के रे उ अ प्र सं-मैसूरु

CSRTI-MYSURU

वार्षिक प्रतिवेदन
ANNUAL REPORT
2015-16

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान

CENTRAL SERICULTURAL RESEARCH AND TRAINING INSTITUTE

केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय, भारत सरकार, मैसूरु-570 008

Central Silk Board, Ministry of Textiles, Government of India, Mysuru 570 008

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(आई एस ओ 9001 : 2008 प्रमाणित)

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(ISO 9001 : 2008 Certified)

केंद्रीय सिल्क बोर्ड, भारत सरकार, वस्त्र मंत्रालय, भारत सरकार, मैसूरु-570 008.

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निदेशक
के रे अ प्र सं, मैसूरु

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Director
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FOREWORD

It is pleasure to present the Annual Report 2015-16 of CSRTI Mysuru, unveiling the salient achievements of R&D programmes undertaken on different aspects of mulberry sericulture in the tropical region. The pre-eminence status of CSRTI-Mysuru was maintained due to concerted efforts with significant achievements for the benefit of stakeholders. A record quantity of [illegible] MT bivoltine raw silk production was achieved in the [illegible] Clusters through Cluster Promotion Programmes accounting for [illegible]% in the country.

Development of [illegible], a new mulberry variety for rainfed semi-arid conditions with improved productivity ([illegible] MT/ha/year); development of [illegible] ([illegible]) guidelines for mulberry (PPV&FRA New Delhi); identification of mulberry genetic resources resistance to root knot; field evaluation of [illegible] for the management of root knot (~90% reduction & 10-12% increased leaf yield); introduction of [illegible], bivoltine single hybrid into commercial seed production by NSSO following successful post-authorization trials; successful authorization trials of [illegible], bivoltine hybrid for [illegible] conditions with an average yield of [illegible] kg/100 and [illegible] [illegible]; field evaluation of [illegible], productive bivoltine single hybrid ([illegible] kg/100 dfls) and [illegible], productive double hybrid for favorable conditions ([illegible] kg/100 dfls); development of improved Crossbreed, Cauvery Gold ([illegible]) with improved productivity ([illegible] kg/100 dfls); development of modified LAMP (Loop mediated isothermal amplification reaction) technique for the detection of pebrine caused by Nosema bombycis are the major achievements. The research outcome of R&D programmes lead to the grant of patents for [illegible] composite cocoon harvester; commercialization of [illegible], a new generation disinfectant (consultancy project) and [illegible] for the benefit of sericulture farmers.

In pursuance to the vision and mission of CSRTI Mysuru, all the units are closely working for implementation of R&D programmes including the important task of generating skilled manpower in all the sericultural activities through various capacity building and training programmes. The focused approach to transfer the technologies developed by well coordinated extension programmes resulted in improving economic returns of stakeholders and making [illegible]. CSRTI-Mysuru is able to fulfil the expectations of its main stakeholders, the sericulture farmers continuously through sincere, dedicated, innovative and collective efforts of its scientific, technical and administrative staff.

[illegible]

Dr. V. SIVAPRASAD
Director

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ABOUT CSRTI-MYSURU

The Central Sericultural Research & Training Institute (CSRTI), Mysuru was established under the aegis of Central Silk Board, Ministry of Textiles, Govt. of India. The Institute started functioning at Channapatna in the year 1943 after taking over the Sericulture Research Institute of erstwhile Mysore province and later shifted to Mysuru in the year 1961. With the inclusion of training component, the Institute was renamed as 'Central Sericultural Research & Training Institute (CSRTI), Mysore' in the year 1965. The Institute has completed 70 years of dedicated service for the development of sericulture industry in the country. The Institute is accredited with ISO 9001: 2008 certification (2012) as a hallmark of excellence in quality management in R&D, training and service support to sericultural industry.

