हेतु यह संस्थान 111 रेशमकीट नस्लों और शीतोष्ण मूल के 82 शहतूत प्रजातियों का सम्वर्धन एवं संरक्षण करता है।

संस्थान श्रीनगर-जम्मू राष्ट्रीय राजमार्ग पर श्रीनगर शहर से लगभग 16 किलोमीटर की दूरी पर गालंदर, पंपोर में स्थित है। निकटतम हवाई अड्डा श्रीनगर है जबकि निकटतम रेलवे स्टेशन जम्मू है, जो 290 किमी की दूरी पर है।

दृष्टि:

- उत्तरी भारत में उत्कृष्ट प्रमुख रेशम उत्पादन अनुसंधान संस्थान के रूप में उभरे।

ध्येय:

- उत्पादन, उत्पादकता एवं द्विप्रजरेशमकी गुणवत्ता में वृद्धि हेतु रेशम उत्पादन अनुसंधान, प्रशिक्षण एवं विस्तार गतिविधियों में व्यावसायिकता को बढ़ावा देने के लिए प्रतिबद्ध है।
- पर्यावरण, गरीब एवं महिलाओं के अनुकूल प्रौद्योगिकियों को उत्पन्न कर रेशम उत्पादन को एक व्यवहार्य उद्यम में रूपांतरण करना।
- ग्रामीण जनसंख्या के समावेशी विकास संबंधी राष्ट्रीय एजेंडे में विशेषकर महिलाओं एवं गरीब ग्रामीणों की आय पैदा करने की क्षमता में वृद्धि के माध्यम से योगदान करना।

अधिदेश

- भारतीय रेशमकी उत्पादन, उत्पादकता एवं गुणवत्ता में वृद्धि करने के लिए वैज्ञानिक, तकनीकी एवं लाभदायक अनुसंधान का संचालन करना।
- परपोषी पादप, रेशमकीट पालन, को सोत्तर प्रौद्योगिकी एवं इसके प्रसार के लिए अभ्यास पैकेज विकसित करना।
- उत्पाद एवं प्रौद्योगिकियों तथा उद्योग इंटरफेस का व्यवसायीकरण।
- लागत आय एवं कठिन परिश्रम को कम करने एवं उप-उत्पादों का उपयोग कर शुद्ध आय एवं उत्पादकता में वृद्धि करना।

- आयात प्रतिस्थापन और विदेशी मुद्रा अर्जित करने के लिए अन्तरराष्ट्रीय ग्रेड रेशम के उत्पादन में वृद्धि।
- मानव संसाधन विकास।
- प्रजनक भण्डार का संरक्षण।
- रोग एवं पीड़क अनुवीक्षण तथा पूर्वानुमान एवं पूर्वसूचना।
- सूचना संचार प्रौद्योगिकी उपकरणों के माध्यम से ज्ञान का प्रसार, अनुसंधान व विकास नवाचार एवं अभ्यास पैकेज का प्रसार करना।
- प्रतिष्ठित राष्ट्रीय और अंतरराष्ट्रीय संस्थानों के सहयोग से अनुसंधान कार्यक्रम / परियोजनाओं पर कार्य करना।
- वर्तमान अनुसंधान, सहयोगी गतिविधियों, वैज्ञानिक और तकनीकी गतिविधियों को संबल करने के लिए संस्थागत ढांचे को सुदृढ़ करना।
- बेहतर तालमेल के लिए अंतरसंस्थागत सहयोग करना।
- रेशम उत्पादन प्रौद्योगिकियों की तकनीकी-आर्थिक व्यवहार्यता पर अध्ययन।
- तकनीकी और परामर्श सेवाएं प्रदान करना।

About CSR&TI, Pampore

Central Sericultural Research & Training Institute, Pampore is one among the premier institutes of Central Silk Board, Ministry of Textiles, Govt. of India entrusted with Research & Development of mulberry sericulture in North India. The Institute has two Regional Sericultural Research Stations at Miransahib, Jammu (J&K) and Dehradun (U.K.), 06 Research Extension Centres and one P4, Basic Seed Farm (B.S.F.) Station at Manasbal (J&K). The Institute provides need based Research, Development/Extension and HRD support to the states of North India viz. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Punjab, Rajasthan and Haryana.

With the primary aim to boost and revitalize the silk industry of North India, the Institute has implemented a number of research projects in mulberry, silkworm improvement, silkworm crop management etc., so that, region/season specific technologies could be developed to increase the mulberry sericulture qualitatively & quantitatively in North India. The Institute maintains a rich germplasm of 111 silkworm races and 82 mulberry accessions of temperate origin for conservation and utilization.

The Institute is located at Gallandar, Pampore at a distance of approximately 16 kms from Srinagar city on the Srinagar - Jammu National Highway. The nearest airport is Srinagar while as the nearest railway station is Jammu Tawi, which is at a distance of 290 km.

VISION:

- To emerge as a premier sericulture research institute of excellence in Northern India.

MISSION:

- Committed to promote professionalism in sericulture research, training and extension activities leading to enhancing production, productivity and quality of bivoltine silk.
- To generate eco-friendly, pro-poor and women friendly technologies for transforming sericulture as a viable enterprise.
- Contribute to the national agenda of inclusive development of rural population especially women and rural poor by enhancing their income generation capability.

MANDATE:

- Conduct scientific, technical and economic research to enhance production, productivity and quality of Indian Silk.
- Development of package of practices for Host Plant, Silkworm Rearing, Post Cocoon Technology and its dissemination.
- Commercialization of products & technologies and industry interface.
- Efforts to reduce input cost & drudgery and by-product utilization to increase net income and productivity.
- Enhance production of international grade silk for import substitution and earning foreign exchange.
- Human Resource Development.
- Maintenance of Breeders Stock.
- Disease & Pest Monitoring and Forecasting & Forewarning.
- Dissemination of knowledge, R&D innovations and package of practices through ICT tools.
- Undertake collaborative Research Programmes/Projects with reputed National and International R&D Institutions.
- Strengthening Institutional framework to support ongoing research, allied activities, scientific and technical activities.
- Inter Institutional collaboration for better synergy.
- Studies on techno-economic feasibility of sericulture technologies.
- Providing technical and consultancy services.

RESEARCH HIGHLIGHTS

New research projects initiated as PI during 2023-24

1. Evaluation of drought tolerant mulberry genotypes through preliminary yield trial for rainfed sericulture in Jammu region (PIE 03015 SIC): Cuttings of all test genotypes have been planted in nursery for raising saplings and multiplication for further evaluation under Preliminary Yield Trial. Maintenance of nursery by following all the necessary cultural operations.
2. Primary Yield Trial (PYT) of newly evolved mulberry hybrids under temperate conditions of Kashmir Valley (PIE030016SIC): The stem cuttings of five mulberry hybrids viz., 1-19, 2-35, 2-37, 3-39 and 3-40 were planted in nursery bed for raising of sapling for transplantation during 2025-26.

Research projects continued as PI during 2023-24

1. Indo-Uzbekistan Collaborative Research Project on Improvement of Mulberry and Silkworm Breeding in Temperate Regions of India and Uzbekistan (AIB03006CI): The Import permit for the import of four silkworm breeds (Mechenaya 1, Mechenaya 2, YA-120, Ipakchi 2) was obtained from DPPQS, Faridabad.
2. Evaluation of Mulberry Somatic Hybrids (PIE03012SI): Evaluation somatic hybrids and control mulberry varieties were planted in RBD design, with studies on sprouting, rooting, biochemical analysis, and bioassays. SH1 and SH2 showed comparable performance to ruling temperate varieties, while all three hybrids (SH1, SH2, SH3) demonstrated over 60% rooting ability and performed well in bioassays.
3. Evolving superior mulberry varieties for temperate region through in vitro mutagenesis (PIB03014SI): During 2023-24; the induced callus from various explants of ruling mulberry varieties was sub-cultured on MS basal media in three batches for the multiplication of callus. The multiplied callus was treated with different concentrations of individual chemical mutagens.
4. Development of high yielding quality mulberry (*Morus spp.*) genotypes under sub-tropical conditions of Northern India (PIB03013SI): Fresh seeds collected from polyclonal seed orchard established at CSR&TI, Berhampore during spring flowering season were sown at RSRS, Jammu under controlled field conditions for raising sufficient seedlings for better evaluation. Based on the morphological characters, a total of 605 hybrid progeny seedlings have been selected and transplanted in main field in Augmented Block design for further evaluation under Progeny Row Trial. Maintenance of test genotypes in main field by following all the local cultural practices.
5. Evaluation of mulberry genotypes for improvement in productivity and quality under sub-tropical conditions of Jammu (PIE03009SI): 7 test genotypes along with 3 checks [S-146, C-2038 & G4] were evaluated for growth, leaf yield and yield contributing characters and disease and pest incidence during Summer and Autumn season 2023. All the test genotypes are being maintained in the main field as per the layout design by following recommended package of practices.

Research projects concluded as PI during 2023-24

1. Development of autumn specific bivoltine silkworm *Bombyx mori* L. suitable for temperate region of Jammu & Kashmir (AIB03007SI). An autumn-specific hybrid (ASH-14: Line18 × Line6) was developed for the temperate region of Jammu and Kashmir. OST trials in autumn 2023 showed higher yields (68, 58, and 63 kg/100 DFLs) at CSR&TI, Pampore, RSRS Jammu, and RSRS Sahaspur, compared to the control SH6 × NB4D2 (57, 49, and 55 kg/100 DFLs).
2. Development of nutrigenetic hybrids of bivoltine silkworm, *Bombyx mori* L. under sub-tropical conditions of North West India (AIB03008SI): On Station Trials in 2023 of hybrids CSR50×Bcon1, CSR50×Bcon4, and RSJ14×Bcon1 during spring and autumn at CSR&TI Pampore and RSRS Jammu and Sahaspur showed significant improvement over the control SH6×NB4D2. The highest yields were 70.81 kg/100 DFL (CSR50×Bcon4), 67.43 kg/100 DFL (CSR50×Bcon1), and 67.34 kg/100 DFL (RSJ14×Bcon1).
3. Popularization of Mulberry Sericulture in Kargil (Ladakh UT) (MOT03011MI): Discussions followed by field survey in Batalik Sector determined the feasibility of mulberry sericulture in Kargil. To empower local farmers, 100 individuals were trained through visits to CSR&TI, Pampore, College of Temperate Sericulture (COTS), SKUAST-Kashmir, and private reeling and weaving units. During these visits, farmers had the opportunity to discuss with the Member Secretary, Central Silk Board. To provide hands-on experience, 100 DFLs were reared at the farmer's level in Batalik Sector, Kargil, achieving a cocoon yield of 44.26 kg/100 DFLs. To support the industry, 3000 mulberry saplings were planted, and awareness campaigns were conducted to promote mulberry sericulture.
4. Evaluation of improved mulberry silkworm hybrids and technologies for North & North West India (MOE03010SI)

Component-I: Large scale farmer level trial of summer crop and its impact on autumn crop in selected areas of North West India (outcome of MOE-03001SI): Summer crop trials of 2500 DFLs were initiated in HP, J&K, UK. In HP, summer rearing in Kinour, Kullu, and Mandi districts generated additional income for farmers. In UK, 500 DFLs were reared in Almora, Pauri Garhwal, Sahaspur, and RSRS with varying cocoon yields. The trials demonstrated a significant improvement in cocoon yield for the summer crop compared to the traditional autumn-only crop.

Component-II: Cocoon production improvement during Autumn rearing through fortification of mulberry leaf (outcome of PIN-3608): A trial involving 20 farmers was conducted to improve cocoon production using fortified mulberry leaves. Treatment batches, which received mulberry leaves sprayed with glutamic acid, yielded 40 kg/100 DFLs, compared to 35 kg/100 DFLs in control batches. This represents a 12.5% improvement in cocoon yield.

Component-III: Revalidation of induction of water stress tolerance in mulberry under rainfed condition by application of triazole compound (Paclobutrazol) [Outcome of PIP-3543]: A trial was conducted to test the effectiveness of paclobutrazol (20 mg/lit) on mulberry trees in four districts of J&K. Mulberry trees treated with paclobutrazol showed a ~30% increase in leaf yield under water stress conditions compared to control trees.

Component-V: Soil health based fertilizer recommendation for DOS farms in North India (Outcome of PPA-3603): Soil samples collected from different DoS mulberry farms (5 samples from each farm) of Jammu province of J&K, Himachal Pradesh, Punjab and Haryana states were analysed through Dept. of Agriculture, Govt. of J&K, Talab Tillo, Jammu for nutrient analysis on outsourcing basis.

Component-VI: A survey of CRCs in North India revealed several key issues. Many mulberry gardens are over 15 years old and require replacement. Rearing appliances are often inadequate for the brushing load, which needs to be reassessed. Irrigation facilities are limited, available in only 64% of CRCs. Discrepancies were found between reported and recorded CRC operation locations, particularly in J&K. Additionally, frontline CRC operators lack technical knowledge and require training and skill development. The survey data was collected on-site using a structured format.

Component –VII: On Farm Trial of BmNPV tolerant Silkworm Hybrids in North & North West India. (Outcome of AIB-3569): A total 600 Dfls which comprised of 500 Dfls of PamDR1xPamDR6 and 100 dfls of FC1xFC2 & SH6xNB4D2 a ruling hybrid were tested with 9 farmers in Sahaspur region during spring season'2023. The results revealed that there was a cocoon yield ranged from 20 kg to 35 kg/100 Dfls and a potential cocoon yield was recoded 35 kg/100 dfls in favourable rearing season indicates that there was a good disease tolerance capacity in this PamDR1xPamDR6 was recorded.

Research projects Continued as CI during 2023-24

1. All India coordinated experimental trial for mulberry (AICEM-Phase IV) (PIE01003MI): Of the four test entries C-1360 mulberry sprouted early and showed complete resistance to powdery mildew. PPR-1 sprouted seven days later in temperate regions, and both C-1360 and PPR-1 had minimal frost damage. C-1360, PPR-1, and AGB-8 displayed resistance to moderate resistance against leaf webber.
2. Recommendations of novel fungicidal and insecticidal applications for mulberry (ARE10129MI): Three fungicides (Difenoconazole 25 EC, Myclobutanil 10 WP and Metrafenone 50 SC) were tested through silkworm bioassay and there was no side effects on silkworm as well as cocoon parameters *i.e.*, SSW, SSW, SR%.
3. Development of bivoltine hybrids with higher productivity and high temperature & humidity tolerance through Marker assisted selection (AIB02019MI):

CSR&TI, Pampore: Rearing of F4, F5, and F6 generations of ten silkworm lines, composing oval lines (HH2, HH2A, HH2B, HH27, HH27A, HH27B) and constricted lines (HH6, HH6A, HH26, HH26A) during spring, summer and autumn seasonal rearing of 2023.

Jammu: Rearing of F3, and F4 generations of nine silkworm lines, composing oval(HH2, HH2A, HH2B, HH27, HH27A) and constricted lines (HH6, HH6A, HH26, HH26A) maintained at RSRS, Jammu during spring and autumn seasonal rearing of 2023.

4. Life cycle assessment of Mulberry Silk: A National assessment (MTL01025MI): Soil samples from mulberry plantations located at various locations of temperate regions of J&K and three test sites at different depths were collected, processed and sent for analysis. Similarly, leaf

samples from three test sites, water samples from reeling units, and silk samples were collected, processed and sent for analysis. Further, multiple surveys were conducted, including consumer surveys, surveys of sericulture farmers, reelers, and weavers.

5. Impact assessment of mulberry sericulture technologies in India (MTS13002MI): Survey data was collected from 100 pre-cocoon farmers across Kashmir and Uttar Pradesh, with pre-testing in Pulwama (25), Budgam (27), Ananthenag, and Tral (33 each), and Varanasi (15). The data, including GPS-tagged photographs, was uploaded to Kobo-toolbox.
6. Evaluation of high yielding and low temperature stress tolerance mulberry varieties C-01 & C-11(MOE02015MI): Data was recorded for yield and leaf quality characters and disease and pest infestation for spring, summer and autumn seasons 2023. Bioassay study by rearing FC1xFC2 silkworm hybrid was also taken up during spring 2024. Maintenance of experimental plantation as per the local cultural practices were continued to be taken up during the period under report.

Table 1 New research projects initiated as PI during 2023-24 (CSB Coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	PIE 03015 SIC	Evaluation of drought tolerant mulberry genotypes through preliminary yield trial for rainfed sericulture in Jammu region	Dec 2023 to May 2027	Dr. Santoshkumar Magadum
2.	PIE03016SIC	Primary Yield Trial (PYT) of newly evolved mulberry hybrids under temperate conditions of Kashmir Valley.	Mar 2024 to Feb 2028	Dr. Pawan Saini

Table 2 Research projects continued as PI during 2023-24 (CSB Coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	AIB03006CI	Indo-Uzbekistan Collaborative Research Project on Improvement of Mulberry and Silkworm Breeding in Temperate Regions of India and Uzbekistan.	Aug., 2020 - July, 2026	Dr.N K Bhatia, Dr. Pawan Saini, Sh. Bharath Kumar Neelaboina, Dr.Santoshkumar Magadum
2.	PIE03012SI	Evaluation of mulberry Somatic Hybrids.	March, 2022- Feb., 2025	Dr. Gulab Khan Rohela
3.	PIB03014SI	Evolving superior mulberry varieties for temperate region through in vitro mutagenesis.	June, 2022- May, 2027	Dr. Gulab Khan Rohela
4.	PIB03013SI	Development of high yielding quality mulberry (<i>Morus</i> spp.) genotypes under sub-tropical conditions of Northern India	June, 2022- May, 2026	Dr.Santoshkumar Magadum
5.	PIE03009SI	Evaluation of mulberry genotypes for improvement in productivity and quality under sub-tropical conditions of Jammu.	October, 2021- Nov.2024	Dr.Santoshkumar Magadum

Table 3 Research projects concluded as PI during 2023-24 (CSB Coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	AIB03007SI	Development of autumn specific bivoltine silkworm <i>Bombyx mori</i> L. suitable for temperate region of Jammu & Kashmir.	March 2021 - Feb., 2024	Sh. Bharath Kumar Neelaboina
2.	AIB03008SI	Development of nutrigenetic hybrids of bivoltine silkworm, <i>Bombyx mori</i> L. under sub-tropical conditions of North West India.	March 2021 - Feb., 2024	Dr. Kiran R
3.	MOT03011MI	Popularization of Mulberry Sericulture in Kargil (Ladakh UT)	March, 2022 – Feb., 2024	Dr.Muttanna, Sh.Kumaresan P
4.	MOE03010SI	Evaluation of improved mulberry silkworm hybrids and technologies for North & North West India.	March, 2022- Feb. 2024	Dr.Sardar Singh

Table- 4: New research projects initiated as C.I DURING 2023-24 (CSB coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	SIB01038MGC	Utilization of Japanese Silkworm genetic resources for the development of productive Bivoltine hybrids	Jan-24 to Mar-28	Sh. Kumaresan P
2.	MOE02022MIC	Vulnerability of Sericulture to Climate Change in India	Mar-24 to Aug-26	Dr.Plabani Roy

Table-5: Research projects continued as C.I during 2023-24 (CSB Coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	PIE01001MI	All India coordinated experimental trial for mulberry (AICEM-Phase IV)	2019-2025	Dr. N. K. Bhatia, Dr. Pawan Saini, Dr.Santoshkumar Magadum, Sh. Chhattar Pal
2.	ARE10129MI	Recommendations of novel fungicidal and insecticidal applications for mulberry	May, 2022 – April, 2025	Dr. Pawan Saini, Sh. Chhattar Pal
3.	AIB02019MI	Development of bivoltine hybrids with higher productivity and high temperature & humidity tolerance through Marker assisted selection	June, 2022 – May, 2025	Dr.Kiran R, Dr.Santoshkumar Magadum, Dr. Sunil
4.	MTL01025MI	Life cycle assessment of Mulberry Silk: A National assessment	March, 2022 – January 2026	Dr.Kiran R
5.	MTS13002MI	Impact assessment of mulberry sericulture technologies in India	July, 2022 – June, 2025	Dr.Ashok Kumar Kasukurthi
6.	MOE02015MI	Evaluation of high yielding and low temperature stress tolerance mulberry varieties C-01 & C-11	Feb, 2022- January 2025	Dr.Santoshkumar Magadum, Sh. Chhattar Pal

Table- 6: Research projects concluded as C.I during 2023-24(CSB coded)

#	Project Code	Project Title	Period	Investigator(s)
1.	AIB01009MI	Evaluation of new bivoltine silkworm double hybrid TT21×TT56 at farmer's level for authorisation for commercial exploitation.	April 2020- March-2023	Dr.Rita Singh

Table- 7: Continuous programmes

#	Programme Code	Programme Title	Period	Investigator(s)
1.	SS Pam-01	Nutrient analysis of soils & mulberry under temperate conditions	Continous	Dr. Gulab Khan Rohela
2.	PIB-Pam 1	Acquisition, Conservation, Characterization and Utilization of mulberry germplasm under temperate conditions	Continous	Dr. Pawan Saini
3.	AIE -3056	Maintenance of Silkworm germplasm	Continous	Dr.Kiran R, Sh. Bharath Kumar Neelaboina, Sh. Kumaresan P
4.	AIE -3202	Maintenance of Silkworm Breeders' stock.	Continous	Dr.Kiran R, Sh. Bharath Kumar Neelaboina, Sh. Kumaresan P
5.	AIB 2016	Maintenance and Evaluation of Silkworm Germplasm Bank [with Maintenance of Parental Lines and Breeders' Stock]	Continous	Dr. Sardar Singh
6.	OFT-PAM-17	Evaluation and characterization of silkworm germplasm under Sub-tropical conditions of J&K.	Continous	Dr.Santoshkumar Magadum, Dr. Kiran R
7.	Evaluation and maintenance of sub-tropical mulberry germplasm at RSRS, Jammu		Continous	Dr.Santoshkumar Magadum
8.	Maintenance of Mulberry Germplasms at P4 Manasbal		Continous	Dr.Rajesh Kumar
9.	Maintenance of Silkworm Breeds at P4 Manasbal		Continous	Dr.Rajesh Kumar

NEW RESEARCH PROJECTS INITIATED AS PI DURING 2023-24 (CSB CODED)

- 1. Project title and code:** Evaluation of drought tolerant mulberry genotypes through preliminary yield trial for rainfed sericulture in Jammu region (PIE 03015 SIC)

Investigators involved: Dr.Santoshkumar Magadum (PI)

Project period: December, 2023 - May, 2027

Objective:

- Evaluation of newly developed drought tolerant genotypes for leaf yield and associated agronomic traits under PYT.
- Qualitative assessment of superior genotypes through biochemical and silkworm moulting test.

Progress achieved:

- Cuttings of nine shortlisted drought tolerant genotypes along with check varieties (S-146 and C-2038) have been planted in nursery for raising saplings and multiplication and further evaluation under preliminary yield trial (Table 8 and Figure 1).
- An indent for supply of saplings of C-1730 variety has been submitted to CSR&TI, Berhampore to use the variety as drought tolerant check for evaluation during PYT trial.
- Necessary irrigation provided. Weeding carried out. Maintenance of nursery by following all the necessary cultural operations.

Table-8: List of shortlisted drought tolerant genotypes and checks for PYT evaluation

Sl No.	Cross Combination	Selected Progeny/ Plant number
1	ME-0256 × MI-0836	P-7
2	MI-0827 × MI-0836	P-19
3	ME-0256 × MI-0440	P-40
4	MI-0853 × MI-0836	P-15
5	MI-0853 × MI-0836	P-17
6	MI-0458 × ME-0125	P-8
7	MI-0324 × MI-0313	P-15
8	MI-0310 × MI-0012	P-11
9	MI-0439 × MI-0012	P-40
10	S-146	Local Check
11	C-2038	National Check
12	C-1730	Drought tolerant Check (Released from CSR&TI, Berhampore)



Figure 1 Planting the cuttings of test genotypes in nursery for multiplication

- 2. Project title and code:** Primary Yield Trial (PYT) of newly evolved mulberry hybrids under temperate conditions of Kashmir valley (PIE0300016SIC)

Investigator(s): Dr. Pawan Saini, Dr. Gulab Khan Rohela and Dr. Basanagouda Gonal

Project Duration: March 2024 – February 2028

Objectives:

1. Evaluation of short-listed mulberry hybrids for growth leaf yield and yield attributing traits and propagation efficiency.
2. Bioassay of the mulberry progenies through silkworm rearing.

Progress: Stem cuttings of five short-listed selections from PIB-3586 research project viz., 1-19, 2-35, 2-37, 3-39 and 3-40 has been planted in nursery beds during March 2024.

Table 9 Details of number of stem cuttings of short-listed selections and check varieties planted during March 2024 in nursery

Mulberry Progeny Number	Number of Cuttings Planted
1-19	32
2-35	37
2-37	10
3-39	70
3-40	107
Check Varieties	
Goshoerami	200 (bag grafts)
PPR-1	200



Figure 2 Plantation of stem cuttings of short-listed selections in nursery beds during March 2024

RESEARCH PROJECTS CONTINUED AS PI DURING 2023-24 (CSB CODED)

1. **Project title and code:** Indo-Uzbekistan collaborative research project for improvement of mulberry and silkworm breeding in temperate regions of India and Uzbekistan(AIB03006CI)

Investigator(s): Dr. N. K. Bhatia, Dr. Pawan Saini, Sh. Bharath Kumar Neelaboina, Dr. Santoshkumar Magadum

Project Duration: August 2020 – July 2030

Objectives:

1. To identify silkworm breeds / hybrids and mulberry varieties/ lines that are suitable for the temperate regions of India and the sharply continental climate of Uzbekistan.
2. To use exotic breeds to produce silkworm hybrids (*Bombyx mori* L.) to increase the silk content in cocoons and their productivity.
3. To utilize and develop exotic mulberry (*Morus* spp.) varieties/ lines for high leaf nutrients and yield.

Progress:

Import Permit for Silkworm Breeds to be Imported from SRIS, Tashkent, Uzbekistan: An import permit no. 01/2023-24 dated: 17.04.2023 has been issued by Directorate of Plant Protection, Quarantine and Storage (DPPQS), Faridabad during May 2023 with the validity of one year from the date of issue for import of four silkworm breeds viz., Mechenaya-1, Mechenaya-2, Ipakchi 2 and YA-120 from Scientific Research Institute of Sericulture (SRIS), Tashkent, Uzbekistan.

Initiation of Procedure for Arrangement of Post-Entry Quarantine (PEQ) facility for Mulberry and Silkworm: The investigating team of CSR&TI, Pampore contacted the SKUAST-K, Shalimar and ICAR-NBAIR, Bengaluru for providing the PEQ facility for mulberry and silkworm. Both the institute has given consent for PEQ facility after the import of the mulberry and silkworm genetic resources from SRIS, Tashkent, Uzbekistan.

Correspondence with National Biodiversity Authority (NBA), Chennai: The response from National Biodiversity Authority (NBA), Chennai regarding the request submitted by CSR&TI, Pampore for exemption of the collaborative research project under the Section 5 of Biological Diversity Act (BDA) 2005 has taken so much time and submitted the original Form 5 signed by Joint Secretary (Silk), Ministry of Textiles (MoT), Government for obtaining the approval for export permission for mulberry and silkworm genetic resources.

2. Project title and code: Evaluation of mulberry somatic hybrids(PIE03012SI)

Investigator(s): Dr. Gulab Khan Rohela, Dr. Pawan Saini, Dr. Ashok Kumar Kasukurthi

Project Duration: Mar 2022 to Feb 2025

Objectives:

1. Karyotyping and evaluation of somatic hybrids for yield and yield associated traits
2. Analysis of biochemical characters in somatic hybrids
3. Bioassay of somatic hybrids to determine their suitability for rearing

Progress: During 2023-24; the somatic hybrids and control mulberry varieties were planted in RBD design. The sprouting behavior, rooting ability, biochemical analysis and bioassay studies of somatic hybrids and control mulberry varieties were carried out along with the post cocoon analysis.

1. **Sprouting behavior:** The sprouting nature of somatic hybrids and parental mulberry varieties were recorded during February and March, 2024 (Table 10). As per the second year (2023-24) data, all the three somatic hybrids were observed with earlier sprouting nature as compared to ruling varieties of Ichinose and Goshierami, and similar to sprouting nature of PPR-1. Among the three somatic hybrids; SH1 was sprouted on 25th March, 2024, SH2 on 27th March, 2024 and SH3 on 20th March, 2024 (Table 10). Among the parental and ruling mulberry varieties; Chinese white sprouted on 23rd March, 2024; PPR-1 on 25th March, 2024; Goshierami was sprouted on 08th April, 2024 and Ichinose on 10th April, 2024 (Table 11).
2. **Biochemical Analysis:** The moisture content, moisture retention capacity and biochemical characters of somatic hybrids and parental mulberry varieties were estimated during 2023-24 (Table 12 and Table 13). As per the first year (2022-23) data, the somatic hybrids moisture content, moisture retention capacity and biochemical characters are on par with ruling and parental mulberry varieties. Analysis of biochemical characters such as total soluble protein, total soluble carbohydrates and total chlorophyll content was estimated in somatic hybrids and control mulberry varieties during 2023-24. Among the three somatic hybrids better results were obtained in SH2 somatic hybrids in terms of total soluble carbohydrates and total soluble protein content and SH3 somatic hybrids for total chlorophyll content (Table 13).
3. **Bioassay Studies:** Carried the Bioassay studies of somatic hybrids and control mulberry varieties along with Post Cocoon analysis during 2023-24 (Table 14 and Table 15). The rearing was performed with the Bivoltine Double Hybrid (FC1× FC2) seed and the feeding of leaves of three somatic hybrids and three control mulberry varieties was carried out. The total duration of rearing has taken 27 days in approximate. In bioassay studies; the performance of mulberry somatic hybrids is similar to the ruling mulberry varieties with SR % ranging from 19% to 23%. The average Single Cocoon Weight (SCW) is 2.00 grams and the average Single Shell weight (SSW) is 0.45 grams related to when somatic hybrids leaves were feeded to bivoltine silkworms, which is similar to the control mulberry varieties feeded one (Table 14). As per the post cocoon analysis data SH2 and SH3 leaf feeded silkworms has shown the promising results with regard to Average Filament Length, Total Weight of Filament and Estimated Renditta and Estimated Reelability (Table 15).

4. **Rooting Studies:** During 2023-24, the rooting ability studies of somatic hybrids was carried by planting the 363 stem cuttings of three somatic hybrids and control mulberry varieties of PPR-I, Chinese White, Goshierami and Ichinose during Feb/March, 2023 (Table 16). Similarly as Ichinose and Goshierami are bad rooters 121 of bag grafts of these two varieties were prepared and planted during Feb/March, 2023. The rooting data was taken after 30, 60, 90, 120, 150 and 180 days of duration. As per the data, after 180 days of duration among the somatic hybrids; SH1 recorded 68.59% of rooting, SH2 recorded 80.16% of rooting and SH3 recorded 86.77% of rooting (Table 17). Among the stem cuttings of control mulberry varieties Chinese white has recorded 83.47% of rooting, PPR-1 has recorded 71.90% of rooting, Ichinose has recorded 04.14% of rooting and Goshierami has recorded 19.00% of rooting. From the bag grafts, after 180 days of duration Ichinose grafts has showed 61.98% of results and Goshierami grafts has showed 55.37% of results (Table 18). Among the somatic hybrids, SH2 and SH3 has showed similar percentage of good rooting (80.16% and 86.77%) as that of control mulberry variety of Chinese white.

As per the data obtained during 2023-24; the sprouting behavior and biochemical analysis of somatic hybrids SH1 and SH2 are on par with the ruling varieties of temperate region. As per the bioassay studies all the three somatic hybrids (SH1, SH2 and SH3) are performed in accordance to the ruling mulberry varieties. The rooting ability of two somatic hybrids (SH2 and SH3) is more than 80%.

Table 10 Sprouting data of somatic hybrids and control mulberry varieties recorded in Feb, March and April, 2024

#	Mulberry Variety/Hybrid	22/02	23/02	24/02	25/02	26/02	27/02	28/02	01/03	02/03	03/03	04/03	05/03	06/03	07/03	08/03	09/03
1	SH1 (PPR1-ICHINOSE)	Dormant															
2	SH2 (PPR1-CW)	Dormant															
3	SH3 (PPR1-PPR1)-15	Dormant															
	SH3 (PPR1-PPR1) -01	Dormant															
4	CONTROL-1 (CHINESE WHITE)	Dormant													BB		
5	CONTROL-2 (PPR1)	Dormant															
6	CONTROL-3 (GOSHOERAMI)	Dormant															
7	CONTROL-4 (ICHINOSE)	Dormant															

- 1) BB=Bud Break
- 2) GT=Green Tip
- 3) BK=Beaking
- 4) LE=Leaf Emergence
- 5) FE=Floral Emergence
- 6) SP=Sprouted

Cont. Table 10 Sprouting data of somatic hybrids and control mulberry varieties recorded in Feb, March and April, 2024

#	Mulberry Variety/Hybrid	10/03	11/03	12/03	13/03	14/03	15/03	16/03	17/03	18/03	19/03	20/03	21/03	22/03	23/03	24/03	25/03
1	SH1 (PPR1-ICHINOSE)	Dormant			BB				GT	BK		LE+FE					SP
2	SH2 (PPR1-CW)	Dormant		BB					GT	BK					LE		
3	SH3 (PPR1-PPR1) 15	Dormant						BB		GT			BK				
	SH3 (PPR1-PPR1) 01	BB			GT		BK			LE		SP					
4	CONTROL-1 (CHINESE WHITE)	BB				GT				BK			FE		SP		
5	CONTROL-2 (PPR1)	Dormant	BB				GT			BK		LE					SP
6	CONTROL-3 (GOSHOERAMI)	Dormant															
7	CONTROL-4 (ICHINOSE)	Dormant															

Cont. Table 10 Sprouting data of somatic hybrids and control mulberry varieties recorded in Feb, March and April, 2024

#	Mulberry Variety/Hybrid	26/03	27/03	28/03	29/03	30/03	31/03	01/04	02/04	03/04	04/04	05/04	06/04	07/04	08/04	09/04	10/04
1	SH1 (PPR1-ICHINOSE)																
2	SH2 (PPR1-CW)	LE	SP														
3	SH3 (PPR1-PPR1) 15			LE		SP											
	SH3 (PPR1-PPR1) 01																
4	CONTROL-1 (CHINESE WHITE)																
5	CONTROL-2 (PPR1)																
6	CONTROL-3 (GOSHOERAMI)	BB				GT			BK				LE		SP		
7	CONTROL-4 (ICHINOSE)	BB					GT			BK					LE		SP

Table 11 Sprouting Data of Somatic Hybrids and Control Mulberry Varieties During, 2024

#	Stages	Somatic Hybrids			Control mulberry varieties			
		SH1	SH2	SH3	Chinese white	PPR1	Goshoerami	Ichinose
1	Dormant	Up to 12-03-2024	Up to 11-03-2024	Up to 15-03-2024	Up to 09-03-2024	Up to 10-03-2024	Up to 25-03-2024	Up to 25-03-2024
2	Bud Break	13/03/2024	12/03/2024	16/03/2024	10/03/2024	11/03/2024	26/03/2024	26/03/2024
3	Green Tip	17/03/2024	17/03/2024	18/03/2024	14/03/2024	15/03/2024	30/03/2024	31/03/2024
4	Beaking	18/03/2024	18/03/2024	21/03/2024	18/03/2024	17/03/2024	02/04/2024	03/04/2024
5	Leaf Emergence/ Floral Emergence	20/03/2024	23/03/2024	28/03/2024	21/03/2024	19/03/2024	06/04/2024	08/04/2024
6	Sprouted	25/03/2024	27/03/2024	30/03/2024	23/03/2024	25/03/2024	08/04/2024	10/04/2024

Table 12 Moisture content and moisture retention capacity of somatic hybrids and control mulberry varieties during spring season, 2023

#	Somatic Hybrids	Leaf Harvesting Date	Fresh Weight (gr) of 10 Leaves (03/05/23)	Weight of Leaf after 6 hours of preservation under room temperature (22.0° C)	Moisture Retention Capacity (%)	Dry Weight (gr) of 10 Leaves (17/05/23)	Moisture Content (%)
1	SH-1 (PPR1-Ichinose)	03-05-2023	14.63	12.58	85.98	3.78	74.16
2	SH-2(PPR1-Chinese white)	03-05-2023	16.86	13.84	82.08	4.89	70.99
3	SH-3 (PPR1-PPR-1)	03-05-2023	25.67	21.26	82.82	6.87	73.23
4	Control-1(Chinesewhite)	03-05-2023	15.03	11.55	76.84	4.24	71.78
5	Control-2 (PPR-1)	03-05-2023	27.41	22.83	83.29	6.36	76.79
6	Control-3(Ichinose)	03-05-2023	25.35	21.63	85.32	6.03	76.21
7	Control-4(Goshoerami)	03-05-2023	25.94	22.51	86.77	7.58	70.77

Moisture Retention Capacity (%) = $\text{Weight of leaf after 6 hours of preservation} \times 100 / \text{Fresh weight of Leaf}$

Moisture Content (%) = $\text{Fresh weight of Leaf} - \text{Dry weight of Leaf} / \text{Fresh weight of Leaf} \times 100$

Table- 13: Biochemical analysis of mulberry somatic hybrids during Spring season, 2023 (Average values of three replicates of each variety was represented below)

#	Variety	Total Soluble Carbohydrate (TSC) (mg/g dwt)	Total Soluble Protein (TSP) (mg/g dwt)	Total Chlorophyll Content (TCC) (mg/g dwt)
1	SH1	267.64	45.08	4.57
2	SH2	299.58	50.34	4.96
3	SH3	263.07	44.27	6.75
4	PPR-1 (C)	277.08	48.47	5.37
5	Tr-10	226.88	39.15	4.95
6	Ichinose (C)	276.43	49.28	5.18
7	Goshoerami (C)	271.86	42.91	4.97
8	Rokokuyasu	198.08	42.11	4.80
9	Kariyoro	249.37	46.02	4.33
10	KNG	251.66	50.38	5.78
11	Chinese white (C)	270.56	42.61	5.84

	First highest
	Second highest
	Third highest
	Fourth highest

Table- 14: Data sheet for evaluation of mulberry somatic hybrids by bioassay studies (Rearing)

Test Var.	Total larval duration (Mean±SD)	No. of Cocoons Harvested (Mean±SD)	Wt. of Cocoons Harvested (g) (Mean±SD)	Yield/ 10,000 larva	
				By No. (Mean±SD)	By Wt. (Mean±SD)
SH-1	27±0	246±1.53	509±27.06	9853±61.10	20.35±1.08
SH-2	27±0	245±2.00	487±4.73	9800±80.00	19.49±0.19
SH-3	27±0	242±2.52	506±11.93	9667±100.66	20.23±0.48
PPR-1	27±0	245±2.65	476±16.82	9800±105.83	19.04±0.67
Goshoerami	27±0	238±3.51	471±28.16	9507±140.48	18.84±1.13
SH-1	27±0	246±1.53	509±27.06	9853±61.10	20.35±1.08
SH-2	27±0	245±2.00	487±4.73	9800±80.00	19.49±0.19

Note: The silkworm rearing test was conducted at the CSR&TI, Pampore during the spring season of 2023. A bivoltine double hybrid was utilized for this purpose, employing the leaf feeding method. After the third moult, 250 silkworm larvae were retained for further rearing.

Table 15 Post cocoon analysis of mono cocoon samples received from biotechnology section of this institute, (Spring- 2023)

FC2 × FC1 Fed with Hybrid/ Variety of Mulberry	SCW (g)	SSW (g)	SR (%)	Pup. Rate (%)	AFL (Mtr.)	Avg. Non Fila. Length (Mtr.)	Wt. of 10 Cocoons (Dry) (g)	Total Wt. of Fila. (g)	Total Wt. of Silk Waste (g)	Avg. Fila. Denier	Estimated Renditta	Estimated Reelability
SH-1	2.08	0.46	22.11	93.50	881	801	10.152	3.282	0.210	3.350	3.090	94
SH-2	2.01	0.45	22.38	95.00	935	850	9.340	3.309	0.187	3.180	2.820	95
SH-3	2.08	0.48	23.07	94.50	1011	-	9.770	3.639	0.223	3.230	2.680	94
PPR-1	1.97	0.45	22.80	94.00	885	804	9.597	3.252	0.910	3.300	2.950	94
Goshoerami	2.07	0.45	21.07	94.50	847	-	9.160	3.136	0.205	3.330	2.920	93
Ichinose	1.94	0.37	19.07	94.00	863	785	9.614	3.192	0.191	3.320	3.010	94

Table 16 Propagation of somatic hybrids and control mulberry varieties through stem cuttings-2023

11 × 11 (121 Stem Cuttings of Ichinose) 04.03.2023	11 × 11 (121 Stem Cuttings of Goshierami) 06.03.2023	11 × 11 (121 Stem Cuttings of Chinese White)02.03.2023	(TYPE-IV Quarters)
11 × 11 (121 Stem Cuttings of Chinese White)02.03.2023	11 × 11 (121 Stem Cuttings of SH3)08.03.2023	11 × 11 (121 Stem Cuttings of SH2) 03.03.2023	
11 × 11 (121 Stem Cuttings of SH1) 07.03.2022	11 × 11 (121 Stem Cuttings of PPR1) 02.03.2023	11 × 11 (121 Stem Cuttings of Goshierami) 06.03.2023	
11 × 1 (121 Stem Cuttings of SH3) 08.03.2022	11 × 11 (121 Stem Cuttings of Chinese White)02.03.2023	11 × 11 (121 Stem Cuttings of Ichinose) 04.03.2023	
11 × 11 (121 Stem Cuttings of PPR1) 02.03.2023	11 × 11 (121 Stem Cuttings of SH2)03.03.2023	11 × 11 (121 Stem Cuttings of SH1) 07.03.2022	
11 × 11 (121 Stem Cuttings of Goshierami)06.03.2023	11 × 11 (121 Stem Cuttings of Ichinose) 04.03.2023	11 × 11 (121 Stem Cuttings of PPR1) 02.03.2023	
11 × 11 (121 Stem Cuttings of SH2) 03.03.2023	11 × 11 (121 Stem Cuttings of SH1)07.03.2022	11 × 11 (121 Stem Cuttings of SH3) 08.03.2023	

➤ Stem Cuttings (11 Cuttings/Row × 11 Rows) of SH-1, SH-2, SH-3, Control-1 (Chinese white), Control-2 (PPR1), Control-3 (Ichinose) and Control-4 (Goshierami) were planted from 02.03.2023 to 08.03.2023

Table 17 Rooting and survival data of somatic hybrids and control mulberry varieties (from planted stem cuttings)

Variety/Hybrid	No. of Stem Cuttings Planted (08/03/2023)	% of Survival After 30 Days (07/04/2023)	% of Survival After 60 Days (08/05/2023)	% of Survival After 90 Days (08/06/2023)	% of Survival After 120 Days (07/07/2023)	% of Survival After 150 Days (07/08/2023)	% of Survival After 180 Days (08/09/2023)
SH-1(STEM CUTTINGS OF PPR1-ICHINOSE)	363	363/363 100%	363/363 100%	339/363 93.38%	306 /363 84.29%	283 /363 77.96%	249 /363 68.59%
SH-2(STEM CUTTINGS OF PPR1-CHINESE WHITE)	363	363/363 100%	327/363 90.08%	315/363 86.77%	309 /363 85.12%	303 /363 83.47%	291 /363 80.16%
SH-3(STEM CUTTINGS OF PPR1-PPR1)	363	363/363 100%	357/363 98.34%	342/363 94.21%	342 /363 94.21%	315 /363 86.77%	315 /363 86.77%
CONTROL-1(STEM CUTTINGS OFCHINESE WHITE)	363	363/363 100%	327/363 90.08%	309/363 85.12%	309/363 85.12%	303/363 83.47%	303 /363 83.47%
CONTROL-2(STEM CUTTINGS OF PPR1)	363	363/363 100%	345/363 95.04%	321/363 88.42%	309 /363 85.12%	273 /363 75.20%	261 /363 71.90%
CONTROL-3(STEM CUTTINGS OF ICHINOSE)	363	162/363 44.62%	123/363 33.88%	81/363 22.31%	21 /363 05.78%	15 /363 04.13%	15 /363 04.13%
CONTROL-4(STEM CUTTINGS OF GOSHOERAMI)	363	264/363 72.72%	216/363 59.50%	123/363 33.88%	111 /363 30.57%	96 /363 26.44%	69 /363 19.00%

<50% of Rooting/Survival

>50% of Rooting/Survival

Table 18 Rooting and survival data of somatic hybrids and control mulberry varieties (from planted bag grafts with stock material of Chinese white)

Variety/Hybrid Grafted on the Stock Material of Chinese White	No. of Bag Grafts Planted (08/03/2023)	% of Survival After 30 Days (07/04/2023)	% of Survival After 60 Days (08/05/2023)	% of Survival After 90 Days (08/06/2023)	% of Survival After 120 Days (07/07/2023)	% of Survival After 150 Days (07/08/2023)	% of Survival After 180 Days (08/09/2023)
CONTROL-3 (BAG GRAFTS OF ICHINOSE)	121	100/121 82.64%	95/121 78.51%	95/121 78.51%	89/121 73.55%	86/121 71.07%	75 /121 61.98%
CONTROL-4 (BAG GRAFTS OFGOSHOERAMI)	121	108/121 89.25%	103/121 85.12%	97/121 80.16%	82 /121 67.76%	73 /121 60.33%	67 /121 55.37%

<50% of Rooting/Survival

>50% of Rooting/Survival

Project title and code: Evolving superior mulberry varieties for temperate region through *in vitro* mutagenesis (PIC03014SI)

Investigator(s): Dr. Gulab Khan Rohela, Dr. Pawan Saini, Dr. Ashok Kumar Kasukurthi

Project Duration: June, 2022 - May, 2025

Objectives:

1. Induction of callus from different explants
2. *In vitro* mutagenesis (treatment of induced callus with mutagenic agents).
3. Raising of mutant mulberry lines from mutated callus through *in vitro* regeneration.
4. Screening of mutants for better leaf yield and rooting abilities over existing ruling varieties of temperate region (PRT Trials).

Progress:

1. Sub-Culturing of Callus:

To multiply callus derived from various explants (leaf, petiole, and nodal explants) of four ruling mulberry varieties (PPR-1, Goshierami, Ichinose, and Chinese white) for further use in *in vitro* mutagenesis.

- Selection of Mulberry Varieties: The study focused on four superior mulberry cultivars: PPR-1, Goshierami, Ichinose, and Chinese White. These varieties were chosen due to their agronomic importance and potential for genetic improvement.
- Induction and Sub-culturing of Callus: Callus was initially induced (during 2022-23) from various explants (such as leaf, stem, and root) of these mulberry varieties. The induced callus was then sub-cultured (during 2023-24) on Murashige and Skoog (MS) basal medium, a widely used nutrient medium in plant tissue culture. The sub-culturing process was carried out in three batches, ensuring consistent and robust callus multiplication. As per the observations, leaf explant based callus of all the mulberry varieties are multiplied and the callus was found as fragile nature and suitable for carrying *in vitro* mutagenesis. Whereas petiole and nodal explant based callus were become compact and dark brown in colour. The compact and brownish type of callus is not suitable for carrying *in vitro* culture based experiments, hence these calli were discarded.
- Selection Criteria for Callus: The leaf explant based callus that exhibited a fragile nature was selected for subsequent experiments. Fragile callus is more amenable to chemical treatment, making it suitable for inducing mutations. The multiplication of this fragile callus was essential to provide a sufficient quantity of material for the mutagenesis experiments.

2. *In vitro* Mutagenesis

To induce genetic variability in mulberry callus using chemical mutagens, facilitating the development of improved cultivars with desirable traits.

- Chemical Mutagens Used: The multiplied callus was treated with various chemical mutagens (Figure 3), each known for its potential to induce genetic changes. The mutagens used included:

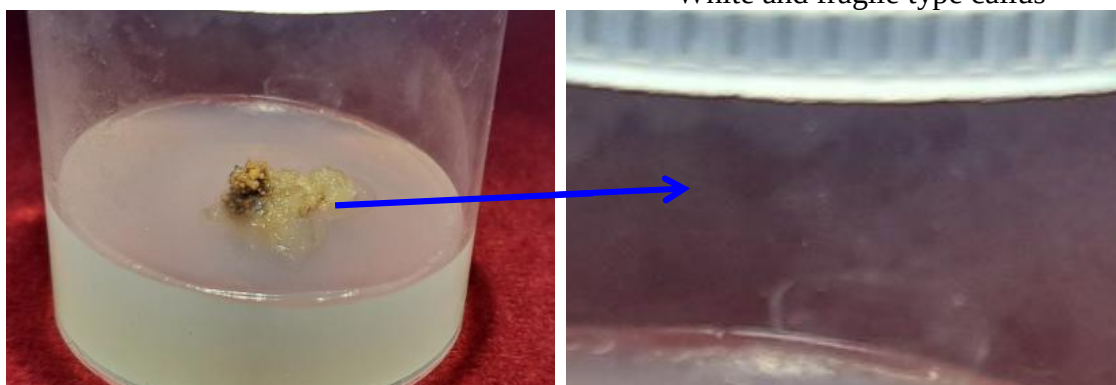
1. Nitroso Ethyl Urea (NEU): Known for its ability to induce point mutations, NEU was used at concentrations ranging from 0.01% to 0.50%.
 2. Methyl Methanesulphonate (MMS): A chemical mutagen that alkylates DNA, leading to mutations. MMS was also applied in varying concentrations (0.01% to 0.50%).
 3. Ethyl Methanesulphonate (EMS): A commonly used chemical mutagen that induces random mutations by alkylating guanine bases. EMS was tested in concentrations similar to NEU and MMS.
 4. Diethyl Sulphate (DES): Another alkylating agent, DES was included to assess its effectiveness in generating mutations in mulberry callus.
 5. Sodium Azide (SA): Known for its mutagenic effects in various plant species, SA was used as an alternative mutagenic agent.
 6. Hydroxyl Amine (HA): A mutagen that introduces mutations by modifying DNA bases. HA was tested to explore its potential for inducing genetic changes in mulberry callus.
- Media Preparation and Sterilization: The preparation of MS media and its sterilization were carefully conducted to ensure a sterile environment for callus inoculation and mutagen treatment. This step is critical to prevent contamination, which can affect the outcomes of in vitro experiments.
 - Inoculation of Explants: Following media preparation, the explants (tissue samples) were inoculated to induce fresh callus. This step involved placing the explants on the sterilized MS media under controlled conditions to promote callus formation.
 - Treatment of Callus with Combinations of Mutagens: The leaf explant based induced and sub-cultured callus of fragile nature of each variety was subjected to individual chemical mutagen treatment was carried in different concentrations (Table 19). In table 12; *in vitro* mutagenesis in PPR-1 leaf explant based callus was represented. The leaf induced and sub-cultured fragile callus of every variety was subjected to different concentrations of individual chemical mutagens. Responses related to division with fragile nature were recorded after 20 and 45 days of Culture, as per the observations; good response in terms of multiplication of callus with retaining of fragile nature was obtained from the treatments of 0.01%-0.08% EMS, 0.01%-0.08% MMS, 0.01%-0.08% DES, 0.01%-0.06% SA, 0.01%-0.10% NEU and 0.01%-0.02% HA-HCl (Figure 4).
 - Conclusion: The achievements made in the 2023-24 research period have successfully sub-cultured the leaf based callus with fragile nature. The treatments experiments of fragile callus with different concentrations of chemical mutagens have provided the suitable concentration of mutagens. Further in 2024-25, the chemical mutagen treated callus of fragile nature will be subjected to regeneration studies for the evolving the mutant lines of mulberry.

CHEMICAL MUTAGENS



Figure 3 Chemical Mutagens

Multiplication of treated (0.01% EMS) callus of PPR1
White and fragile type callus



Multiplication of treated (0.04% MMS) callus of PPR1

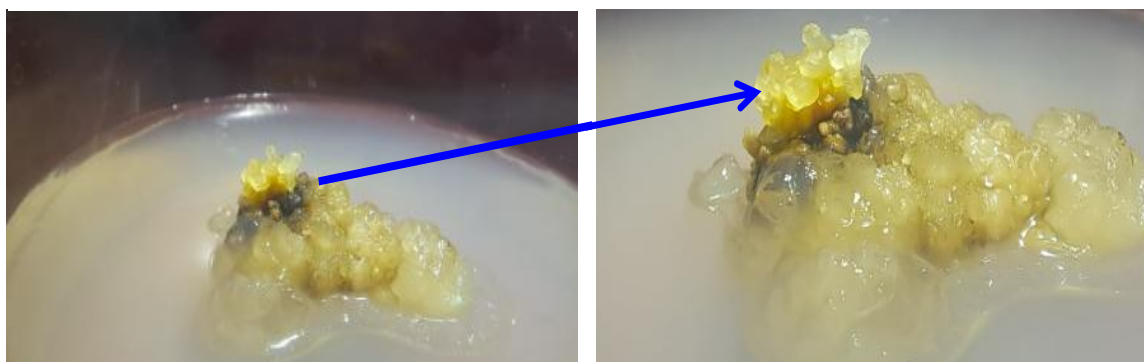


Figure 4 Response of chemical mutagens treated leaf explant based callus of PPR-1

Table 19 Treatment of leaf explant (PPR-1) based callus with different chemical mutagens.

#	Chemical Mutagen	Conc. of Chemical Mutagen (%)	Response of Treated Callus after 20 Days of Culture	Status of Callus after 45 Days of Culture
1	Ethyl Methane Sulfate	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Multiplication of Callus was observed	Callus is Fragile in nature
		0.06	Multiplication of Callus was observed	Callus is Fragile in nature
		0.08	Multiplication of Callus was observed	Callus is Fragile in nature
		0.10	Callus has turned into brownish and become compact	Callus is compact in nature
		0.20	Callus has turned into brownish and become compact	Callus is compact in nature
		0.30	Callus has turned into brownish and become compact	Callus is compact in nature
		0.40	Callus has turned into brownish and become compact	Callus is compact in nature
		0.50	Callus has turned into brownish and become compact	Callus is compact in nature
2	Methyl Methane Sulfate	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Multiplication of Callus was observed	Callus is Fragile in nature
		0.06	Multiplication of Callus was observed	Callus is Fragile in nature
		0.08	Multiplication of Callus was observed	Callus is Fragile in nature
		0.10	Multiplication of Callus was observed	Callus is compact in nature
		0.20	Multiplication of Callus was observed	Callus is compact in nature
		0.30	Callus has turned into brownish and become compact	Cultures were Discarded
		0.40	Callus has turned into brownish and become compact	Cultures were Discarded
		0.50	Callus has turned into dark brownish and become compact	Cultures were Discarded

Cont. Table 19 Treatment of leaf explant (PPR-1) based callus with different chemical mutagens.

#	Chemical Mutagen	Conc. of Chemical Mutagen (%)	Response of Treated Callus after 20 Days of Culture	Status of Callus after 45 Days of Culture
3	Hydroxylamine Hydrochloride	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Callus has turned into brownish and become compact	Callus is compact in nature
		0.06	Callus has turned into dark brownish and become compact	Callus is compact in nature
		0.08	No Divisions were observed	Callus is compact in nature
		0.10	No Cell Divisions were observed	Cultures were Discarded
		0.20	No Cell Divisions were observed	Cultures were Discarded
		0.30	No Cell Divisions were observed	Cultures were Discarded
		0.40	No Cell Divisions were observed	Cultures were Discarded
		0.50	No Cell Divisions were observed	Cultures were Discarded
4	Sodium Azide	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Multiplication of Callus was observed	Callus is Fragile in nature
		0.06	Multiplication of Callus was observed	Callus is Fragile in nature
		0.08	Multiplication of Callus was observed	Callus is compact in nature
		0.10	Multiplication of Callus was observed	Callus is compact in nature
		0.20	Callus has turned into dark brownish and become compact	Cultures were Discarded
		0.30	Callus has turned into dark brownish and become compact	Cultures were Discarded
		0.40	Callus has turned into dark brownish and become compact	Cultures were Discarded
		0.50	Callus has turned into dark brownish and become compact	Cultures were Discarded

Cont. Table 19 Treatment of leaf explant (PPR-1) based callus with different chemical mutagens.

#	Chemical Mutagen	Conc. of Chemical Mutagen (%)	Response of Treated Callus after 20 Days of Culture	Status of Callus after 45 Days of Culture
5	Diethyl Sulfate	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Multiplication of Callus was observed	Callus is Fragile in nature
		0.06	Multiplication of Callus was observed	Callus is Fragile in nature
		0.08	Multiplication of Callus was observed	Callus is Fragile in nature
		0.10	Treated callus had turned into brownish color	Callus is compact in nature
		0.20	Treated callus had turned into brownish color	Callus is compact in nature
		0.30	Treated callus had turned into brownish color	Callus is compact in nature
		0.40	Treated callus had turned into brownish color	Callus is compact in nature
		0.50	Treated callus had turned into brownish color	Callus is compact in nature
6	N-Nitroso-N-ethyl Urea	0.01	Multiplication of Callus was observed	Callus is Fragile in nature
		0.02	Multiplication of Callus was observed	Callus is Fragile in nature
		0.04	Multiplication of Callus was observed	Callus is Fragile in nature
		0.06	Multiplication of Callus was observed	Callus is Fragile in nature
		0.08	Multiplication of Callus was observed	Callus is Fragile in nature
		0.10	Multiplication of Callus was observed	Callus is Fragile in nature
		0.20	Treated callus had turned into brownish color	Cultures were Discarded
		0.30	Callus has turned into dark brownish and become compact	Cultures were Discarded
		0.40	No Cell Divisions were observed	Cultures were Discarded
		0.50	No Cell Divisions were observed	Cultures were Discarded

3. Project title and code: Development of high yielding quality mulberry (*Morus* spp.) genotypes under sub-tropical conditions of Northern India (PIB03013SI)

Investigators involved: Dr.Santoshkumar Magadum (PI) and Yallappa H. (CI)

Project period: June, 2022 - May, 2026

Objective:

- To develop promising mulberry genotypes with better productivity and leaf quality over the existing ruling variety in North West India.

Progress achieved:

➤ Raising of F₁ progenies in nursery under controlled conditions at RSRS, Jammu

- Hybrid progeny seeds were harvested from 16 female parents present in Polyclonal Seed Orchard at CSR&TI, Berhampore and were sown in cement pots at RSRS, Jammu.
- A total of 865 hybrid seedlings were raised in cements pots. Based on the different morphological characters, a total of 331 hybrid progeny seedlings were selected (Figure 5).
- Further, as per the suggestions of 44th RAC of CSR&TI Pampore, fresh seeds were collected again from CSR&TI, Berhampore and sown under controlled field conditions for raising sufficient number of seedlings for better evaluation.
- Freshly collected seeds were sown under rainout shelter polyhouse for better germination and higher survivability of seedlings (Figure 6).

➤ Selection and transplantation of hybrid progenies in main field

- More than 4000 seedlings were raised under controlled conditions. A total of 605 hybrid progenies were selected based on different morphological characters viz., leaf greenness, leaf smoothness, leaf thickness, leaf entireness (lobation), leaf erectness, better plant health/height, plant erectness etc.
- A total of 936 selected hybrid progeny seedlings (331 seedlings from cement pots and 605 seedlings from rain out shelter poly-house) were transplanted in main field in Augmented Block Design by using four check varieties (S-146, S-1635, C-2038 and C-1360) for further evaluation under Progeny Row Trial.
- FYM and inorganic fertilizers applied. Necessary irrigation provided. Weeding and digging carried out.
- All the hybrid progenies are being maintained appropriately by following all the local cultural practices for better establishment in main field (Figure 7).



Figure 5 Sowing of hybrid seeds and maintenance of seedlings in cement pots



Figure 6 Sowing of fresh hybrid seeds under rainout shelter and maintenance of seedlings



Figure 7 Transplantation, establishment and maintenance of hybrid progenies in main field

4. Project title and code: Evaluation of mulberry genotypes for improvement in productivity and quality under sub-tropical conditions of Jammu (PIE03009SI)

Investigators involved: Dr.Santoshkumar Magadum (PI)

Project period: December, 2021 - November, 2025

Objectives:

- To evaluate newly developed mulberry genotypes for leaf yield and associated agronomic characters.
- To assess leaf quality traits through physio-biochemical parameters and silkworm rearing for prospective commercial utilization.

Progress achieved:

- Seven test genotypes (PPY-3, PPY-6, PPY-7, A-6, A-9, D-33 and S-106) along with three controls (S-146, C-2038 and G-4) were multiplied and transplanted in main field in RBD design.
- All the test genotypes were established and maintained appropriately in main field by following all the recommended cultural practices (Figure 8).
- After the establishment, all the test genotypes along with controls were evaluated for growth, yield and leaf quality parameters during summer and autumn seasons in 2023.

Evaluation of test genotypes during Summer, 2023

After establishment of all test genotypes in main field, the first season data on growth, yield and leaf quality characters was recorded from all the test genotypes and check varieties during Summer 2023. It has been observed that there is significant difference among all the test genotypes for all the characters studied. It has been recorded that leaf yield per plant (kg) was highest in PPY-6 (0.541 kg) followed by PPY-3 (0.524 kg) and PPY-7 (0.492 kg) and were out performing as compared to three check varieties. Number of leaves per meter of shoot was higher in D-33 (27) followed by A-6 (24) and PPY-6 (23). Similarly, leaf moisture content (%) was highest in PPY-6 (77.33%) followed by PPY-7 (74.66%) and A-9 (74.66%) (Table 20).

Table 20 Data recorded on growth, yield and leaf quality characters of test genotypes during Summer, 2023

#	Genotype	No. of new shoots/plant	Longest shoot length (cm)	No. of leaves / meter	Inter-nodal distance (cm)	Diameter of shoot (cm)	Total shoot length/plant (cm)	Leaf yield/plant (Kg)	Leaf area (cm ²)	Petiole length (cm)	Weight of 10 fresh leaves (g)	Leaf Moisture Content (%)	Moisture Retention Content (%)
1	PPY-3	8	147	21	4.8	3.6	1050	0.524	274	3.3	28.20	72.98	62.15
2	PPY-6	8	151	23	4.3	3.5	1073	0.541	295	3.2	35.91	77.33	63.92
3	PPY-7	7	135	21	4.8	3.8	910	0.492	280	3.2	42.96	75.14	65.18
4	A-6	6	125	24	4.2	3.3	716	0.386	300	3.5	32.10	71.53	60.93
5	A-9	6	160	21	4.8	3.5	850	0.481	240	4.2	46.81	74.66	60.77
6	D-33	6	128	27	3.7	3.1	550	0.288	187	2.5	20.51	70.94	47.63
7	S-106	5	130	19	5.3	3.6	550	0.372	380	4.0	54.80	71.73	61.90
8	S-146 (ch)	7	132	22	4.5	3.4	870	0.308	255	4.0	34.48	74.01	53.49
9	C-2038 (ch)	8	150	22	4.5	3.4	1015	0.385	320	4.5	35.65	73.94	58.54
10	G-4 (ch)	7	110	21	4.8	3.3	600	0.354	255	3.0	35.62	72.94	57.39
	CD at 5%	1.04	13.61	0.92	0.19	0.33	203.74	0.11	59.08	0.43	5.48	1.97	8.58
	SE.m±	0.35	4.58	0.31	0.06	0.11	68.57	0.04	19.89	0.14	1.84	0.66	2.89
	SE(d)	0.49	6.48	0.44	0.09	0.16	96.98	0.05	28.12	0.20	2.61	0.94	4.08
	CV (%)	8.99	5.72	2.45	2.40	5.45	14.18	14.30	11.89	6.97	8.17	1.56	8.51

Evaluation of test genotypes during Autumn, 2023

All the test genotypes along with check varieties were evaluated for growth, yield and leaf quality characters during Autumn season 2023. It has been observed that there is significant difference among all the test genotypes for all the characters studied, except diameter of the shoot. It has been recorded that leaf yield per plant (kg) was highest in PPY-6 (0.662 kg) followed by PPY-3 (0.616 kg) and PPY-7 (0.504 kg) and were out performing as compared to three check varieties. Number of leaves per meter of shoot was higher in D-33 (26) followed by A-6 (23) and PPY-6 (22). Similarly, leaf moisture content (%) was highest in PPY-6 (75.31%) followed by PPY-3 (73.07%) and PPY-7 (72.34%) (Table 21).

Table 21 Data recorded on growth, yield and leaf quality characters of test genotypes during Autumn, 2023

#	Genotype	No. of new shoot s/ plant	Longest shoot length (cm)	No. of leaves / meter	Inter-nodal distance (cm)	Diameter of shoot (cm)	Total shoot length/ plant (cm)	Leaf yield/ plant (Kg)	Leaf area (cm ²)	Petiole length (cm)	Weight of 10 fresh leaves (g)	Leaf Moisture Content (%)	Moisture Retention Content (%)
1	PPY-3	10	153	21	4.7	3.4	1110	0.616	221	3.5	31.66	73.07	67.05
2	PPY-6	10	147	22	4.5	3.4	1060	0.662	282	3.4	35.69	75.31	69.63
3	PPY-7	8	115	21	4.8	3.4	880	0.504	322	3.4	38.94	72.34	66.89
4	A-6	7	133	23	4.3	3.3	812	0.479	285	4.4	33.03	70.67	61.86
5	A-9	7	148	20	5.1	3.4	937	0.436	292	4.0	38.08	71.60	61.61
6	D-33	7	113	26	3.8	3.0	538	0.357	194	3.1	27.72	70.73	62.91
7	S-106	5	103	18	5.5	3.3	475	0.307	428	5.3	58.08	70.36	65.87
8	S-146 (ch)	8	112	21	4.6	3.2	797	0.283	232	4.1	29.07	70.97	58.54
9	C-2038(ch)	8	128	20	4.9	3.4	967	0.347	390	5.5	42.98	70.43	63.26
10	G-4 (ch)	8	127	20	5.1	3.5	803	0.322	267	4.0	32.53	68.30	57.08
	CD at 5%	1.44	17.59	1.09	0.27	NA	187.09	0.11	50.63	0.51	4.89	0.84	2.32
	SE.m±	0.48	5.92	0.37	0.09	0.15	62.97	0.04	17.04	0.17	1.64	0.28	0.78
	SE(d)	0.68	8.37	0.52	0.13	0.21	89.05	0.05	24.10	0.24	2.33	0.40	1.11
	CV (%)	10.68	8.01	2.97	3.31	7.86	13.02	14.58	10.13	7.29	7.74	0.69	2.11



Figure 8 Establishment and maintenance of test genotypes in main field of RSRS, Jammu

RESEARCH PROJECTS CONCLUDED AS PI DURING 2023-24 (CSB CODED):**1. Project title and code: Development of autumn specific bivoltine silkworm (*Bombyx mori* L.)hybrids suitable for temperate region of Jammu & Kashmir (AIB03007SI)****Project Duration:** March, 2021 – February, 2024**Investigator:** Sh. Bharath Kumar Neelaboina**Objective(s):**

- To develop stable autumn specific bivoltine hybrids to suit the temperate region of Jammu & Kashmir
- To increase autumn season cocoon yields in the temperate region of Jammu & Kashmir

Progress:

OST trial completed as per schedule at CSR&TI, Pampore, RSRS, Jammu and RSRS, Sahaspur during spring and autumn 2023. A total of 10 DFLs of shortlisted autumn specific hybrid Line-18 × Line-6 were reared along with control SH6×NB4D2 at three locations to assess the yield during different seasons and at different locations (Figure 9). The OST yield data recorded at three locations is presented in the following table 22.

Figure 9 On-Station Trial of the test hybrid at three locations**Table 22** Yield comparison of ASH14 during spring and autumn season of 2023

Test Site	Yield (kg)/ 100 DFLs Spring 2023		
	ASH-14	SH6xNB4D2	Improvement Over Control (%)
CSR&TI, Pampore	64	55	14.06
RSRS, Jammu	53	43	18.87
RSRS, Sahaspur	69	64	7.25
Avg.	62	54	12.90
Test Site	Yield (kg)/ 100 DFLs Autumn 2023		
	ASH-14	SH6xNB4D2	Improvement Over Control (%)
CSR&TI, Pampore	68	57	63
RSRS, Jammu	58	49	54
RSRS, Sahaspur	63	55	59
Avg.	63	54	58

2. Project title and code: Development of nutrigenetic hybrids of bivoltine silkworm (*Bombyx mori* L.) under sub-tropical conditions of North-West India (AIB03008SI)

Duration: March, 2021 to February, 2024

Investigators: Dr. Kiran R, Dr.Santoshkumar Magadum, Sh. Chhattar Pal

Objective: Development of superior bivoltine silkworm nutrigenetic hybrids under sub-tropical conditions for enhancement of cocoon productivity.

Using a partial diallel crossing design, a total of fifteen hybrids, along with control hybrid, were reared during spring and autumn seasonal rearing during 2021 and 2022 as part of a hybrid evaluation process. This evaluation assessed rearing performance, cocoon quality, and nutrigenetic characteristics of all fifteen hybrids. Following the hybrid evaluation, three season-specific hybrids emerged as the most promising candidates based on their superior performance in terms of rearing efficiency, cocoon yield, and silk quality: CSR50xBcon1 and CSR50xBcon4 for spring rearing and CSR50xBcon1 and RSJ14xBcon1 for autumn rearing. These three shortlisted hybrids were then subjected to field trials conducted at three locations (CSR&TI, Pampore; RSRS Jammu; and Sahaspur) during the spring and autumn seasons of 2023. The shortlisted hybrids demonstrated significant improvement over the control hybrid, SH6xNB4D2. Data from the trial are mentioned in the following Tables 23 and 24.

Table 23 Comparative yield performance of two test hybrids and control during spring seasonal rearing of 2023

Region	CSR50x Bcon1 (Test-1)	CSR50x Bcon4 (Test-2)	SH6x NB4D2 (Control)	% Improve. of (Test-1) over Control	% Improve. of (Test-2) over Control
CSR&TI, Pampore	66.21	70.81	58.93	11.00	16.78
RSRS, Sahaspur	67.43	69.28	64.75	3.97	6.54
RSRS, Jammu	57	59	43.4	23.86	26.44

Table 24 Comparative yield performance of two test hybrids and control during autumn seasonal rearing of 2023

Region	CSR50x Bcon1 (Test-1)	RSJ14x Bcon1 (Test-2)	SH6x NB4D2 (Control)	% Improve. of (Test-1) over Control	% Improve. of (Test-2) over Control
CSR&TI, Pampore	62.1	66.5	50.36	18.9	24.27
RSRS, Sahaspur	62.65	63.2	52.2	16.68	17.41
RSRS, Jammu	59.5	67.34	54.9	7.73	18.47

3. Project title and code: Popularization of mulberry sericulture in Kargil (Ladakh UT) (MOT03011MI)

Project Duration: March, 2022 to February, 2024

Investigator(s): Dr. Muttanna (April, 2022 to November, 2023), Sh. Kumaresan P (November, 2022 to February, 2024) and Zaffar Iqbal Buhroo (March 22 to February 2024)

Objectives:

- To understand the context and interest of local people of Kargil towards mulberry sericulture with respect to their existing livelihood
- To organize a large-scale demonstration for awareness creation and building of capacities of the stakeholders of sericulture in Kargil

Progress:

A comprehensive assessment determined the feasibility of mulberry sericulture in Batalik Sector, Kargil. To enhance mulberry cultivation, 3000 mulberry saplings were strategically planted in May 2023. To disseminate information among local stakeholders, informative technical bulletins and folders were distributed throughout the selected villages. Additionally, educational awareness classes were incorporated into the curriculum of schools and colleges in Kargil district to promote mulberry sericulture.

A silkworm rearing demonstration was conducted in Batalik Sector to provide hands-on experience to farmers. During this demonstration, 100 DFLs were carefully brushed on July 11, 2023, under the expert guidance of investigators and technical staff. This practical training resulted in a cocoon yield of 44.26 kg/100 DFLs, offering farmers valuable insights into the intricacies of silkworm rearing. The rearing performance during silkworm rearing demonstration at farmer's levels were mentioned under below (Table 25; Figure 10).

Table 25 Rearing performance of Silkworm rearing demonstration at farmers level

Year	Hybrid	Date of Hatching	Hatching %	Larval period (D)	Wt. of 10 mature larvae (g)	Cocoon Yield / 100DFLs (kg)	Single Cocoon wt.(g)	Single shell wt.(g)	Shell ratio%
2023	FC1xFC2	11/07/2023	95	30	39	44.26	1.60	0.30	18.75



The plantation drive in the selected villages (Batalik, Chulichan and Darchick) of Batalik sector



Survivability of Mulberry plantation at Batalik Sector



The Mulberry cultivation class at University of Ladakh, Kargil



The awareness creation about mulberry sericulture through technical bulletins



The Brushing of 100 DFLs and silkworm rearing demonstration in Batalik sector and rearing at farmers level



The harvesting of cocoons by selected farmers



The silkworm rearing demonstration at farmers level



The harvested cocoons during Silkworm rearing demonstration at Batalik Sector

Figure 10 Silkworm rearing demonstration in Batalik sector of Kargil at farmer's level for awareness creation of mulberry sericulture among stakeholders

4. Project title and code: Evaluation of improved mulberry silkworm hybrids and technologies for North & North West India (MOE03010SI)

Component-I: Large scale farmer level trial of summer crop and its impact on autumn crop in selected areas of North West India (outcome of MOE-03001SI)

Project Investigators: Dr. Rita Singh, Dr. Santoshkumar Magadum, Dr. Kiran R, Dr. Sardar Singh

Objective: Large scale farmers level trial of summer crop and its impact on autumn crop in selected areas of North West India.

Progress: Large scale farmer level trial of summer crop and its impact on autumn crop in selected areas of North West India (outcome of MOE-03001SI): Trial was initiated through DOSs of HP and Jammu province of J&K during 2021 after concluding the project, latter on it became a part of TOT project (Code: MOE03010SI) from 2022 @ 2500 DFLs /crop. In HP DOS has introduced summer crop in Kinour, Kullu Mandi district in large scale as the outcome of summer rearing generating extra remuneration to the farmers besides securing good autumn crop. In Uttarakhand, 500 DFLs were reared during summer 2023 at different locations viz., Almora, Pauri Garhwal, Sahaspur and RSRS station. The data revealed that the yield per 100 DFLs harvested was 30 kg at Pauri Garhwal, 14.350 kg at Almora, 22.400 kg at Sahaspur and 27.200 kg at RSRS, Sahaspur. The impact of the project observed that significant cocoon yield improvement was noted in autumn crop compared to sole autumn crop.

Table 26 Rearing performance during summer 2023(June-July 2023)

Location (State/UT)		No. of DFLS reared	Cocoon Yield (Kg.)/100DFLS			
			Maximum	Minimum	Average	Range
Uttarakhand	Bilkhet, Pauri	100	50.400	19.200	30.000	19.200-50.400
	Almora	200	18.600	9.600	16.400	9.600-18.600
	RSRS, Sahaspur (PPP mode)	200	27.200	21.100	24.800	21.100-27.200
Jammu	Lamberi	575	37.300	29.300	33.04	29.300-37.300
	RSRS, Jammu	25	58.0	58.0	58.00	
Himanchal Pradesh	Ghumarwin	1400	40.00	8.60	23.26	8.600-40.00
	Total/Average	2500			30.91	8.600-50.400

Table 27 Rearing performance during Autumn 2023

Location (State/UT)		No. of DFLS reared	Cocoon Yield (Kg.)/100DFLS			
			Maximum	Minimum	Average	Range
Uttarakhand	Bilkhet, Pauri	200	22.600	11.000	15.00	11.000-22.600
	Almora	200	24.800	10.000	17.350	10.000-24.800
	RSRS, Sahaspur (PPP mode)	100	35.000	35.000	35.000	
	Total/Average	500		35.00	22.45	10.000-24.800

Component-II: Cocoon production improvement during Autumn rearing through fortification of mulberry leaf (PIN-3608)

Project Duration: March, 2022–February, 2024

Investigator (s): Sh. Bharath Kumar Neelaboina, Sh. Chhattar Pal, Dr.Rita Singh, Dr.Santoshkumar Magadum, Dr.Rajesh Kumar, Dr. Kiran R and Dr.Sardar Singh

Objective(s):

- Validation of technology for Autumn rearing through fortification of mulberry leaf with Glutamic acid.

Progress at Kashmir division:

A total of 10 farmers were selected for treatment (Application of 0.5% Glutamic acid) and 02 farmers as control (No application of 0.5% Glutamic acid) during autumn season 2023 at Kashmir zone (Pulwama and Shopian). An increase of 5.68% average gain on cocoon yield in treatments over control was observed in silkworm larvae fed with 0.5% Glutamic acid treated mulberry leaf. Additional revenue gain per farmer is Rs.1860/-. The data is presented here under

Table 28 Autumn 2023 farmer data at CSR&TI, Pampore (Pulwama dist. and Shopian dist.)

#	Farmer Name	Qty of DFLs	Resident
1	Sh. ZahidKhandey	50	Barbugh, Shopian
2	Sh. Bashid Syed	50	Barbugh, Shopian
3	Sh. Nasir Syed	50	Barbugh, Shopian
4	Sh. Mohd. YounusWani	50	Ladhoo, Pulwama
5	Sh. Muzimal	50	Ladhoo, Pulwama
6	Sh. JalaluddinWani	50	Ladhoo, Pulwama
7	Sh. GhulamMohd. Sheikh	50	Lalpora, Pulwama
8	Sh. Ali Mohd. Bhat	50	Mandoora, pulwama
9	Sh. Shabir Ahmad Dar	50	Sombura, Pulwama
10	Sh. Abdul Ahad Bhat	50	Choular, Pulwama
11	Sh.Shahid Syed	50	Barbugh, Shopian
12	Smt. ShabnumAkhtar	50	Sombura, Pulwama

Table 29 Autumn 2023 yield data at CSR&TI, Pampore (Pulwama dist. and Shopian dist.)

#	T/C	Yield/ 100DFLs (kg)	Gain % over control 1	Gain % over control 2	Yield gain (kg) over control 1	Yield gain (kg) over control 2
1	T1	44	-25.0	-9.1	-11.0	-4.0
2	T2	60	8.3	20.0	5.0	12.0
3	T3	56	1.8	14.3	1.0	8.0
4	T4	63	12.7	23.8	8.0	15.0
5	T5	65	15.4	26.2	10.0	17.0
6	T6	42	-31.0	-14.3	-13.0	-6.0
7	T7	66	16.7	27.3	11.0	18.0
8	T8	40	-37.5	-20.0	-15.0	-8.0
9	T9	50	-10.0	4.0	-5.0	2.0
10	T10	60	8.3	20.0	5.0	12.0
11	C1	55				
12	C2	48				

Figure 11 Dissemination of technology at the farmers rearing



Dissemination of technology at the farmers rearing

Progress at Himachal Pradesh:

Rearing of 1000 DFLs (500 DFLs in each season) was completed during summer and autumn season 2023 in Himachal Pradesh.

Summer trial 2023: During Summer season 2023, field trial was conducted with 250 DFLs treated with Glutamic acid and 250 DFLs as control. The overall yield of 37.460 kg/100 DFLs for treated (fortified) and 22.96 kg/100 DFLs for control batch during summer 2023 was recorded.

Name of Hybrid	Seed distributed (DFLs)	Total amino acid used (kg)	No of rearers	Total green cocoon harvested (kg)	Avg yield /100 DFLs	SCW (gm)	SSW (gm)	SR (%)
SH6x NB4D2	250 (Treated)	62.50	10	93.65	37.46	1.66	0.31	18.67
SH6x NB4D2	250 (Control)	00.00	10	57.40	22.96	1.34	0.24	17.54

*SCW: Average Single Cocoon Weight, SSW: Average Single Shell Weight, SR: Shell Ratio

Autumn trial 2023: During Autumn season 2023, field trial was conducted with 250 DFLs treated with Glutamic acid and 250 dfls as control. The overall yield of 40.360 kg/100 DFLs for treated (fortified) and 36.62 kg/100 DFLs for control batch during Autumn 2023 was recorded.

Name of Hybrid	Seed distributed (DFLs)	Total amino acid used (kg)	No of rearers	Total green cocoon harvested (kg)	Avg yield /100 DFLs	SCW (gm)	SSW (gm)	SR (%)
SH6x NB4D2	250 (Treated)	62.50	10	111.00	40.36	1.87	0.36	19.25
SH6x NB4D2	250 (Control)	00.00	10	91.55	36.62	1.61	0.29	18.01

*SCW: Average Single Cocoon Weight, SSW: Average Single Shell Weight, SR: Shell Ratio
Overall, the fortification of mulberry leaves with 0.5% Glutamic acid resulted in a considerable improvement in the yield, cocoon weight, shell weight and shell ratio.

Component-III: Revalidation of induction of water stress tolerance in mulberry under rainfed condition by application triazole compound (Paclobutrazol) (Outcome of PIP-3543)

Investigators involved: Dr.Santoshkumar Magadum

Project period: March, 2022 - February, 2024

Objectives:

- To determine the effective concentration of paclobutrazol conferring maximum water stress tolerance in the existing mulberry trees.
- Quantitative and qualitative assessment of mulberry trees treated with different concentrations of paclobutrazol.

- Validation and popularization of economical and effective dose of triazole (paclobutrazol) at farmers' field condition.

Progress achieved:

On Station Trial (OST):

The lead received from concluded project PIP-3543 that lower concentration (10-25 mg/litre) of paclobutrazol significantly improved leaf biomass of mulberry plantations by increasing net photosynthetic rates. Therefore, for identifying the appropriate and effective concentration of paclobutrazol required for the existing mulberry trees, an On Station Trial (OST) trial was conducted to evaluate different lower concentrations (10, 15, 20 and 25 mg/litre) of paclobutrazol and determine the effective concentration among them.

Experimental locations: Three locations viz., RSRS Jammu; DoS Nowshera and DoS Sunderbani

Mulberry plantation: The existing mulberry trees of S-146 variety (>10 years old) were selected.

Design: The experiment was carried out in Randomized Block Design (RBD) with 4 replications and 5 treatments.

Treatments: T₁ (10 mg/litre), T₂ (15 mg/litre), T₃ (20 mg/litre), T₄ (25 mg/litre) of paclobutrazol and T₅ (only water as Control).

Method of application of treatments: Paclobutrazol powder was dissolved in water to prepare the desired concentration of solution. The treatment solution was applied as a soil drench (3 litre/tree) at four intervals after 15 days each.

Data recorded: Data on growth, yield and leaf quality parameters were recorded after 90 days of the first application of the treatment (Table 30).

Table 30 Performance of different treatments for leaf yield per plant over the control at all test sites under OST.

Concentration of paclobutrazol	RSRS, Jammu		DoS, Nowshera		DoS, Sunderbani		Overall	
	Leaf yield/ plant (kg)	% increase over Control	Leaf yield/ plant (kg)	% increase over Control	Leaf yield/ plant (kg)	% increase over Control	Avg. leaf yield/ plant (kg)	Avg. % increase over Control
10 mg/lt (T ₁)	5.78	24.30 %	4.14	7.53 %	4.98	15.55	4.97	16.39
15 mg/lt (T ₂)	6.43	38.28 %	4.52	17.40 %	5.58	29.47	5.51	29.04
20 mg/lt (T ₃)	7.84	68.60 %	5.71	48.31 %	6.92	60.56	6.82	59.72
25 mg/lt (T ₄)	6.85	47.31 %	5.04	30.91 %	5.96	38.31	5.95	39.34
Control (T ₅)	4.65	-	3.85	-	4.31	-	4.27	-

Leaf yield per plant was maximum in treatment 20 mg/litre (T₃) with 59.72% of average per cent increase over control followed by 25 mg/litre (T₄) with 39.34% and 15 mg/litre (T₂) with 29.04%. The treatment 20 mg/litre (T₃) performed better among all the treatments at all the test sites. Therefore, based on the results of On Station Trial, it will be

concluded that 20 mg/litre paclobutrazol treatment found effective and significantly improved leaf biomass of mulberry plantations at all test sites. Further, the effective dose of 20 mg/litre paclobutrazol will be validated at farmers' field condition through On Farm Trial (OFT).