The Institute has the distinction of being premier institution for sericulture research par excellence with all modern facilities and infrastructure including experienced scientific personnel. CSRTI has made mark as a leading R&D institution for quality research and services on tropical sericulture in the country and abroad and is well recognized as center for higher learning and advanced training. CSRTI caters to the need of bivoltine sector of mulberry sericulture in Karnataka, Andhra Pradesh, Tamil Nadu, Telangana, Kerala, Maharashtra and Madhya Pradesh. To date CSRTI has trained about 50,000 persons including 800 foreign nationals in various aspects of sericulture technology. The Institute besides conducting research, training and extension activities, also offers consultancy and advisory services to national and international agencies.

<table>
<tr><td colspan="2">Vision
To become an International Sericulture Institute par excellence in Bivoltine Sericulture</td></tr>
<tr><td>Mission
To achieve excellence in application oriented research to transform Indian Sericulture Industry from the subsistence level of production to a vibrant competitive commercial production base.</td><td>Objectives
• Research to enhance production, productivity and quality of Indian silk
• Development of package of practices for mulberry and silkworm rearing
• Commercialization of products and technologies
• Transfer of technology
• Enhance production of import substitute silk through transfer of technology
• Training
• Strengthening institutional framework to support research programmes
• Maintenance of breeders stock
• Disease forecasting and forewarning
• Publication of R&D innovations and package of practices
• Collaborative research with other R&D organizations in India and abroad</td></tr>
</table>

Organization Setup

CSRTI-Mysuru is the largest and most diversified institution engaged in sericultural R&D in the country supported by about 150 scientists of various disciplines including agricultural engineers, working in its various divisions. These personnel working in close coordination for the development of appropriate technologies and their transfer through the main institute and its nested units located in the states of Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Maharashtra and Madhya Pradesh. R&D activities and technology development are carried out in four major divisions viz. Host Plant Production & Protection, Silkworm Production & Protection, Extension and Training. CSRTI-Mysuru also utilises the services of several able technical and administrative staff in undertaking the mandated activities. The Director monitors the progress of R&D activities of Institute and nested units with the support of Planning, Monitoring, Coordination and Evaluation cell. CSRTI-Mysuru regularly publishes books, bulletins, leaflets and technical pamphlets. Over 55 books have been brought out so far in addition to large number of technical and research papers published in leading national and international journals. The Institute has the distinction of publishing Indian Journal of Sericulture, a biannual journal of international repute and Sericoin documenting literature on sericultural sciences.

Extension Network

CSRTI-Mysuru has a three-tier system of extension network, Regional Sericultural Research Stations (RSRS), Research Extension Centres (REC) and Sub-Units (REC-SU) for the field validation and transfer of laboratory findings effectively to the field. RSRSs are located in major sericultural zones of southern states carrying out region specific research and applied research. Technology Resource Centres conducted to meet the regional requirements besides providing training to farmers and grassroot level extension staff. RECs and sub units share the major responsibility of technology transfer to the beneficiaries and also provide technological inputs and support services. CSRTI-Mysuru coordinates 125 clusters (Cluster Promotion Programme) and seven [illegible] centres for the promotion of bivoltine sericulture in Southern States along with Maharashtra and Madhya Pradesh. Effective transfer of technologies is undertaken in close coordination with technical personnel of State Departments of Sericulture.

Training Centre

CSRTI-Mysuru is recognised as flagship centre for generation of trained technical resource in tropical sericulture at international and national level. The Institute is affiliated to University of Mysore for conducting research including Ph.D. programmes. CSRTI-Mysuru also conducts training programmes sponsored by DBT, DST and Ministry of Textiles, Govt. of India for socio-economic and technological empowerment of the rural poor, weaker sections and women sericulturists. Besides catering to the HRD needs of the state departments of sericulture in the country, CSRTI-Mysuru also conducts sericulture training programmes for international students/personnel through various organizations such as JICA and Ministry of External Affairs, Govt. of India (ITEC). The training hub houses well-equipped classrooms and the programmes are managed by qualified faculty. The attached hostels can accommodate about 125 persons.