On Farm Trial (OFT):

The lead received from On Station Trial (OST) that 20 mg/litre paclobutrazol treatment found effective and significantly improved leaf biomass of mulberry plantations at all test sites. Therefore, for further validation and popularization of economical and effective dose of paclobutrazol at farmers' field condition, an On Farm Trial (OFT) was conducted in four locations viz., Lamberi (Rajouri district), Tanda (Reasi district), Tikri (Udhampur district) and GurahKalyal (Kathua district) covering 5 farmers at each location with a total of 20 farmers.

Mulberry plantation: The existing mulberry trees of >10 years old were selected.
Number of trees selected: 5 trees as treatment and 5 trees as control

Data recorded: Data on various parameters were recorded for all five trees applied with effective dose of paclobutrazol (20 mg/litre) and also from control trees at all the selected farmers' field conditions. Treatment performed better than the control at all the test sites. Among the trees treated with paclobutrazol chemical, leaf yield per plant ranged from 8.615 kg to 16.552 kg with an average of 12.440 kg under treatment and 8.987 kg under control conditions (Table 31).

Data recorded was subjected to Paired t-test analysis. The extremely low p-values (close to zero) indicate that the means of the two groups are significantly different. The positive t-statistic suggests that the mean of the "Treatment" group is significantly higher than that of the "Control" group. The results of the paired t-test provide strong evidence that there is a significant difference between the two groups, with the "Treatment" group having a significantly higher mean than the "Control" group.

Table 31 Performance of leaf yield and quality characters over the control at all test sites under OFT

Characters	Control average	Treatment average	% increase over control
New shoots per plant	42.90	64.25	49.76
Leaf yield per plant (kg)	8.987	12.440	38.42
Weight of 10 fresh leaves (g)	33.67	46.27	37.39
Moisture content (%)	66.31	74.17	11.84
Moisture retention capacity (%)	64.08	81.41	27.04

Conclusion:

The leaf yield per plant of mulberry trees treated with 20 mg/litre of paclobutrazol chemical recorded 38.42% increase over control. Similarly, new shoots per plant, weight of 10 fresh leaves, moisture content and moisture retention capacity of leaves recorded 49.76%, 37.39%, 11.84% and 27.04% increase over control, respectively. Therefore, based on the results of On Farm Trial (OFT) conducted at 20 farmers' field conditions, it may be concluded that 20 mg/litre paclobutrazol treatment found effective and significantly improved leaf biomass of mulberry plantations at all test sites.

This provides an economic, eco-friendly and easy technology to sericulture farmers of NW India for improvement of mulberry foliage under rainfed water stress condition and increase in quality silk production. Further, the technology needs to be popularized among sericulture farmers through extension activities of Department of Sericulture of different NW Indian states.

Component IV: Evaluation of Identified Bivoltine Silkworm Hybrids for Temperate Region of North West India (Outcome of AIB-3626)

Project investigator (s): Sh. Bharath Kumar Neelaboina, Dr. Rajesh Kumar, Dr. Sardar Singh

Objectives:

- **OST:** To evaluate the performance of spring and summer specific hybrid CSR 27 × Pam 117 and autumn specific hybrid Line-7 × N5 at three test locations.
- **OFT:** To evaluate the performance of CSR 27 × PAM 117 during summer and Line-7 × N5 during autumn at Farmer Level.

Progress:

OST'2022: During spring season the performance of spring and summer specific hybrid CSR 27 × Pam 117 was demonstrated at Pampore the potential yield 67.6 kg/100DFLs were achieved over the control SH6 × NB4D2 (64.20 kg/DFLs). Similarly, during summer season the potential yield 56.80 kg/100DFLs were recorded over the control 48.10 kg/100 DFLs. However, during autumn season the yield achieved by the test hybrid is 43.00 kg/100 DFLs and control 42.30 kg/100 DFLs were considerably less compared to spring and summer season.

In RSRS, Jammu the spring crop was undertaken with hybrid CSR 27 × Pam 117 and control hybrid FC1 × FC2. The potential yield 64.90 kg/100 DFLs was achieved by test hybrid CSR 27 × Pam 117 and control 74.20 kg/100 DFLs. During autumn season yield around 25.60 kg/100 DFLs recorded by hybrid NW24 (Line 7 × N5) and 56.00 kg/100 DFLs were recorded by control (FC1 × FC2).

In Uttarakhand, OST was conducted at RSRS, Sahaspur during spring season the potential yield 65.00 kg/100DFLs was recorded by hybrid CSR 27 × Pam 117 over the control CSR 2 × CSR 4 (62.00KG/100 DFLs). However, during autumn season the lower yield 32.00 kg/100 DFLs was recorded by NW24 (Line 7 × N5) and control 39.00 kg/100 DFLs (CSR 2 × CSR 4).

OFT'2022: Summer crop'2022 were conducted at Sumbar area of Gandarbal district and the potential yield 18.00 kg/100DFLs was achieved by the test hybrid CSR 27 × Pam 117. Due to non-synchronized emergence of both parents (Line-7 and N5), production of 500 DFLs of Line7xN5 unable to achieve during summer 2022.

Component-V: Soil health based fertilizer recommendation for DOS farms in North India (Outcome of PPS-3603)

Investigators involved: Dr. Santoshkumar Magadum, Dr. Gulab Khan Rohela, Dr. Ram Lakhan Ram, Sh. Chhattar Pal, Dr. Sardar Singh

Project period: March, 2022 - February, 2024

Objectives:

- To validate and provide a soil nutrient status based balanced recommendation of fertilizer application for mulberry cultivation in NW India.

Progress achieved:

Experimental details: Soil samples were collected by following standard soil sampling procedure from the DoS mulberry farms of Jammu region, Himachal Pradesh, Punjab and Haryana. A total of 10 DoS farms were selected from the above location/state and five soil samples from each DOS farm were collected for analyzing soil nutrient status (Table 32).

Procedure of Soil Testing: Soil samples were analysed by following standard soil analysis procedure through outsourcing from Department of Agriculture, Govt. of J&K, Jammu. All the soil samples were analysed to estimate 11 different soil parameters viz., pH, Electrical Conductivity (EC), Organic Carbon (OC), Nitrogen (N), Phosphorus (P), Potassium (K), Sulphur (S), Zinc (Zn), Copper (Cu), Iron (Fe) and Manganese (Mn).

Recommendations: Data was analyzed for availability of soil nutrient status and fertilizer application recommendations were given based on the soil nutrient status.

Most of the mulberry bush plantations in NW India are being maintained under rainfed conditions. Therefore, the fertilizer recommendations for mulberry bush plantations under rainfed conditions as recommended by CSR&TI, Pampore (for sub-tropical conditions: N:P:K: 150:75:75 kg/ha/year, FYM at 10 MT/ha/year, nitrogen in two split doses) were considered for calculation of fertilizer recommendations.

Table 32 Details of soil samples collected from different DoS farms of NW India.

State/ UT	DoS mulberry farm	No. of soil samples collected
Jammu region	Cherry, Udhampur district	5
	Pouni, Reasi district	5
	Nowshera, Rajouri district	5
	Barnoti, Kathua district	5
	Miran Sahib, Jammu district	5
Punjab	Sujanpur, Pathankot district	5
	Mukerian, Hoshiarpur district	5
Himachal Pradesh	Ghumarwin, Bilaspur district	5
	Nadaun, Hamirpur district	5
Haryana	Panchkula, Panchkula district	5
Total	10 DoS farms	50

Results:**Jammu division:**

DoS farm wise detail of soil nutrient status is given in (Table 33) and major observations are summarized below.

- I. DoS mulberry farm, Cherry, Udhampur: Soil samples were found to be slightly acidic in pH (<6.5). Lower average values for organic carbon (<0.65%), phosphorus (<15 kg/ha) and zinc (<0.6 ppm) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.
- II. DoS mulberry farm, Pouni, Reasi: Lower average values for organic carbon (<0.65%), nitrogen (<280 kg/ha) and phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.
- III. DoS mulberry farm, Nowshera, Rajouri: Soil samples were found to be neutral in pH. Lower average values for organic carbon (<0.65%), nitrogen (<280 kg/ha) and phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.
- IV. DoS mulberry farm, Barnoti, Kathua: Soil samples were found to be neutral in pH. Lower average values for organic carbon (<0.65%) and phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.
- V. DoS mulberry farm, Miran Sahib, Jammu: Soil samples were found to be neutral in pH. Lower average values for organic carbon (<0.65%) and nitrogen (<280 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.

Himachal Pradesh:

- I. DoS mulberry farm, Ghumarwin, Bilaspur: All the soil parameters recorded were either in medium or higher ranges when compared with standard values and didn't show any deficiency for any nutrient.
- II. DoS mulberry farm, Naduan, Hamirpur: All the soil parameters recorded were either in medium or higher ranges when compared with standard values and didn't show any deficiency for any nutrient.

Punjab:

- I. DoS mulberry farm, Mukerian, Hoshiarpur: Lower average values for organic carbon (<0.65%) and phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.
- II. DoS mulberry farm, Sujampur, Pathankot: Lower average values for phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.

Haryana:

- i. DoS mulberry farm, Panchkula: Lower average values for organic carbon (<0.65%), nitrogen (<280 kg/ha) and phosphorus (<15 kg/ha) were recorded whereas remaining all the soil parameters recorded were either in medium or higher ranges when compared with standard values.

Table 33 Soil nutrient status analysis (average values) of DoS farms of Jammu division of J&K, Himachal Pradesh, Punjab and Haryana

State/ UT	DoS Farm	pH	EC (ds/m)	OC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (ppm)	Zn (ppm)	Fe (ppm)	Mn (ppm)	Cu (ppm)
Jammu	Cherry, Udhampur	6.4	0.43	0.61	424.09	14.37	404.55	12.93	0.30	16.28	9.82	0.85
	Pouni, Reasi	6.7	0.49	0.31	219.13	11.70	328.33	13.25	0.99	17.22	11.34	1.01
	Nowshera, Rajouri	6.9	0.50	0.34	233.50	10.02	348.22	10.48	2.47	15.29	5.15	0.76
	Barnoti, Kathua	6.9	0.51	0.44	305.62	13.04	220.01	14.99	0.69	12.06	5.75	0.51
	Miran Sahib, Jammu	7.0	0.69	0.39	271.05	16.95	171.59	12.66	0.95	14.66	9.04	0.72
Himachal Pradesh	Ghumarwin, Bilaspur	7.0	0.50	0.91	629.66	18.68	167.02	11.81	0.90	11.07	5.92	0.44
	Naduan, Hamirpur	7.0	0.68	1.01	699.16	18.02	183.19	12.40	0.72	14.20	6.71	0.85
Punjab	Mukerian, Hishiarpur	7.0	0.71	0.50	350.90	13.03	182.31	12.12	0.80	13.16	7.92	0.82
	Sujanpur, Pathankot	7.0	0.68	0.70	488.10	12.87	183.73	10.78	0.83	16.51	7.95	0.70
Haryana	Panchkula, Haryana	7.0	0.65	0.39	269.66	13.83	181.40	11.89	0.76	15.48	7.91	0.65

Conclusion:

To maintain the overall soil health for the growth and maintenance of mulberry plants in selected DoS farms of North-West India, the following recommendations were provided based on the soil nutrient status of the respective sample.

Jammu division of J&K: It has been observed that majority of soil samples analyzed of Jammu division reported to possess lower amounts of organic carbon, nitrogen, phosphorous and zinc. Hence, application of farm yard manure (FYM) of 13 t/ha, neem coated urea of 289 kg/ha, single super phosphate of 419 kg/ha and zinc sulphate of 15-25 kg/ha was recommended respectively for application to improve the soil nutrient status for mulberry cultivation.

Himachal Pradesh: It has been observed that soil samples collected from the selected DoS mulberry farms of Himachal Pradesh state recorded either medium or higher range of soil nutrient status for all the soil parameters analyzed. None of the selected DoS farm showed deficiency or low nutrient status for any soil nutrients.

Punjab: It has been observed that majority of soil samples analyzed from the selected DoS mulberry farms of Punjab state reported to possess lower amounts of organic carbon and phosphorous. Hence, application of farm yard manure (FYM) of 13 t/ha and single super phosphate of 419 kg/ha was recommended respectively for application to improve the soil nutrient status for mulberry cultivation.

Haryana: It has been observed that majority of soil samples analyzed from the selected DoS mulberry farms of Haryana state reported to possess lower amounts of organic carbon, nitrogen and phosphorous. Hence, application of farm yard manure (FYM) of 13 t/ha, neem coated urea of 289 kg/ha and single super phosphate of 419 kg/ha was recommended respectively for application to improve the soil nutrient status for mulberry cultivation.

Soil nutrient based fertilizer application to mulberry plantations will help in increasing soil fertility, productivity and sustainability. Soil nutrient based fertilizer

application will help department of sericulture to understand nutrient status of soil, judicious application of fertilizers with minimum cost and less environmental pollution. Further, it will benefit the farmers in producing better quality and higher quantity of mulberry leaves with the application of recommended fertilizer doses.

Component-VI: Popularization of CRC concepts & its strengthening at selected DoS, CRC locations in North India.

Project investigator (s): Dr. Rita Singh, Sh. Chhattar Pal, Dr. Ram Lakhan Ram, Dr. Santoshkumar Magadum, Dr. Rajesh Kumar, Dr. Sardar Singh,

Objectives:

- Infrastructure mapping and assessment of extent and level of chawki rearing operation in North India.
- To workout measures for strengthening the CRCs operation in the region for its popularization among sericulture farmers.

Progress: Popularization of CRC concepts and its strengthening at selected DoS, CRC locations in North India. Under this component, the primary data was collected from CRCs of North-West states of India through field survey. Totally 49 CRCs of the following states were surveyed, Viz., Haryana (1 No.), Punjab (1 No.), Himachal Pradesh (5 Nos.), Uttarakhand (6 Nos.), Uttar Pradesh (11 Nos.), Jammu (15 Nos.) and Kashmir (10 Nos.). The survey data has been recorded on general information of the CRCs, technical assessment of CRCs and knowledge assessment of the CRC personnel.

Preliminary general observations:

- 30 out of 50 sampled CRCs are more than 15 years of age hence replacement of the garden is required.
- Rearing appliances at most of CRCs are critically inadequate as compare to the brushing load of CRC.
- Brushing load of each CRC needs to reassessed as per the infrastructure and equipments available.
- Irrigation facility available at 32 CRCs out of 50 CRCs sampled i.e. availability of irrigation facility is 64%.
- No of CRCs as reported is not matching as recorded in DOS documents specially in case of J&K.
- Technical knowledge of frontline CRC operators is poor-needs for training and exposure and skill up-gradations.
- DOSs on priority should propose suitable interventions under Silk Samagra-2 for up scaling and strengthening the CRCs and develop exclusive trained manpower for CRC operations.

CRCs Demonstration

Demonstration of CRC in respect to disinfection of CRC building, CRC appliances and CRC surroundings, handling of silkworm seeds, incubation of seeds (tem. and humidity), brushing, collection of chawki leaves, chopping of leaves and feeding were demonstrated among the staff of DOS in all the states.

CRCs demonstration in the following DoS locations has been conducted during project period (March'2022 to Feb'2024).

1. Jammu division (Lamberi, Rajouri)
2. Kashmir division (Dangara)
3. Himachal Pradesh (GhumarwinandLadda, Bilaspur)
4. Uttarakhand (Selaqui, Dehradun)
5. Uttar Pradesh (Karjikund, Basti)

Component-VII: On Farm Trial of BmNPV tolerant silkworm hybrids in North & North-West India (outcome of AIB-3569)

Project Duration: March, 2022 to February, 2024

Investigator(s): Dr. Sardar Singh, Sh. Kumaresan P, Sh. Bharath Kumar Neelaboina, Dr. Santoshkumar Magadum, Dr. Kiran R, Dr. Ram Lakhan Ram

Objectives:

- To popularizing newly developed BmNPV tolerant silkworm hybrids at farmers level in temperate and sub-tropical regions of North and North-West India

Progress:

Nine *BmNPV* disease resistant silkworm breeds were evolved under the project AIB-3475 and from these breeds, 20 disease resistant hybrids were tested at three locations viz., CSR&TI, Pampore, RSRS, Jammu and RSRS, Sahaspur under the project AIB-3569 and shortlisted the following region specific BmNPV tolerant silkworm hybrids based on highest EI from the pooled data.

Region	Silkworm hybrid
Kashmir	Pam DR4 x Pam DR6
Jammu and UP	Pam DR7 x Pam DR8
Uttarakhand	Pam DR1 x Pam DR6

The above shortlisted hybrids were tested at farmer's level in the form of OFT in North and North West India for Autumn, 2022 and Spring, 2023 season.

OFT locations: CSR&TI, Pampore (J&K), RSRS, Jammu(J&K), RSRS, Sahaspur(U.K) and REC, Basti (UP)

Autumn Crop, 2022

The results obtained from Autumn, 22 crop revealed that in Kashmir region a total 600 DFLs which comprised of 500 DFLs of PamDR4xPamDR6 and 100 DFLs of FC1xFC2 a ruling Double hybrid was used as control and distributed to 11 farmers in Pulwama Dist., and Anantanag Dist. Of Kashmir region. The potential yield of 34kg/100 DFLs was recorded by a single farmer only. The cocoon yield was ranged from 6.4kg to 34kg/100 DFLs (Table 34). Since the germ load during late age silkworm was out-breached due to climatic changes and un-warranted rain most of the farmers couldn't get expected results, since the control rearing was also affected due to disease incidence. The positive trend on potential yield of 34kg/100 DFLs indicates that there was a moderate level of disease tolerance capacity of selected hybrid combination was recorded.

Whereas in case of Uttar Pradesh region, which was selected as a test site since similar climatic condition is prevailed as like as Jammu region, the hybrid PamDR7xPamDR8 was found to performed better when compared to Kashmir region. A

total 600 DFLs which comprised of 500 DFLs of PamDR7xPamDR8 and 100 DFLs of FC1xFC2 and SH6xNB4D2 a ruling hybrid were tested with 12 farmers in Basti, Uttar Pradesh region in Autumn season. The results revealed that there was a cocoon yield ranged from 17.50kg to 51.20kg/100 DFLs and a potential cocoon yield was recorded 50kg/100 DFLs even in the unfavourable rearing season indicates that there was a good disease tolerance capacity in this PamDR7xPamDR8 was recorded (Table35)

Similarly, for Uttarakhand region, a total 600 DFLs of selected hybrid PamDR1xPamDR6 including 100 DFLs of FC1xFC2 and SH6xNB4D2 were distributed to 11 farmers in the Sahaspur region. The results revealed that there was a cocoon yield ranged from 9.47kg to 36kg/100DFLs with a potential yield of 36kg/100 DFLs was recorded. The result indicates that there was a moderate level of disease tolerance in this hybrid combination (Table 36). On the other hand data from the field trial conducted at Jammu region are provided in the table 37. Similarly, the post cocoon characters studied from the harvested cocoons of farmers during Autumn season at Kashmir region showed that there was a 842m filament length with 2.6 fine denier and the reelability was 82.86% recorded (Table-38).

The overall results obtained from all the three regions showed that the selected hybrid combinations were performed well for moderate disease tolerance in their respective regions particularly during Autumn rearing season was confirmed.

Table 34 Rearing performance of farmers level in Kashmir region during Autumn season

#	Name of the Farmers	Address	Hybrid	No. of DFLs brushed	Actual cocoon yield	Cocoon yield/100 DFLs	Gain % over Control 1	Gain % over Control 2
1	Fayaz Ahmad kumar S/O Gh Rasool	Arihal, Pulwama Dist.	PamDR4xPamDR6	50	6.00	12.00	-1.67	-1.25
2	Manzoor Ah.Kumar S/O Gh Rasool	Arihal, Pulwama Dist.	PamDR4xPamDR6	50	7.00	14.00	-1.29	-0.93
3	Ah.GaniWani S/O M Shaben	Pirpora, Pulwama Dist	PamDR4xPamDR6	50	3.20	6.40	-4.00	-3.22
4	NaseerAh.Wani	S/O Ah ganiwani	PamDR4xPamDR6	50	4.20	8.40	-2.81	-2.21
5	Fayaz Ah malik S/O Ganie Ah malik	PajirinPulwamDist	PamDR4xPamDR6	50	8.00	16.00	-1.00	-0.69
6	Bashir Ah Pedder S/O Mohd. Akrampedder	Nanil, Anantanagdist	PamDR4xPamDR6	50	7.20	14.40	-1.22	-0.88
7	Bilal Ah khan S/o Habib khan	Brisnoo, AnantanagDist	PamDR4xPamDR6	50	6.60	13.20	-1.42	-1.05
8	Gh Hussain Bhat S/O GhQadirKoka	Khoveripora, Anantanag Dist.	PamDR4xPamDR6	100	34.00	34.00	0.06	0.21
9	Amir Hussain S/O Gh Qadir	Bemidoora, Anantanag Dist.	PamDR4xPamDR6	50	0.00	0.00	0.00	0.00
10	Bashir Ah. Dar	Panerjagir, Troll	FC1xFC2(Cont.1)	50	16.00	32.00	0.00	0.16
11	Ali Mohd.Bhat	Mandoora Troll	FC1xFC2(Cont.2)	50	13.50	27.00	-0.19	0.00
	Total/Avg.			600	105.70			
Avg. Cocoon yield 105.70kg/600DFLs (Avg.cocoonyield/100 DFLs= 17.62kg/100 DFLs; Potential cocoon yield=34kg/100DFLs.)								

Table 35 Rearing performance of farmers level in Uttar Pradesh region during Autumn season

#	Name of the Farmer	Hybrid	No. Of DFLs brushed	Actual cocoon yield	Cocoon yield/100 DFLs	Gain % over control1	Gain % over control 2
1	Trishala Devi C/O Sri Shivkumar	Pam DR7 x Pam DR8	50	22.87	45.7	36.76	15.1
2	Smt. Anara Devi C/O Ramshinagar	Pam DR7 x Pam DR8	50	25.6	5.2	43.55	24.22
3	Smt. Vidyotana Devi C/O Shiv Prasad	Pam DR7 x Pam DR8	50	25.2	50.4	42.66	23.02
4	Smt. Dharma Devi C/O Ramgyan	Pam DR7 x Pam DR8	50	18.8	37.6	23.14	-3.19
5	Smt. Durgawati C/O Ramgyan	Pam DR7 x Pam DR8	50	19.4	38.8	25.52	0
6	Smt. Sharda C/O Saraju	Pam DR7 x Pam DR8	50	21.2	42.4	31.84	8.49
7	Km. Shailaja C/O Ramlagan	Pam DR7 x Pam DR8	50	9.07	18.1	-59.67	-114.36
8	Km. Chandani C/O Patlu Ram	Pam DR7 x Pam DR8	50	8.77	17.5	-65.14	-121.71
9	Smt. Kalawati C/O Ramdas	Pam DR7 x Pam DR8	50	10.4	20.8	-38.94	-86.54
10	Km. Seema C/O Uday Raj	Pam DR7 x Pam DR8	50	12.47	24.9	-16.06	-55.82
11	Smt. Usha C/O Ram Briksh	FC1 x FC2	50	14.47	28.9	0	-34.26
12	Smt. Kewala C/O Devala	SH6 x NB4D2 (Cont. 2)	50	19.4	38.8	25.52	0
Total/ Average:			207.65/600 DFLs				207.65
(Actual cocoon yield = 207.65 kg/600 DFLs) (Avg. Cocoon yield/ 100 DFLs; Potential cocoon yield = 50 kg/100 DFLs)							

Table36 Rearing performance of farmers level in Uttarakhand region during Autumn season

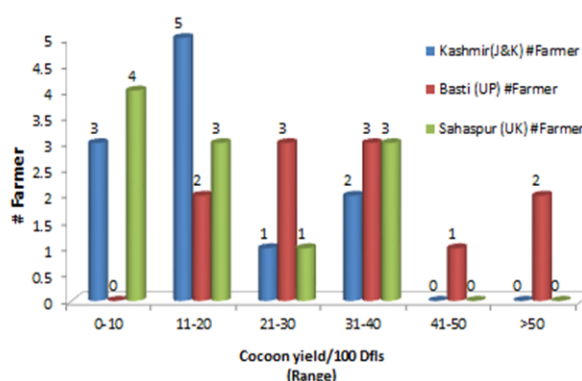
#	Name of the Farmer	Hybrid	No. Of DFLs brushed	Actual cocoon yield	Cocoon yield/100 DFLs	Gain % over control1	Gain % over control 2
1	Smt. Seema W/O Uday Singh	Pam DR1x Pam DR6	50	18.0	36.0	0.37	-0.09
2	Shri Shyam Singh S/O Balram	Pam DR1x Pam DR6	75	7.10	9.47	0.83	-3.14
3	Shri Virendar Singh S/O Ratnu	Pam DR1x Pam DR6	75	12.30	16.40	0.63	-1.39
4	Shri Mohan S/O Krishan	Pam DR1x Pam DR6	50	10.60	21.20	0.72	0.85
5	Smt. Bugli Devi S/O Krishan	Pam DR1x Pam DR6	50	0.0	0.00	0.00	0.00
6	Smt. Pinky W/O Ranveer	Pam DR1x Pam DR6	50	17.20	34.40	0.83	-0.14
7	Shri Om Prakash S/O Mahendra	Pam DR1x Pam DR6	50	6.60	13.20	0.55	-1.97
8	Shri Jaipal S/O Baliram	Pam DR1x Pam DR6	50	6.30	12.60	0.52	-2.11
9	Shri Mahindra S/O Jyoti	Pam DR1x Pam DR6	50	0.00	0.00	0.00	0.00
10	Shri Kalu S/O Kripal	Pam DR1x Pam DR6	50	3.0	6.00	0.00	-5.53
11	Smt. Savitri W/O Seeshpal	Pam DR1x Pam DR6	50	19.60	39.20	0.85	0.00
Total/ Average:			600	100.70			
Actual cocoon yield = 100.70 kg/600 DFLs (Avg. Cocoon yield/ 100 DFLs; Potential cocoon yield = 36 kg/100 DFLs)							

Table 37 Rearing performance of farmers level in Jammu region during Autumn season

Sl. No	Name of farmer with parentage	Village	Race	Qty of seed (Dfls)	Green Cocoon harvested in (Kg)	Av. Yield per 100 dfls in (Kg)	Single cocoon wt (gms)	Single Shell Wt (gms)	Shell Ratio (%)
01	Sh. Mohd Ishtyaq S/o Sh. Abdul Majid	Lamberi-A	PamDR7x PamDR8	25	10.000	40.000	1.486	0.301	20.25
02	Sh. Mohd Javed S/o Sh. Salamat Ali	Dhandani	PamDR7x PamDR8	50	16.000	32.000	1.417	0.281	19.83
03	Sh. Krishan Lal S/o Sh. Doulat Ram	Dhandani	PamDR7x PamDR8	50	18.000	36.000	1.433	0.276	19.26
04	Sh. Pawan Kumar S/o Sh. Jagdish Raj	Dhandani	PamDR7x PamDR8	50	19.500	39.000	1.440	0.283	19.65
05	Sh. Namit Sharma S/o Sh. Chander Mohan	Guroi Dharat	PamDR7x PamDR8	50	18.000	36.000	1.466	0.286	19.50
06	Sh. Mohd Anwar S/o Sh. Jan Mohd.	Dandaser	PamDR7x PamDR8	50	15.500	31.000	1.422	0.271	19.05
07	Sh. Mohd Tanvir S/o Sh. Mohd Azim	Dandaser	PamDR7x PamDR8	50	16.000	32.000	1.453	0.284	19.54
08	Smt. Priyanka Sharma w/o Sh. Rahul Metha	Guroi Dharat	PamDR7x PamDR8	50	17.500	35.000	1.482	0.292	19.70
09	Sh. Mohd Ishaq S/o Sh. Abdul Hussain	Chak Jarallan	PamDR7x PamDR8	50	17.500	35.000	1.476	0.292	19.78
10	Smt. TanzeemAkther S/o Sh. Sardar Ali	Dandaser	PamDR7x PamDR8	50	15.500	31.000	1.410	0.275	19.50
11	Sh. Ramesh Chander S/o Sh. Krishan Lal	Nalla/ Bagnoti	PamDR7x PamDR8	25	08.500	33.000	1.456	0.282	19.37
	TOTOL			500	172.000	34.400	1.449	0.283	19.53

Table 38 Post cocoon parameters of farmer's cocoon reared in Kashmir region during Autumn season

#	Parameter	Value obtained
1	Average filament length (m)	842 m
2	Avg. Denier (d)	2.6 d
3	Reelability (%)	82.86 %
4	Raw silk (%) Dry	31.79%
5	Silk waste %	8.94%
Post cocoon parameter of PamDR4x PamDR6 in Autumn, 2022 at Kashmir region (Sample size: 300)		

Comparative Performance of Cocoon yield in Autumn Trial, 2022

Spring Crop, 2023: The results obtained from Spring, 2023 crop revealed that in Kashmir region a total 600 DFLs which comprised of 500 DFLs of PamDR4xPamDR6 and 100 DFLs of FC1xFC2 a ruling Double hybrid was used as control and distributed to 12 farmers in Pampore and Troll zones of Kashmir region. The potential yield of 30kg/100 DFLs was recorded by three farmers. The cocoon yield was ranged from 20kg to 30kg/100 DFLs (Table 39). The positive trend on potential yield of 30kg/100 DFLs indicates that there was a moderate level of disease tolerance capacity of selected hybrid combination was recorded.

Whereas in case of Uttarakhand region, the hybrid PamDR1xPamDR6 was found to performed better when compared to Kashmir region. A total 600 DFLs which comprised of 500 DFLs of PamDR1xPamDR6 and 100 DFLs of FC1xFC2 and SH6xNB4D2 a ruling hybrid were tested with 9 farmers in Sahaspur region in Spring season. The results revealed that there was a cocoon yield ranged from 20kg to 35.5kg/100 DFLs and a potential cocoon yield was recoded 35.5kg/100 DFLs in favourable rearing season indicates that there was a good disease tolerance capacity in this PamDR1xPamDR6 was recorded (Table40). Similarly, the data from the field trials are provided in the table 41 and 42.

The post cocoon characters studied from the harvested cocoons of farmers during Spring season at Kashmir region showed that there was a 799m filament length with 2.42 fine denier and the reelability was 77.19% recorded (Table 43), when compared to control (FC1xFC2) which is lower than control, which showed 814m filament length with 2.7 denier and 81.13% reelability was obtained.

The overall results obtained from all the three regions showed that the selected hybrid combinations were performed well for moderate disease tolerance in their respective regions particularly during Spring rearing season was confirmed.

Table 39 Rearing performance of farmers level in Kashmir region during Spring season

#	Name of the Farmer	Address	Hybrid	No.of DFLs brushed	Actual cocoon yield (Kg)	Cocoon yield/100 DFLs	Gain % over Control
1	Farooq Ah. Sofi	Krumchoo	PamDR4xPamDR6	50	9.00	18.00	-45.45%
2	Mohd.Younis Wani	Ladhoo	PamDR4xPamDR6	50	15.00	30.00	-9.09%
3	Ayoub Lone	Ladhoo	PamDR4xPamDR6	50	10.00	20.00	-39.39%
4	MuzafarahLone	Ladhoo	PamDR4xPamDR6	50	11.00	22.00	-33.33%
5	Manzoor ah.Wani	Ladhoo	PamDR4xPamDR6	50	10.00	20.00	-39.39%
6	Gh.Ahmed Koka	Buthnoor	PamDR4xPamDR6	50	Crop failure		
7	Nazi ahmed Dar	Janganoor	PamDR4xPamDR6	50	15.00	30.00	-9.09%
8	Farooq Ah.Dar	Janganoor	PamDR4xPamDR6	50	15.00	30.00	-9.09%
9	Adil Ah. Ganei	Khankha	PamDR4xPamDR6	50	12.00	24.00	-27.27%
10	Farooq Ah.Bhat	Satoora	PamDR4xPamDR6	50	Crop failure		
	Total			500	97.00	194 (@24.25kg/ 100DFLs)	
11	Bashir Ah.Shah	Takiya	FC1xFC2	100	21.00	21.00	
12	Farooq Ah.Bhat	Satoora	FC1xFC2	100	45.00	45.00	
	Avg.					33.00	
	(Potential yield= 30.00kg/100 DFLs) (Avg. Cocoon yield= 24.25kg/100 DFLs)						

Table 40 Rearing performance of farmers level in Uttarakhand region during Spring season

#	Name of the Farmer	Address	Hybrid	No.of DFLs brushed	Actual cocoon yield (Kg)	Cocoon yield/100 DFLs	Gain % over Control 1	Gain % over Control 2
1	Smt.Poonam W/O Dharambai	Kaidenwala	PamDR1xPamDR6	100	35.50	35.50	-33.76%	61.36
2	Sh. B.S.Tomer S/o Bhagwan singh	Sherba	PamDR1xPamDR6	50	10.00	10.00	-62.68%	-9.09
3	Smt.Sarita W/O pramood	Baluwala	PamDR1xPamDR6	100	20.70	20.70	-61.38%	-5.91
4	Sh.Jaipal S/O Bali Ram	Baluwala	PamDR1xPamDR6	100	24.70	24.70	-53.92%	12.27
5	Smt.Selma W/O Irshad	Rudrupur	PamDR1xPamDR6	50	17.30	34.60	-35.45%	57.27
6	Smt.Sunita W/O Subei Singh	Godia	PamDR1xPamDR6	50	13.80	27.60	-0.49	25.45
7	Smt. Maya Devi W/O Pradeep kumar	Godia	PamDR1xPamDR6	50	12.30	24.60	-54.10%	11.82
8	Sh. Pratab S/O Kalyan	Kaidenwala	SH6xNB4D2 (C1)	50	26.80	53.60	0.00%	143.64
9	Smt.Prem Lala W/O Sanjay Kumar	Godia	FC1xFC2 (2)	50	11.00	22.00	-58.95%	0.00
	Total			600	172.10			
Potential cocoon yield=35.50 kg/100DFLs Avg.Cocoon yield=28.68kg/100 DFLs								

Table 41 Rearing performance of farmers level in Uttar Pradesh region during Spring season

Sl. No.	Name of farmer	Hybrid	No. of DFLs brushed	Wt. of 10 matured larvae (g)	Single Cocoon weight (g)	Single shell weight (g)	SR (%)	Cocoon yield/100 DFLs
1.	Shri Ram Dayal	Pam DR7 x Pam DR8	50	38.4	1.46	0.30	20.5	62.2
2.	Shri Balak Ram	Pam DR7 x Pam DR8	50	36.4	1.40	0.28	20.0	43.2
3.	Shri Ramjas	Pam DR7 x Pam DR8	50	36.7	1.47	0.30	20.4	49.0
4.	Smt.Phoolmati	Pam DR7 x Pam DR8	50	38.0	1.48	0.31	20.9	59.0
5.	Smt. Ramrati	Pam DR7 x Pam DR8	50	35.3	1.39	0.28	20.1	48.1
6.	Shri Mangali	Pam DR7 x Pam DR8	50	35.6	1.55	0.31	20.0	47.1
7.	Smt. Shivrani	Pam DR7 x Pam DR8	50	35.1	1.53	0.29	19.0	43.2
8.	Smt. Aarti	Pam DR7 x Pam DR8	50	34.8	1.35	0.28	20.7	42.4
9.	Shri Rangi Lal	Pam DR7 x Pam DR8	50	34.5	1.35	0.25	18.5	38.4
10.	Smt. Anita W/o Shri Anil	Pam DR7 x Pam DR8	50	35.0	1.35	0.26	19.3	38.8
11.	Smt. Vitana	FC1 x FC2	50	33.8	1.56	0.31	19.9	37.2
12.	Shri Shyamta Prasad	SH6xNB4D2	50	35.5	1.44	0.28	19.4	47.0

Table 42 Rearing performance of farmers level in Jammu region during Spring season

Sl. No	Name of farmer with parentage	Address	Hybrid	No. of DFLs brushed	Actual cocoon yield (Kg)	Cocoon yield/100 DFLs	Single cocoon wt (gms)	Single Shell Wt (gms)	Shell Ratio (%)
01	Sh. Kundan lal S/o Sh. Sunder Dass	Lamberi	PamDR7xPamDR8	50	27.000	54.000	1.596	0.335	20.99
02	Sh. Balbir Singh S/o Sh. Baldev Singh	Dhandani	PamDR7xPamDR8	50	25.000	50.000	1.593	0.332	20.84
03	Sh. Kala Ram S/o Sh. Jeet Kumar	Dhandani	PamDR7xPamDR8	50	21.000	42.000	1.581	0.329	20.81
04	Sh. Gulshan Kumar S/o Prithvi Raj	Dhandani	PamDR7xPamDR8	50	22.000	44.000	1.486	0.294	19.78
05	Sh. Surinder Kumar S/o Sh. Kundan lal	Lamberi	PamDR7xPamDR8	50	21.000	42.000	1.481	0.291	19.65
06	Sh. Gulshan Kumar Sh. Sh. Noratham Dass	Chak Jarallan	PamDR7xPamDR8	50	23.000	46.000	1.542	0.320	20.75
07	Sh. Kapil Dev S/o Sh. Raj Kumar	Lamberi	PamDR7xPamDR8	50	30.000	60.000	1.601	0.336	20.98
08	Smt. Gorkhi Devi W/o Sh. Gulshan Kumar	Bagnoti	PamDR7xPamDR8	50	21.000	42.000	1.485	0.283	19.05
09	Smt. Beena Devi W/o Sh. Kamalkumar	Dhandani	PamDR7xPamDR8	50	20.000	40.000	1.483	0.285	19.21
10	Sh. Raj Singh S/o Sh. Dharam Chand	Lamberi	PamDR7xPamDR8	50	25.000	50.000	1.578	0.326	20.66
Sub.Total		----	-----	-----	235.000	47.000	1.542	0.313	20.27

Table 43 Post cocoon parameters of farmer's cocoon reared in Kashmir region during Spring season

#	Parameter	PamDR4x PamDR6	DH (FC1xFC2)
1	Avg. Filament length (m)	799(637-862)	814(645-950)
2	Avg. NBFL(m)	726	752
3	Avg. Denier (d)	2.42	2.7
4	Reelability (%)	77.19	81.13
5	Silk waste%	19.14	18.86
6	Renditta (Dry wt)	3.47	3.81
Post cocoon parameter of PamDR4xPamDR6 in Spring, 2023 at Kashmir Region (Sample size: 300)			

Farmers interaction and guidance provided during trial rearing at Kashmir region**NEW RESEARCH PROJECTS INITIATED AS C.I DURING 2023-24****1. Project title and code: Utilization of Japanese Silkworm genetic resources for the development of productive Bivoltine hybrids (SIB01038MGC)****Project duration:** March, 2024-August, 2028**Investigator(s):** Sh. Kumaresan P**Objectives:**

- To identify the informative markers associated with the productivity in silkworm genetic resources of Japan
- To develop productive silkworm breeds and hybrids through marker assisted selection
- Evaluation of the hybrids at institute level

Progress:

The collaborative project was initiated in March 2024. The necessary communications regarding the recruitment of a Project Assistant and preparations for rearing Japanese silkworm lines were initiated.

2. Project title and code: Vulnerability of Sericulture to Climate Change in India (MOE02022MIC)

Project duration: March, 2024-August, 2026

Investigator(s): Dr. Plabani Roy

Objectives:

1. To assess the vulnerability and adaptation strategies of seri-farmers to climate change.
2. To explore the potential areas of sericulture based on climate factors.
3. To build the climate resilience among seri-farmers through extension approaches.

Progress

The collaborative research project was formally approved in March 2024. Subsequent preparations for the project's initiation commenced, including the recruitment of a Project Assistant.

RESEARCH PROJECTS CONTINUED AS C.I DURING 2023-24 (CSB CODED)

1. Project title and code: All India Coordinated Experimental Trials for Mulberry (AICEM) Phase – IV (PIE13001MI)

Zonal Coordinator: Dr. N. K. Bhatia

Investigator(s): Dr. Pawan Saini, Dr. Gulab Khan Rohela, Dr. Rajesh Kumar, Sh. Chhattar Pal and Dr. Santoshkumar Magadum

Project Duration: 2019-2025

Objectives: Identification of suitable mulberry variety for regional, zonal and national use based on their performance.

Progress:

Maintenance of plantation of mulberry genotypes under AICEM testing

The transplanted saplings of mulberry test entries/genotypes (CBP-01, CMY-01 and CPP-01) were maintained at all the four test sites (CSR&TI, Pampore; P4 BSF, Manasbal; RSRS, Miransahib, Jammu Division and RSRS, Sahaspur, Dehradun) of North-West India along with control varieties during 2023-24. Goshorami was used as local check variety at CSR&TI, Pampore and P4 BSF, Manasbal test sites. At RSRS, Miransahib, Jammu test site; S-146 was used as local check variety. At RSRS, Sahaspur, Dehradun three checks were used viz., S-146 (local check), C-2038 (zonal check) and Vishala (national check). The advocated cultural practices such as fertilizer application, irrigation, weeding, FYM application, etc., were performed as per the scheduled activity calendar at each test site. The survival percentage of test entries along with check varieties was assessed after leaf sprouting (Table 44).

Yield and yield attributing traits: Data on economic traits i.e. total shoot length (cm), no. of leaves, total shoot yield (including leaf) (kg), fresh leaf weight (kg), leaf/shoot ratio, moisture content (%), moisture retention capacity (%), leaf yield/plot (kg) and leaf yield/ha (kg) were recorded during spring and autumn 2023-24 and statistically analysed using OP Stat. The F-statistic and critical difference (CD) were worked out for comparison of test entries with control varieties (Table 45-52).

Silkworm Bioassay: The silkworm bioassay was conducted during the spring 2023 (March) and autumn 2023 (September) at RSRS, Miransahib and RSRS, Sahaspur and spring (May) 2023 and autumn (September 2023) at CSR&TI, Pampore and P4 BSF, Manasbal. Also, the spring bioassay during March 2024 was conducted at RSRS, Miransahib and RSRS, Sahaspur. (Table 56-60).

Disease and Insect-Pest Incidence: During autumn 2023, disease and insect-pests incidence (Leaf spot, leaf rust, powdery mildew and leaf webber) was recorded at all the four test sites (Table 61). The incidence of disease and pests were recorded from longest shoot of five randomly selected plants as per the guidelines and grading was given. Based upon the grading using the Percent Damage Index (PDI) was computed and ranked as resistance/tolerance/susceptibility as per the Mulberry Germplasm Catalogue, Hosur. The PDI scale followed for ranking was: resistant (0.1 – 5.0%), moderately resistant (5.1 – 20.0%), susceptible (20.1 – 50.0) and highly susceptible (50.1 – 100.0%).

Leaf Sprouting Behaviour during spring 2024: The leaf sprouting is an important characteristic of mulberry and based upon the bud growth, leaf sprouting has been assessed in test entries and check varieties after winter dormancy during January 2024 at RSRS, Miransahib and RSRS, Sahaspur while in March 2024 at CSR&TI, Pampore and P4 BSF, Manasbal test sites. Amongst the test entries, C-1360 sprouted first at all the four test sites of North-West zone. In temperate region PPR-1 sprouted 5-10 days after of C-1360. Under sub-tropical test sites, PPR-1 and AGB-8 was sprouted late than C-1360 as well as check varieties (Table 62).

Analysis of soil health status of AICEM field: The soil samples were collected from four sites of Kashmir division viz., CSR&TI, Pampore; P4 BSF, Manasbal; RSRS, Miransahib, Jammu and RSRS, Sahaspur, Dehradun. The soil samples were analysed through mridaparikshak in Agronomy and Soil Science section and 12 parameters including macro- and micro-nutrients content were estimated (Table 63).

Meteorological data of AICEM test sites: The meteorological data on temperature, relative humidity, rainfall and number of rainy days are recorded at all the test sites on day to day basis (Table 64).

Table 44 Survival percentage of test entries (as on 31-03-2024)

Mulberry Varieties	CSR&TI Pampore, Kashmir	P4 Manasbal, Kashmir	BSF RSRS Miransahib, Jammu	RSRS Sahaspur, Dehradun
C-1360	98.98	100.00	100.00	100.00
AGB-8	83.67	100.00	98.63	100.00
PPR-1	97.27	100.00	100.00	100.00
Goshoerami (Local check)	98.98	100.00	-----	-----
S-146 (Local check)	-----	-----	100.00	100.00
Vishala (National check)	-----	-----	-----	100.00
C-2038 (Zonal check)	-----	-----	-----	100.00

Table 45 Yield and yield attributing parameters of Mulberry Varieties at CSR&TI, Pampore during Spring 2023

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	1354.00	20.20	3.938	1.369	0.586	75.32	57.54	51.13	12470.73	1354.00
AGB-8	623.90	21.17	1.336	0.577	0.860	77.18	55.29	41.09	10024.55	623.90
PPR-1	1114.33	20.67	3.713	1.614	0.807	76.71	59.02	51.93	12665.45	1114.33
Goshoerami(Control)	987.77	19.00	4.011	1.832	0.900	77.98	62.91	54.01	13173.97	987.77
CD 5%	321.01	1.369	0.982	0.359	0.109	-----	3.386	3.740	912.390	321.01

Table 46 Yield and yield attributing parameters of Mulberry Varieties at CSR&TI, Pampore during Autumn 2023

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY(kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	1727.47	22.93	2.49	1.00	0.71	77.88	70.13	54.62	13322.76	1727.47
AGB-8	1497.77	21.37	2.23	1.09	1.04	77.35	69.06	50.24	10334.96	1497.77
PPR-1	1698.67	19.60	2.79	1.22	1.13	74.77	66.51	42.37	12252.44	1698.67
Goshoerami(Control)	1408.13	19.70	2.48	1.39	1.33	76.69	65.94	59.30	14463.01	1408.13
CD 5%	224.92	2.06	0.60	0.33	0.51	2.70	4.20	13.69	3341.07	224.92

Table 47 Yield and yield attributing parameters of Mulberry Varieties at P4 BSF, Manasbal during Spring 2023

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	2555.87	19.50	3.068	1.538	1.006	73.21	92.59	50.90	12415.65	2555.87
AGB-8	1396.70	18.47	1.742	0.870	1.005	73.05	92.83	42.79	10438.84	1396.70
PPR-1	2317.07	18.73	2.722	1.401	1.063	69.17	88.94	49.04	11960.57	2317.07
Goshoerami (Control)	2386.17	19.20	3.569	1.836	1.067	70.65	91.04	54.39	13226.30	2386.17
CD 5%	655.795	0.238	0.810	0.422	0.039	1.860	2.549	3.302	805.297	655.795

Table 48 Yield and yield attributing parameters of Mulberry Varieties at P4 BSF, Manasbal during Autumn 2023

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY(kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	1773.43	20.17	1.91	0.97	1.02	72.03	93.07	49.63	12104.06	1773.43
AGB-8	1429.53	19.37	1.58	0.79	1.02	71.82	91.54	39.72	9688.41	1429.53
PR-1	1798.80	18.23	1.96	1.00	1.06	72.41	92.89	47.63	11617.48	1798.80
Goshoerami(Control)	1795.57	18.90	2.11	1.17	1.28	72.67	93.71	52.99	12923.98	1795.57
CD 5%	337.91	0.66	0.39	0.23	0.09	2.04	2.47	3.46	844.16	337.91

Table 49 Yield and yield attributing parameters of Mulberry Varieties at RSRS, Miransahib, Jammu during Spring 2024

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	1487.6	19.43	2.12	1.12	1.12	76.27	79.15	42.08	10263.41	1487.6
AGB-8	2211.6	19.93	1.78	0.86	0.93	74.85	78.65	34.81	8490.24	2211.6
PPR-1	1233.4	19.30	2.07	1.03	1.00	75.43	76.88	32.04	7814.63	1233.4
S-146(Control)	1567.16	19.60	2.32	1.2	1.09	73.18	75.12	25.89	6314.63	1567.16
CD 5%	385.63	NS	0.26	0.18	NS	NS	NS	9.44	2268.5	385.63

Table 50 Yield and yield attributing parameters of Mulberry Varieties at RSRS, Miransahib, Jammu during Autumn 2023

Varieties	TSL (cm)	NLPM	LW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	1767.07	18.57	2.19	1.05	0.92	76.37	76.28	40.36	9843.90
AGB-8	1889.17	22.83	1.72	0.92	1.15	75.79	79.12	44.93	10958.53
PPR-1	1507.67	17.87	2.18	1.06	0.95	73.51	75.52	37.50	9146.34
S-146 (Control)	1941.60	19.90	2.42	1.24	1.05	75.19	76.05	38.12	9297.56
CD 5%	315	0.65	0.29	0.22	NS	NS	NS	3.19	1421

Table 51 Yield and yield attributing parameters of Mulberry Varieties at RSRS, Sahaspur, Dehradun during Spring 2024

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	994.03	19.33	2.29	1.08	0.85	73.17	84.87	53.08	12946.34	994.03
AGB-8	764.20	22.63	1.95	0.96	0.96	76.04	81.09	47.04	11473.17	764.20
PPR-1	774.37	19.70	1.89	0.92	0.95	79.91	82.50	44.84	10936.58	774.37
S-146 (Local Control)	783.31	19.37	2.35	1.06	0.82	84.85	84.44	51.86	12648.78	783.31
C-2038 (Zonal Control)	778.67	18.77	2.29	1.14	0.99	75.30	85.73	55.62	13565.85	778.67
Vishala (National Control)	864.13	20.73	2.37	1.01	0.75	75.96	80.12	49.49	12070.73	864.13
CD 5%	126.24	1.21	0.25	0.12	0.09	4.16	NS	5.71	987.65	126.24

Table 52 Yield and yield attributing parameters of Mulberry Varieties at RSRS, Sahaspur, Dehradun during Autumn 2023

Varieties	TSL (cm)	NLPM	LW (kg)	SW (kg)	TSY (kg)	LSR	MC (%)	MRC (%)	NPY	TLY
C-1360	998.03	18.13	1.28	0.59	0.86	72.19	82.15	23.70	5781.30	998.03
AGB-8	934.20	22.82	0.91	0.45	0.98	75.84	81.75	22.82	5566.26	934.20
PPR-1	894.24	16.95	0.93	0.52	1.26	78.59	82.42	25.35	6183.33	894.24
S-146 (Local Control)	801.12	19.67	1.32	0.54	0.69	83.15	83.95	28.18	6872.76	801.12
C-2038 (Zonal Control)	812.15	17.67	1.02	0.49	0.92	77.21	85.05	23.98	5847.56	812.15
Vishala (National Control)	894.31	20.95	1.09	0.51	0.88	76.91	82.96	24.55	5988.62	894.31
CD 5%	114.26	1.09	0.31	NS	0.13	3.95	NS	2.71	645.22	114.26

Note: TSL: Total Shoot length; NLPM: Number of Leaves per Meter length; LW: Fresh Leaf Weight; SW: Fresh Shoot Weight; TSY: Total Shoot Yield (including leaf); LSR: Leaf/Shoot Ratio; MC: Moisture Content; MRC: Moisture Retention Capacity; NPY: Net Plot Yield and TLY: Total Leaf Yield

Table 53 Silkworm bioassay during spring 2023 at CSR&TI, Pampore

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	58.66	27:00	472	1032.00	2.27	0.49	21.86	18.09
CMY-01 (AGB-8)	59.67	27:00	477	1031.33	2.14	0.49	23.02	17.61
CPP-01 (PPR-1)	56.33	27:00	483	981.33	1.99	0.47	23.69	18.85
Goshoerami (Control)	53.00	27:00	480	1134.00	2.29	0.52	22.79	16.61
CD 5%		-----	-----	55.50	0.167	0.03	-----	-----

Table 54 Silkworm bioassay during autumn 2023 at CSR&TI, Pampore

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	50.40	25:00	446	0.83	2.43	0.70	28.84	22.89
CMY-01 (AGB-8)	49.83	25:00	457	0.93	2.34	0.58	24.68	20.41
CPP-01 (PPR-1)	49.55	25:00	473	0.94	2.14	0.44	20.46	20.19
Goshoerami (Control)	49.92	25:00	450	0.86	2.22	0.45	20.36	21.86
CD 5%	-----	-----	-----	0.11	0.12	0.08	3.44	-----

Table 55 Silkworm bioassay during spring 2023 at P4 BSF, Manasbal

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	60.94	27:00	500	1092.00	2.05	0.47	22.74	12.93
CMY-01 (AGB-8)	60.02	27:00	500	987.83	1.82	0.42	22.95	14.29
CPP-01 (PPR-1)	61.14	27:00	500	886.00	1.88	0.40	21.35	15.94
Goshoerami (Control)	62.08	27:00	500	1005.83	2.15	0.50	23.27	14.04
CD 5%		-----	-----	75.318	0.065	0.04	-----	-----

Table 56 Silkworm bioassay during autumn 2023 at P4 BSF, Manasbal

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	46.03	23:00	492	0.79	18.50	4.00	21.63	26.20
CMY-01 (AGB-8)	44.86	23:00	492	0.66	15.50	3.33	21.49	31.57
CPP-01 (PPR-1)	44.95	23:00	493	0.73	16.33	3.67	22.43	28.56
Goshoerami(Control)	46.95	23:00	496	0.83	19.00	4.83	25.44	25.00
CD 5%	-----	-----	-----	0.08	0.86	0.50	2.79	-----

Table 57 Silkworm bioassay during spring 2023 at RSRS, Miransahib, Jammu

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	58.49	25:4	486	934.20	1.97	0.41	20.90	26.08
CMY-01 (AGB-8)	58.09	25:4	484	933.20	1.98	0.41	21.04	26.21
CPP-01 (PPR-1)	57.15	25:4	486	917.20	1.94	0.41	21.19	27.26
S-146 (Control)	55.39	25:4	487	871.00	1.84	0.37	20.09	29.09
CD 5%		-----	-----	48.012	0.101	0.022	0.764	-----

Table 58 Silkworm bioassay during autumn 2023 at RSRS, Miransahib, Jammu

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	56.8	21:3.30	487.8	975	1.89	0.41	21.55	22.76
CMY-01 (AGB-8)	56	21:3.30	469	938	1.89	0.39	20.61	24.82
CPP-01 (PPR-1)	56	21:3.30	483.2	966	1.88	0.40	21.01	22.77
S-146 (Control)	55.8	21:3.30	475.2	915	1.88	0.38	19.99	23.77
CD 5%	-----	-----	3.6	43.5	-----	0.02	-----	0.91

Table 59 Silkworm bioassay during spring 2023 at RSRS, Sahaspur, Dehradun

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	55	23:00	470	1058.17	2.25	0.49	21.84	17.28
CMY-01 (AGB-8)	58	23:00	453	1073.67	2.38	0.51	21.53	13.39
CPP-01 (PPR-1)	64	23:00	451	1119.50	2.48	0.53	21.43	11.84
S-146 (Control)	50	23:00	467	1073.67	2.30	0.55	24.01	14.99
C-2038 (Control)	56	23:00	470	1097.00	2.33	0.49	20.98	13.93
Vishala (Control)	64	23:00	444	1058.83	2.38	0.51	21.34	13.05
CD 5%	-----	-----	-----	-----	-----	-----	-----	-----

Table 60 Silkworm bioassay during autumn 2023 at RSRS, Sahaspur, Dehradun

Varieties	Larval Weight (g)	Larval Duration (D:H)	No. of cocoons harvested/ 500 larvae	Weight of cocoons harvested/ 500 larvae (g)	SCW (g)	SSW (g)	SR (%)	LCR
CBP-01 (C-1360)	54.2	22:12	434.66	896.00	2.193	0.494	22.524	31.89
CMY-01 (AGB-8)	55.1	22:12	473.33	1025.66	2.301	0.513	22.277	26.44
CPP-01 (PPR-1)	55.2	22:12	486.32	1060.00	2.192	0.482	22.003	23.87
S-146 (Control)	54.8	22:12	488.33	1062.00	2.272	0.520	22.883	21.96
C-2038 (Control)	53.6	22:12	449.33	992.66	2.210	0.525	23.739	20.75
Vishala (Control)	54.1	22:12	494.00	1041.32	2.179	0.460	21.128	15.87
CD 5%	-----	-----	12.22	45.68	-----	0.32	-----	-----

Note: SCW: Single Cocoon Weight (Average); SSW: Single shell Weight (Average); SR: Silk Ratio; LCR: Leaf to Cocoon ratio

Table 61 Disease and insect pest incidence at four test sites during autumn 2023

Test Sites	Test Entry	Percent Damage Index (PDI)									
		Leaf Spot	Reaction	Leaf Rust	Reaction	Tukra	Reaction	Powdery Mildew			Reaction
CSR&TI, Pampore (Temperate)	C-1360	27.86	S	-----	-----	-----	-----	2.01	R	8.23	MR
	AGB-8	35.67	S	-----	-----	-----	-----	16.43	MR	4.76	R
	PPR-1	33.45	S	-----	-----	-----	-----	18.95	MR	3.98	R
	Goshoerami	5.79	MR	-----	-----	-----	-----	34.67	S	6.87	MR
P4 BSF, Manasbal (Temperate)	C-1360	13.67	MR	-----	-----	-----	-----	5.00	R	8.39	MR
	AGB-8	20.78	MR	-----	-----	-----	-----	19.21	MR	9.44	MR
	PPR-1	24.58	S	-----	-----	-----	-----	16.89	MR	8.67	MR
	Goshoerami	17.50	MR	-----	-----	-----	-----	19.37	MR	30.78	S
RSRS, Miransahib, Jammu (Sub-tropical)	C-1360	18.0	MR	-----	-----	-----	-----	10.67	MR	15.0	MR
	AGB-8	9.67	MR	-----	-----	-----	-----	7.69	MR	11.0	MR
	PPR-1	7.00	MR	-----	-----	-----	-----	10.33	MR	12.33	MR
	S-146	17.67	MR	-----	-----	-----	-----	11.00	MR	11.33	MR
RSRS, Sahaspur, Dehradun (Sub-tropical)	C-1360	7.00	MR	-----	-----	0.33	R	0.00	R	5.00	R
	AGB-8	9.87	MR	-----	-----	0.67	R	0.33	R	4.33	MR
	PPR-1	7.63	MR	-----	-----	0.33	R	0.67	R	6.33	MR
	Vishala	9.32	MR	-----	-----	0.00	R	0.33	R	5.67	MR
	C-2038	8.67	MR	-----	-----	0.00	R	1.50	R	6.67	MR
	S-146	14.00	MR	-----	-----	0.36	R	1.50	R	7.67	MR

Table 62 Leaf Sprouting (Days to 75% and 100%) Behaviour of Test Entries at Four Test Sites (Spring 2023)

Test Entries	CSR&TI, Pampore		P4 BSF, Manasbal		RSRS, Miransahib Jammu		RSRS, Sahaspur, Dehradun	
	D75	D100	D75	D100	D75	D100	D75	D100
CBP01 (C-1360)	16	20	21	23	50	55	20	28
CMY01 (AGB-8)	25	30	25	27	65	70	55	61
CPP01 (PPR-1)	23	27	29	31	70	75	61	64
Goshoerami (Local check)	31	35	41	43	-----	-----	-----	-----
S-146 (Local check)	-----	-----	-----	-----	50	55	18	27
Vishala (National check)	-----	-----	-----	-----	-----	-----	25	31
C-2038 (Zonal check)	-----	-----	-----	-----	-----	-----	25	30

Table 63 Soil health status of four test sites during spring 2023

Test Sites	pH	EC (dS/m)	OC (%)	N(Kg/ha)	P ₂ O ₅ (Kg/ha)	K ₂ O(Kg/ha)
CSR&TI, Pampore, Kashmir	7.32	0.40	1.32	494	80	206
P4 BSF, Manasbal, Kashmir	6.98	0.51	1.33	385	65	191.5
RSRS, Miransahib, Jammu	7.03	0.74	0.85	340	51.23	125.63
RSRS, Sahaspur, Dehradun	6.67	0.96	1.12	311	26.50	171.88

Test Sites	S(mg/kg)	Zn(mg/kg)	B(mg/kg)	Fe(mg/kg)	Mn(mg/kg)	Cu(mg/kg)
CSR&TI, Pampore, Kashmir	32	2.62	18.87	14.02	8.861	6.12
P4 BSF, Manasbal, Kashmir	18.2	0.72	21.10	23.5	9.32	8.12
RSRS, Miransahib, Jammu	20.23	5.25	13.15	15.29	9.13	5.12
RSRS, Sahaspur, Dehradun	58.60	3.15	13.98	16.89	6.56	5.03

Table 64 Meteorological data of four test sites (April 2023 – March 2024)

Month/Year	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)	No. of Rainy Days
	Min.	Max.	Mean	Min.	Max.	Mean		
Test Site: CSR&TI, Pampore, Kashmir								
April – 2023	7.3	19.8	13.55	44	73	58.5	146.4	12
May	10.6	22.4	16.50	54	72	63.0	85.7	13
June	15.9	28.9	22.4	43	70	56.5	62.4	07
July	17.8	29.4	23.6	48	75	61.5	82.4	10
August	18.5	28.5	23.50	58.00	80.00	69.00	187.1	11
September	18.5	31.4	24.95	47.00	75.00	61.00	9.2	2
October	15.1	30.0	22.55	43.00	72.00	57.50	27.6	4
November	7.2	22.6	14.90	66.00	84.00	75.00	44.4	4
December	2.2	15.3	8.75	74.00	92.00	83.00	36.6	3
January - 2024	-2.1	10.4	6.25	75.00	95.00	85.00	17.3	1
February	-3.2	11.7	7.45	64.00	90.00	77.00	3.0	2
March	-1.1	10.2	5.65	53.00	89.00	71.00	87.8	8
Test Site: P4 Basic Seed Farm (BSF), Manasbal, Kashmir								
April – 2023	6.80	17.60	11.59	51.54	61.37	25.19	08	08
May	9.45	20.61	14.21	48.19	51.51	25.10	11	11
June	15.00	30.54	14.73	42.17	58.40	21.63	00	00
July	18.74	26.48	21.93	59.48	68.93	26.75	08	08
August	19.83	30.70	23.21	30.70	56.03	24.58	-----	-----
September	18.7	30.6	18.34	46.6	59.6	23.45	-----	-----
October	7.62	21.80	10.83	44.90	60.83	22.88	110	04
November	1.84	11.37	4.85	48.74	63.90	22.88	24	02
December	0.12	8.22	0.45	43.67	59.25	22.84	-----	-----
January - 2024	-2.98	8.90	0.19	38.80	53.96	22.29	75	04
February	1.40	7.06	5.75	57.41	75.10	22.16	93	05
March	1.54	11.67	4.09	48.38	62.19	24.11	100	05
Test Site: RSRS, Jammu, Miransahib								
April – 2023	16.0	32.2	24.10	34.3	77.2	55.75	71.4	5
May	19.1	34.1	26.6	38.0	68.0	53.00	138.4	10
June	24.2	36.2	30.2	47.0	74.0	60.5	182.0	6
July	25.5	33.6	29.55	67.0	85.0	76.0	388.8	10
August	34.8	25.2	30.0	87.00	66.00	76.50	356.2	12
September	33.9	23.1	28.5	89.00	60.00	74.50	114.6	08
October	30.3	16.3	23.3	88.00	51.00	69.50	100.0	04
November	26.2	10.9	18.5	92.00	51.00	71.50	66.8	03
December	21.4	5.9	13.65	96.00	54.00	75.00	9.0	02
January - 2024	13.1	5.0	9.05	96.00	77.00	86.50	7.4	01
February	21.1	5.4	13.25	93.00	50.00	71.50	34.4	05
March	26.2	10.8	18.5	89.00	48.00	68.50	72.4	03

Month/Year	Temperature (°C)			Relative Humidity (%)			Rainfall (mm)	No. of Rainy Days
	Min.	Max.	Mean	Min.	Max.	Mean		
Test Site: CSR&TI, Pampore, Kashmir								
April – 2023	12.8	32.1	22.45	30.8	82.1	56.45	47.2	04
May	16.8	33.9	25.35	39.4	78.0	58.70	67.9	07
June	21.1	35.2	28.15	50.7	80.9	65.80	211.4	09
July	24.01	31.65	27.83	80.90	96.32	88.60	857.00	22
August	24.32	32.18	28.25	76.97	96.00	86.49	542	21
September	22.53	33.23	27.88	63.80	94.67	79.24	108.9	08
October	14.02	31.45	22.74	45.23	93.90	69.57	16.40	02
November	8.96	27.17	18.07	47.20	94.30	70.75	0.40	01
December	4.01	23.17	13.59	42.19	95.87	69.03	0.50	01
January - 2024	3.51	19.84	11.68	47.03	94.61	70.82	0.00	00
February	5.41	21.65	13.53	46.46	94.96	70.71	64.5	06
March	9.45	27.49	18.47	42.97	93.52	68.25	48.40	05

2. Project title and code: Recommendation of Novel Fungicidal and Insecticidal Applications in Mulberry (ARE01028MI)

Investigator(s): Dr. Pawan Saini, and Sh. Chhattar Pal

Project Fellow(s): Danishta Aziz (JRF) and Summira Rafiq (PA)

Project Duration: May 2022 – April 2025

Objectives:

1. To identify suitable novel fungicide/nematicide and insecticide molecule under in vitro studies against mulberry pathogens and pests.
2. *In vivo* evaluation of identified novel fungicide/nematicide and insecticide molecule against mulberry pathogens.
3. To study the safety of novel fungicide/nematicide/insecticides on silkworm.

Progress:

Conduct of silkworm biosafety bioassay with new fungicides

The three new fungicides viz., Difenoconazole 25 EC, Myclobutanil 10 WP and Metrafenone 50 SC were sprayed on the dwarf plantation of Goshierami with three concentrations (0.25 %, 0.5 % & 1 %). The fungicide treated leaves were given to silkworm at 3rd instar stage after 7 days and 10 days of spray. The observation on silkworm mortality was recorded after 24th, 48th, 72nd and 96th hours of continuous feeding of the worms on fungicide treated leaves. There was no silkworm mortality with fungicide treatments. Literature related to impact of fungicides on silkworm was also checked and as per literature also there are no side effects of fungicide treatments on silkworm.

Fungicides – safe to use in mulberry as the fungicide treated leaves does not have any side effect on silkworm and cocoon parameters i.e. Larval weight, cocoon weight, shell weight.

Table 65 Larval mortality and weight of larva, cocoon, shell and pupa of silkworm fed on fungicide treated leaves 7 DAS

Treatment	Larval Weight (g)	Cocoon Weight (g)	Shell Weight (g)	Pupal Weight (g)	Larval Mortality (%)
Difenoconazole 25EC (0.25%)	55.33	22.30	5.17	17.02	0
Difenoconazole 25EC (0.5%)	56.00	21.03	4.92	15.90	0
Difenoconazole 25EC (1%)	57.67	21.65	5.50	16.11	0
Myclobutanil 10WP (0.25%)	56.33	23.23	5.10	17.58	0
Myclobutanil 10WP (0.5%)	54.33	23.07	5.16	17.82	0
Myclobutanil 10WP (1%)	61.33	22.88	5.03	17.99	0
Metrafenone 50SC (0.25%)	55.67	22.22	4.85	17.77	0
Metrafenone 50SC (0.5%)	57.67	22.23	5.02	17.15	0
Metrafenone 50SC (1%)	54.33	21.42	4.76	16.35	0
Untreated Control	63.00	24.04	5.23	18.82	0
C.D ($p \leq 0.05$)	1.99	1.27	0.52	1.30	

Table 66 Larval mortality and weight of larva, cocoon, shell and pupa of silkworm fed on fungicide treated leaves 10 DAS

Treatment	Larval Weight (g)	Cocoon Weight (g)	Shell Weight (g)	Pupal Weight (g)	Larval Mortality (%)
Difenoconazole 25EC (0.25%)	55.67	21.31	5.15	16.11	0
Difenoconazole 25EC (0.5%)	59.33	21.49	4.94	16.33	0
Difenoconazole 25EC (1%)	55.67	20.83	4.84	15.94	0
Myclobutanil 10WP (0.25%)	54.00	21.39	4.80	16.43	0
Myclobutanil 10WP (0.5%)	56.00	22.86	4.92	17.70	0
Myclobutanil 10WP (1%)	58.00	22.80	5.17	17.34	0
Metrafenone 50SC (0.25%)	54.00	21.92	4.78	16.94	0
Metrafenone 50SC (0.5%)	56.00	22.67	5.01	17.37	0
Metrafenone 50SC (1%)	58.00	21.58	4.96	16.26	0
Untreated Control	58.00	23.62	5.31	17.95	0
C.D ($p \leq 0.05$)	1.62	1.47	0.30	1.37	



Figure 12 Cocoon Weight of Day 7 treated (Fungicides) silkworms

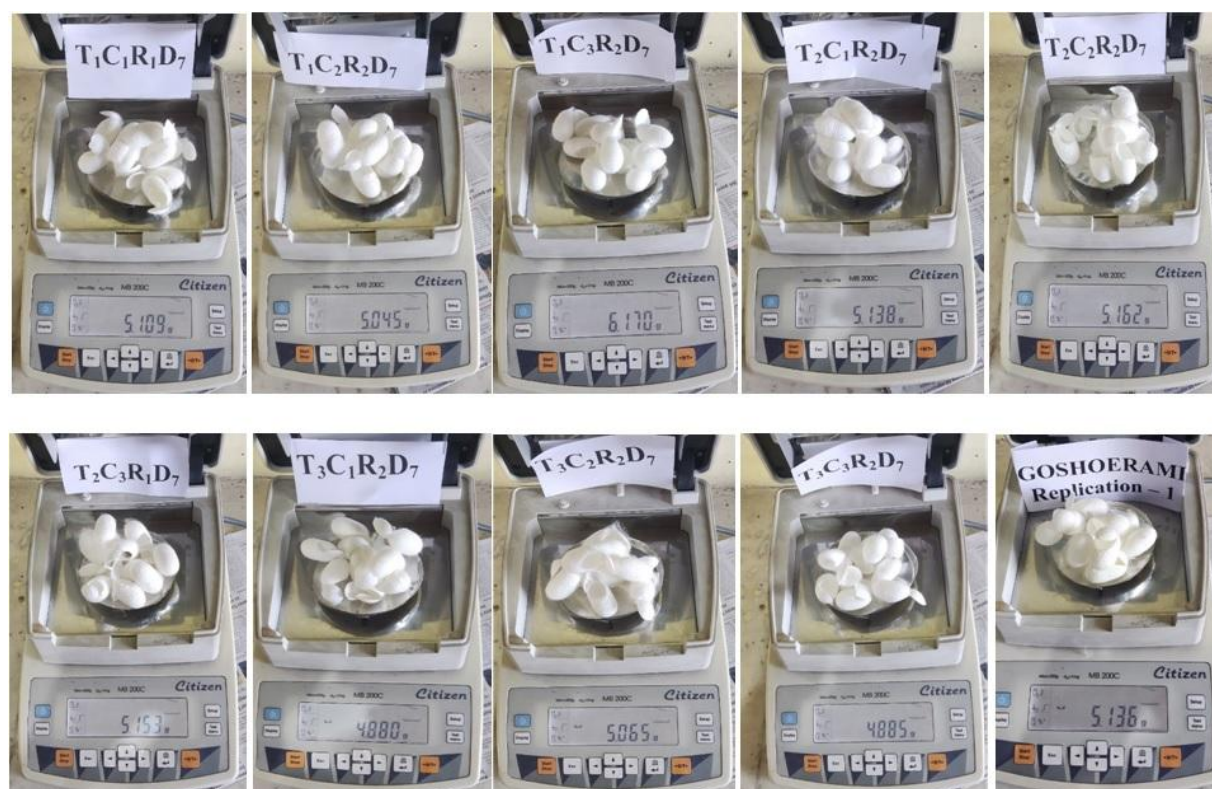


Figure 13 Cocoon Shell Weight of Day 7 treated (Fungicides) silkworms



Figure 14 Pupal Weight of Day 7 treated (Fungicides) silkworms



Figure 15 Cocoon Weight of Day 10 treated (Fungicides) silkworms



Figure 16 Cocoon Shell Weight of Day 10 treated (Fungicides) silkworms



Figure 17 Pupal Weight of Day 10 treated (Fungicides) silkworms

3. Project title and code: Development of bivoltine double hybrids suitable for different regions of India (AIB02019MI)

Investigator: Dr. Kiran R (CSR&TI, Pampore), Dr.Santoshkumar Magadum (RSRS, Jammu) and Dr. Sunil (RSRS, Jammu) (w.e.f. 08.12.2024)

Project Fellow: Nadiya Ashraf

Objectives

- Development of bivoltine breeds with high temperature and humidity tolerance through Marker assisted selection
- Improvement of viability in the parents of FC1, FC2 through Marker assisted selection
- Evaluation and identification of productive bivoltine double hybrids with abiotic tolerance

Progress achieved at CSR&TI, Pampore:

Ten silkworm lines (including Oval: HH2, HH2A, HH2B, HH27, HH27A, HH27B; and Constricted: HH6, HH6A, HH26, HH26A) were successfully reared during the Spring, Summer and Autumn seasonal rearing of 2023 (Table 67, 68, 69). Cocoon and larval selection was based on larval markings and cocoon shapes. Larvae with markings spun constricted cocoons, while plain larvae spun oval cocoons. Subsequently, backcrosses were made with a CSR foundations crosses: oval lines were crossed with FC2, and constricted lines were crossed with FC1 after spring seasonal rearing of 2023.

Table 67 Comparative rearing performance of 10 silkworm lines during spring seasonal rearing of 2023.

Spring 2023	F (No) (Mean±SE)	H (%) (Mean±SE)	LW (g) (Mean±SE)	ERR(Kg) (Mean±SE)	SCW (g) (Mean±SE)	SSW (g) (Mean±SE)	SR (%) (Mean±SE)	PR (%) (Mean±SE)
HH2	508±21.01	94.12±0.94	42.60±0.92	14.51±0.49	2.00±0.03	0.40±0.01	19.93±0.44	76.67±4.63
HH2A	533±20.73	94.23±0.60	42.07±1.60	13.56±0.72	1.65±0.02	0.40±0.00	23.95±0.28	80.80±3.12
HH2B	589±13.40	93.00±0.76	40.00±1.25	14.85±0.74	1.81±0.05	0.40±0.01	21.82±0.14	82.67±4.07
HH27	587±48.54	93.04±0.91	37.72±1.35	13.10±1.35	1.97±0.04	0.39±0.00	20.06±0.38	78.13±1.50
HH27A	586±27.95	93.24±0.98	38.53±0.18	15.73±0.16	1.83±0.01	0.38±0.01	20.83±0.71	89.60±1.39
HH27B	575±23.69	92.09±1.45	43.60±1.10	15.05±0.59	1.88±0.02	0.36±0.00	19.28±0.33	82.13±2.82
HH6	655±27.18	92.17±1.27	35.40±2.12	12.31±1.23	1.75±0.10	0.36±0.02	20.40±0.53	73.73±4.76
HH6A	544±27.97	93.45±0.68	37.80±1.40	13.35±0.84	1.72±0.01	0.35±0.00	20.55±0.16	77.47±4.81
HH26	596±22.50	93.50±0.75	39.13±0.29	15.15±0.37	1.78±0.05	0.35±0.02	19.65±0.54	84.93±0.58
HH26A	649±41.76	92.64±1.33	41.07±0.70	14.55±0.98	1.87±0.07	0.37±0.00	19.74±0.80	81.20±5.00

Note: F – Fecundity; H-Hatching; LW-Larval weight, ERR- Yield/ 10000 larva, SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio;PR- pupation rate.

Table 68 Comparative rearing performance of 10 silkworm lines during summer seasonal rearing of 2023.

Summer 2023	F (No) (Mean±SE)	H (%) (Mean±SE)	LW (g) (Mean±SE)	ERR(Kg) (Mean±SE)	SCW (g) (Mean±SE)	SSW (g) (Mean±SE)	SR (%) (Mean±SE)	PR (%) (Mean±SE)
HH2	540±33.19	88.62±0.79	41.17±0.17	13.07±0.44	1.67±0.02	0.34±0.01	20.40±0.56	78.00±1.83
HH2A	528±23.69	94.80±0.32	42.50±0.38	15.23±0.34	1.78±0.02	0.36±0.01	20.47±1.01	86.93±0.93
HH2B	501±49.68	94.10±1.13	41.29±0.66	15.14±0.64	1.77±0.04	0.36±0.01	20.13±0.45	88.13±4.81
HH27	415±42.97	92.58±1.30	40.10±0.35	15.54±0.88	1.77±0.01	0.34±0.00	19.19±0.32	88.67±4.21
HH27A	546±55.47	94.88±1.13	40.53±0.45	15.29±0.86	1.75±0.03	0.36±0.00	20.74±0.34	91.20±3.06
HH27B	547±31.44	95.53±0.59	42.46±0.38	15.24±0.99	1.70±0.05	0.36±0.01	20.92±0.52	84.53±5.70
HH6	523±20.23	94.80±0.70	39.66±0.45	13.93±1.02	1.71±0.06	0.35±0.00	20.75±0.75	82.53±7.56
HH6A	501±25.74	94.82±1.04	38.57±0.37	14.78±0.42	1.71±0.03	0.34±0.01	19.86±0.48	91.60±2.80
HH26	520±38.59	94.77±0.46	35.29±0.30	15.37±1.11	1.75±0.04	0.33±0.01	18.93±0.71	93.60±2.54
HH26A	530±24.69	95.49±0.61	36.60±0.32	13.73±0.57	1.80±0.06	0.35±0.01	19.47±0.20	80.80±2.80

Table 69 Comparative rearing performance of 10 silkworm lines during autumn seasonal rearing of 2023.

Autumn 2023	F (No) (Mean±SE)	H (%) (Mean±SE)	LW (g) (Mean±SE)	ERR(Kg) (Mean±SE)	SCW (g) (Mean±SE)	SSW (g) (Mean±SE)	SR (%) (Mean±SE)	PR (%) (Mean±SE)
HH2	600±1.11	84.25±2.20	33.7±0.41	11.87±0.17	1.43±0.02	0.25±0.01	17.31±0.57	82.80±1.06
HH2A	546±42.58	85.35±1.82	34.16±1.00	13.32±0.51	1.55±0.04	0.31±0.00	19.77±0.23	95.20±1.01
HH2B	517±46.86	80.02±2.37	32.13±1.25	12.36±0.26	1.49±0.07	0.28±0.02	18.37±0.49	85.20±1.62
HH27	507±38.71	81.64±3.13	34.76±0.47	13.99±0.38	1.62±0.03	0.34±0.02	21.14±0.93	91.60±2.62
HH27A	542±19.40	80.43±3.19	32.97±1.04	13.35±0.43	1.48±0.05	0.30±0.02	19.88±0.60	94.27±2.94
HH27B	577±15.73	87.99±2.02	32.83±0.49	13.45±0.31	1.56±0.05	0.32±0.01	20.49±0.07	91.47±2.31
HH6	584±32.91	84.85±2.31	33.95±0.19	12.70±0.30	1.50±0.04	0.28±0.01	18.87±0.38	91.60±1.85
HH6A	575±33.64	86.02±4.72	33.04±0.31	14.19±0.22	1.66±0.08	0.33±0.01	20.15±0.22	87.07±3.61
HH26	554±30.57	84.96±2.65	34.72±0.50	13.53±0.44	1.65±0.03	0.32±0.01	19.35±0.37	85.20±2.66
HH26A	556±17.28	90.21±2.70	32.13±0.92	13.18±0.57	1.54±0.02	0.29±0.01	18.69±0.40	92.00±2.31

Note: F – Fecundity; H-Hatching; LW-Larval weight, ERR- Yield/ 10000 larva, SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio;PR- pupation rate.

Progress achieved at RSRS, Jammu:

Nine races were studied by rearing during spring (2023) to study high temperature and high humidity tolerance through marker assisted selection. Among these nine races, the fecundity observed was highest in HH27 is 508 and lowest in HH2B is 389 and all the races are showed non-significant among each other, whereas hatching percentage was highest in HH2B (98.18) and lowest in HH26 (96.70) and significant among each other. Yield per 10,000 larvae by weight (Kg) recorded as highest of 17.05 Kg in HH27A and lowest of 11.33 Kg in HH26 showing statistically significant among all the races with regard to weight basis. The shell ratio (%) also shows statistically significant among all the races and was highest in HH2 (19.29) and lowest in HH2B (17.92), respectively (Table 70). The pupation rate was recorded as maximum in HH2A (93.87 %) and lowest in HH2B (572.53 %) and showed statistically significant among all the breeds (Table 70).

Nine races were studied by rearing during autumn (2023) to study high temperature and high humidity tolerance through marker assisted selection. Among these nine races, the fecundity observed was highest in 26A is 525 and lowest in HH2B is 465 and all the races are showed non-significant among each other, whereas hatching percentage was highest in HH27A, HH2, and HH26 (94) and lowest in HH2A (92) and significant among each other. Yield per 10,000 larvae by weight (Kg) recorded as highest of 16.86 Kg in HH27 and lowest of 15.33 Kg in HH2B showing statistically non-significant among all the races with regard to weight basis. The shell ratio (%) was highest in HH6A and HH2B (19.8) and lowest in HH26 (18.18) (Table 71).

Table 70 Evaluation of test hybrids Spring rearing 2023

Race	F.	H. %	Wt. of 10 Larvae	Larval Period	Yield/10000 (ERR)		SCW	SSW	SR %	PR %
					No	Wt				
HH2	448	98.5	46	28:18:00	8733	14.89	1.63	0.3	18.55	87.33
HH2A	436	98.03	45.67	28:18:00	9387	15.8	1.64	0.31	19.08	93.87
HH2B	389	98.18	46	28:18:00	7253	12.81	1.73	0.31	17.92	72.53
HH27	508	97.96	44.33	28:18:00	7867	12.51	1.61	0.31	19.29	78.67
HH27A	496	97.64	47	28:18:00	9240	17.05	1.75	0.33	18.53	92.4
HH6	462	97.69	45	28:18:00	7507	12.69	1.59	0.29	18.35	75.07
HH6A	471	97.78	45.67	28:18:00	9053	15.4	1.65	0.29	18.15	90.53
HH26	474	96.7	43	28:18:00	7373	11.33	1.58	0.29	18.53	73.73
HH26A	424	98.43	45.33	28:18:00	6787	10.92	1.6	0.3	18.81	67.87
CD	-	0.343	1.448	-	8.638	0.377	16.7	23.45	13.14	56.1
CV	-	-	-	-	5.548	5.908	3.34	2.62	2.21	2.74

Note: F – Fecundity; H-Hatching; PR- pupation rate; SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio; Values in parentheses are statistically transformed.

Table 71 Evaluation of test hybrids Autumn rearing 2023

Race	F.	H.%	Wt. of 10 Larvae	Larval Period	Yield/10000 (ERR)		SCW	SSW	SR%	PR%
					No	Wt				
HH2	490	94	40	22:12:00	9280	15.64	1.74	0.32	18.58	90.33
HH2A	458	92	41	22:12:00	9293	15.57	1.69	0.33	19.55	90.66
HH2B	465	94	40	22:12:00	9213	15.33	1.74	0.35	19.84	87.66
HH27	513	93	42	22:12:00	9333	16.86	1.76	0.33	18.98	91.00
HH27A	521	94	41	22:12:00	9253	16.65	1.76	0.33	18.82	89.00
HH6	472	93	41	22:12:00	9360	15.97	1.75	0.34	19.36	89.00
HH6A	531	93	41	22:12:00	9133	15.46	1.75	0.35	19.81	90.66
HH26	488	94	41	22:12:00	9346	16.26	1.7	0.31	18.18	90.66
HH26A	525	93	41	22:12:00	9173	15.41	1.76	0.35	19.78	92.33
CD	-	0.815	-	-	-	-	-	-	-	-
CV	4.36	0.52	1.18	-	0.991	2.337	0.048	5.23	4.03	1.53

Note: F – Fecundity; H-Hatching; PR- pupation rate; SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio; Values in parentheses are statistically transformed.