Infrastructure Facilities

- Well-equipped laboratories, mulberry gardens and rearing houses to carry out advanced research.
- Large scale rearing houses for technology validation and farmers' training.
- Model chawki rearing centre (CRC) to promote the concept of CRC.
- Engineering Division with excellent facilities to support designing, development and fabrication of machines/ equipments.
- Video Conferencing Studio @ CSRTI, Mysuru ensures faster communication and efficient transfer of technology for effective interactions with nested units, DOSs and other organizations.
- Computer center provides internet connectivity to all through LAN (with print/file share support).
- Bioinformatics Centre (NBN Sub-DIC, DBT) provides database retrieval services.
- Library Services (20000 books, 7269 bound volumes of scientific journals; 85 journals; dissertations/ 225 theses/ 23 technical reports and CD-ROM database AGRIS, [illegible], BIOTECHNOLOGY CITATION INDEX, [illegible]

स्वास्थ्य परीक्षण एवं विभाग कर्मचारियों के सुझाव

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खेलकूद विकास एवं प्रोत्साहन

- कुछ खेलकूद और खेल संबंधी मामलों में खेलकूद विकास एवं प्रोत्साहन, खेलसंस्कृति प्रोत्साहनकार्य कार्यक्रम के अनुसरण xxii खेलसंस्कृति केन्द्रक खेलकूद का बढ़ावा देने के लिए वित्तीय सहायता।
- खेल हिंसा संबंधी मामलों, खेल विवादों, खेल विधेयक खेल खेलकूद संबंधित मामलों पर राय देने के उद्देश्य से खेलसंस्कृति xxiii खेलसंस्कृति का गठन, उसके कार्यों का संक्षिप्त वर्णन।
- राष्ट्रीय खेलकूद संघों/महासंघों को मान्यता देने संबंधी दिशा-निर्देश।
  के.1 खेलों को छोड़ कि खेल xxiv के खेल कुछ दिशा-निर्देशों को संबंधित राष्ट्रीय खेलकूद में खेलसंस्कृति प्रोत्साहन xxv दिशा-निर्देश और खेल खेलकूद संबंधित संघों/महासंघों xxvi द्वारा का xxvii संघ संघों xxviii के दिशा-निर्देश xxix के भी दिए गए खेलों xxx के लिए अतिरिक्त-संघ संघ/महासंघ संघ/महासंघ संबंधित दिशा-निर्देश।
- खेलसंस्कृति संघ/महासंघ, खेलसंस्कृति/खेलकूद xxxi संघ/महासंघ के xxxii खेलसंस्कृतिकारों के लिए आचार संहिताओं xxxiii खेलसंस्कृति संघ/महासंघ संघ/महासंघ द्वारा आचरणीय नियम तथा नियम राष्ट्रीयकृत खेलों में खेलसंस्कृति प्रोत्साहन संघ/महासंघ आचरणीय नियम संघ।
- खेलों xxxiv की खेलसंस्कृति नियम खेलसंघ/महासंघ द्वारा खेलसंस्कृति की खेलसंस्कृति खेलसंस्कृतिकारों को खेलसंस्कृति खेलसंस्कृति नियम संघ/महासंघ/संघ विधेयक में प्रस्तावित खेलसंस्कृति में संघ/महासंघ नियम संघ संघ/महासंघ।