4. Project title and code: Life Cycle Assessment of Mulberry Silk: A National Assessment (MTL01025MI)

Investigator: Dr. Kiran R

Project Assistant: Abeera Wani

Objectives:

- To assess GHGs emission, GWP and C, N, water and energy footprints in the life cycle of Mulberry silk systems.
- To prepare life cycle inventory of mulberry silk and its product.
- To identify alternative practices to mitigate GHG emission and minimize the C, N and water footprints in mulberry silk production system along with their socio-economic implication.

Progress:

Soil Samples: A total of 120 soil samples at a depth of 15cm from mulberry plantations maintained by State Sericulture Department, J&K, and farmers field located at Baramulla, Srinagar, Kulgam, Shopian, Anantanag, Budgam districts were collected, processed and sent to CSR&TI, Mysore for analysis. Further, a total of 48 soil samples were collected from test sites at varying depths (15, 30, 45, and 60 cm) before and after the spring and autumn seasonal rearing of 2023. These sites included the Gosherami tree plantation at a farmer's field in Anantanag, as well as the Gosherami bush and tree plantation maintained by the institute.

Leaf samples: Leaf samples from Gosherami plantations located at farmer's field in Anantanag, as well as the Gosherami bush and tree plantation maintained at the institute were collected, processed and sent to CSR&TI, Mysore for analysis.

Mulberry tree measurements: Information related to height and trunk diameter was collected for a total of 103 trees.

Water samples: Water samples from reeling units comprising of cottage basin, MRM and ARM were collected and sent to CSR&TI, Mysore for processing.

Surveys: Multiple surveys were conducted to explore different facets of the silk industry. A consumer survey with 271 respondents, a survey of 64 sericulture farmers, and surveys of two reeling and two weaving units in the post-cocoon sector were completed in the study.

5. Project title and code: Impact Assessment of Mulberry Sericulture Technologies in India (MTS13002MI)

Project Duration: 03 years (July 2022-June 2025).

Investigators: Dr. Ashok Kumar Kasukurthi

Objectives:

- To create a protocol for maintaining the data-base of technologies developed by CSB R&D institutes and enlisting all the technological interventions along with the expected impact.
- To understand the socio-economic aspects of the impact of sericulture technologies on seri-farmers' livelihoods from different regions.
- To work out comparative economics of sericulture vis a vis other commercial agricultural and horticultural enterprise in select regions.

Progress:

Collected the survey data from hundred (100) pre-cocoon farmers in Kashmir and Uttar Pradesh region for pre-testing (25) in Pulwama district (Village: Sathpukhran, Khrew) and (27) In Budgam district (Village: Haran, soibug), (33) each in Anantnag and Tral districts and (15) Varanasi district (U.P) (Ganjari village) data has been uploaded in Kobotoolbox application along with GPS photographs. Apart from compiling the information pertaining to the performance, suitability of the technologies and response of each of the farmers during the course of the study. The data revealed increased in seed intake, number of reares and increase in cocoon yield by 8-13 kg with the adoption of identified technologies among the target farmers.

Interaction with sericulture farmers in Kashmir valley- Kupwara Pulwama, Badgam, Anantnag and Tral areas



6. Project title and code: Evaluation of promising mulberry varieties, bed disinfectant and low cost drip fertigation system for Eastern and North-Eastern India (MOE02015MI)

Component - II: Evaluation of high yielding and low temperature stress tolerant C-01 & C-11 (in collaboration with CSR&TI, Berhampore)

Investigators: Dr. Santoshkumar Magadum (Co-I), Sh. Chhattar Pal, (Co-I)

Project period: February, 2022 - January, 2025

Objectives:

- To evaluate promising high yielding and low temperature stress tolerant genotypes C-01 and C-11 in sub-tropical condition.

Progress achieved:

- Saplings of test genotypes (C-01 and C-11) along with check (C-2038) received from CSR&TI, Berhampore have been transplanted along with local check (S-146) in the main field in Randomized Block Design with 3 replications at RSRS, Jammu.
- All the necessary cultural operations, pruning and training were carried out at appropriate time for better establishment of experimental plantation.
- Soil samples were collected from all the experimental plots and analyzed and appropriate quantity of farm yard manure and inorganic fertilizers were applied.
- All the test genotypes were established and maintained appropriately in main field by following all the recommended cultural practices (Figure 18).
- After the establishment, all the test genotypes along with check varieties were evaluated for growth, yield and leaf quality parameters during Spring, Summer and Autumn seasons in 2023 and submitted to Director, CSR&TI, Pampore for onward submission to PI of the project at CSR&TI, Berhampore (Table 72).
- Bioassay study by rearing FC1xFC2 silkworm hybrid during Spring 2024 is under progress.
- Based on the data analysis, it has been observed that C-11 (C-2065) has been found to be high yielding during all the three seasons followed by C-01 (C-2060) as compared to both the control varieties.

Table 72 Growth and yield attributing parameters of test genotypes recorded during Spring, Summer and Autumn seasons 2023

Season	Genotypes	Days to sprout after pruning (days)	Leaves per meter shoot length (Nos)	Leaf moisture (%)	Primary shoots per plant (Nos)	Length of the longest shoot (cm)	Leaf yield (g/plant)	Leaf yield (kg/plot)
Spring, 2023	C-01(C-2060)	29	18	72.29	19	96	0.667	32.680
	C-11(C-2065)	32	17	73.56	21	114	0.748	36.642
	C-2038 (C)	36	18	70.92	17	99	0.620	30.380
	S-146 (C)	35	17	72.66	17	94	0.584	28.629
Summer, 2023	C-01(C-2060)	10	22	78.46	17	157	0.858	42.035
	C-11(C-2065)	9	22	80.03	19	142	0.963	47.207
	C-2038 (C)	10	19	77.75	14	150	0.813	39.850
	S-146 (C)	12	20	80.47	19	152	0.734	35.969
Autumn, 2023	C-01(C-2060)	16	21	76.26	11	157	0.733	35.933
	C-11 (C-2065)	18	19	80.46	12	137	0.797	39.053
	C-2038 (C)	20	18	76.14	11	133	0.680	33.343
	S-146 (C)	23	18	78.77	12	146	0.672	32.935



Figure 18 Establishment and maintenance of experimental plantation in main field at RSRS Jammu

At RSRS Sahaspur

The plantation of two mulberry varieties viz. C-01 (C2060) and C-11 (C-2065) as treatment and C-2038 and S-146 as check was done during last week of January, 2022 in the plots earmarked in Randomized Block Design. 147 saplings of each variety were planted in three replication (49 plants each replication) under the spacing 3' x 3'. The first pruning at 8" above from ground level for development of crown has been done in the month of March, 2023. The plantation is being maintained as per the recommended package of practices of RSRS, Sahaspur. The morphological and yield attributes data has been recorded during summer and autumn 2023 and is depicted in the following table 73, 74, 75.

Table 73 Yield and morphological data of OST Summer 2023

Variety	Days to sprout after pruning (Days)	Leaves per meter shoot length (Nos.)	Leaf moisture (%)	Primary Shoot/plant (Nos.)	Length of longest shoot (cm)	Leaf yield (g/plant)	Leaf yield (kg/plot)
C-01	7.53±0.64	21.40±3.18	74.70 ± 1.96	5.53±1.41	195.47±15.45	844.53±224.13	30.97 ± 1.58
C-11	9.60±0.74	22.73±2.76	78.33 ± 0.70	5.27±0.96	169.27±32.51	1007.73±386.41	33.81 ± 5.97
C-2038	14.33±0.62	19.60±1.55	76.89 ± 4.01	4.33±0.49	183.93±15.39	974.47±176.18	35.84 ± 5.32
S-146	9.67±0.49	25.67±2.99	76.29 ± 0.67	5.00±0.93	179.40±23.12	1074.60±303.47	42.29 ± 1.80

Table 74 Disease and pest damage index Summer 2023

Variety	Total No. of leaves/branch (Mean)	PDI Scale			Percent damage index
		Leaf spot (Mean)	Tukra (Mean)	Powdery mildew (Mean)	Leaf webber (Mean)
C-01	42	0	0	0	0
C-11	38	0	0	0	0
C-2038	36	0	0	0	0
S-146	46	0	0	0	0

Table 75 Yield and morphological data of OST during Autumn 2023

Variety	Days to sprout after pruning (Days)	Leaves per meter shoot length (Nos.)	Leaf moisture (%)	Primary shoot/plant (Nos.)	Length of longest shoot (cm)	Leaf yield (g/plant)	Leaf yield (kg/plot)
C-01	5.60±0.51	20.87±3.25	69.73 ± 1.63	6.87±1.25	191.40±16.27	754.40±16.27	33.65 ± 1.79
C-11	7.67±0.72	22.53±2.61	63.93 ± 1.07	5.73±1.49	156.60±29.64	719.60±29.64	34.25 ± 2.01
S-146	8.47±0.52	18.47±4.37	74.72 ± 3.87	5.53±1.19	182.33±16.29	745.33±16.29	35.33 ± 0.48
C-2038	9.47±0.52	20.27±7.70	73.48 ± 3.19	5.27±0.96	167.53±19.52	730.53±19.52	34.16 ± 1.20

Table 76 Disease and pest index Autumn2023

Variety	Total No. of leaves/branch (Mean)	PDI Scale			Percent damage index
		Leaf spot(Mean)	Tukra(Mean)	Powdery mildew(Mean)	Leaf webber(Mean)
C-01	39	1	0	0	1
C-11	34	1	1	0	1
C-2038	42	1	0	0	1
S-146	36	1	1	0	1

RESEARCH PROJECTS CONCLUDEDAS C.I DURING 2023-24

- Project title and code: Evaluation of new bivoltine silkworm double hybrid TT21×TT56 at farmer's level for authorization for commercial exploitation (AIB01009MI)**

Project Duration: April 2020- March-2023 03 years (Extended for Six months).

Investigators: Dr. K.K Rai, Dr. Rita Singh

Objectives: To evaluate the performance of bivoltine hybrid TT21xTT56 in field for productivity and silk quality.

As per the project's established milestones, field trials of the 7200 DFLs of the hybrid TT21xTT56 were conducted between 2020 and 2023. These trials identified a potential yield of up to 87.80 kg/100 DFLs. The trials were carried out in the following locations: Kathua, Udhampur, Reasi, Rajouri, Dehradun, and Udham Singh Nagar.

CONTINEOUS PROGRAMMES

- Project: SS Pam-01 Nutrient analysis of soil and mulberry under temperate conditions**

Duration:Continuous project (Since 2012)

Investigator(s):Dr. Gulab Khan Rohela, Dr.Plabani Roy (w.e.f. 15.11.2023)

Objectives:

- Evaluation of soil health status at CSR&TI, Pampore and nested units of the institute.
- Biochemical analysis of mulberry varieties.
- Progress: Soil nutrient composition and biochemical content analysis of mulberry cultivars in temperate conditions

In the temperate regions, particularly focusing on the spring and autumn of 2023, a comprehensive analysis was conducted to evaluate the soil's nutrient composition and the biochemical content of leaves from selected superior mulberry cultivars. This analysis was carried out to better understand the environmental conditions affecting mulberry growth and to optimize cultivation practices.

Soil sampling and preparation: During the first week of April 2023, soil samples were meticulously collected from two distinct locations: the CSR&TI in Pampore and the P4 Basic Seed Farm in Manasbal. The chosen locations are well-known for their mulberry cultivation, making them ideal for this study. The collected soil samples underwent a series of preparatory steps to ensure accurate and reliable analysis:

1. **Drying:** The soil samples were air-dried at room temperature. This method helps preserve the soil's natural properties, ensuring the integrity of the subsequent analysis.
2. **Removal of stony and coarse material:** To obtain a uniform sample for testing, all stony and coarse materials were carefully removed. This step ensures that the sample consists of fine soil particles, which are essential for precise testing.
3. **Powdering:** The cleaned soil was finely powdered to facilitate thorough mixing and accurate measurement of its properties.

Soil Analysis Parameters: The finely prepared soil samples were then analyzed for 12 crucial parameters in the Agronomy and Soil Science section laboratory at CSR&TI, Pampore. These parameters were chosen to provide a comprehensive profile of the soil's health and its suitability for mulberry cultivation. The parameters analyzed included:

1. **pH:** To assess the acidity or alkalinity of the soil, which affects nutrient availability and microbial activity.
2. **Electrical Conductivity (EC):** To measure the soil's ability to conduct electrical current, which is an indicator of soil salinity and overall ion content.
3. **Organic Carbon (OC):** To evaluate the soil's organic matter content, which is crucial for soil fertility and structure.
4. **Macronutrients:**
 - **Nitrogen (N):** Essential for plant growth, affecting leaf development and chlorophyll production.
 - **Phosphorus (P):** Important for root development and energy transfer within the plant.
 - **Potassium (K):** Vital for overall plant health, influencing water uptake and resistance to diseases.
5. **Micronutrients:**
 - **Sulfur (S):** Necessary for protein synthesis and chlorophyll formation.
 - **Iron (Fe):** Crucial for chlorophyll synthesis and enzyme function.
 - **Manganese (Mn):** Important for photosynthesis and nitrogen metabolism.
 - **Zinc (Zn):** Involved in various enzymatic functions and growth regulation.
 - **Copper (Cu):** Required for lignin synthesis and various plant metabolic processes.
 - **Boron (B):** Essential for cell wall formation and reproductive growth.

Findings during 2023-24: The soil analysis revealed that, with the exception of zinc, all other nutrient values in the soils from CSR&TI, Pampore, and P4 Basic Seed Farm, Manasbal, were within the normal limits (Table 77). This indicates a generally favorable environment for mulberry cultivation, with adequate availability of essential nutrients. The deficiency in zinc, however, suggests the need for targeted fertilization strategies to address this specific nutrient gap.

This detailed understanding of soil nutrient composition, coupled with the biochemical content analysis of the mulberry leaves, provides critical insights into optimizing mulberry cultivation practices under temperate conditions. The results of this study will aid in developing tailored fertilization regimes, ensuring the healthy growth and productivity of mulberry crops in these regions.

Table 77 Soil analysis of soil samples collected from CSR&TI, Pampore and P4, Basic Seed Farm, Manasbal (Spring- 2023)

Location	Macronutrients							Micronutrients				
	pH	EC (dS/m)	OC (%)	N (Kg/ha)	P (Kg/ha)	K (Kg/ha)	S mg/kg	Zn mg/kg	B mg/kg	Fe mg/kg	Mn mg/kg	Cu mg/kg
CSR&TI, Pampore	7.32	0.32	1.44	467	125	202	26	2.04	15.22	12.32	8.20	5.34
Soil Health Report	Medium	Medium	High	Medium	High	Medium	High	High	High	High	Medium	High
P4-Manasbal	7.00	0.45	1.30	342	87	145	14	0.54	17.02	20.12	8.33	10.45
Soil Health Report	Medium	Medium	M High	Medium	High	Medium	Medium	Low	High	High	High	High

Biochemical Analysis of Superior Mulberry Cultivars in Spring and Autumn 2023:

To understand the biochemical properties of superior mulberry cultivars, an extensive analysis was conducted on leaf samples collected during the spring and autumn seasons of 2023. This study aimed to quantify key biochemical components—total soluble protein content, total soluble carbohydrate content, and total chlorophyll content—across different mulberry varieties cultivated at the CSR&TI, Pampore.

Selection of mulberry Cultivars: The following eight mulberry cultivars were chosen for their superior qualities and relevance to mulberry cultivation practices:

1. Goshierami
2. PPR1
3. Chinese White
4. Rokokuyasu
5. KNG
6. TR-10
7. Ichinose
8. Karioroso

Leaf samples from these cultivars were collected from the CSR&TI, Pampore mulberry farm during both the spring and autumn growing seasons, ensuring that seasonal variations in biochemical composition could be accurately assessed.

Biochemical parameters and methods used: The collected leaf samples were subjected to biochemical analysis using the following methods:

1. **Total soluble protein content:** Measured using Bradford's method, which involves the binding of Coomassie Brilliant Blue dye to protein molecules, resulting in a color change proportional to protein concentration. The intensity of the color was measured using a spectrophotometer.
2. **Total soluble carbohydrate content:** Determined by the anthrone method, a widely used calorimetric method that reacts with carbohydrates to produce a green-colored complex. The intensity of the color, which is directly proportional to the carbohydrate content, was also measured using a spectrophotometer.
3. **Total chlorophyll content:** Quantified using the acetone method, where chlorophyll is extracted with acetone and the resulting solution's absorbance is measured using a spectrophotometer. This method allows for the estimation of chlorophyll content by measuring the intensity of light absorption.

Key Findings: The biochemical analysis revealed distinct differences in the biochemical content of mulberry leaves between the spring and autumn seasons, as detailed below:

1. **Higher biochemical content in Spring:** Across all eight cultivars, it was observed that the leaves had higher levels of chlorophyll, protein, and carbohydrate content during the spring season compared to the autumn season (Table 78). This seasonal variation indicates that the spring growing conditions are more favorable for the accumulation of these critical biochemical compounds.
2. **Chlorophyll content:** Among the cultivars, Chinese White exhibited the highest chlorophyll content in the spring season, with a concentration of 6.18 mg/g leaf. This high chlorophyll content suggests a robust photosynthetic capacity, which is essential for the growth and vigor of the plant.
3. **Carbohydrate content:** The cultivars Goshierami and PPR1 showed the highest total soluble carbohydrate content in the spring, with concentrations of 301 mg/g dwt and 296 mg/g dwt of leaf, respectively. This high carbohydrate content indicates efficient energy storage and metabolic activity in these cultivars.
4. **Protein content:** In terms of total soluble protein content, the cultivars Ichinose and KNG stood out with the highest values, measuring 54.45 mg/g dwt and 48.85 mg/g dwt of leaf, respectively, during the spring season. High protein content is indicative of the leaves' nutritional quality and is crucial for silk production in sericulture.
5. **Lower biochemical values in Autumn:** All the examined cultivars showed lower biochemical measurements in the autumn compared to the spring (Table 78). The reduction in chlorophyll, carbohydrate, and protein content during autumn suggests that cooler temperatures and shorter daylight hours negatively impact the synthesis and accumulation of these compounds.

Conclusion: The study's findings underscore the importance of the spring season for the cultivation of superior mulberry cultivars, as evidenced by the higher biochemical content in leaves during this period. These results highlight the need for optimized cultivation and harvesting practices that align with seasonal variations to maximize the biochemical potential of mulberry leaves. By understanding these seasonal dynamics, mulberry growers can better plan their cultivation strategies to improve yield and quality, particularly for applications in sericulture.

Table 78 Biochemical analysis of mulberry leaves during Spring and Autumn 2023 (CSR&TI, Pampore)

Mulberry variety	Moisture Content (%)		Total Chlorophyll (mg/g leaf)		Total Carbohydrate (mg/g dwt leaf)		Total Protein (mg/g dwt leaf)	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Goshoerami	79.32	71.65	4.81	4.32	301	282	44.53	39.36
KNG	80.11	73.81	4.96	4.59	264	237	49.85	46.31
Ichinose	83.24	72.43	5.32	4.92	283	246	54.45	49.62
Chinese White	77.39	70.65	6.18	5.61	272	224	42.36	38.23
PPR1	80.07	75.56	5.21	4.88	296	255	48.88	41.40
Tr-10	74.33	66.34	4.18	3.89	247	231	39.31	36.27
Rokokuyaso	67.92	61.67	4.56	4.11	201	194	45.63	43.29
Karioroso	77.71	68.92	4.10	3.98	224	216	43.78	42.13

2. Programme Title and code: Maintenance of Silkworm Germplasm (AIE-3056)

Project Duration: Continuous

Project Investigator(s): Dr. KiranR, Sh. Bharath Kumar Neelaboina, Sh. Kumaresan P

Objective: Evaluation, characterization and maintenance of Germplasm of bivoltine races of different origin.

A total of 111 bivoltine silkworm genetic resources of different origins are maintained at Silkworm Division, CSR&TI, Pampore during the year 2023-24. The races were brushed in composite mode during spring, 2023. After 3rd stage, 300 larvae were retained in each replication. The seed was prepared in all the races for next generation maintenance as *ex-situ* conservation process. The Origin-wise breakups of exotic and indigenous races are given in table 79 and rearing performance of the 111 races maintained under Germplasm is presented in Table 80.

Table 79 Origin-wise breakups of exotic and indigenous races maintained under silkworm germplasm

Exotic races		Indigenous races	
Origin	Number	Origin	Number
European	04	Mirgund	10
Japanese	26	Dehradun	01
Chinese	13	Mysore	03
Russian	17	Assam	02
Total	60	Pampore	34
		Berhampore	01
		Total	51
Grand Total		111	

Table 80 Mean performance of Silkworm Genetic resources during Spring, 2023

#	Acc. No.	Race/GPRs	ERR		PR	SCW	SSW	SR	Cocoon character	
			By No.	By Wt.	(%)	(g)	(g)	(%)	Colour	Shape
1	GPB-PAM-001	Alps Jaune	5600	9.77	56	1.607	0.31	19.29	Flesh yellow	Dumbel
2	GPB-PAM-002	Alps Yellow	9000	11.9	90	1.368	0.22	16.12	Golden yellow	Oval
3	GPB-PAM-003	Cevenese Yellow	8233	13.51	82.33	1.561	0.247	15.84	Golden yellow	Oval
4	GPB-PAM-004	Ascoli Yellow	6633	8.79	66.33	1.433	0.205	14.29	Yello	Dumbel
5	GPB-PAM-005	KN-2	9000	11.27	90	1.53	0.274	17.9	White	Dumbel
6	GPB-PAM-006	Meigetsu	8167	12.85	81.67	1.59	0.26	16.33	White	Oval
7	GPB-PAM-007	B-36	7600	13.36	76	1.874	0.31	16.52	White	Dumbel
8	GPB-PAM-008	B-37	9933	13.01	99.33	1.382	0.225	16.25	White	Oval
9	GPB-PAM-009	B-39	6733	10.01	67.33	1.562	0.23	14.75	White	Dumbel
10	GPB-PAM-010	B-40	9833	19.93	98.33	1.146	0.196	17.12	White	Dumbel
11	GPB-PAM-013	Gunko Marie	8333	12.59	83.33	1.612	0.273	16.96	White	Oval
12	GPB-PAM-014	SS-4A	8300	13	83	1.586	0.269	16.96	White	Dumbel
13	GPB-PAM-015	SS-15A	7667	12.23	76.67	1.729	0.291	16.83	White	Dumbel
14	GPB-PAM-016	SS-17	9733	17.5	97.33	1.282	0.201	15.7	White	Dumbel
15	GPB-PAM-017	SS	9867	15.63	98.67	1.519	0.276	18.16	White	Dumbel
16	GPB-PAM-018	KY-I	8567	13.34	85.67	1.61	0.277	17.18	White	Dumbel
17	GPB-PAM-019	KY-II	5333	9.32	53.33	1.531	0.268	17.5	White	Dumbel
18	GPB-PAM-020	Taichoan x Hokoshingyako	7700	11.49	77	1.567	0.3	19.13	White	Oval
19	GPB-PAM-021	N124 X C124	6700	11.87	67	1.6	0.313	19.58	White	Dumbel
20	GPB-PAM-022	(N112 x C110) X (N124 x C124)	8733	12.01	87.33	1.189	0.217	18.29	White	Dumbel
21	GPB-PAM-023	Shoko Ginrei	8767	13.12	87.67	1.678	0.3	17.89	White	Dumbel
22	GPB-PAM-024	Fuji Sukara	8167	13.49	81.67	1.845	0.333	18.02	White	Dumbel
23	GPB-PAM-025	Taichoan	9767	14.91	97.67	1.534	0.302	19.71	White	Dumbel
24	GPB-PAM-026	ShogetsuHosho	5467	9.6	54.67	1.733	0.316	18.23	White	Oval
25	GPB-PAM-027	KyorieShimpaku (P)	6467	9.2	64.67	1.523	0.282	18.5	White	Dumbel
26	GPB-PAM-028	KyorieShimpaku (M)	6500	10.61	65	1.826	0.353	19.34	White	Oval
27	GPB-PAM-029	ShinkiReyaku	6700	11.41	67	1.687	0.348	20.63	White	Dumbel
28	GPB-PAM-030	ShuneriShogetsu	9733	16.55	97.33	1.613	0.283	17.52	White	Oval
29	GPB-PAM-034	SM-2	7500	10.95	75	1.377	0.257	18.63	White	Oval
30	GPB-PAM-038	Zebra	9833	12.45	98.33	1.397	0.17	12.18	Flesh yellow	Dumbel
31	GPB-PAM-039	Yakwei	7700	12.17	77	1.587	0.281	17.68	White	Oval
32	GPB-PAM-040	Chang Naung	6067	10.93	60.67	1.991	0.374	18.8	White	Oval
33	GPB-PAM-043	C-110	9333	13.57	93.33	1.663	0.27	16.24	White	Oval
34	GPB-PAM-044	Chukwei	6167	8.86	61.67	1.454	0.273	18.76	White	Oval
35	GPB-PAM-045	Chinese Farmer	6467	9.56	64.67	1.588	0.258	16.26	White	Oval
36	GPB-PAM-046	Chinese Golden-70	6700	9.95	67	1.532	0.259	16.92	Golden yellow	Dumbel
37	GPB-PAM-047	Chinese Golden-80	7700	11.27	77	1.496	0.242	16.19	Golden yellow	Dumbel
38	GPB-PAM-048	Chinese Golden-90	6300	10.05	63	1.51	0.259	17.15	Golden yellow	Oval
39	GPB-PAM-049	Haulak	8367	12.46	83.67	1.6	0.27	16.88	White	Oval
40	GPB-PAM-050	King Haung	9367	13.75	93.67	1.457	0.284	19.52	White	Dumbel
41	GPB-PAM-051	Hauchi	7333	11.31	73.33	1.338	0.21	15.7	White	Oval
42	GPB-PAM-053	Nan Naung - 6A	7200	14.11	72	1.576	0.245	15.56	White	Oval
43	GPB-PAM-054	Chinese Yellow	5933	9.99	59.33	1.846	0.306	16.55	Golden yellow	Oval
44	GPB-PAM-055	M-III	6767	11.42	67.67	1.702	0.284	16.68	White	Oval
45	GPB-PAM-056	M-10	6833	11.99	68.33	1.748	0.302	17.28	White	Dumbel

46	GPB-PAM-057	M-42	8433	13.53	84.33	1.609	0.28	17.39	White	Oval
47	GPB-PAM-058	M-43	8733	13.56	87.33	1.552	0.285	18.36	White	Oval
48	GPB-PAM-059	M-45	7100	11.05	71	1.587	0.229	14.43	White	Oval
49	GPB-PAM-060	M-46	7933	10.61	79.33	1.499	0.215	14.34	White	Oval
50	GPB-PAM-061	MJ-20	6800	9.69	68	1.42	0.252	17.74	White	Dumbel
51	GPB-PAM-062	MJ-23	6800	10.5	68	1.382	0.227	16.46	White	Oval
52	GPB-PAM-063	MJ-103	7833	12.31	78.33	1.522	0.254	16.67	White	Dumbel
53	GPB-PAM-064	MJ-107	6067	10.19	60.67	1.417	0.265	18.73	White	Oval
54	GPB-PAM-072	Azad	7333	11.23	73.33	1.52	0.267	17.58	White	Dumbel
55	GPB-PAM-073	Azerbaijan	5700	9.59	57	1.748	0.294	16.84	White	Dumbel
56	GPB-PAM-074	Sanish-E1 (P)	6200	9.29	62	1.549	0.275	17.78	White	Dumbel
57	GPB-PAM-075	Sanish-E1 (M)	6300	10.51	63	1.648	0.265	16.08	White	Dumbel
58	GPB-PAM-076	Sanish-E2 (M)	6833	13.88	68.33	1.387	0.243	17.54	White	Dumbel
59	GPB-PAM-077	Sanish-8	5833	8.61	58.33	1.587	0.281	17.68	White	Dumbel
60	GPB-PAM-078	Sanish-17	6500	11.94	65	1.585	0.264	16.67	White	Dumbel
61	GPB-PAM-079	Sanish-18 (P)	7067	10.12	70.67	1.381	0.26	18.83	White	Dumbel
62	GPB-PAM-080	Sanish-18(M)	7467	12.22	74.67	1.816	0.287	15.78	White	Dumbel
63	GPB-PAM-081	Sanish-21 (P)	8067	13.33	80.67	1.719	0.306	17.79	White	Dumbel
64	GPB-PAM-082	Sanish-30	7833	12.63	78.33	1.668	0.286	17.14	White	Oval
65	GPB-PAM-083	Sheiki-I	6867	10.93	68.67	1.561	0.272	17.39	White	Dumbel
66	GPB-PAM-084	Sheiki-II	6067	9.69	60.67	1.831	0.257	14.05	White	Dumbel
67	GPB-PAM-085	Tashkash-112	9467	12.79	94.67	1.328	0.253	19.02	White	Dumbel
68	GPB-PAM-086	Gyandza	8833	15.25	88.33	1.727	0.279	16.13	White	Oval
69	GPB-PAM-087	Belkokona	8867	14.38	88.67	1.623	0.3	18.51	White	Dumbel
70	GPB-PAM-088	Merifa-7	9033	13.77	90.33	1.495	0.303	20.27	White	Dumbel
71	GPB-PAM-092	SH-6	5900	9.85	59	1.672	0.302	18.05	White	Oval
72	GPB-PAM-110	NB4D2	9633	14.87	96.33	1.688	0.285	16.89	White	Dumbel
73	GPB-PAM-116	CSR-2	9100	16.56	91	1.788	0.337	18.83	White	Oval
74	GPB-PAM-117	CSR-4	8067	11.83	80.67	1.52	0.283	18.62	White	Oval
75	GPB-PAM-124	PLF	9933	14.32	99.33	1.451	0.255	17.57	White	Dumbel
76	GPB-PAM-125	BL-1	8733	13.59	87.33	1.533	0.277	18.06	White	Oval
77	GPB-PAM-126	SF-17	9667	14.43	96.67	1.613	0.259	16.06	White	Dumbel
78	GPB-PAM-127	AT-4	8533	13.6	85.33	1.654	0.303	18.29	White	Dumbel
79	GPB-PAM-128	AT-9	8633	13.88	86.33	1.665	0.312	18.75	White	Oval
80	GPB-PAM-129	IB-2	6700	10.7	67	1.531	0.276	18.05	White	Dumbel
81	GPB-PAM-130	IB-3	7667	11.24	76.67	1.413	0.288	20.39	White	Oval
82	GPB-PAM-131	IB-9	6233	9.23	62.33	1.495	0.294	19.66	White	Dumbel
83	GPB-PAM-132	IB-11	8600	13.13	86	1.516	0.252	16.61	White	Oval
84	GPB-PAM-133	TA-3	9433	13.61	94.33	1.593	0.274	17.2	White	Dumbel
85	GPB-PAM-134	J-Plain	9800	15.44	98	1.533	0.252	16.44	White	Oval
86	GPB-PAM-135	J-Marked	7067	11.17	70.67	1.761	0.295	16.73	White	Oval
87	GPB-PAM-136	HS-6 (SL)	9833	16.05	98.33	1.519	0.233	15.36	White	Dumbel
88	GPB-PAM-137	C-Nichi (SL)	6333	9.64	63.33	1.407	0.261	18.55	White	Dumbel
89	GPB-PAM-138	RP-I	6900	10.55	69	1.466	0.256	17.44	White	Oval
90	GPB-PAM-139	RP-II	5400	9.06	54	1.535	0.265	17.25	White	Oval
91	GPB-PAM-140	Pam-101	8567	13.52	85.67	1.409	0.281	19.92	White	Oval
92	GPB-PAM-141	Pam-102	7333	12.47	73.33	1.508	0.25	16.55	White	Dumbel
93	GPB-PAM-142	Pam-103	6900	8.22	69	1.751	0.295	16.86	White	Oval
94	GPB-PAM-143	Pam-104	8167	11.76	81.67	1.309	0.262	20	White	Dumbel
95	GPB-PAM-144	Pam-105	8433	13.43	84.33	1.508	0.283	18.74	White	Dumbel
96	GPB-PAM-145	Pam-106	7900	12.01	79	1.366	0.265	19.37	White	Dumbel
97	GPB-PAM-146	Pam-107	8133	15.35	81.33	1.566	0.258	16.48	White	Oval
98	GPB-PAM-147	Pam-108	5333	8.11	53.33	1.554	0.279	17.98	White	Oval
99	GPB-PAM-148	Pam-109	8633	14.39	86.33	1.743	0.301	17.25	White	Oval
100	GPB-PAM-149	Pam-110	9167	13.05	91.67	1.473	0.233	15.84	White	Oval

101	GPB-PAM-150	Pam-111	8233	13.78	82.33	1.476	0.284	19.24	White	Dumbel
102	GPB-PAM-151	Pam-112	7333	10.14	73.33	1.347	0.239	17.78	White	Dumbel
103	GPB-PAM-152	Pam-113	6667	9.25	66.67	1.538	0.301	19.56	White	Dumbel
104	GPB-PAM-153	Pam-114	7333	12.33	73.33	1.66	0.296	17.81	White	Dumbel
105	GPB-PAM-154	Pam-115	8333	13.18	83.33	1.423	0.275	19.35	White	Dumbel
106	GPB-PAM-155	Pam-116	7767	12.72	77.67	1.863	0.36	19.33	White	Dumbel
107	GPB-PAM-156	Pam-117	9267	14.08	92.67	1.669	0.283	16.93	White	Dumbel
108	GPB-PAM-157	CS-6	6300	10.31	63	1.636	0.299	18.3	White	Oval
109	GPB-PAM-122	Barapolu	9467	9.34	94.67	1.003	0.128	12.8	Golden yellow	Spindle
110	GPB-PAM-123	Borpat	8800	8.52	88	0.948	0.115	12.17	Greenish yellow	Spindle
111	GPB-PAM-158	S-36	7833	12.2	78.33	1.61	0.285	17.67	White	Oval
	Mean		7755	12.07	77.55	1.554	0.271	17.4		
	SD		1272	2.17	12.73	0.17	0.039	1.61		

Programme title and code: Maintenance of Silkworm Breeder's Stock (AIE-3202)

Project Duration: Continuous

Project Investigator(s): Dr. Kiran R, Sh. Bharath Kumar Neelaboina, Sh. Kumaresan P

Objective: Maintenance of silkworm breeder's stock to their original characteristics and to make supply of P3 layings for further utilization.

Progress: A total of 13 bivoltine silkworm breeder stocks are being maintained under this programme. The breeds which comprised of 13 existing breeders stocks and 37 newly included breeders stocks which are currently utilized in the on-going research programme were reared during spring, 2023-24. The races were brushed in cellular mode during spring, 2023-24. After 3rd stage, 300 larvae were retained in each replication. The seed was prepared in all the races for next generation and for utilization in various breeding programmes. The performance of the races is given in Table 81.

Table 81 Mean performance of Breeders stocks during Spring 2023

#	Acc.No.	Race/ GPRs	Yield/10,000 larvae		SCW (g)	SSW (g)	SR %	Cocoon	
			By No.	By Wt.				Colour	Shape
1	BS-PAM-001	CSR 2	8167	13.90	1.921	0.377	19.62	white	Oval
2	BS-PAM-002	CSR 4	8467	12.43	1.565	0.284	18.14	white	Dumbell
3	BS-PAM-003	CSR 6	9867	14.92	1.457	0.279	19.13	white	Dumbell
4	BS-PAM-004	CSR 26	9933	16.89	1.399	0.277	19.83	white	Dumbell
5	BS-PAM-005	CSR 27	7533	13.69	1.470	0.262	17.83	white	Oval
6	BS-PAM-006	SH-6	6400	10.22	1.792	0.317	17.67	white	Oval
7	BS-PAM-007	NB4D2	9867	16.21	1.537	0.256	16.67	white	Dumbell
8	BS-PAM-008	CS 6	9833	15.57	1.412	0.284	20.13	white	Oval
9	BS-PAM-009	Pam-101	9667	15.89	1.434	0.242	16.84	white	Dumbell
10	BS-PAM-010	Pam-111	9800	14.65	1.347	0.258	19.17	white	Dumbell
11	BS-PAM-011	Pam-114	9867	16.01	1.518	0.279	18.36	white	Oval
12	BS-PAM-012	Pam-115	9533	16.49	1.528	0.259	16.97	white	Dumbell
13	BS-PAM-013	Pam-117	9333	16.41	1.274	0.254	19.95	white	Dumbell
	Mean		9097	14.87	1.51	0.28	18.49		
	SD		1120.49	1.91	0.17	0.04	1.24		

REGIONAL SERICULTURAL RESEARCH STATION, SAHASPUR, DEHRADUN (UK)

Regional Sericultural Research Station, Sahaspur, Dehradun (Uttarakhand) was established as Univoltine Research Substation in 1973 at Majra, Dehradun to provide Research and Development support to sericulture industry of five north western non-traditional states. It was upgraded to RSRS in 1985 and got shifted to Sahaspur at its present location in September, 1993. It is situated between Shivalik range at foothills of Himalayas at a latitude of 30°21'N and longitude of 77°52'E at an altitude of 516.5 metres above mean sea level. Soil is medium textured sandy silt in top layers and silty clay loam in deeper layers with pebbles having moderate permeability, pH range of 5.5 to 6.5 and average annual rainfall of about 1600 mm with >85% precipitation in monsoon. Temperature ranges from 2.8°C in winter and 39.5°C during summer. Area under station is 15.62 acre with 11.00 acres effective under mulberry plantation and rest for roads, rearing buildings, grainages, farmhouse, administrative cum technical block and staff quarters. The rich germplasm of 82 mulberry varieties and 77 mulberry silkworm races is being maintained by following maintenance protocol.

MANDATE OF RSRS, SAHASPUR:

- ❖ To maintain germplasm bank of mulberry genotypes, evaluate and recommend suitable mulberry variety for the region.
- ❖ To formulate research projects and adaptive research on horticulture and on silkworm aspects & their implementation.
- ❖ To provide cultivation technology for mulberry varieties for plain and hills
- ❖ To maintain germplasm bank of mulberry silkworms, evaluation, hybridization and evaluation of suitable hybrids for the region after thorough experimentation and field trials.
- ❖ To provide cost effective rearing technology to the farmers after thorough experimental field trials.
- ❖ To transfer the technology in the field, to study the yield gap and to suggest the measures to improve the cocoon productivity in different states.
- ❖ To provide training to technical staff of different states and silkworm farmers.

VISION

- ☞ Research & Development support for development of Sericulture Industry in Uttarakhand, Uttar Pradesh and Haryana.

MISSION

- ☞ Make continuous efforts in R&D and Technology Transfer to Uttarakhand, Uttar Pradesh, and Haryana as per their specific need.
- ☞ State specific efforts for greater opportunities in employment in sericulture and to improve the levels of income of farmers through sericulture.
- ☞ Productivity enhancement through region and season specific silkworm hybrids and mulberry varieties.
- ☞ Strengthening level of our efficiency through a commitment to quality support to sericulture farmers.
- ☞ Watch on soil health of sericulture farmers and its improvement through cost effective Integrated Nutrient management.

Maintenance of Mulberry & Silkworm Germplasm

Moriculture Section

- Eighty-two (82) mulberry accessions (10 exotic and 72 indigenous) were maintained at RSRS, Sahaspur as Sub-tropical Mulberry Germplasm.
- Seventy-seven (77) silkworm accessions viz., 48 accessions - Germplasm Bank (GPB) and 29 accessions - Parental Breeders' Stock (PBS) were maintained at RSRS, Sahaspur during the year 2023-2024. GPB maintenance was carried out spring to spring season while PBS was maintained under both spring and autumn schedule every year.



Maintenance of silkworm germplasm

Sericulture Section

Project code & Title: (AIB 2016)Maintenance and Evaluation of Silkworm Germplasm Bank [with Maintenance of Parental Lines and Breeders' Stock]

Project Duration: Continuous

Project Investigators: Dr. Sardar Singh, Scientist-D

Objective:

- 1) *To maintain the basic gene pool for future utilization in breeding projects.*
- 2) *To serve as basic material for development of region and season specific hybrids for different eco-zones.*

Maintenance of Silkworm Germplasm Bank (GPB): Spring rearing, 2023 GPB stock was initiated with 490 DFLs in respect to 49 races (all @ 10 DFLs each except mentioned in parenthesis/brackets against the race) viz. SM Series (2) : SM 1, SM 3 (01 DFLs); JP Series (3) : JP1A (P), JP1A(M), JP1B (M); PY Series (2) : PY 1(08 DFLs), PY 5; AF Series (2) : AF 2, AF 6; C Series (2) : C 108, C 122; CP Series (2) CP1B (P) (06 DFLs), CP1B (M) J Series (2) : J 112, J 122; ATR Series (2): ATR 16, ATR 29, SH Series (1) : SH 2; YS Series (3) : YS 3, YS 5, YS 7; SF Series (4) : SF 2, SF 4, SF19,SF21; SL Series (6) : SL 3, SL6, SL 7, SL 9. SL 10, SL 11; Dun Series (3): Dun 12, Dun 19, Dun 21; Others (10): RB 8, AS.HAHI, JJ 5, SY 6, NS 6, JD 6, ADG 6, Su, NN6D, KA (02 DFLs); Lines (4): Line 1, Line 4, Line 13 & Line 14 (09 DFLs). Brushing is done on 06-03-2022. Rearing and grainage were completed successfully.

On assessment of GPB races on different parameters, following observations have been made during Spring-2023 rearing viz. Fecundity; Hatching%; Yield/10000 larvae by weight (kg); Yield/10000 larvae by number; Single cocoon weight (gm); Single shell weight (gm); Shell Ratio % and Pupation rate (%). The data recorded is depicted in table 82.

Table 82: Rearing performance of Silkworm Germplasm in spring, 2023.

Race	Fec.	Hatching (%)	Larval period (D:H)	Wt. of 10 matured larvae (g)	Yield/ 10,000 Larvae Retained		Cocoon per liter (No.)	SCW (g)	SSW (g)	SR (%)
					By Wt. (Kg)	By No.				
SM series (2)										
SM 1	498	65.52	25:02	39	15.003	9343	62	1.648	0.330	20.02
SM 3	190	97.15	26:00	38.75	14.928	9499	74	1.577	0.285	18.07
JP series (4)										
JP1A(P)	462	96.21	25:02	38.75	16.271	9828	76	1.635	0.306	18.72
JP1A(M)	464	96.12	24:02	39.00	15.143	9843	64	1.667	0.313	18.77
JP1B (P)	514	97.27	25:04	38.75	16.272	9786	68	1.651	0.307	18.59
JP1B (M)	482	98.04	25:03	38.75	16.115	9915	85	1.616	0.314	19.43
PY series (2)										
PY 1	493	98.27	25:00	38.50	15.457	9886	65	1.656	0.317	19.14
PY 5	476	97.89	25:04	38.50	16.215	9872	82	1.561	0.322	20.63
AF series (2)										
AF 2	477	98.43	27:02	38.75	16.315	9786	71	1.583	0.290	18.32
AF 6	481	98.36	26:02	38.75	16.157	9729	74	1.632	0.312	19.12
C series (4)										
C 108	481	98.23	25:02	38.75	15.842	9814	81	1.626	0.324	19.93
C 122	489	97.95	25:04	38.50	16.572	9915	63	1.639	0.304	18.55
CP1B (P)	486	98.05	25:02	39.50	16.528	9928	73	1.567	0.286	18.25
CP1B (M)	490	97.86	25:04	38.50	16.186	9786	85	1.532	0.310	20.23
J series (2)										
J 112	501	97.01	26:00	38.75	16.457	9943	74	1.664	0.314	18.87
J 122	493	97.86	26:00	38.75	16.399	9799	79	1.616	0.297	18.38
ATR Series (2)										
ATR16(P)	481	97.19	26:00	38.50	16.000	9914	66	1.566	0.291	18.58
ATR29(M)	494	98.17	27:00	38.75	16.400	9843	97	1.626	0.308	18.94
SH series (1)										
SH 2	492	97.36	27:00	39.75	15.786	9843	65	1.499	0.276	18.41
YS series (3)										
YS 3	476	97.79	27:00	38.50	16.049	9900	67	1.559	0.295	18.95
YS 5	479	97.71	26:00	38.50	15.943	9686	69	1.639	0.299	18.24
YS 7	485	98.04	27:00	38.75	15.957	9928	65	1.660	0.314	18.92
SF series (4)										
SF 2	451	97.34	27:00	38.75	16.157	9834	67	1.615	0.308	19.07
SF 4	494	97.87	27:00	39.50	16.428	9828	76	1.591	0.308	19.36
SF 19	476	97.37	27:00	38.75	16.386	9814	69	1.593	0.293	18.39
SF 21	482	97.19	26:00	38.50	15.786	9757	64	1.530	0.303	19.80
SL series (6)										
SL 3	448	97.44	25:02	38.50	16.543	9943	83	1.656	0.303	18.30
SL 6	475	97.99	25:02	38.50	16.328	9728	76	1.610	0.295	18.32
SL 7	486	97.12	26:00	38.50	16.386	9786	71	1.635	0.298	18.23
SL 9	442	96.49	25:03	38.75	16.386	9786	86	1.561	0.298	19.09
SL10	497	97.03	26:02	38.00	16.314	9872	66	1.586	0.301	18.98
SL 11	472	97.87	26:02	38.50	16.228	9657	64	1.624	0.306	18.84

Race	Fec.	Hatching (%)	Larval period (D:H)	Wt. of 10 matured larvae (g)	Yield/ 10,000 Larvae Retained		Cocoon per liter (No.)	SCW (g)	SSW (g)	SR (%)
					By Wt. (Kg)	By No.				
Dun series (3)										
Dun 12	484	97.83	26:00	39.50	16.443	9843	67	1.632	0.307	18.81
Dun 19	442	97.06	25:04	39.75	16.286	9914	77	1.564	0.287	18.35
Dun 21	463	96.97	26:04	38.75	15.414	9872	78	1.665	0.311	18.68
Others (14)										
RB 8	509	97.16	25:04	39.75	16.300	9814	77	1.682	0.313	18.61
AsHAHI	425	97.64	26:00	37.75	16.500	9900	91	1.583	0.298	18.83
JJ 5	495	97.56	26:00	38.50	15.872	9614	65	1.537	0.327	21.27
SY 6	466	97.21	26:02	39.50	16.371	9771	72	1.535	0.289	18.83
NS 6	518	97.49	26:00	39.75	15.928	98.71	76	1.626	0.306	18.82
JD6	522	97.79	26:04	39.50	16.286	9799	91	1.613	0.298	18.47
ADG6	482	97.93	25:00	38.50	15.128	9799	83	1.545	0.304	19.67
Su	406	95.69	25:02	38.75	16.114	9800	73	1.493	0.275	18.42
NN6D	486	95.99	25:04	39.00	16.543	9943	86	1.576	0.286	18.15
KA	479	96.45	26:04	39.00	16.443	9743	66	1.606	0.316	19.67
Line-1	502	97.01	27:00	39.75	16.414	9814	61	1.632	0.298	18.26
Line-4	484	97.01	26:02	39.75	16.372	9772	74	1.618	0.295	18.23
Line-13	495	97.47	26:02	39.75	16.414	9743	74	1.657	0.307	18.53
Line-14	508	97.44	27:05	39.75	16.300	9700	74	1.586	0.300	18.92

To maintain the basic gene pool material for preparation of hybrids for Hybrid

Testing Programmes: Spring rearing, 2023 of PBS stock was initiated with 450 DFLs in respect of 29 races / breeds @ 20 DFLs each except the races viz. SK6, SK7, APS5, APS9, BBE-198, APS-4, PamDR-4, PamDR-7, PamDR-8, PamDR-9, PamDR-12, PamDR-16, PamDR-18, MASN-4, MASN, 6 and MASN-7 @ 10 DFLs each and PamDR-1 & PamDR6 @ 25 DFLs were brushed. Rearing and grainage activities were carried out successfully.

Following observations have been made during Spring-2023 rearing viz. Fecundity; Hatching%; Yield/10000 larvae by weight (kg); Yield/10000 larvae by number; Single cocoon weight (gm); Single shell weight (gm); Shell Ratio % and Pupation rate (%). The data recorded is depicted in table 83.

Table 83: Rearing performance of silkworm races maintained in PBS during Spring- 2023.

Race	Fec.	Hat. (%)	Larval period (D:H)	Wt. of 10 matured larvae (gm)	Yield/ 10,000 Larvae Retained		SCW (g)	SSW (g)	SR (%)
					By Wt. (Kg)	By No.			
SH6	532	98.39	25:00	44.00	19.000	9600	1.778	0.369	20.75
NB4D2	522	98.84	25:06	44.00	18.999	9533	1.868	0.382	20.47
DUN6	494	98.38	25:00	45.00	17.666	9483	1.681	0.324	19.30
DUN17	475	98.10	25:00	40.00	16.833	9433	1.583	0.309	19.55
DUN18	499	98.39	25:02	39.00	16.333	9499	1.664	0.327	19.68
DUN22	503	98.40	25:00	40.00	18.000	9500	1.805	0.357	19.80
CSR2	499	98.29	26:00	42.00	18.833	9583	1.859	0.348	18.74

Race	Fec.	Hat. (%)	Larval period (D:H)	Wt. of 10 matured larvae (gm)	Yield/ 10,000 Larvae Retained		SCW (g)	SSW (g)	SR (%)
					By Wt. (Kg)	By No.			
CSR4	475	98.10	26:05	40.00	16.724	9516	1.639	0.340	20.77
CSR6	498	98.69	25:00	40.00	16.666	9483	1.825	0.345	18.93
CSR26	506	98.12	26:00	40.00	19.166	9566	1.694	0.344	20.33
CSR27	505	99.20	25:00	42.00	18.499	9533	1.758	0.334	18.99
SK6	507	98.02	26:02	42.00	19.083	9266	1.759	0.345	19.61
SK7	506	97.72	25:03	38.00	14.750	9416	1.688	0.324	19.22
APS5	507	98.61	26:00	45.00	13.916	8250	1.701	0.327	19.22
APS9	503	98.10	26:00	40.00	13.816	9399	1.607	0.331	20.62
BBE-198	514	98.73	25:00	43.00	16.133	9516	1.711	0.334	19.52
APS4	503	98.00	25:05	44.00	18.333	9550	1.707	0.333	19.53
PAM-DR1	503	98.51	25:00	40.00	17.499	9600	1.765	0.325	18.44
PAM-DR4	501	98.50	26:00	42.00	15.566	9246	1.646	0.320	19.47
PAM-DR-6	508	98.42	26:04	40.00	17.666	9583	1.771	0.322	18.18
PAM-DR-7	504	98.41	26:00	43.00	17.999	9500	1.781	0.323	18.13
PAM-DR-8	505	98.61	26:00	44.00	17.633	9483	1.827	0.342	18.74
PAM-DR-9	506	97.63	25:00	41.00	16.000	9550	1.716	0.317	18.50
PAM-DR-12	507	98.51	25:00	42.00	15.800	9583	1.649	0.312	18.92
PAM-DR-16	516	97.86	25:00	42.00	17.999	9516	1.773	0.354	19.99
PAM-DR-18	518	98.84	25:00	38.00	14.833	9333	1.653	0.307	18.60
MASN4	507	98.91	26:00	40.00	16.666	9483	1.680	0.318	18.95
MASN6	523	98.46	25:00	42.00	14.133	9566	1.792	0.328	18.30
MASN7	512	98.24	25:00	42.00	15.700	9449	1.840	0.333	18.09

Autumn rearing, 2023 of PBS stock was initiated with 290 DFLs in respect of 29 races / breeds viz. (all @ 10 DFLs each were brushed. Rearing and grainage activities were completed successfully.

On assessment of PBS races on different parameters, following observations have been made during autumn 2023 rearing viz. Fecundity; Hatching%; Yield/10000 larvae by weight (kg); Yield/10000 larvae by number; Single cocoon weight (gm); Single shell weight (gm); Shell Ratio % and Pupation rate (%). The data recorded is depicted in table 84.

Table 84: Rearing performance of silkworm races maintained in PBS during autumn-2023.

Race	Fec.	Hat. (%)	Larval period (D:H)	Wt. of 10 matured larvae (gm)	Yield/ 10,000 Larvae Retained		SCW (g)	SSW (g)	SR (%)
					By Wt. (Kg)	By No.			
SH6	528	97.35	22:00	38.50	16.250	9934	1.646	0.306	18.59
NB4D2	519	98.07	22:05	39.50	16.700	9850	1.652	0.303	18.31
DUN6	527	97.81	22:04	38.50	16.100	9866	1.605	0.303	18.85
DUN17	521	97.88	22:03	39.50	15.316	9884	1.646	0.307	18.68
DUN18	526	98.29	22:02	38.50	16.366	9900	1.659	0.311	18.72
DUN22	534	97.85	22:02	38.50	15.234	9900	1.628	0.299	18.37
CSR2	522	98.36	22:02	40.50	16.216	9916	1.565	0.313	20.00
CSR4	516	98.45	22:04	40.50	15.550	9850	1.622	0.303	18.68
CSR6	519	97.88	22:05	39.50	15.684	9884	1.548	0.306	19.76
CSR26	534	97.64	22:00	38.50	14.634	9916	1.514	0.289	19.08
CSR27	530	97.74	22:02	40.50	15.384	9817	1.544	0.308	19.85
SK6	502	98.41	22:02	38.50	16.484	9884	1.548	0.291	18.79
SK7	513	98.44	22:02	38.50	14.616	9916	1.451	0.271	18.67
APS5	516	98.35	22:05	40.50	15.933	9916	1.608	0.325	20.21
APS9	533	98.03	22:00	39.50	16.100	9916	1.589	0.304	19.13
BBE-198	527	98.57	21:05	38.50	16.716	9916	1.632	0.310	18.99
APS4	536	98.05	21:03	39.50	15.684	9916	1.604	0.300	18.70
PAM-DR1	521	97.79	21:00	40.50	15.934	9916	1.585	0.289	18.23
PAM-DR4	529	98.21	22:05	40.50	16.200	9916	1.616	0.305	18.87
PAM-DR-6	534	97.94	22:00	40.50	14.266	9900	1.576	0.285	18.08
PAM-DR-7	525	98.27	21:03	39.50	16.034	9916	1.559	0.296	18.98
PAM-DR-8	519	98.46	22:05	39.50	16.217	9916	1.669	0.316	18.93
PAM-DR-9	511	97.95	22:02	38.50	16.216	9916	1.667	0.314	18.84
PAM-DR-12	517	98.36	22:02	39.50	15.266	9916	1.531	0.285	18.62
PAM-DR-16	532	97.84	22:00	39.50	14.850	9916	1.628	0.309	18.98
PAM-DR-18	528	97.73	22:00	40.50	14.234	9916	1.639	0.307	18.73
MASN4	525	97.71	22:06	39.50	15.250	9884	1.517	0.285	18.78
MASN6	519	97.07	23:00	39.50	15.666	9900	1.568	0.296	18.87
MASN7	529	98.22	22:02	39.50	14.700	9850	1.506	0.286	18.99

Maintenance and Characterization of mulberry gene pool

Project Code: PIB – 3212

Duration: Continuous

Investigators: Chhattar Pal, Scientist-C

Objectives: To evaluate the mulberry cultivars for their performance ability.

Progress: 82 mulberry genotypes (10 exotic and 72 indigenous) were maintained in the mulberry Germplasm at RSRS, Sahaspur. 43 genotypes were planted and maintained with a spacing of 4'x 4' having 10 plants of each genotypes whereas, 21 varieties planted and maintained with a spacing of 3'x3' having 24 plants each in two plots of each genotype. Rest of the 18 genotypes were maintained in scattered pattern having different number of

genotypes by adopting the regular package of practices of this station. Phenotypic characters viz, No. of branch, Shoot length, Average internodal distance, Moisture (%), Weight of 100 leaves and Average leaf yield (gm) have been recorded during 2023 (Spring & Autumn).

Out 50 mulberry accessions received from CSGRC, CSB, Hosur (TN) 35 varieties viz. MI-0002, MI-0005, MI-0073, MI-0139, MI-0174, MI-0366, MI-0369, MI-0370, MI-0376, MI-0384, MI-0405, MI-0406, MI-0407, MI-0424, MI-0438, MI-0439, MI-0440, MI-0491, MI-0492, MI-0499, MI-0511, MI-0574, MI-0575, MI-0576, MI-0577, MI-0611, MI-0615, MI-0637, MI-0638, MI-0639, MI-0643, MI-0640, MI-0723, MI-0724 and MI-0741 comprising of *Morus indica*, *M. alba*, *M. laevigata*, *M. serrata* and *M. latifolia* species are being maintained as per the package of practices recommended by RSRS, Sahasapur.

Table 85: Morphological and yield characters of mulberry germplasm bank during spring'2023

Sl. No	Variety	No. of branches	Shoot length (cm)	Avg. No. of nodes	Wt. of 100 leaves (g)	Moisture (%)	Avg. leaf yield per plant (g)
1	China White	23.33	80.33	6.66	165.66	61.99	422.00
2	S-741	24.50	51.20	4.80	70.30	62.50	244.00
3	Rokokuyaso	16.00	36.33	4.20	96.30	67.80	88.50
4	MS-3	18.33	19.33	2.50	124.33	66.40	86.20
5	Local lobed	27.33	26.60	3.50	89.22	66.20	205.00
6	Kokuso-27	18.00	77.60	5.50	142.50	64.20	330.60
7	Majra-11	0.00	0.00	0.00	0.00	0.00	0.00
8	MS-2	25.30	72.20	5.66	122.30	73.60	372.20
9	LF-2	22.66	52.22	5.11	132.76	68.80	442.32
10	MS-8	7.20	23.70	4.20	101.20	73.50	69.50
11	MS-1	20.33	31.20	3.50	106.20	67.20	82.20
12	MS-5	27.60	49.30	4.30	105.96	66.69	285.50
13	S-642	21.33	49.60	4.22	106.20	67.80	310.60
14	MR-2	18.60	49.66	4.33	26.30	73.20	172.60
15	S-799	16.50	60.30	4.20	195.22	64.33	422.20
16	MS-9	22.50	30.83	3.00	113.20	70.22	162.10
17	S-1096	13.60	29.40	4.22	106.55	66.20	110.50
18	S-523	24.88	42.70	3.88	79.22	68.22	320.20
19	Sujanpur	23.66	64.55	4.66	116.32	69.60	384.60
20	MS-6	18.62	36.55	3.99	84.66	66.52	159.66
21	C-776	31.55	76.44	6.22	143.50	74.66	810.20
22	S-31	17.88	32.55	3.22	94.00	76.10	162.30
23	S-1301	19.66	40.22	4.20	83.22	69.30	205.3
24	MS-7	19.50	32.11	2.77	68.50	79.80	126.50
25	C-763	32.33	56.88	4.22	172.33	70.60	672.50
26	C-741	25.66	50.50	4.22	72.66	70.43	286.66
27	K-2(M)	14.50	43.20	4.22	86.33	66.20	172.50
28	Ichinose	22.88	80.20	5.80	172.55	80.50	522.33
29	LF-1	18.33	40.66	9.50	99.50	64.80	170.30
30	PGDTR-9	14.60	22.33	4.33	110.20	72.50	128.90
31	Kaiyosao	0.00	0.00	0.00	0.00	0.00	0.00
32	C-1729	28.50	42.55	7.55	128.60	66.20	266.33
33	S-1635	25.20	40.55	5.55	160.44	76.40	476.44
34	C-1726	22.33	38.66	11.40	65.50	60.70	182.77

Sl. No	Variety	No. of branches	Shoot length (cm)	Avg. No. of nodes	Wt. of 100 leaves (g)	Moisture (%)	Avg. leaf yield per plant (g)
35	C1730	27.33	34.55	3.77	102.40	68.41	297.33
36	Mandaley	18.00	45.55	4.55	106.22	62.20	192.33
37	S-1685	15.33	38.80	12.60	104.60	67.50	168.50
38	C-1608	11.66	24.90	4.10	77.30	66.30	117.60
39	C-1737	6.20	29.50	3.66	103.22	70.33	124.33
40	C-1690	26.80	54.66	4.11	126.66	70.22	436.20
41	TR-4	22.60	73.80	8.22	190.33	70.20	224.20
42	S-1708	33.22	56.20	6.20	160.00	64.20	198.60
43	TR-5	39.20	73.66	6.22	232.40	66.70	780.30
44	TR-8	21.50	36.77	5.00	123.62	64.20	186.30
45	S-13	9.20	22.50	3.22	82.60	62.44	129.30
46	Philippines	22.40	66.44	6.88	134.88	63.55	155.70
47	Punjab Local	17.50	44.50	6.20	64.20	66.50	132.40
48	K2 (S)	15.40	42.20	4.30	106.50	68.50	164.33
49	S 799	24.70	38.60	4.22	82.50	67.50	134.33
50	L-4	22.60	70.50	6.40	138.40	62.40	277.50
51	S-146	21.50	30.44	4.20	114.60	65.30	267.20
52	L-6	25.33	52.33	5.22	119.30	66.80	160.40
53	China White (S)	22.66	62.88	7.22	165.00	64.88	244.30
54	S-41	21.44	40.55	4.22	110.30	64.30	386.22
55	S-1531	19.66	38.55	6.40	110.40	68.22	255.50
56	L-1	19.40	48.60	6.10	96.60	64.20	270.50
57	L-4	33.22	48.66	5.22	98.50	66.50	360.50
58	S-1	20.55	43.66	5.66	94.55	60.44	270.33
59	Tr-10	16.10	38.60	5.22	160.44	65.20	289.30
60	CM	23.44	36.50	3.22	133.40	63.20	320.20
61	S-54	16.50	38.90	5.20	133.40	70.99	320.50
62	Goshoerami	6.66	24.88	4.10	118.20	61.00	135.60
63	L-2	18.44	46.55	4.10	155.20	66.20	260.50
64	L-3	19.55	58.60	5.40	110.20	70.25	144.50
65	Kollegal L	62.00	37.50	7.50	116.66	72.78	562.00
66	Mysore L	28.00	52.22	5.55	139.64	66.40	272.50
67	S-30	18.33	47.55	4.50	152.66	68.50	210.50
68	RFS-135	22.60	52.20	6.50	182.50	72.60	262.30
69	RFS-175	22.30	46.30	5.22	201.30	62.50	410.50
70	V1	22.33	33.80	5.22	140.8	70.50	350.50
71	Vishala	41.40	46.20	5.22	173.50	66.20	510.40
72	Kajli	0.00	0.00	0.00	0.00	0.00	0.00
73	Motigara-L	20.66	66.66	5.44	160.44	63.88	244.60
74	H.P.-02/12	17.60	62.50	5.88	196.50	70.55	252.40
75	H.P.-02/13	0.00	0.00	0.00	0.00	0.00	0.00
76	H.P.-02/8	22.20	56.30	5.10	132.50	66.50	280.40
77	S-36	24.33	53.33	5.22	189.50	66.50	372.20
78	S-34	22.10	52.60	5.22	110.20	64.20	290.50
79	AR-12	28.60	56.30	5.22	172.44	66.50	330.40
80	AR-14	16.50	55.20	5.22	270.22	66.20	550.20
81	C-4	24.20	40.22	5.22	157.20	60.50	290.33
82	BR-2	18.20	36.22	3.66	96.55	64.80	150.20

CSB-NHAI : PILOT PROJECT

Implementation of NHAI project “Development of mulberry (*Morus spp.*) plantation on selected stretches of National Highways on the sides of carriageways in Uttarakhand”.

Project Period : 2022-27

Scientist associated

- 1) Dr. Sardar Singh Scientist-D & Nodal Officer
- 2) Sh. Chhatrapal Scientist-C & field implementation scientist

Objectives:

- To develop mulberry tree reserve in identified stretches on carriageways of NHAI
- To explore sericulture-based livelihood opportunities for the farmers residing on sides of carriageways.

Progress on NH- 72A & 73 (Roorkee-Chutmalpur)

- 3500 saplings were transplanted during winter plantation of 2023-24 for gap filling.
- Total 7000 saplings has been transplanted on a road stretch of 10.44 Km.
- Plantation is under maintenance and establishment phase.



High level NHAI team from New Delhi & Regional Office Dehradun inspecting on site plantation on NH 72 A & 73 along with CSB Nodal officer at (Roorkee –Chhutmalpur section) & current status

Progress on NH- 74 (Najibabad-Nagina Bypass)

- Land leveling, pit making, & saplings transplantations were carried. 7000 saplings have been transplanted in tree mode on designated stretches during winter season.
- Fencing/barbed work was initiated as per approved action plan
- Plantation is under maintenance and establishment phase.



Different stages of mulberry plantations on designated stretches of NH 74 (Najibabad bypass)

Progress on NH- 125 (Khatima bypass)

- 4100 saplings were transplanted during winter plantation of 2023-24 (3100 new plantation and 1000 gap filling).
- Total 5000 saplings has been transplanted on a road stretch of 3.0 Km.
- Plantation is under maintenance and establishment phase.



Mulberry plantations status on NH- 125 (Khatima bypass)

Progress on NH-87 (Rudrapur-Kathgodam)

- 1080 saplings were transplanted during 2023-24 on identified stretches.
- Plantation is under maintenance and establishment phase.



Site development and plantation at NH-87 (Rudrapur-Kathgodam)

REGIONAL SERICULTURAL RESEARCH STATION, MIRANSAHIB, JAMMU

Introduction: Central Silk Board, Ministry of Textiles established Regional Sericultural Research Station at Miransahib in Jammu district of J&K in the year 1994 for providing R&D support to the sericulture sector in the sub-tropical region of the J&K state and also for the similar agro-climatic areas of the adjoining states, viz; Punjab and Himachal Pradesh.

Land Area: The station is having a land area of 34.52 Acres comprising 27.50 Acres under effective mulberry plantation and 7.02 Acres under Roads & Buildings. Maintenance of 27.50 acres of active mulberry plantation effectively by conducting all the need based local cultural operations for producing better leaf yield.

Nested Units: The station is supported by two extension units, viz; REC, Lamberi in Rajouri district of Jammu Division and REC, Ghumarwin in Bilaspur district of Himachal Pradesh.

Mandates:

- Identify region specific problems, undertake research studies and feedback analysis in consultation with respective DOS and allied units.
- OST and OFT for test verifying the technologies developed by the main research institutes and suggest fine tuning / modifications of such technologies to provide solutions to region specific problems.
- Conduct on-farm trials (OFT) / demonstration of the selected technologies with selected farmers in coordination with DOS.
- Popularization the proven technologies using various extension methods through cluster area approach.
- Conduct training for both grass root level extension staff of DOS and farmers on advanced technological aspects.
- Crop monitoring and troubleshooting / crisis management.
- Conduct survey on crop yield, economics and disease & pest surveillance for forecasting / forewarning.
- Coordination of cluster Promotion programme.
- Soil health analysis and database maintenance of sericulture farmers.

Evaluation and maintenance of sub-tropical mulberry germplasm at RSRS, Jammu

Investigators involved: Dr.Santoshkumar Magadum (PI)

Project period: Continuous

Objectives:

- To evaluate mulberry germplasm under sub-tropical conditions of Jammu region.

Progress achieved: A total of 34 mulberry germplasm genotypes are being maintained at RSRS, Jammu farm by following the recommended package of practices. Out of 34 genotypes, 18 evolved indigenous mulberry genotypes were evaluated during Spring and Autumn season 2023.

Evaluation of Mulberry Germplasm during Spring, 2023

Data on various parameters were recorded for 18 mulberry germplasm during spring 2023. It has been observed that number of new shoots per plant was recorded maximum in BC-259 (39) followed by Chinese White (27), V1 (27) and S-1 (22). Similarly, number of leaves per

meter of shoot was highest in S-13 (20) followed by V-1 (18), Sujanpur local (17), AR-12 (17), TR-10 (17), S-1 (17), K-2 (17) and AR-14 (16). Leaf yield per plant (kg) was highest in case of BC-259 (2.549) followed by V1 (2.492) and S-1635 (1.663). The leaf moisture content (%) was highest in MS-9404 (77.63) followed by S-41 (76.31) and BC-259 (74.44). Similarly, leaf moisture retention capacity (%) was observed maximum in BR-2 (97.00) followed by C-4 (96.05) and BC-259 (95.44) (Table 86).

Table 86: Evaluation data of mulberry germplasm genotypes during Spring, 2023

Sl. No	Genotype	No. of new shoots/plant	Longest shoot length (cm)	No. of leaves/meter	Inter-nodal distance (cm)	Total shoot length/plant (cm)	Leaf yield/plant (Kg)	Weight of 10 fresh leaves (g)	MC (%)	MRC (%)
1	V-1	27	181	18	5.7	4286	2.492	53	71.63	94.54
2	K-2	14	156	17	6.0	2073	0.740	39	69.49	93.40
3	Sujanpur local	13	177	17	5.8	1552	0.678	32	65.76	91.20
4	TR-10	12	178	17	5.9	1750	0.980	61	72.33	94.26
5	Chak Majra	20	161	16	6.4	2323	1.075	54	71.30	91.85
6	Chinese white	27	192	14	7.0	3717	1.455	50	66.89	93.85
7	S-146	17	162	16	6.3	1523	1.079	57	70.15	94.67
8	C-4	17	226	14	7.0	2637	1.340	63	72.48	96.05
9	BR-2	7	173	16	6.4	980	0.599	82	71.56	97.00
10	AR-14	16	200	16	6.3	2255	1.145	31	72.43	90.79
11	AR-12	13	191	17	5.9	1707	1.234	44	73.52	94.68
12	AR-10	8	167	16	6.4	1127	0.723	47	72.67	94.64
13	S-41	12	186	15	6.8	1710	0.824	49	76.31	95.11
14	S-13	18	195	20	4.9	2270	1.501	35	72.79	92.66
15	BC-259	39	204	15	6.5	6074	2.549	59	74.44	95.44
16	S-1	22	220	17	6.0	3208	1.424	35	68.93	92.63
17	MS-9404	16	241	16	6.4	2640	1.558	41	77.63	93.13
18	S-1635	20	195	15	6.5	3325	1.663	53	72.79	95.13
	SE.m±	1.74	10.48	0.60	0.22	284.51	0.17	2.43	1.70	0.92
	CD at 5%	5.00	30.13	1.73	0.63	817.69	0.49	7.01	4.90	2.65

Evaluation of Mulberry Germplasm during Autumn, 2023

Data on various parameters were recorded for 18 mulberry germplasm during autumn 2023. It has been observed that number of new shoots per plant was recorded maximum in K2 (23) followed by S-1635 (18), S-13 (17) and Sujanpur local (17). Similarly, number of leaves per meter of shoot was highest in S-13 (23) followed by TR-10 (22), BC-259 (21), V-1 (21) and K-2 (21). Leaf yield per plant (kg) was highest in case of K-2 (2.241) followed by V-1 (1.806) and S-1635 (1.655). The leaf moisture content (%) was highest in S-146 (76.76) followed by MS-9404 (76.35) and AR-10 (76.19). Similarly, leaf moisture retention capacity (%) was observed maximum in K-2 (91.96) followed by V-1 (90.30) and BC-259 (89.87) (Table 87).

Table 87: Evaluation data of mulberry germplasm genotypes during Autumn, 2023

#	Genotype	No. of new shoots/ plant	Longest shoot length (cm)	No. of leaves/ meter	Inter-nodal distance (cm)	Total shoot length/ plant (cm)	Leaf yield/ plant (Kg)	Weight of 10 fresh leaves (g)	MC (%)	MRC (%)
1	V-1	16	212	21	4.8	2247	1.806	44	70.49	90.30
2	K-2	23	228	21	4.8	2842	2.241	30	73.98	91.96
3	Sujanpur local	12	220	19	5.4	1680	0.744	28	76.19	86.59
4	TR-10	12	188	19	5.4	1490	1.036	35	73.06	88.31
5	Chak Majra	10	179	18	5.5	1463	0.697	37	73.27	87.27
6	Chinese white	17	182	15	6.5	2322	0.919	39	70.10	86.24
7	S-146	13	188	20	5.1	1708	1.026	42	72.45	88.40
8	C-4	14	218	17	5.8	2288	1.593	47	76.35	87.57
9	BR-2	11	145	20	5.0	1593	0.682	39	71.68	87.50
10	AR-14	14	188	20	4.9	2038	1.117	30	76.76	87.51
11	AR-12	15	187	22	4.6	2153	1.370	48	66.27	88.15
12	AR-10	5	172	21	4.7	607	0.579	31	72.61	89.87
13	S-41	14	198	17	5.9	1885	0.771	42	70.04	87.61
14	S-13	17	214	23	4.4	2323	1.271	27	73.63	89.05
15	BC-259	16	191	16	6.1	2295	1.083	41	75.77	87.13
16	S-1	15	195	20	5.1	1965	1.293	29	75.74	86.58
17	MS-9404	9	225	18	5.6	1988	0.916	33	73.86	83.42
18	S-1635	18	179	17	5.9	2365	1.655	47	70.73	87.10
	SE.m±	1.66	8.14	0.55	0.15	282.52	0.16	2.12	1.64	0.94
	CD at 5%	4.79	23.41	1.58	0.43	811.99	0.46	6.11	4.71	2.70

Evaluation and characterization of silkworm germplasm under Sub-tropical conditions of J & K.

Project Code: OFT-PAM-17

Scientists involved: Dr.Santoshkumar Magadum, Dr. Kiran R

Objective: Evaluation and characterization of silkworm germplasm under Sub-tropical conditions of J&K.

Abstract:

Fifty five breeds were studied by rearing during spring (2023) under germplasm maintenance programme. Among these 39 breeds maintained under germplasm, the fecundity observed was highest in JAM-125 is 597.67 & lowest in CSR-4 is 382.00 and all the breeds showed significantly different from each other whereas hatching percentage was highest in JAM-24 (98.52) and lowest in JAM-119 (57.51). Yield per 10,000 larvae by weight (Kg) recorded as highest of 11.53 Kg in RSJ-15 and lowest of 8.17 Kg in JAM-18(M) showing statistically significant among all the breeds with regard to weight basis and showing statistically significant among all the breeds. The shell ratio (%) also shows statistically significant among all the breeds and was highest in RSJ-1 (18.64) and lowest in RSJ-15 (16.12) respectively (Table 1). The pupation rate was recorded as maximum in JAM-1 (81.67 %) and lowest in RSJ-5 (59.00 %) and showed statistically non-significant among all the breeds (Table 88).

Seven breeding lines were studied by rearing during spring (2023) under continuous maintenance programme. Among these breeds, the fecundity observed was highest in O3 is about 486.67 and lowest in D2 is 378.33 and all the breeds were significantly different from each other whereas, hatching percentage was highest in D2 (98.22) and lowest in 322 (95.85). Yield per 10,000 larvae by weight (Kg), the highest about 11.04 Kg in 322 and lowest of about 9.90 Kg in O3 showing statistically significant among all the breeds with regard to weight basis and showing statistically significant among all the breeds. The shell ratio (%) shows statistically significant among all the breeds and was highest in D2 (17.10) and lowest in O2 (15.46) respectively (Table 2). The pupation rate (%) was recorded as maximum in D1 (69.33 %) and lowest in 322 (62.33%) and showed statistically non-significant among all the breeds (Table 89).

Nine breeds were studied by rearing during spring (2023) under continuous maintenance programme. Among these breeds, the fecundity observed was highest in PAMDR 4 is 483.33 and lowest in PAMDR 16 is 406 and all the breeds were significantly different from each other whereas, hatching percentage was highest in PAMDR 9 (97.82) and lowest in PAMDR 18 (95.31). Yield per 10,000 larvae by weight (Kg), the highest about 13.11 Kg in PAMDR 9 and lowest of about 11.20 Kg in PAMDR 7 showing statistically significant among all the breeds with regard to weight basis and by number was highest in PAM DR 8 (9055.33) and was lowest in PAMDR 7 (8333.33) and showing statistically non-significant among all the breeds. The shell ratio (%) shows statistically significant among all the breeds and was highest in PAM DR 12 (18.18) and lowest in PAMDR 1 (17.13) respectively. The pupation rate was recorded as maximum in PAMDR 16(93.33) and lowest in PAMDR 18 (89.33%) and showed statistically non-significant among all the breeds (Table 90).

Table 88: Average data recorded (39 breeds) maintained under germplasm during Spring 2023

Race	F. (No.)	H. %	TLD	FLD	LWT (gm)	ERR		SCW (gm)	SSW (gm)	SR %	Pupation (%)
			Days : Hrs			By No.	By wt.				
JAM-1	581 (24.11)	95.57 (77.89)	25:00	6:21	37.00	7499 (86.54)	10.11	1.43	0.24	16.71 (24.12)	81.67 (64.67)
JAM-2	494 (22.24)	95.88 (78.41)	25:00	6:21	36.67	7844 (88.47)	10.00	1.40	0.24	16.99 (24.25)	74.33 (59.59)
JAM-10	418 (22.79)	98.14 (82.21)	25:08	6:29	47.00	7333 (85.60)	9.33	1.35	0.25	17.29 (24.56)	68.67 (55.97)
JAM-11	437.33 (20.94)	95.03 (77.14)	24:83	6:04	38.33	7022 (83.75)	8.78	1.32	0.23	17.26 (24.54)	66 (54.32)
JAM-18(M)	485 (22.04)	96.42 (79.06)	24:33	5:88	37.00	6771 (82.32)	8.17	1.30	0.22	16.66 (24.08)	71 (57.42)
JAM- 18(p)	390.33 (19.78)	97.69 (81.27)	25:12	6:33	37.33	7822 (88.44)	10.17	1.41	0.25	17.42 (24.66)	68.67 (55.95)
JAM-21	485 (22.05)	96.63 (79.44)	25:12	6:33	42.67	8266 (90.93)	10.17	1.42	0.22	15.64 (23.29)	72 (58.04)
JAM-22	416.67 (20.44)	96.64 (79.42)	24:75	5:96	41.00	8278 (90.92)	10.32	1.38	0.22	16.17 (23.70)	67 (54.94)
JAM-23	396.67 (19.93)	95.70 (78.11)	25:12	6:33	37.00	7977 (89.32)	10.06	1.41	0.23	16.43 (23.90)	72.67 (58.47)
JAM-24	473 (21.78)	98.52 (83.03)	25:12	6:33	40.33	8566 (92.48)	10.14	1.40	0.25	18.02 (25.11)	68.67 (55.98)
JAM-25	423 (20.59)	97.69 (81.25)	25:12	6:33	38.33	8011 (89.51)	10.37	1.37	0.23	16.73 (24.13)	66.33 (54.53)
JAM-27	399 (20.00)	97.45 (80.81)	24:08	5:54	45.00	8955 (89.20)	10.43	1.39	0.22	15.83 (23.44)	64 (53.13)
JAM-103	493 (22.23)	98.58 (83.14)	25:12	6:33	36.33	7911 (88.95)	10.28	1.38	0.24	17.70 (24.86)	71.33 (57.63)
JAM-110	442.67 (21.20)	97.05 (80.15)	25:01	6:03	43.67	7988 (89.38)	10.69	1.45	0.25	17.38 (24.63)	66.33 (54.55)

JAM-118	432.67 (20.82)	92.77 (74.70)	24:95	6:17	38.33	7744 (88.00)	9.96	1.38	0.23	16.77 (24.16)	69.33 (56.61)
JAM-119	521.67 (22.86)	57.51 (80.96)	24:95	6:17	35.67	8533 (92.23)	9.90	1.38	0.23	16.77 (24.16)	68 (55.57)
JAM-121	439.33 (20.98)	96.80 (79.89)	26:50	6:71	36.00	7755 (88.07)	10.06	1.37	0.23	16.98 (24.33)	69.67 (56.68)
JAM-122	408 (20.22)	95.91 (78.36)	26:43	7:04	34.33	7822 (88.45)	9.62	1.29	0.21	16.53 (23.98)	69.67 (56.58)
JAM-124	431.67 (20.80)	94.99 (77.04)	24:95	6:17	35.33	7811 (88.39)	10.10	1.31	0.22	16.79 (24.18)	68.67 (56.01)

Continued. Table 88: Average data recorded (39 breeds) maintained under germplasm during Spring 2023

Race	F. (No.)	H. %	TLD	FLD	LWT (gm)	ERR		SCW (gm)	SSW (gm)	SR %	Pupation (%)
			Days : Hrs			By No.	By wt.				
JAM-125	597.67 (24.47)	94.98 (77.03)	24:95	6:17	40.67	7777 (88.19)	10.61	1.42	0.24	16.72 (24.13)	69.67 (56.74)
JAM-127	480.33 (21.94)	94.80 (76.80)	24:95	6:17	45.67	7689 (87.68)	11.03	1.49	0.25	17.09 (24.41)	73.33 (59.70)
CSR-2	557.33 (23.63)	98.51 (82.97)	27:15	6:69	36.33	7467 (86.41)	10.01	1.37	0.23	16.61 (24.04)	61.67 (56.10)
CSR-4	382 (19.57)	78.39 (64.27)	25:12	6:33	38.33	7644 (87.44)	10.55	1.43	0.24	17.10 (24.41)	67 (55.03)
CSR-6	484.67 (22.04)	96.35 (78.97)	25:12	6:33	45.00	7689 (87.69)	10.88	1.48	0.25	17.05 (24.38)	73 (59.28)
CSR-26	470.67 (21.72)	93.98 (75.83)	27:95	9:95	44.00	7811 (88.37)	9.50	1.52	0.27	18.01 (25.10)	64 (53.16)
CSR-27	525 (22.93)	97.97 (81.79)	24:75	5:96	42.67	7754 (88.04)	8.46	1.45	0.26	18.10 (25.17)	70.67 (57.43)
RSJ-1	472.33 (21.76)	95.69 (78.09)	24:95	6:17	38.00	7633 (87.37)	9.88	1.35	0.25	18.64 (25.57)	73 (59.11)
RSJ-3	546.33 (23.40)	97.86 (81.62)	24:95	6:17	42.00	7466 (86.41)	9.99	1.44	0.25	17.16 (24.46)	65 (53.79)
RSJ-4	399.67 (20.01)	94.87 (76.93)	24:95	6:17	40.00	7100 (84.17)	9.80	1.48	0.25	17.12 (24.43)	69 (56.33)
RSJ-5	447.33 (21.17)	95.45 (77.71)	24:87	6:09	38.67	7411 (86.08)	10.70	1.55	0.27	17.20 (24.49)	59 (50.25)
RSJ-6	393.33 (19.86)	97.31 (80.65)	24:95	6:17	41.33	7344 (85.69)	9.71	1.43	0.25	17.19 (24.48)	61.00 (51.39)
RSJ-11	410.33 (20.28)	94.09 (75.97)	24:95	6:17	42.00	6866 (82.82)	8.89	1.36	0.22	16.24 (23.76)	73.00 (59.12)
RSJ-13	413.33 (20.79)	94.60 (76.58)	24:79	6:00	40.67	7655 (87.50)	10.89	1.45	0.24	16.28 (23.78)	64.67 (53.61)
RSJ-14	458.67 (21.44)	96.46 (79.54)	24:95	6:17	40.33	7511 (86.67)	11.24	1.58	0.26	16.67 (24.08)	63.33 (52.81)
RSJ-15	444.67 (21.11)	92.15 (73.74)	24:88	6:10	38.33	8244 (90.59)	11.53	1.47	0.24	16.12 (23.67)	69.33 (56.58)
RSJ-16	439.33 (20.98)	95.15 (77.32)	24:82	6:02	37.00	7455 (86.34)	9.74	1.36	0.23	17.04 (24.37)	58.33 (49.88)
RSJ-17	428 (20.71)	95.57 (95.90)	25:00	6:21	40.33	7713 (87.94)	10.15	1.44	0.24	16.64 (24.06)	71 (57.46)
SH6	476 (21.84)	97.56 (81.08)	25:00	6:21	40.67	7588 (87.12)	10.92	1.55	0.26	16.78 (24.17)	62 (52.01)
NB4D2	502 (22.43)	96.82 (79.74)	24:66	6:20	44.33	7444 (86.27)	11.17	1.56	0.26	16.45 (23.91)	64.33 (53.34)
C.D.	0.54	4.99	0.62	0.43	0.13	4.53	1.01	0.04	0.02	0.58	-
SE(m)	0.19	1.77	0.22	0.15	0.05	1.61	0.36	0.02	0.01	0.21	2.93
C.V.	1.54	3.90	1.51	4.18	1.30	3.17	6.16	1.91	4.05	1.47	9.08

Note: F – Fecundity; H-Hatching; TLD- Total Larval Duration; FLD- Fifth instar Larval Duration, LW- Larval Weight; ERR- Yield/10000 larva; PR- pupation rate; SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio; Values in parentheses are statistically transformed.

Table 89: Average data recorded (7 germplasm breeding lines) evaluated during Spring 2023

Race	F. (No.)	H. %	TLD	FLD	LWT (gm)	ERR		SCW (gm)	SSW (gm)	SR %	Pupation (%)
			D:H			By No.	By wt.				
O-1	425.00 (22.17)	96.49 (77.51)	24:23	6:04	46.33	7500.33 (86.76)	10.16	1.41	0.22	15.53 (23.74)	66.00 (55.48)
O-2	383.00 (19.59)	97.04 (80.06)	24:23	6:04	40.67	7455.67 (86.34)	10.33	1.46	0.23	15.46 (23.14)	67.00 (55.21)
O-3	486.67 (22.08)	96.65 (79.48)	24:23	6:05	36.67	7622.00 (87.31)	9.90	1.36	0.22	16.40 (23.88)	64.67 (55.52)
D-1	421.67 (22.55)	97.32 (80.59)	24:23	6:17	39.00	7633.33 (87.37)	10.67	1.42	0.24	17.06 (24.38)	69.33 (56.53)
D-2	484.00 (22.02)	98.22 (82.38)	24:23	6:04	40.67	7311.00 (85.50)	10.81	1.56	0.27	17.10 (24.41)	65.67 (54.15)
322	378.33 (19.47)	95.85 (78.26)	24:23	6:04	40.67	7622.00 (87.31)	11.04	1.53	0.26	16.99 (24.33)	65.00 (53.76)
323	382.67 (19.58)	96.60 (79.38)	24:23	6:04	39.67	7444.67 (86.28)	10.19	1.43	0.23	16.09 (23.63)	62.33 (52.25)
C.D.	0.334	2.245	-	-	2.913	-	0.57	0.034	0.008	0.328	-
SE(m)	0.109	0.733	0.148	0.146	0.951	0.87	0.186	0.011	0.003	0.107	3.077
C.V.	0.909	1.594	1.023	4.069	4.066	1.75	3.09	1.334	1.911	0.776	9.79

Note: F – Fecundity; H-Hatching; TLD- Total Larval Duration; FLD- Fifth instar Larval Duration, LW- Larval Weight; ERR- Yield/10000 larva; PR- pupation rate; SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio; Values in parentheses are statistically transformed.

Table 90: Average data recorded (9 PAM Breeds) Spring 2023

Race / Combination	F. (No.)	H. %	TLD	FLD	LWT (gm)	ERR		SCW (gm)	SSW (gm)	SR %	Pupation (%)
			Days : Hrs			By No.	By wt.				
PAMDR-1	467.33 (21.64)	96.72 (79.54)	24:23	6:04	40.00	8789.00 (93.75)	12.99	1.54	0.26	17.13 (24.43)	92.67 (74.48)
PAMDR-4	483.33 (22.00)	96.29 (79.01)	24:19	5:22	40.67	8911.00 (94.39)	12.06	1.44	0.26	17.68 (24.85)	93.00 (74.79)
PAMDR-6	422.33 (20.57)	97.24 (80.40)	24:12	5:17	40.67	8711.33 (93.33)	11.91	1.54	0.28	18.18 (25.22)	92.67 (74.40)
PAMDR-7	421.67 (20.55)	95.82 (78.19)	24:19	5:75	42.00	8333.33 (91.26)	11.22	1.46	0.26	17.99 (25.08)	90.67 (72.38)
PAMDR-8	433.00 (20.83)	95.61 (77.89)	24:23	6:04	45.33	9055.33 (95.16)	13.11	1.55	0.25	16.19 (23.71)	92.00 (73.76)
PAMDR-9	488.67 (22.12)	97.82 (81.51)	24:23	6:04	40.00	8866.33 (94.16)	11.69	1.43	0.25	17.46 (24.68)	93.00 (74.62)
PAMDR-12	386.33 (19.67)	96.22 (78.82)	24:78	6:08	38.33	8844.33 (94.03)	11.75	1.35	0.25	18.18 (25.22)	90.00 (71.74)
PAMDR-16	406.00 (20.17)	95.00 (77.06)	24:21	5:77	41.00	8800.33 (93.78)	12.42	1.54	0.28	18.05 (25.13)	93.33 (75.25)
PAMDR-18	417.67 (20.46)	95.31 (77.57)	24:21	5:77	43.67	8688.67 (93.21)	12.91	1.53	0.28	18.00 (25.09)	89.33 (71.05)
C.D	0.385	2.338	0.255	0.25	1.882	-	0.781	0.034	0.01	0.365	-
SE(m)	0.129	0.781	0.085	0.084	0.629	0.984	0.261	0.011	0.003	0.122	1.795
C.V	1.066	1.714	0.593	2.41	2.636	1.189	3.694	1.337	2.102	0.851	2.539

Note: F – Fecundity; H-Hatching; TLD- Total Larval Duration; FLD- Fifth instar Larval Duration, LW- Larval Weight; ERR- Yield/10000 larva; PR- pupation rate; SCW- Single cocoon weight; SSW- Single shell weight; SR – Shell ratio; Values in parentheses are statistically transformed.

RESEARCH EXTENSION CENTRE LAMBERI, DISTT. RAJOURI, J&K:

- Research Extension Centre, Central Silk Board, Lamberi was established in July 2018 in district Rajouri after closure and shifting of erstwhile REC Nowshera for the development of sericulture in the area. The topography of the area is semi-hilly, altitude varying from 700-800 meters MSL, perennial vegetation of Conifers, Sesum and Mulberry etc. Climate of the area is sub-tropical with temperature going up to 42°C during summer and 5°C during winter. Silkworm rearing is practiced during spring (March- April) and autumn (August- September).
- **Geographical situation:** - REC, Lamberi is situated at Jammu- Poonch National highway at a distance of 111 Km. from Jammu. The Nearest railway, station/airport is Jammu. The district headquarter Rajouri is at a distance of 70 km from Lamberi. Lamberi is situated at latitude 33.13° N and longitude 74.26° E & altitude varying from 700-800 MSL.

RESEARCH EXTENSION CENTRE, GHUMARWIN, DISTT. BILASPUR, HP.

- Research Extension Center, Ghumarwin under Mulberry Sector was restructured during June 2018 and presently functioning from accommodation provided by DOI, HP. It is located 20 km towards North from district headquarters Bilaspur, 105 km from state capital Shimla towards East. The latitude of Ghumarwin is 31° 26' N and the longitude is 76° 42' E. The altitude of Ghumarwin town is about 1800 feet above mean sea level. The town has the sub tropical climate and characterized by hot summer and cold winter. The temperature varies between 10 to 42° C with June as hottest and January as cold month. Geographically the Ghumarwin town is located in seismic zone. The REC provides the technological support & time to time technical guidance to sericulture farmers of District Bilaspur (HP) under two Clusters, Ghumarwin&Sangaswin, besides IVLP Daslehra.

RESEARCH EXTENSION CENTRE, BASTI, UP

- Research extension centre, Basti is entrusted with the responsibility to provide the new and improved technology to the mulberry sericulture farmers of Uttar Pradesh for their skill updation and betterment of sericulture industry. Besides, this centre is also committed to provide the technical guidance to the officials of Directorate of Sericulture, Uttar Pradesh for their technological advancement in sericulture and extension approaches. The centre is actively involved in various clusters located at Basti, Gonda, Gorakhpur, Kushinagar, Bahraich, Shravasti and Varanasi district of Uttar Pradesh to supervise the chawki rearing at Govt. sericulture farm level and late age rearing at farmers' level during the spring and autumn season.

P4-BSF (BASIC SEED FARM), MANASBAL

1. INTRODUCTION

Location: The P4, Basic Silkworm Seed Farm is situated at the North Bank of Manasbal Lake about 32 km North of Srinagar, Jammu and Kashmir, 34° 14'59'N, 74° 39'11'E; 1583m above sea level. It has predominantly rural surroundings with three villages, Kondabal, Jarokbal and Gratbal.

- **History & Broad Outline:** Originally Regional Research Laboratory (CSIR), Srinagar had a Drug Research Centre at this lake side land at Manasbal (J&K) which was later taken over by Sericulture Development Department, (Govt. of J&K) Srinagar.
- **In the year 1984**, to organize the production of silkworm seed on scientific lines, Central Silk Board, Govt. of India established **P1 Basic Silkworm Seed Farm**.
- **In the year 1989**, the station was upgraded as P4 Basic Seed Farm with the aim to produce and supply disease parental stock (P3) of bivoltine silkworm races to P3 Stations of Central Silk Board.
- **In the year 2000 onwards**, four (04) silkworm races viz., SH-6, NB4D2, CSR-2 and CSR-4 were maintained as parental stock of bivoltine silkworm races. Out of these four silkworm races three races were replaced by CSR-6, CSR-26 and CSR-27 in 2013 and seven more silkworm races viz., Pam-114, Pam-115, Pam-116, Pam-117, CSR6, CSR-26 and CSR-27 were added for maintenance under breeder's stock.

2. MANDATE AND ACTIVITIES OF THE STATION

- To maintain standards in timely production and supply of parental seed and plant material.
- To produce and supply disease free high yielding parental stock of bivoltine silkworm races to Sericulture Development Department and other stations as a basic stock for the preparation of industrial hybrid seed.
- To maintain mulberry plantation and mulberry chawki garden to ensure quality leaf for silkworm rearing and production of quality silkworm seed.
- To act as a nuclear farm for multiplication of improved mulberry varieties by latest grafting techniques for supply to Sericulture Development Department, CDC's, other stations and extension centers under different projects / programmes.
- To maintain Temperate Mulberry Germplasm Bank (TMGB) for exchange of breeding material.
- In total P4 station maintain 141 mulberry genotypes
- To act as test centre of AICEM Phase IV experiment to evaluate the performance of four newly evolved mulberry varieties viz., PPR-1, AGB-8, C-1360 and control (Goshoerami) under temperate climatic conditions.
- To conduct experimental programmes in collaboration with CSR&TI, Pampore J&K.

- To create Awareness of Sericulture / Silk among students/ local people/ youth / faculties / visiting dignitaries involved in the sericulture / allied sectors.
- Other programmes like Conference, awareness programme, Resham Krishi Mela (as per assigned by Dir-CSB-CSRTI, Pampore)
- Publications

Maintenance of Temperate Mulberry Germ Plasm Bank (TMGB):

Scientists involved: Dr. Rajesh Kumar

The station is maintaining 141 genotypes / accessions in 1.65 acre under dwarf type of plantation for the multiplication of breeding material. The plantation was maintained as per applied package of practices. The list of genotypes / accessions maintained at this station is given in table 91.

Table 91 List of mulberry genotypes / accessions maintained at P4 Manasbal.

1	Almora local	49	ME-53	97	Georgia
2	AR-12	50	ME-58	98	M.ihouseringe
3	AR-14	51	ME-129	99	Papua new guinea
4	ACC-48	52	MS-8	100	Kokoso
5	ACC-67	53	Vishalla	101	Burma-8
6	ACC-77	54	Nadigam	102	Kanmasari
7	ACC-92	55	Obowase	103	Lazuraso
8	ACC-99	56	Okinowa	104	Venosa
9	ACC-100	57	Punjab local	105	Moulai
10	BR-2	58	Rokokiyaso	106	Ruggetto
11	BC-259	59	Senmetsu	107	S-1
12	Brantualkashmir	60	Shimnouchi	108	Atsubamidori
13	Botatul	61	Sanish-5	109	Sosuke-II
14	C-4	62	Shrim-5	110	ACC-165
15	Chinese white	63	Shrim-8	111	China-9
16	Chatatulzangir	64	Serpentina	112	China hybrid-2
17	Chatatul	65	S-30	113	M-Macroua
18	Chinar pati	66	S-36	114	ACC-152
19	C-776	67	S-41	115	SRDC-2
20	C-1733	68	S-54	116	Bogurai-1
21	Exotica	69	S-146	117	Thaibeelad
22	English black	70	S-799	118	Hungarian
23	Enshatkasukwe	71	S-1531	119	Acc-148
24	FGDTR	72	S-1635	120	Sosuki-1
25	French	73	S-1708	121	Thailand lober
26	Female local	74	T.Sukasagwa	122	Large black
27	Goshoerami	75	Tomeiso	123	Bogurai-4
28	Himachal local	76	Tr-10	124	Australia
29	Ichihei	77	Togowase	123	Roso
30	Ichinose	78	Victory	124	Seizuro
31	Italian Sernal	79	Zagtul	125	Mizusawa
32	Kasuga	80	Zangbad	126	Cattaneo
33	Kanva-2	81	Morus nigra	127	BR-3

34	Kokuso-13	82	PPR1 (S140)	128	Xuan-9
35	Kokuso-20	83	Shivalik	129	China-2
36	Kokuso-21	84	C2038	130	Japan
37	Kokuso-27	85	Japan-II	131	Vietnam-3
38	Kairyoroso	86	Kamiso-402	132	Kenmochi
39	K2 x Kosin	87	China-27	133	FYT/99-G4
40	Karionizamigashi (KNG)	88	BR-8	134	Survana-2
41	Kosin	89	BR-4	135	S145
42	Limoncina	90	Japanesa	136	S106
43	Lajaward	91	Moretiana	137	C1360
44	Mysore local	92	Xuan-5	138	AGB-8
45	Muraiso	93	Creeping mulberry hybrid	139	TR-8
46	M.Multicaulis	94	Canton china	140	C-763
47	Mandalay	95	Furcata	141	S-130
48	ME-27	96	Tiliaefolia		

Maintenance of Breeder's Stock (P3): The station maintained thirteen silkworm races as per norms. The rearing of these parents was conducted in cellular mode in spring, 2023. The brushing of the worms was carried on 05-02-2023 (M-D-Y). After 3rd stage 250 larvae were retained. The seed prepared in all the races and shifted to cold storage for hibernation. The performance of the races is given in table 93

Table 92 The rearing performance of P3 breeders' stock during the spring rearing, 2023 at P4 Basic seed Farm Manasbal.

Race	F (No.) *	LB (No.) *	H (%) *	LD (Days)	FLD (Hrs)	LW (gm)	NC (No.)	AC (gm)	ERR	ERR	SCW (gm)	SSW (gm)	SR (%)	PR (%)	FL (Mtr)	R	D
									By no.	By wt.							
SH6	510	470	92.54	27	150	49.48	248	408.3	9900	16.33	1.82	0.32	17.76	93.2	850	3.29	1.8
NB4D2	542	512	95.20	27	150	48.03	248	418.8	9920	16.86	1.69	0.32	18.73	92.6	789	3.62	1.79
CSR-2	573	526	92.22	27	150	45.7	247	377.8	9892	15.08	1.54	0.36	23.60	91.9	897	3.52	1.72
CSR-4	513	487	95.42	27	150	46.8	247	409.3	9864	16.37	1.68	0.34	20.50	92.4	912	3.72	1.7
CSR-6	524	498	93.62	27	150	48.02	247	391.6	9874	15.66	1.51	0.34	21.14	92.3	911	2.85	2.07
CSR-26	535	499	93.83	27	150	49.5	248	390.3	9900	15.73	1.60	0.36	22.60	91.5	862	3.7	1.7
CSR-27	519	482	93.59	27	150	45.9	248	356.5	9896	14.26	1.45	0.30	20.79	92	769	3.29	1.87
CS-6	514	482	94.13	27	150	45.8	247	400	9862	16	1.64	0.33	20.17	92	798	3.93	1.7
PAM-101	562	528	94.51	27	150	46.2	247	374.8	9872	14.99	1.54	0.31	20.13	91.8	817	2.88	2.01
PAM-114	572	534	93.78	27	150	45.3	247	393	9888	15.72	1.61	0.32	20.17	91.9	797	2.96	2.03
PAM-115	566	536	95.12	27	150	45.2	247	407.1	9864	16.41	1.67	0.33	19.80	92.4	867	3.29	1.8
PAM-116	566	533	94.73	27	150	46.3	247	396	9860	15.84	1.62	0.31	19.05	92.1	789	3.45	1.88
PAM-117	565	530	94.31	27	150	46.8	247	385.9	9870	15.15	1.58	0.32	20.32	91.8	810	3.66	2

Note: DOB: Date of brushing, DFLs: Number of Disease Free Layings, F: Fecundity, LB: Larva brushed, H: Hatching, LR: Larval Retained after III Moults, LD: Larval Duration, LW: Larval Weight, NC: Number of cocoons, AC: Actual yield, ERR: Yield/ 10000 larva, SCW: Single Cocoon Weight (gm), SCW: Single Shell Weight (gm), SSW: Single Shell Weight (gm), SR: Shell Ratio, PR: Pupation Rate, FL: Filament Length, R: Renditta

CAPACITY BUILDING & TRAININGS (CBT)

The Capacity Building is one among the mandates of R&D Institutes of Central Silk Board, Bengaluru. Under the Capacity Building & Trainings (CBT), the CSB-Central Sericultural Research & Training Institute (CSR&TI) Pampore during the year 2023-24 targeted 1082 stakeholders within specific programmes, as fixed by the CSB, Bengaluru, across the Bivoltine sericulture practicing states of North India, along with its nested Regional Sericultural Research Station(s) [(Sahaspur, Dehradun & Miransahib, Jammu (J&K)) and Research Extension Centres (REC's) [(Lamberi; Ghumarwin & Basti)], with the aim to update them with the latest trends and developments in the field of sericulture, thereby, resulting in capacity building of stakeholders involved in Sericulture. Additionally, the institute and its nested sub-units hosted 814 individuals as part of diverse exposure visits aimed at promoting awareness about sericulture.

While organising the training programmes, care was taken for ideal orientation as well as practical demonstration of technologies for improvement of sericulture industry qualitatively and quantitatively at the respective levels.

The consolidated detail of CBT programmes conducted by CSRTI, Pampore during the year 2023-24 is depicted below:

#	Particulars of the Training Programme	Training Duration	No. of programmes	No. of beneficiaries
1.	Intensive Sericulture Training	30 days	03	60
2.	Farmers Skill Training (FST)	05 days	24	587
3.	Technology Orientation Programme (TOP)	05 days	05	111
4.	Training through Sericulture Resource Centre	01 day	22	300
5.	Management Development Programme	01 day	01	24
Total			55	1082
6.	Exposure of Students/Farmers/Govt. officials (Institute/RSRS)	Demand based	--	814

Unit wise detail of training programmes conducted during the year 2023-2024 is indicated in the succeeding tables below:

CSR&TI, Pampore and P4, BSF, Manasbal

#	Training programme	Programmes Conducted	Beneficiaries covered
1	Farmers Skill Training Programme (FST)	05	112
2	Technical Orientation Programme (TOP)	01	25
3	Management Development Programme (MDP)	01	24
4	Sericulture Resource Centre (SRC)	07	150
	Total	14	311
5	(Non-CBT): Exposure visit to Main Institute (Students/farmers/NGOs)	--	314

Management Development Programme conducted by CSR&TI, Pampore



Technology Orientation Programme



Non-CBT Training Programmes



FST Training programme during winter period at P4, BSF, Manasbal



Trainings under SRC



Regional Sericultural Research Station, Jammu& REC, Ghumarwin& REC, Lamberi

#	Training programme	Programmes (no.)	Beneficiaries (no.)
1	Intensive Sericulture training programme	01	20
2	Farmers Skill Training Programme (FST)	11	275
3	Technical Orientation Programme (TOP)	02	47
Total		14	342
4	(Non-CBT): Exposure visit to RSRS, Sahaspur (Students/farmers/NGOs)	--	257

**Technology Orientation Programme
(RSRS, Jammu)****Exposure Visits****Farmer's Skill and Training Programme
REC, Ghumarwin****REC, Lamberi****Regional Sericultural Research Station, Sahaspur and REC, Basti**

#	Training programme	Programmes (no.)	Beneficiaries (no.)
1	Intensive Sericulture training programme	02	40
2	Farmers Skill Training Programme (FST)	08	200
3	Technical Orientation Programme (TOP)	02	39
4	Sericulture Resource Centre (SRC)	15	150
Total		27	429
5	(Non-CBT): Exposure visit to RSRS, Sahaspur (Students/farmers/NGOs)	--	243

Intensive Sericulture Training Programme

RSRS, Sahaspur



REC, Basti



Extension Communication Programmes

The CSB-Central Sericultural Research & Training Institute (CSR&TI), Pampore, conducts Extension Communication Programmes (ECPs) across North-western India. These programs are organized through the main institute, Regional Sericulture Research Stations (RSRSs) in Jammu and Sahaspur, Dehradun (Uttarakhand), and Research Extension Centers (RECs). The primary goal of the ECPs in the sericulture sector is to enhance the practices and productivity of sericulture farmers by introducing them to innovative techniques and technologies. By focusing on improving the knowledge, skills, and attitudes of the beneficiaries, these programs facilitate the adoption of advanced sericulture methods. ECPs are integral to the Research and Development (R&D) efforts, aiming to increase awareness and expose stakeholders to the latest advancements in the field. The overarching objective is to ensure that farmers are well-equipped to implement new practices effectively, thereby enhancing their skill sets and improving overall productivity in the sericulture sector. Through these initiatives, CSR&TI plays a pivotal role in fostering sustainable growth and innovation in sericulture across the region. In addition to the ECP, the institute offers various training programs for officials from the Department of Sericulture (DoS), non-profit organizations, and private sector institutes across North Indian states. These programs cater to the specific needs of the participants, providing targeted training to improve their capabilities in sericulture management and development. Through these initiatives, the institute aims to foster a comprehensive and sustainable growth in the sericulture sector by building a knowledgeable and skilled workforce capable of driving innovation and improving productivity.

Extension Communication Programme (ECP) includes:

1. Technical demonstration cum enlightenment programmes,
2. Awareness Programmes
3. Farmers Field Day
4. Krishi Mela
5. Workshop/Seminar.

The brief progress for Extension Communication Programmes (ECP) carried out during 2023-2024 is presented as under:

- 03 Reshem Krishi Mela was organized by at , Basic seed Station Manasbal, RSRS-Jammu, and RSRS-Sahaspur a total no. of **1042** farmer were participated in all the 03 Krishi Melas' under Extension Communication Programmes (ECP) .
- A Total no **1221** Stakeholders were participated in 24 Famers field days (Programmes) in north India under Extension Communication Programmes (ECP) during the year 2023-24. The theme of the programmes is to highlight the various technologies of the Institute, and urge the farmers to adopt the technologies and also calling farmers to approach the Institute for technical guidance whenever necessary and aware farmers to adopt and maintain the plantations technology being exclusively is very beneficial for quality leave harvest.
- Under Awareness programmes a total of **1272** stakeholders were benefitted in 24 programmes.

Conducted indifferent States/ areas viz. Jammu & Kashmir, Jammu, Uttarakhand, and Utter Pradesh (U.P).The awareness programmes always emphasis on successful silkworm rearings of farmers and guiding farmers about adoption and diligent follow the various technologies right from Chawkie rearing upto late age rearing. Special focus is always given towards importance of maintaining hygiene, as silkworms are very sensitive to diseases animals and also upgrading of skills, under these said programmes
- A total of **568** persons/stakeholders were participated in 26 Technical demonstrations cum enlightenment programmes' in north-western sericulture under Extension Communication Programmes (ECP) during the year 2023-24.
- A total No. **118** persons/stakeholders were participated in workshop on hybrid mode from north west India under sericulture Extension Communication Programmes (ECP) during the year 2023-24.
- In addition of above Extension Communication Programmes (ECP) 615 persons/stakeholders where trained by CSR&TI, Pampore and its nested RSRSs during filed visits.
- A total no 4221 Persons/stakeholders where covered under 78 ECPs (Programmes) beside that 615 Persons/stakeholders were aware about the Sericulture technologies and its impact .

Details of Programmes (ECP) conducted under CSR&TI-Pampore during the year 2023-2024

#	Name of event	CSR&TI, Pampore			RSRS, Jammu			RSRS, Sahaspur		
		Achievement during 2023-24		Total expenditure (Lakhs) (Appox)	Achievement during 2023-24		Total expenditure (Appox)	Achievement during 2023-24		Total expenditure (Appox)
		No. of Events	No. of farmer covered		No. of Events	No. of farmer covered		No. of Events	No. of farmer covered	
1.	Krishi Mela	01	500	3.44	01	292	1.01	01	250	1.41
2.	Farmers field day	08	400	0.56	08	448	0.56	08	373	0.319
3.	Awareness Programme	08	400	0.40	08	430	0.40	08	442	0.36
4.	Technical demonstration cum Enlightenment programme	07	142	0.059	10	231	0.10	09	195	0.09
5.	workshop	01	118	0.069	-	-	-	-	-	-
6.	* Field visits	10	106	-	25	252	-	25	257	-
	Total	25	1560	4.535	27	1401	2.072	26	1260	2.18

*Note Field Visits not included in total

Programme details conducted at CSR&TI, Pampore and its nested RSRSs:

#	Programme	CSR&TI, Pampore & RSRSs				
		Total Porg (No)	Target Beneficiaries (No)	Achievement Beneficiaries (No)	Financial Budget (Lakh)	Financial Expenditure (Lakhs) appox
1.	Krishi Mela	03	800	1042	6.0	5.870
2.	Farmers Field Day	24	1200	1221	1.68	1.439
3.	Awareness Programme	24	1200	1272	1.20	1.162
4.	Technology Demonstration	26	520	568	0.26	0.249
5.	Workshop/seminar	01	100	118	2.0	0.069
6.	* Other activities (Field visit)	60	600	615	-	-
	Total	78	3820	4221	11.14	8.792

Note: * Field visits not included in Total

One day ReshemKrishi Melaat P4, BSF, Manasbal on 17.01.2024



Farmer Field Day at Ayautmullah, Bandipora



One awareness program at Ajas,Bandipora



Technology Demonstration cum Enlightenment Programme at Bangund, Pulwama



Resham Krishi Mela conducted by RSRS Sahaspur



Extension Communication Programmes conducted by RSRS Sahaspur



Post Cocoon Technology Section

The Post Cocoon Technology section of the institute is looking after the following activities:

- Post Cocoon activities (silk reeling & testing etc)
- Pre-shipment Inspection of Silk Consignments.
- Promotion of Silk Mark Scheme in Jammu & Kashmir.

The details of the work done during the period under report are as under:

Silk reeling and testing wing: This office is continuously testing cocoon samples tendered by Silk worm Breeding and Genetics Division, Microbiology Division, Host plant Divisions of CSR&TI, Pampore P4 BSF, Manasbal and also samples procured from cocoon Market of Kashmir Division, and accordingly submit the detailed test results to the concerned. During the period under report, this office has under taken complete testing of 280 cocoon samples received from various divisions of this Institute, P4 BSF, Manasbal also from cocoon Auction Market of Kashmir Division including 15 Mass cocoon reeling samples and complete assessment reports were furnished to the concerned.

Silk Reeling & Testing Wing of the PCT Section, CSR&TI, CSB, Pampore is in close touch with the functional reeling units of the Kashmir valley and tries to motivate the entrepreneurs/ designated officers concerned for bringing improvement in their raw-silk production for good returns. Tangible signs of improvement in raw silk quality at private/public reeling entrepreneur's level are appreciating. Further, this office is working hard to enable the reeling units to work with perfection and achieve success in producing quality raw silk by constantly visiting the reeling units and providing technical guidance to the reelers and concerned staff.

During the period under report, the technical staff has under taken field visits to different functional reeling units of Kashmir valley and discussed in detail their technical problems and suggested suitable measures to overcome these. General suggestions were also given which are as under:-

- Increasing the length of croissure to ensure good strength of the thread reduction of defects in reeled thread.
- Adoption of mixed reeling principles, changing of damaged porcelain buttons,
- keeping optimum temperature at re-reeling machinery to ensure the proper drying of sericin,
- Adoption of proper procedure for three pan cocoon cooking in order to ensure proper loosening of sericin and reduce no. of breaks during the entire reeling operation, hence generation of less silk waste and increasing the Renditta of raw-silk reeled.
- Demonstration of the technologies like, pressing plate and three pan cooking as per CSTRI norms was shown to the reelers during these visits.

Field/ Awareness programme: During the period under report, Awareness programmes were conducted in cocoon Auction Market Srinagar and rearers were educated to take various steps for ensuring 'A' grade cocoons. Practically cocoon drying under black cloth was shown to avoid damage to silk by the ultra violet rays of

sunlight. Besides, the rearers were shown handling of green cocoons with care in willow baskets and also proper storage technique was also shown to them. During the programme Director Sericulture Dev. Deptt., Srinagar, Additional Director SDD, Project Officer SDD and other Senior Officers of DOS and CSB, were also present.

Establishment of cocoon assessment cell in cocoon auction market Srinagar: During the period under report, the PCT Section, established cocoon quality cell in the Cocoon auction market, held at SDD, Tulsi-Bagh, Srinagar. Collected 160 samples of dry cocoons and the same were assessed for various parameters. During the market, black cloth cocoon drying technique was also demonstrated among the rearers, for better drying of cocoons.



Cocoon market Srinagar



Cocoon assessment

Field visits: During the year under report the staff undertook, 25 field visits to the functional reeling units of the Kashmir valley and stressed the various measures to be taken by them, for effecting both quality-wise and quantity-wise improvement in their production.



Field Visit to ARM Unit



Technical Guidance to MRM unit during Field Visit



Technical guidance during Field Visit

Reeling of Cocoons: During the year, 100 Kgs of green defective cocoons received from SBG Division are reeled and produced 12 Kg raw-silk as a measure to sale raw-silk instead of cocoons inorder to increase the revenue of the Institute.

Cocoon Stifling/Drying: During the year 340 Kg green cocoons received from SBG Division were stifled/Dried during the year.

Cocoon Sorting: During the period under report 120 Kg green cocoons are sorted and the rejection cocoons obtained from sorting are stored defect-wise, and finally disposed off.

Inspection wing: The inspection work is need based and demand dependent. Although, the pre-shipment inspection of the natural goods meant for exports, is not compulsory, whenever an exporter approaches the office for inspection of silk goods on voluntary basis, services are provided without any delay. The inspection wing provides prompt, timely and quick services of inspection to the exporters, both at exporter's premises and in the office complex.

During the year, the office received One [01] applications from Silk carpet exporters for inspection on voluntary basis.

In all 106 carpets, measuring 161.73 square Mtrs. and valued at [Rs1, 72, 71,000/=] Rupees Seventy two Lakh Seventy one thousand, were certified and passed for exports.

The details are as under:

Particular	Details	Remarks
No of Applications received for Inspection	01	
No of carpets Certified	106	
Square Meters of the Certified Carpets	161.73	
FOB Value of the Certified Silk Goods	72, 71,000	

Out of the five Silk consignments, four were inspected at the exporter's premises, while as one consignment was inspected in the office.

Revenue collection: The inspection wing collected Rs 12,600/- [Rupees Twelve Thousand Six Hundred] only as revenue during the period.

SMOI wing:

The chapter has been entrusted the duty of popularising the Silk Mark scheme in its jurisdiction, Jammu and Kashmir. The main objective of the Silk Mark scheme is to ensure 100% purity in all silk products fixed with the Silk Mark tag.

- Annual targets are fixed for the chapter by the corporate office, SMOI, CSB Bangalore and maximum efforts are put in to achieve the set targets.
- During the year, as against a set target of twelve [12] Authorised user's, the chapter, enrolled four [4] new parties as authorised users 03 (Three) Authorised Users were encouraged to renew their license, for a period of next five years.
- The chapter sold 10300 Silk Mark, Hang Tag/Sew-in labels/ Stiker lables and imparted training to the 17 sales persons (new/old).
- The office collected Ten [10] fresh subscriptions for the Silk Mark magazine and also sold 10 cocoon boxes to different parties.
- During the year, the chapter conducted 09 programmes, to create awareness regarding the Silk Mark scheme. Also conducted 08 days Silk Mark Expo. At Jammu in which

16 Authorise Users from different states participate and there was a business turnover of around 30,00,000/-

- The details of the programmes conducted by the chapter are: Awareness Programmes: 02, Training programme 06, Participated in Exhibition: 01. Silk Mark Expo. 01
- Around, 73 visits were paid to the existing and prospective members, in connection with the Silk Mark work.

Revenue collection: The SMOI wing, collected an amount of Rs 94,100/- [Rupees Ninety Four Thousand One Hundred] only, as Member/AU/renewal fee, cost of labels and Silk Mark magazine subscription fee.

The details are as under:

S.No	Particular	Fee Collected [Rs]	Remarks
01	Membership/AU Fee	35,000.00	+ GST @ 18%
02	AU Renewal Fee	-	
03	Cost of Labels	50,600.00	
04	Silk Mark Magazine Subscription Fee	3,500.00	
05	Sale of cocoon boxes 10@ Rs 500/-	5000.00	

Total revenue collection: The PCT Section collected an amount of Rs 1,06,700/- [Rupees One lakh six Thousand Seven Hundred] only, during the year 2023-24. Also an amount of Rs 34,300/- was collected as revenue by PCT Section from the sale of rejected cocoons /silk waste.

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, पाम्पोर के हिन्दी अनुभाग द्वारा वर्ष 2023-24 के दौरान राजभाषा कार्यान्वयन में अर्जित उपलब्धियां

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, पाम्पोर द्वारा वर्ष 2023-24 में राजभाषा हिन्दी के प्रगामी

प्रयोग एवं राजभाषा नीति के कार्यान्वयन से संबंधित निम्नलिखित कार्य किए गये।

1. राजभाषा अधिनियम, 1963 एवं नियमावली, 1976 का अनुपालन :

राजभाषा अधिनियम, 1963 की धारा 3(3) के शत प्रतिशत अनुपालन सुनिश्चित करने के अलावा, 1976 के नियम 05 के अधीन हिन्दी में प्राप्त पत्रों के उत्तर हिन्दी और द्विभाषी में ही दिये गए तथा मूल पत्राचार एवं वार्षिक कार्यक्रम 2023-24 में निर्धारित लक्ष्य भी प्राप्त किया गया।

2. राजभाषा कार्यान्वयन समिति (राभाकास) की बैठकों का आयोजन :

वर्ष के दौरान प्रत्येक तिमाही में विभागीय राजभाषा कार्यान्वयन समिति की तिमाही बैठकों का आयोजन निम्नानुसार किया गया एवं बैठकों में राजभाषा कार्यान्वयन संबंधी विषयों पर लिए गये निर्णयों पर अनुवर्ती कार्रवाई भी की गयी।

वर्ष के दौरान आयोजित राजभाषा कार्यान्वयन समिति की बैठकों का विवरण

क्रमांक	समिति की बैठक संख्या	तिमाही	अध्यक्ष	दिनांक
1	94वीं	अप्रैल-जून, 2023	डॉ. एन. के. भाटिया, निदेशक	30.06.2023
2	95वीं	जुलाई-सितम्बर, 2023	डॉ. एन. के. भाटिया निदेशक	25.09.2023
3	96वीं	अक्टूबर-दिसम्बर, 2023	डॉ. एन. के. भाटिया निदेशक	28.11.2023
4	97वीं	जनवरी-मार्च, 2024	डॉ. एन. के. भाटिया निदेशक	27.03.2024

3. तिमाही प्रगति रिपोर्ट : वर्ष के दौरान संस्थान द्वारा राजभाषा हिन्दी के प्रगामी प्रयोग संबंधी तिमाही प्रगति रिपोर्ट केन्द्रीय कार्यालय, बैंगलुरु, राजभाषा विभाग, नई दिल्ली (राजभाषा विभाग को तिमाही प्रगति रिपोर्ट ऑन लाइन के माध्यम से भेजी गई) एवं नराकास, श्रीनगर को निम्नानुसार भेजी गई। सभी तिमाहियों में पत्राचार का प्रतिशत वार्षिक कार्यक्रम के लक्ष्यानुसार रहा।

वर्ष के दौरान भेजी गयी तिमाही प्रगति रिपोर्टों का विवरण

क्रमांक	तिमाही की प्रगति रिपोर्ट	तिमाही प्रगति रिपोर्ट भेजने की दिनांक
1	अप्रैल-जून, 2023	14.07.2023
2	जुलाई-सितम्बर, 2023	28.10.2023
3	अक्टूबर-दिसम्बर, 2023	10.01.2024
4	जनवरी-मार्च, 2023	19.04.2024

4. हिन्दी पखवाड़ा / दिवस का आयोजन : संस्थान में दिनांक 15.09.2023 से 30.09.2023 तक हिन्दी पखवाड़े का आयोजन किया गया तथा पखवाड़े के दौरान हिन्दी प्रतियोगिताएं आयोजित की गयी जिसमें संस्थान के अधिकारियों एवं कर्मचारियों ने भाग लिया तथा दिनांक 14.09.2023 को हिन्दी दिवस का आयोजन किया गया जिसमें माननीय गृह राज्य मंत्री जी, संघ सरकार के संदेश का वाचन किया गया तथा प्रतियोगिताओं के विजेताओं को पुरस्कार भी वितरित किए गए।

5. हिन्दी कार्यशालाओं का आयोजन : संस्थान में नियमित रूप से प्रत्येक तिमाही में हिन्दी कार्यशालाओं का आयोजन किया गया। एवं राजभाषा हिन्दी के प्रयोग से संबंधित विषयों जैसे; टिप्पण लेखन, पत्र लेखन एवं सरल हिन्दी वाक्य रचना एवं राजभाषा विभाग द्वारा विकसित सूचना प्रौद्योगिकियों जैसे, लीला मोबाइल ऐप, ई-महाशब्दकोश, यूनीकोड एवं गूगल हिन्दी वाक् टंकण आदि विषयों पर प्रशिक्षण दिया गया।

वर्ष के दौरान आयोजित हिन्दी कार्यशालाओं का विवरण

क्रमांक	तिमाही	कार्यशाला के आयोजन की तारीख
1	अप्रैल-जून, 2023	17.06.2023
2	जुलाई-सितम्बर, 2023	27.09.2023
3	अक्टूबर-दिसम्बर, 2023	30.12.2023
4	जनवरी-मार्च, 2024	30.03.2024

6. नगर राजभाषा कार्यान्वयन समिति (नराकास) एवं अन्य बैठकों में सहभागिता : वर्ष 2023-24 के दौरान इस संस्थान द्वारा निम्नलिखित बैठकों में भाग लिया तथा राजभाषा संबंधी कार्यवृत्तों पर अनुवर्ती कार्रवाई की।

वर्ष के दौरान नराकास, श्रीनगर एवं केन्द्रीय रेशम बोर्ड की बैठकों में सहभागिता का विवरण

क्रमांक	बैठक का नाम	आयोजन की तिथि	बैठक में भाग लेने वाले अधिकारियों एवं कर्मचारियों का नाम
1	नराकास, श्रीनगर	25.04.2023	डॉ. के अशोक कुमार, वैज्ञानिक-बी श्री सत्येंद्र प्रसाद, सहायक अधीक्षक एवं नामित हिन्दी कर्मचारी
2	केन्द्रीय रेशम बोर्ड, बेंगलुरु की राजभाषा कार्यान्वयन समिति की 147वीं बैठक (दृश्य दूरसंलाप द्वारा)	09.06.2023	डॉ.एन. के. भाटिया, निदेशक श्री अशोक कुमार सैनी, सहायक निदेशक (कम्प्यू.) श्री एस. पी. टम्टा, सहायक अधीक्षक
3	केन्द्रीय रेशम बोर्ड, बेंगलुरु की राजभाषा कार्यान्वयन समिति की 148वीं बैठक (दृश्य दूरसंलाप द्वारा)	22.09.2023	डॉ.एन. के. भाटिया, निदेशक श्री अशोक कुमार सैनी, सहायक निदेशक (कम्प्यू.) श्री एस. पी. टम्टा, सहायक अधीक्षक
4	केन्द्रीय रेशम बोर्ड, बेंगलुरु की राजभाषा कार्यान्वयन समिति की 149वीं बैठक (दृश्य दूरसंलाप द्वारा)	06.12.2023	डॉ. एन. के. भाटिया, निदेशक श्री अशोक कुमार सैनी, सहायक निदेशक(कम्प्यू.) श्री एस. पी. टम्टा, सहायक अधीक्षक
5	केन्द्रीय रेशम बोर्ड, बेंगलुरु की राजभाषा कार्यान्वयन समिति की 150वीं बैठक (दृश्य दूरसंलाप द्वारा)	06.03.2024	डॉ.एन. के. भाटिया, निदेशक श्री अशोक कुमार सैनी, सहायक निदेशक (कम्प्यू.) श्री एस. पी. टम्टा, सहायक अधीक्षक सुश्री संचिता नायक, कनिष्ठ अनुवादक(हिन्दी)

• विशिष्ट उपलब्धियाः

1. दिनांक 25.04.2023 को आयोजित नराकास श्रीनगर में आयोजित प्रथम छमाही बैठक में केंद्र के प्रभारी एवं हिन्दी अनुभाग के नामित कर्मचारी द्वारा भाग लिया गया।
2. संस्थान में प्रशिक्षण कार्यक्रम हिन्दी माध्यम से दिया गया।
3. रेशम उत्पादन जैविक प्रौद्योगिकी अनुसंधान प्रशिक्षण संस्थान, बेंगलुरु में दिनांक 15.02.2024 को आयोजित राष्ट्रीय राजभाषा तकनीकी सेमिनार में संस्थान के दो वैज्ञानिकों, डॉ. गुलाब खान एवं डॉ. पावन सैनी द्वारा भाग लिया गया और डॉ. गुलाब खान ने तकनीकी शोध पत्र प्रस्तुतीकरण में द्वितीय स्थान प्राप्त किया।

4. लिफाफो पर पते द्विभाषी में लिखे गए व फाइलों एवं पत्रशीर्षों को द्विभाषी रूप में छपवाया गया।
5. संस्थान में हो रहे सभी कार्यक्रमों के बैनर द्विभाषी बनवाए गए।

• क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्र, सहसपुर

वर्ष के दौरान आयोजित राजभाषा कार्यान्वयन समिति की बैठकों का विवरण

क्रमांक	तिमाही	अध्यक्ष	दिनांक
1	अप्रैल-जून, 2023	डॉ.सरदार सिंह, वैज्ञानिक-डी	24.06.2023
2	जुलाई-सितम्बर, 2023	डॉ.सरदार सिंह, वैज्ञानिक-डी	25.09.2023
3	अक्टूबर-दिसम्बर, 2023	डॉ.सरदार सिंह, वैज्ञानिक-डी	26.12.2023
4	जनवरी-मार्च, 2024	डॉ.सरदार सिंह, वैज्ञानिक-डी	22.03.2024

वर्ष के दौरान भेजी गयी तिमाही प्रगति रिपोर्टों का विवरण

क्रमांक	तिमाही की प्रगति रिपोर्ट	तिमाही प्रगति रिपोर्ट भेजने की दिनांक
1	अप्रैल-जून, 2023	10.07.2023
2	जुलाई-सितम्बर, 2023	06.10.2023
3	अक्टूबर-दिसम्बर, 2023	08.01.2024
4	जनवरी-मार्च, 2024	10.04.2024

क्रमांक	तिमाही	कार्यशाला के आयोजन की तारीख
	अप्रैल-जून, 2023	30.06.2023
2	जुलाई-सितम्बर, 2023	23.09.2023
3	अक्टूबर-दिसम्बर, 2023	29.12.2023
4	जनवरी-मार्च, 2024	30.03.2024

• क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्र, जम्मू

वर्ष के दौरान आयोजित राजभाषा कार्यान्वयन समिति की बैठकों का विवरण

क्रमांक	तिमाही	अध्यक्ष	दिनांक
1	अप्रैल-जून, 2023	डॉ. संतोष कुमार मगदुम, वैज्ञानिक-डी	24.06.2023
2	जुलाई-सितम्बर, 2023	डॉ. संतोष कुमार मगदुम, वैज्ञानिक-डी	20.09.2023
3	अक्टूबर-दिसम्बर, 2023	डॉ. संतोष कुमार मगदुम, वैज्ञानिक-डी	23.12.2023
4	जनवरी-मार्च, 2024	डॉ. संतोष कुमार मगदुम, वैज्ञानिक-डी	28.04.2024

वर्ष के दौरान भेजी गयी तिमाही प्रगति रिपोर्टों का विवरण

क्रमांक	तिमाही की प्रगति रिपोर्ट	तिमाही प्रगति रिपोर्ट भेजने की दिनांक
1	अप्रैल-जून, 2023	10.07.2023
2	जुलाई-सितम्बर, 2023	16.10.2023
3	अक्टूबर-दिसम्बर, 2023	08.01.2024
4	जनवरी-मार्च, 2024	18.04.2024

क्रमांक	तिमाही	कार्यशाला के आयोजन की तारीख
1	अप्रैल-जून, 2023	30.06.2023
2	जुलाई-सितम्बर, 2023	25.09.2023
3	अक्टूबर-दिसम्बर, 2023	26.12.2023
4	जनवरी-मार्च, 2024	30.03.2024

LIBRARY

The library is a comprehensive resource hub with a diverse collection of **1,374 books** that cover a wide range of subjects related to agriculture and its allied fields. These subjects include sericulture, meteorology, entomology, agronomy, soil science, pathology, extension, economics, statistics, animal husbandry, plant breeding, genetics, and biotechnology, among others. This collection serves as a valuable knowledge base for scientists, researchers, and students alike.

Additionally, the library holds an annual associate membership with the **International Sericulture Commission**, which ensures access to global knowledge and advancements in sericulture. It receives a bimonthly magazine called **Indian Silk**, published by the Central Silk Board, Ministry of Textiles, Government of India. This magazine is a crucial source of the latest developments and trends in the silk industry. Furthermore, the library also maintains a collection of *Silk Mark Magazines*, also published by the Central Silk Board, which promotes authenticity in the silk trade.

Beyond magazines and journals, the library possesses a wealth of institutional documents such as **annual reports, newsletters, technological bulletins, technology descriptors, leaflets, folders, pamphlets, and brochures**. These materials are meticulously maintained for record-keeping and serve as ready references for researchers and students.

This resource center is frequently referred to by **Central Silk Board (CSB) scientists, project fellows** as well as research **scholars** and **students** from prestigious institutions like the **College of Temperate Sericulture (COTS)** under **SKUAST-K, Mirgund**, and the **University of Kashmir**. The library plays an integral role in supporting research and academic activities in the field of sericulture and related disciplines.

List of publication:

1. Bharath, K. N., Shivkumar, Kiran, R., Kumaresan, P and Singh, Sardar. Evaluation of elite bivoltine mulberry silkworm (*Bombyx mori* L.) double hybrids suitable for North West India. International Journal of Agricultural Science (2023); 18 (2): 1-7. (NAAS 4.15)
2. Bharath, K. N., Shivkumar, Kiran, R., Kumaresan, P and Singh, Sardar. Identification of superior autumn specific silkworm (*Bombyx mori* L.) hybrids suitable for temperate region of Jammu and Kashmir. International Journal of Agricultural Science., (2023); 19 (1): 1-7. (NAAS 4.73)
3. Bharath, K. N., Shivkumar, Kiran, R., Kumaresan, P and Singh, Sardar. Identification of superior bivoltine mulberry silkworm (*Bombyx mori* L.) double hybridssuitable for North West India. International Journal of Agricultural Science. (2023); 19 (1): 140-146. (NAAS 4.73)
4. **Gonal Basanagouda**, S. Ramesh, G. V. Ranjitha, M. P. Kalpana, B. C. Siddu, H. Satish, R. Kirankumar, and S. Aniket. "Selective genotyping for discovery of QTL controlling flowering time in dolichos bean (*Lablab purpureus* L.)." Crop Breeding and Applied Biotechnology 23, no. 2 (2023): e44182327. (NAAS 7.50)
5. Ranjitha, Goudru Veerabhadrapa, Annabatula Mohan Rao, **Gonal Basanagouda**, Sampangi Ramesh, Madsur Eshwar Kavaya, Aradhya Nateshan, and Venkatesha Prashantha. "Identification of stable sources of resistance to gummy stem blight (GSB) disease in muskmelon (*Cucumis melo* L.)." Genetic Resources and Crop Evolution 71, no. 6 (2024): 2497-2507. (NAAS 8.00)
6. Siddu, Chindi Basavaraj, Sampangi Ramesh, Mugali Pundalik Kalpana, **Gonal Basanagouda**, Hosakoti Sathish, Suryavanshi Aniketh, Narayanaswami Karthik et al. "Identification of inbred lines harbouring favourable dominant alleles not present in the parents of three elite maize (*Zea mays* L.) Single cross hybrids." Genetic Resources and Crop Evolution 71, no. 2 (2024): 851-862. (NAAS 8.00)
7. Kalpana, Mugali Pundalik, Sampangi Ramesh, K. Madhusudan, Chindi Basavaraj Siddu, **Gonal Basanagouda**, Basalapura Rangegowda Chandana, Hosakoti Sathish, Dinesh Sindhu, and Rotti Kirankumar. "Are Indeterminate Genotypes More Productive than Determinate Ones in Dolichos bean [*Lablab purpureus* (L.) Sweet]?: An Analysis based on Near Isogenic Lines Differing in Growth Habit." Legume Research: An International Journal 7 (2024). (NAAS 6.80)
8. Basanagouda, G., S. Ramesh, B. R. Chandana, H. Sathish, C. B. Siddu, M. P. Kalpana, and R. Kirankumar. "Predicting the frequency of transgressive rils and minimum population size required to recover them in dolichos bean [*Lablab purpureus* (L.) Sweet]." Legume Research-An International Journal 1 (2024): 5. (NAAS 6.80)

9. Gonal, Basanagouda, Gangadhara Doggalli, Bhupendra Kumar, Shanti Bhushan, S. Surekha, G. Malathi, and Lakshman Singh. "Exploring the future of plant breeding: Advancements and challenges." *International Journal of Plant & Soil Science* 35, no. 24 (2023): 49-55. (NAAS 5.10)
10. Sahana, P. S., T. Onkarappa, S. Ramesh, N. Manasa, and **G. Basanagouda**. "Estimation of Genotype× Environment interaction in soybean (*Glycine max* (L.) Merrill) crosses for grain yield and its component traits under different sowing dates." *Electronic Journal of Plant Breeding* 14, no. 4 (2023): 1302-1309. (NAAS 5.60)
11. Plabani Roy, Nirmal De, Hemant Jayant, Chandrashekhar Sharma and Preeti Singh (2023). Assessment of soil salinity by geo-spatial technology in Ballia district of Uttar Pradesh. *Agropedology* 2023, 33 (01), 63-67 (NAAS 5.40)
12. Plabani Roy, Ranjan Bhattacharyya, Raman Jeet Singh, N. K. Sharma , Gopal Kumar, M. Madhu , D. R. Biswas , Avijit Ghosh , Shrila Das, Ann Maria Joseph , T. K. Das , Soora Naresh Kumar , S. L. Jat , Y. S. Saharawat and Pramod Jha (2023). Impact of agro-geotextiles on soil aggregation and organic carbon sequestration under a conservation-tilled maize-based cropping system in the Indian Editorial: *Himalayan Climate Interaction*. 16 November 2023. Sec. Soil Processes. Volume 11 - 2023 |. (NAAS 11.60)
13. Rafiq Lone, Newsheen Hassan, Baiza Bashir, **Gulab Khan Rohela**, Nazir Ahmad Malla (2023) Role of Growth Elicitors and Microbes in Stress Management and Sustainable Production of Sorghum. *Plant Stress (Elsevier Journal) International*. (NAAS 12.80)
14. Mahesh Kumar Badhepuri, Prabhakar Rao Beeravelli, Rajender Goud Arolla, Phanikant Jogam, **Gulab Khan Rohela**, Nageswara Rao Singisala Micropropagation and Genetic Fidelity Analysis using SCoT and ISSR Markers in *Muehlenbeckia platyclada* (F.Muell.) Meisn 157: 51 *Plant Cell, Tissue & Organ Culture (Springer Journal) International* (NAAS 9.00)
15. Thirupathi Koppula, Sandhya Dulam **Gulab Khan Rohela**, Saritha Kommidi & Mustafa Mohammed Micropropagation and genetic homogeneity of regenerants by ISSR and ScoT markers in *Solena amplexicaulis* (Lam.) Gandhi – A threatened medicinal cucurbit. Volume 59, pages 724–733 2023 *In vitro Cellular & Developmental Biology-Plant (Springer Journal) International* (NAAS 8.60)
16. Subhash Sirangi, Dulam Sandhya, **Gulab Khan Rohela**, Mahipal S. Shekhawat, Ajmeera Ragan, Vatsavaya S. Raju Leaf explant based direct and indirect regeneration and SCoT marker assisted genetic fidelity analysis of endemic taxon *Corynandra chelidonii* var. *pallae* 36(3): 1-12. (2023) *Vegetos (Springer Journal) International* (NAAS 7.15)
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19. Venkatesha, M. G., & **Kiran, R.** (2023). Chemical composition of *Cymbopogon flexuosus* and *C. winterianus* essential oils and their insecticidal potential against the coffee berry borer *Hypothenemus hampei*. *Jurnal Proteksi Tanaman*, 7(2), 65-77.
20. Rajashekara, S., **Kiran, R.**, Bhavya, V., Chithrashree, C., Chaitra, V., Joshi, D. R., & Venkatesha, M. G. (2023). Screening of botanicals against the adults of rice weevil, *Sitophilus oryzae* L. *International Journal of Industrial Entomology*, 47(1).

Abstracts:

1. भरत कुमार नीलाबोइना*, रीता सिंह, कुमारसन पी और एन.के .भाटिया (2024) “जम्मू-कश्मीर और हिमाचल प्रदेश में क्षेत्रीय स्तर पर सीएसआर डबल हाइब्रिड लार्वा को खिलाई गई 0.5% ग्लूटामिक एसिड फोर्टिफाइड पत्ती की प्रभावकारिता का आकलन” राष्ट्रीय राज भाषा तकनीकी सेमिनार, केंद्रिया रेशम बोर्ड, बंगलुरु.
2. Bharath, K, N., Chattarpal, Rita Singh, Kumaresan P And N.K. Bhatia (2024) “Multilocal trials of bilotine mulberry silkworm double hybrid suitable for North West India” published in souvenir of Silk Tech-2024 Bharat Texpo-International Conference “Global Scenario and Sustainable solutions” held on 28th February at Pragati Maidan, New Delhi.
3. Santoshkumar Magadum, Singh, S., Saheb, S.N.A. and Bhatia, N.K. (2024). Evaluation of improved mulberry genotypes through bioassay of silkworm (*Bombyx mori* L.) under sub-tropical conditions of Jammu. In: Silkworm SeedCon 2024-International conference on Silkworm Seed Industry: Opportunities and Future Prospects, held during 30-31st January, 2024 at Bengaluru. Page: 47.
4. Sreenu Pendli, **Gulab Khan Rohela**, Phanikanth Jogam, Manokari, Mahipal S Shekhawat, Christopher Reuben Thammidala (2023) Micropropagation, biochemical profiling and genetic fidelity analysis in *Hybanthus enneaspermus* (L.) F. Muell: an important medicinal herb with aphrodisiac properties 45International Conference on “Plant Physiology and Biotechnology” Lovely Professional University on 20th & 21st April, 2023.
5. Dulam Sandhya, Phanikanth Jogam, **Gulab Khan Rohela**, Manokari, Mahipal S Shekhawat, Venkataeswar Rao Allini, Sadanandam Abbagani (2023) Efficient indirect regeneration and genetic homogeneity studies in *Origanum majorana* (L.): a multipurpose medicinal plant 63 International Conference on “Plant Physiology and Biotechnology” Lovely Professional University on 20th & 21st April, 2023.

6. Gulab Khan Rohela, Pawan Saini, Aftab Ahmad Shabnam, Azra Nahaid Kamili, Narendra Kumar Bhatia (2023) Mulberry Somatic Hybrids 53 National Conference on “Future of Agriculture and Future For Agriculture” Department of Vegetable Sciences, SKUAST-K from 4th & 6st September, 2023.
7. गुलाब खान रोहेला, पवन सैनी, आफताब अहमद शबनम, अशोक कुमार कासुकुर्थी, अजरा नाहिद कामिली, और नरेंद्र कुमार भाटिया (2024) शहतूत के दैहिक संकरों कीप्लोइडी और रूपात्मक विशेषताएँ One Day Hindi Technical National Seminar on “रेशम बोर्ड के 75 साल:उपलब्धिया और भावी परिदृश्य” SBRL, CSB, Bengaluru on 15th February, 2024.
8. Zarintaj Shukurova, Yusif Shukurlu, **Rajesh Kumar**, (2023). Extraction of Natural Silk Fiber from Cocoons of *Saturnia pyri* (Lepidoptera: Saturniidae). 10th BACSA INTERNATIONAL CONFERENCE “Regeneration of sericultural industries in 21st century” “REGESERI”. Pp-45-46.
9. Subadas Singh, G. Subrahmanyam, Prashanth Sangannavar, **Rajesh Kumar**, Bidyut Choudhury, DK Jigyasu, Reeta Luikham and K.M. Vijaya Kumari, (2023). Conservation of muga silkworm, *Antheraea assamensis* Helfer in different geographical locations of north east India. In: Conservation, improvement and rearing management in Vanya silkworms” of National Symposium on ‘Vanya Sericulture: Opportunities Galore’ organized by CSB-CTRTI Ranchi, 28 to 29 October 2022 at Ranchi.
10. पवन सैनी, गुलाब खान रोहेला, राजेश कुमार, दानिष्टता अजीज, सुमिरा रफ़ीक़, मोहम्मद अमीन भट, राजिंदर कुमार, सरदार सिंह, एन के भाटिया और एस नजीर अहमद साहब, २०२३. उपज मापदंडों और रेशमकीट जैवपरख अध्ययन के माध्यम से शहतूत प्रवृष्टियों का कश्मीर घाटी के अंतर्गत मूल्यांकन। राष्ट्रीय राजभाषा तकनीकी सेमीनार, केन्द्रीय रेशम बोर्ड के 75 साल : उपलब्धिया एवं भावी परिदृश्य । पेज संख्या 12
11. संतोषकुमार मगदुम, सिंह, एस. और भाटिया, एन.के. (2024). जम्मू की उपोष्णकटिबंधीय परिस्थितियों में उपज और गुणवत्ता संबंधी लक्षणों के लिए शहतूत जननद्रव्य का मूल्यांकन. में: राष्ट्रीय राजभाषा तकनीकी सेमीनार - केंद्रीय रेशम बोर्ड के 75 साल : उपलब्धियाँ एवं भवि परिदृश्य. आयोजक - रेशम जैव प्रौद्योगिकी अनुसंधान प्रयोगशाला, कोडती, बंगलुरु. 15 फरवरी 2024. पृष्ठ संख्या- 26.
12. Santoshkumar Magadum and Bhatia, N.K. (2024). Seasonal variability and its impact on silk quality in Jammu region. In: SilkTech 2024: International Conference on Global Scenario and Sustainable Solutions in Silk Industry, held on 28th February, 2024 at Bharat Mandapam, Pragati Maidan, New Delhi. Page: 142
13. Kiran, R., Nadiya Ashraf, & Bhatia, N.K. (2024). Quantification of Homogeneity in Cocoons from Silkworm, *Bombyx mori* L., 1758 (Lepidoptera: Bombycidae) Using Imagej, International conference on Transdisciplinary Research in Life Sciences: Perspectives and Prospects organized by the Department of Life Sciences, Kristu

Jayanti College, Autonomous in association with the University of Trans-Disciplinary Health Sciences and Technology (TDU).

14. Kiran, R., Kumaresan, P., Bharath, K.N., Shivkumar, Ahmad, M.N., & Bhatia, N.K. (2023). From the Archives: Comprehensive Assessment of Pivotal Silkworm Races - Shogetsu Hosho, Shunrei Shogetsu, and N124xC124, National Conference on Silkworm Seed Industry: Opportunities and Future Prospects.

Popular articles:

1. राम लखन राम एवं डा भाटिया .के .एन .(2023) शहतूती रेशम कीटपालन पर कुशल प्रबंधन का प्रभाव. रेशम मित्र । रेशम निदेशालय(पत्रिका), उत्तर प्रदेश, लखनऊ द्वारा प्रकाशित।
2. Kumar, P., **Santoshkumar Magadum** and Rawat, L. (2023). Role of mutagenesis and mutation breeding in crop improvement. Vigyan Varta 4(10): 1-5.
3. Kumar, P., Agnihotri, A., Singh, I., Rawat, L., Bisht, T.S., **Santoshkumar Magadum**, Belwal, V. and Singh, K. (2023). Brief knowledge of Mountain Ebony (*Bauhinia variegata* L.) diversity with ethnobotany and pharmacology. Vigyan Varta 4(10): 91-95.

Pamphlets:

- Bharath, K, N., Shivkumar, Mir Nisar Ahmad, Kiran R, Kumaresan P and NK Bhatia (2023) Double hybrids for North West India DH8-BK20xBK7 and DH3-BK17xBK9, Bulletin No:01, CSR&TI, Pampore publication.
- Bharath, K, N., Shivkumar, Kiran R, Kumaresan and NK Bhatia (2023) Autumn specific hybrid for temperate region of Jammu and Kashmir (ASH-14), Bulletin No:02, CSR&TI, Pampore publication.
- Bharath, K, N., Rajesh, k, Kumaresan and NK Bhatia (2024) Efficacy of 0.5% Glutamic acid fortified leaf during autumn season in Kashmir zone, Bulletin No:01, Published by Director, CSR&TI, Pampore Publication, Jammu and Kashmir.
- गुलाब खान रोहेला, पवन सैनी, मुत्तन्ना, एवं एन के भाटिया मिट्टी का नमूना और इसका विश्लेषण (2023) CSR & TI, Central Silk Board, Pampore (J&K)-192 121
- G.K.Rohela; Saini P, Bhatia N.K. Calendar of Operations for Mulberry Cultivation in Kashmir Region (2024) CSR & TI, Central Silk Board, Pampore (J&K)-192 121
- Rajesh Kumar and N.K. Bhatia, (2023). Silkworm Rearing Technologies in Kashmir Valley for Sericulture Farmers. Published by Director, CSB-CSRTI, and Pampore. Pp 1-7.

Books/Book Chapters

1. Rafiq Lone, Abid Bhat, Naveena Nazim, Nazir Ahmad Malla, **Gulab Khan Rohela** & Heba I. Mohamed Role of Phenolics in Plant–Microbe Interaction: A Review https://doi.org/10.1007/978-981-99-3334-1_1 Plant Phenolics in Biotic Stress Management. Hard Cover ISBN- 978-981-99-3333-4 Soft Cover ISBN: 978-981-99-3336-5 e book ISBN: 978-981-99-3334-1 2024

2. Rafiq Lone, Gulshan Mushtaq, Nowsheen Hassan, Nazir Ahmad Malla, **Gulab Khan Rohela** & Salim Khan Role of Phenolics in Establishing Mycorrhizal Association in Plants for Management of Biotic Stress <https://doi.org/10.1007/978-981-99-3334-1> Role of Phenolics in Plant–Microbe Interaction: A Review. In: Lone, R., Khan, S., Mohammed Al-Sadi, A. (eds.) Plant Phenolics in Biotic Stress Management. Hard Cover ISBN- 978-981-99-3333-4 Soft Cover ISBN: 978-981-99-3336-5 E book ISBN: 978-981-99-3334-1 2024 Springer
3. Jose, A. T., **Syam, S.**, Deepasree, A., Jithu, A., Reddy, A. J., & Chanda, M. Eutrophication: A Bionomical Vision (2024). Water-Soil-Plant-Animal Nexus in the Era of Climate Change, IGI Global, pp. 258-278.
4. Mondal R, **Rohela GK**, Saha P, Sangannavar P, Gnanesh BN (2023). Mulberry genome analysis: Current status, challenges, and future perspective, pp 115-130. The Mulberry Genome ISBN: 978-3-031-28477-9 ISBN: 978-3-031-28478-6 (eBook) Editors: Belaghihalli N. Gnanesh, Kunjupullai Vijayan, Springer
5. Ram, R.L. (2023) Current Research in Soil Fertility (Vol.-IX), Paperback ISBN 978-93-5570-669-0, AkiNik Publications, New Delhi.
6. Ram, R.L. (2023) Current Research in Soil Fertility (Vol.-X), Paperback ISBN 978-93-5570-988-2, AkiNik Publications, New Delhi.

Seminars/Workshops/Trainings Attended

#	Seminars/Workshops/Training Programme	DATE	Organized by	Offline/Online	Name of the Scientist
1	One day Workshop on 'Development of Diversified Serby-products; Recent Achievements and Future Perspectives'	20/05/2023	CSR&TI, Mysore	Online	Dr. Gulab Khan Rohela
2	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Dr.Plabani Roy
3	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Dr Basanagouda Gonal
4	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Dr Shivam Bharadwaj
5	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Syam S
6	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Dr. Arasakumar E., Scientist-B
7	05 week training for newly recruited scientist of CSB	19/01/2024 to 23/02/2024	CSB	Offline	Dr. Sakshi Vaishnav, Scientist-B
8	International conference on the Silkworm Seed Industry: Opportunities, Future prospects at Bengaluru.	30/01/2024 to 31/01/2024	CSB	Offline	Dr.Plabani Roy
9	International conference on the Silkworm Seed Industry: Opportunities, Future prospects at Bengaluru.	30/01/2024 to 31/01/2024	CSB	Offline	Dr Basanagouda Gonal
10	International conference on the Silkworm Seed Industry: Opportunities, Future prospects at Bengaluru.	30/01/2024 to 31/01/2024	CSB	Offline	Dr Shivam Bharadwaj
11	International conference on the Silkworm Seed Industry: Opportunities, Future prospects at Bengaluru.	30/01/2024 to 31/01/2024	CSB	Offline	Syam S
12	Technical orientation programme	26/12/2023 to 30/12/2024	CBT, CSR&TI, Pampore	Offline	Dr.Plabani Roy
13	Technical orientation programme	26/12/2023 to 30/12/2024	CBT, CSR&TI, Pampore	Offline	Dr Basanagouda Gonal
14	Technical orientation programme	26/12/2023 to 30/12/2024	CBT, CSR&TI, Pampore	Offline	Dr Shivam Bharadwaj
15	Technical orientation programme	26/12/2023 to 30/12/2024	CBT, CSR&TI, Pampore	Offline	Syam S
16	Management development programme (MDP) on strategic human resource management for high performance teams	28/03/2024 to 20/03/2024	CSR&TI, Pampore	Offline	Dr.Plabani Roy
17	Management development programme (MDP) on strategic human resource management for high performance teams	28/03/2024 to 20/03/2024	CSR&TI, Pampore	Offline	Dr Basanagouda Gonal

18	Management development programme (MDP) on strategic human resource management for high performance teams	28/03/2024 to 20/03/2024	CSR&TI, Pampore	Offline	Dr Shivam Bharadwaj
19	Management development programme (MDP) on strategic human resource management for high performance teams	28/03/2024 to 20/03/2024	CSR&TI, Pampore	Offline	Syam S
20	One day workshop on extension communication programme	30/03/2024	SEEM,CS R&TI, Pampore	Offline	Dr.Plabani Roy
21	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Dr. Sardar Singh, Scientist-D
22	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Dr. R. L. Ram, Scientist-D
23	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Shri Chhattar Pal, Scientist-C, STA. Shri Piyush, SFA
24	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Dr. Arasakumar, Scientist-B)
25	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Dr. Sakshi Vishnav, Scientist-B
26	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Shri S. K. Singh, STA
27	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Chandrakala, STA
28	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Jyoti Krishali, STA
29	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Gunjan Ameta, STA
30	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Meenakshi Chadha, STA
31	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Vandna Rathore, STA
32	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Mr. Mohd Shafi Mir, STA
33	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Malkiat Kour, STA
34	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Sarojini Negi, STA
35	One day online workshop on “Silkworm Rearing”	30-03-2024	CSR&TI, Pampore	Online	Smt. Rekha Joshi
36	National webinar: Maharana Pratap Memorial Lecture – 2023 on “Future of Indian Agriculture: Challenges and Opportunities”	22 nd May 2023	MPUAT, Udaipur	Participation only through virtual mode	Dr. Santoshkumar Magadum, Scientist D
37	National Webinar on	23 rd May 2023	MPUAT,	Participation	Dr. Santoshkumar

	“Mainstreaming Agrobiodiversity – An integrated approach to reduce climate vulnerability, improve nutrition, livelihoods, and ecosystem services”		Udaipur	only through virtual mode	Magadum, Scientist D
38	Training programme on “Video Production Skills for Extension Functionaries” organized by during	13-17 th February 2024.	National Institute of Agricultural Extension Management (MANAGE), Hyderabad and Tamil Nadu Agricultural University (TNAU), Coimbatore	Participation only through virtual mode	Dr. Kiran R, Scientist-C
39	Silkworm SeedCon 2024- International conference on Silkworm Seed Industry: Opportunities and Future Prospects	30-31 st January, 2024	Central Silk Board, Bengaluru	Participation and Poster Presentation	Dr. Santoshkumar Magadum, Scientist D
40	राष्ट्रीय राजभाषा तकनीकी सेमिनार - केंद्रीय रेशम बोर्ड के 75 साल : उपलब्धियाँ एवं भविष्य	15 फरवरी 2024	रेशम जैव प्रौद्योगिकी अनुसंधान प्रयोगशाला, कोडती, बेंगलुरु	भाग लिया और पोस्टर प्रस्तुति	डॉ. संतोषकुमार मगदुम, वैज्ञानिक डी
41	SilkTech 2024: International Conference on Global Scenario and Sustainable Solutions in Silk Industry	28 th February, 2024	Central Silk Board, Bengaluru	Participation and Poster Presentation	Dr. Santoshkumar Magadum, Scientist D

Awards

#	Name of the Scientist	Award	Date	Awarded by
1	Dr. Gulab Khan Rohela	Young Scientist Award (Biotechnology)	4th September, 2023	Society for Plant Research (Springer)
2	Dr. Santoshkumar Magadum,	“Best Poster Presentation Award (third prize)”	30-31 st January, 2024	Central Silk Board

SCIENTIFIC & ASSOCIATED PERSONNEL

Dr. Narendra Kumar Bhatia, Director

Main Institute, Pampore

Host Plant Division**Host Plant Improvement Section**

Dr. Irfan Illahi, Scientist-D
 Dr. Pawan Saini, Scientist-C
 Dr. Basangouda Gonal, Scientist-B (w.e.f. 07.12.2023)
 Sh. Mohd. Amin Bhat, Sr. Technical Assistant
 Sh. Rajinder Kumar, Sr. Technical Assistant

Host Plant Protection Section

Dr. Irfan Illahi, Scientist-D (w.e.f. 12.10.2023)
 Dr. Pawan Saini, Scientist-C
 Sh. Mohd. Amin Bhat, Sr. Technical Assistant
 Sh. Rajinder Kumar, Sr. Technical Assistant

Agronomy & Soil Section

Dr. Gulab Khan Rohela, Scientist-C
 Ms. Plabani Roy, Scientist-B (w.e.f. 17.11.2023)
 Sh. Sardar Inder Singh, Sr. Technical Assistant

Farm Management Section

Dr. Irfan Illahi, Scientist-D (w.e.f. 12.10.2023)
 Dr. Pawan Saini, Scientist-C
 Sh. Mohd. Amin Bhat, Senior Technical Assistant
 Sh. Rajinder Kumar, Senior Technical Assistant

Biotechnology Division**Host Plant Biotechnology**

Dr. K. Ashok Kumar, Scientist-D (w.e.f. 12.10.2023)
 Dr. Gulab Khan Rohela, Scientist-C
 Sh. S Syam, Scientist-B (w.e.f. 23.11.2023)
 Sh. Sardar Inder Singh, Sr. Technical Assistant

Silkworm Biotechnology

Dr. Ashok Kumar Kasukurthi, Scientist-D
 Smt. Zenab Jan, Senior Technical Assistant

Project Monitoring Coordination & Evaluation Division

Dr. Irfan Illahi, Scientist-D w.e.f. 26.10.2023)
 Dr. Muttanna, Scientist-C (upto 25.11.2023)
 Smt. Jameela Akhter, Field Assistant
 Smt. Nida Mushtaq, Field Assistant

ICT, Section:

Sh. Ashok Kumar Saini, Asstt. Director(Computer)

Confidential Section:

Sh. Subhash Chander, Superintendent(Admn)

Maintenance Section:

Sh. Saadat Hamid Khan, Assistant Director (Insp)
 Sh. Mohd. Altaf Koul, Senior Technical Assistant
 Sh. Ghulam Hassan Ahanger, Technician
 Sh. Mohd. Yousuf Sheikh, Assistant Technician

Training Division**Capacity Building & Training Section**

Dr. K. Ashok Kumar, Scientist-D (w.e.f. 01.12.2023)
 Dr. Mttanna, Scientist-C (upto 23.11.2023)
 Dr. Shivam Bhardwaj, Scientist-B (w.e.f. 24.11.2023)
 Sh. Sheikh Altaf Hussain, Sr. Technical Assistant

Library Section

Dr. Gulab Khan Rohela, Scientist-C (w.e.f. 25.11.2023)
 Dr. Muttanna, Scientist-B (upto 25.11.2023)

Silkworm Division**Silkworm Improvement Section**

Sh. P Kumaresan, Scientist-D
 Sh. N. Bharath Kumar, Scientist-C
 Dr. Kiran R, Scientist-C
 Dr. Shivam Bhardwaj, Scientist-B (w.e.f. 17.11.2023)
 Sh. Mohd. Ashraf Hajam, Sr. Technical Assistant
 Smt.Imtiyaza Akhtar, Senior Technical Assistant

Post Cocoon Technology Section

Sh. Saadat Hamid Khan, Deputy Director (Insp)
 Sh.Mohd.Altaf Koul, Senior Technical Assistant

Silkworm Protection Section

Dr. Irfan Illahi, Scientist-D (w.e.f. 04.07.2023)
 Sh. N. Bharath Kumar, Scientist-C
 Smt. Nisara Akhtar, Sr. Technical Assistant
 Sh Fayaz Ahmad Bhat, Sr. Technical Assistant

Silkworm Rearing Management & Seed Technology

Sh. P. Kumaresan, Scientist-D
 Sh. Farooq Ahmad Dar, Sr. Technical Assistant
 Smt. Zenab Jan, Senior Technical Assistant

SEEM Division**Extension & Publicity Section**

Dr. Kasukurthi Ashok Kumar, Scientist-D
 Sh. Sheikh Altaf Hussain, Sr. Technical Assistant (Additional)
 Sh Sardar Inder Singh, Sr. Technical Assistant (additional)

Trial of Technology Section

Dr. K. Ashok Kumar, Scientist-D (w.e.f 03.08.2022)
 Dr. Muttanna, Scientist-C (upto 25.11.2023)

Economics & Social Studies Section

Dr. K. Ashok Kumar, Scientist-D

Hindi Section:

Sh. Satyandra Prasad Tamta, Asstt. Supdt.(Admn)(upto 28.2.24)
 Ms. Sanchita Nayak, Jr. Translator(Hindi) (w.e.f. 29.02.2024)

Administration & Accounts Section

Sh. Saadat Hamid Khan, Asstt. Director(Insp)
 Sh. Anil Raina, Superintendent (Admn)
 Sh.Subhash Chander, Superintendent (Admn)
 Sh. Dipak Kumar Murmu, Assistant Superintendent (Admn)
 Sh. Madhusudan Sharma, Asstt. Supdt.(Admn)
 Sh. Jagmohan Singh, Asstt. Supdt.(Admn)
 Sh Satyandra PrasadTamta, Asstt. Supdt.(Admn)
 Sh. Ajay Malhotra, Asstt. Supdt.(Admn)
 Sh. Kulwant Singh, Asstt. Supdt.(Admn)
 Sh. Tanuj Kumar Gairola, Asstt. Supdt(Admn) (w.e.f. 12.2.2024)
 Sh.Rakesh Kumar Mishra, Upper Division Clerk
 Sh. Syed Mohd Iqbal Indrabi, Upper Division Clerk
 Smt.Praveen UDC
 Sh. Mohd. Ayub Khan, Upper Division Clerk
 Sh. Nazir Ahmad Malik, Upper Division Clerk
 Smt. Mehmooda Akhter, Upper Division Clerk
 Sh. Fayaz Ahmad Wani, Upper Division Clerk

Vehicle Section:

Sh.Saadat Hamid Khan, Asstt. Director(Insp)
 Sh. Jagmohan Singh, Asstt. Supdt.(Admn) (upto 10.09.2023)

Sh. Sheikh Altaf Hussain, Senior Technical Assistant Multitasking Staff: Sh. Ghulam Mohd. Sheikh Sh. Guru Dayal Sh. Depty Nath Sh. Manzoor Ahmad Mir Sh. Mohd. Shafi Rather Sh. Tirath Lal Sh. Bashir Ahmad Shakhsaz Sh. Balbir Raj Sh. Mohd. Latief Khan Sh. Bashir Ahmad Bhat	Sh. Kulwant Singh, Asstt. Supdt.(Admn) (w.e.f. 11.09.2023) Sh. Mushtaq Ahmad Rather, Staff Car Driver Grade-I Sh. Ranvir Singh, Staff Car Driver Grade - I Computer Section : Sh. Ashok Kumar Saini, Asstt. Director(Computer)
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P-4, Basic Seed Farm, Manasbal

Scientific Staff: Dr. Rajesh Kumar, Scientist-D Technical Staff: Sh. Zahoor Ahmad Bhat, Senior Technical Assistant Sh. Zubida Viqar, Senior Technical Assistant Sh. Abdul Hamid Bhat, Senior Technical Assistant Sh. Ishtiyag Noor, Senior Field Assistant	Multitasking Staff: Sh. Mushtaq Ahmad Shah
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Regional Sericultural Research Station, Miransahib, Jammu

SCIENTIFIC STAFF: Dr. Santoshkumar Magadam, Scientist-C Dr. Rita Singh, Scientist-B (upto 30.04.2023) Dr. Sunil, Scientist-B (w.e.f. 07.12.2023) TECHNICAL STAFF: Sh. Ashok Kumar Bawoor, Sr. Technical Assistant (upto 30.09.2023) Sh. Hira Lal Raina, Senior Technical Assistant Sh. Bachitar Lal, Senior Technical Assistant Sh. Sanjiv Kumar Sharma, Senior Technical Assistant Sh. Yashpal Bhagat, Senior Technical Assistant Sh. Tarsem Lal, Senior Technical Assistant Sh. Kam Raj, Senior Technical Assistant Sh. Chuni Lal, Senior Technical Assistant Sh. Madan Lal, Senior Technical Assistant Smt. Dalip Kour, Senior Technical Assistant Sh. Madan Lal, Senior Technical Assistant Sh. Sarbjit Singh, Senior Technical Assistant Sh. Ajay Sharma, Senior Technical Assistant Sh. Jagdish Singh Raja, Sr. Technical Asstt. Smt. Malavati, Senior Technical Assistant	ADMINISTRATIVE STAFF: Sh. Kourjit Singh, SCD-II Sh. Lekh Raj, Assistant Technician Sh. Mahraj Krishan Raina, Multi Tasking Staff Sh. Kamal Raj, Multi Tasking Staff (upto 31.05.2023) Sh. Mela Ram, Multi Tasking Staff Sh. Madan Lal, Multi Tasking Staff Sh. Bhagat Bui Nath, Multi Tasking Staff Sh. Darshan Lal, Multi Tasking Staff
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Regional Sericultural Research Station, Sahaspur, Dehradun

SCIENTIFIC STAFF: Dr. Sardar Singh, Scientist-D (w.e.f. 10.04.2023) Sh. Chhattar Pal, Scientist-C Dr. E. Araskumar, Scientist-B (w.e.f. 18.11.2023) Dr. Sakshi Vaishnav, Scientist-B (w.e.f. 11.01.2024) TECHNICAL STAFF: Smt. Malkait kour, Senior Technical Assistant Shri S. K. Singh, Senior Technical Assistant Shri Madan Singh Chouhan, Sr. Tech. Asstt. Shri R. P. Godiyal, Senior Technical Assistant Smt. Chandrakala, Senior Technical Assistant Smt. Jyoti Krishali, Senior Technical Assistant Smt. Gunjan Ameta, Senior Technical Assistant Smt. Rekha Joshi, Senior Technical Assistant Smt. Meenakshi Chadha, Senior Technical Assistant Smt. Vandna Rathore, Senior Technical Assistant Shri Mohd Shafi Mir, Senior Technical Assistant Shri Piyush, Senior Field Assistant	ADMINISTRATIVE STAFF: Shri Manoj Kumar, Asstt. Supdt. (Admn) Shri Raj Kumar, MTS Shri Blaster Bhan, MTS Shri Kishan Lal Kalal, MTS Shri Ram Singh Jhala, MTS
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Research Extension Centres (RECs)**REC, Lamberi (J&K)**

Smt. Neelam Kumari, Technical Assistant
 Sh. Parvaz Ahmad, Technical Assistant
 Sh. Parshotam Lal, Technical Assistant
 Sh. Ram Lal, Technical Assistant

REC, Ghumarwin

Dr. Rita Singh, Scientist-B (w.e.f. 01-05-2023)
 Sh. Fayaz Ahmad Begh, Senior Technical Assistant (upto 31.1.24)
 Sh. Yog Raj, Senior Technical Assistant
 Smt. Chander kala Ranaut, Senior Technical Assistant
 Sh. Praveen, Senior Technical Assistant
 Sh. Habibullah Wani, Senior Technical Assistant
 Sh. Rajesh Godyal, Multi Tasking Staff

REC- Basti

Dr. Ram Lakhan Ram, Scientist-D
 Shri Kailash Nath, Senior Technical Assistant
 Shri Ragubir Singh, Staff Car Driver (upto 30.9.2023)
 Sh. Ashish Kumar Verma, Field Assistant.

ADMINISTRATIVE REPORT

EXPENDITURE 2023-2024 – AT A GLANCE

Table-1: Expenditure booked under the following head of accounts at this Institute and its delegated units during year 2023-2024**[Rs. In Lakhs]**

S.N o.	Head of Accounts	Paln Salaries	Plan SCSP	Plan STSP	Paln Recuring	Paln Capital	Total
1.	Salary & allowances				1.85		1.85
2.	Wage & EPF						
3	7 th CPC arrears of SFW / Farm Workers						
4	Gratuity of SFW						
5	Pension Gratuity						
6	Gratuity & Retirement Benefits to Employees						
7	Define Pension Cont.						
8	Travelling Expenses				40.29		40.29
9	Contingencies				124.86		124.86
10	Assets						
11	Recoverable advance						
12	Advance deposited						
13	Released under R&D scheme						
	Total				167.00		167.00

Table-2: Revenue Generation during 2023-2024

Sl. No.	Source of Revenue Generation	Physical (No.)	Revenue generated (Rs. in Lakhs)	
			Target	Achievement
1	Patent (Technology)			
1.1	License Fee collected	--		
1.2	Royalty collected	--		
2	Testing & Analytical charges (Sample)			
2.1	Testing of Soil/water/FYM/ Leaf etc	Need based		
2.2	Quality analysis/ testing of products	Need based		
2.3	Testing of cocoons/silk yarn/fabric etc.	-		
3	Consultancy (Services)	--		
4	Supply/ sale proceeds of cutting / Sapling/ seedling/ chawki worms/ cocoons/ Silk etc.			
4.1	Mulberry cutting/ Mulberry leaf/ sale of green grass mulberry twigs	--		0.86
4.2	Vanya host plant sapling/ seedling	--		
4.3	Mulberry chawki worms	--		
4.4	Mulberry Seed (DFLs)	--		
4.5	Vanya seed (DFLs)	--		
4.6	Cocoons	--		2.55
4.7	Output from R&D Projects (Silk, fabric etc) Auction of scarab item, income from Hostel, Rent of tower, HRR & water charges	--		4.19
4.8	Others (pl specify)	--		
	Total			7.60