खेलकूद नियम प्रशासन राष्ट्रीयकृत नियमों की उपलब्धियां

खो.1 ज.पै.सं.खेलकूद, खेल संघ

- 2016 कुश्ती के खेल xxxv xxxvi संघ की कुश्ती प्रतियोगिता का राष्ट्रीयकृत नियम संघ।
- 42 कुश्ती के खेल का दिया गया खेलों की 11 की 10 तक की 9 तक की 8 तक की 7 तक की 6 तक का 5 की तक 4 की तक 3 तक की 2 तक की 1 तक की 0.50 तक के खेलकूद की कुश्ती के खेलसंघ/महासंघ खेलसंघ/महासंघ नियम खेलसंघ/महासंघ की कुश्ती खेलसंघ की प्रतियोगिता xxxvii द्वारा दी गई।
- कुश्ती पैमाने का संशोधित मानदंड खेलों का 10.0–12.5% खेलों पैमाने 7.0–12.5% कुश्ती का 12.5–42.5% दिया प्रस्ताव xxxviii गया।
- खेल नियम संघ/महासंघ संशोधित राष्ट्रीयकृत की आपूर्ति का कुश्ती खेलों की 12.5 – 17% की 17.5% खेल दिया गया।
- 4 से 10 तक के अनुसार 2.5.1 कुश्ती के खेल दिया खेलों के 12.5 का संघ की खेलों का खेलसंघ/महासंघ 12.5 का खेलों के खेलसंघ/महासंघ की खेलों की खेलसंघ/महासंघ खेलसंघ/महासंघ दिया गया। 10 से 15 तक के अनुसार 2.5.2 कुश्ती के खेल दिया खेलों के 12.5 का खेलों का खेलसंघ दिया गया और 12.5 दिया 12.5 का खेलों की खेलसंघ/महासंघ खेलसंघ/महासंघ हुई।
- खेलसंघ/महासंघ नियम खेलसंघ/महासंघ कुश्ती खेलसंघ/महासंघ और 12 दिनांकित खेलसंघ/महासंघ की खेलसंघ/महासंघ में 12.5 कुश्ती की नियम खेलसंघ/महासंघ खेलसंघ/महासंघ को खेलसंघ दिया गया।

खो.1 ज.पै.सं.खेलकूद/खेलसंघ, खेलसंघ

- 16 से खेलसंघ का खेलसंघ में 12 कुश्तीगीर खेल के खेल 12 खेलों में खेलसंघ/महासंघ खेलसंघ/खेलसंघ।
- खेल कुश्ती के दिया गया खेल कुश्ती खेलसंघ की नियम खेलसंघ/महासंघ कुश्ती के खेल खेलसंघ/महासंघ खेलसंघ/महासंघ खेलसंघ 6.2.2 खेलसंघ/महासंघ खेलसंघ दिया गया।

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HIGHLIGHTS OF RESEARCH, TRAINING AND EXTENSION ACTIVITIES

The R&D programmes undertaken in mulberry and silkworm breeding, production and protection, transfer of technology, extension and training activities to develop technologies catering to the needs of mulberry sericulture farmers in the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, Maharashtra and Madhya Pradesh. A record quantity of 2772 MT bivoltine raw silk production was achieved in the command cluster accounting for 55.6% production through Bivoltine Cluster Promotion Programme in the country. The salient achievements of main institute and its nested units are as follows:

Mulberry Crop Improvement, Production and Protection

- MSG-2, a new mulberry variety for rainfed semi-arid conditions was released for commercial exploitation and the variety has a yield potential of 12.1 MT/ha/year against 10 MT from the existing variety, S13.
- DUS (Distinctiveness, Uniformity, Stability) guidelines for Mulberry were developed by analyzing 40 identified and validated descriptors with 40 example mulberry varieties and submitted to PPV & FRA (Protection of Plant Varieties & Farmers' Rights Authority), New Delhi.
- Divergent mulberry germplasm for root rot resistance (10 resistant & 46 highly susceptible) were identified. Ninety six genotypes were characterized for root rot resistance utilizing 22 polymorphic SSR markers.
- 1030 promising hybrids were short listed through artificial inoculation from >10,000 hybrid populations generated from controlled crossing among 10 resistant and 5 high yielding genotypes for root rot and root knot disease.
- Field evaluation of "Nemahari", a bio-nematicide resulted in the reduction of root knot disease upto 80% with an improved leaf yield (15-20%).
- A new formulation consisting of bio-agents and a systemic fungicides was developed against root rot disease with an efficacy of 59-90% disease suppression.
- Seed gardens for popularizing G2 (chawki) & G4 (late age) mulberry varieties were established. Planting material for about 500 acres was distributed to the farmers.

Silkworm Crop Improvement, Production and Protection

- CSR50 x CSR51, bivoltine single hybrid after successful authorization trials was introduced into the commercial seed production system of NSSO.
- Authorization trials of 4.02 lakh dfls of [illegible] x [illegible], bivoltine double hybrid recorded an average yield of 67.21 kg/100 dfls with 2A-2A graded silk in Andhra Pradesh, Karnataka, Tamil Nadu, Telangana and Maharashtra.
- Three thermo-tolerant bivoltine hybrids, Double: [illegible] x [illegible] & [illegible] x [illegible]; Single: [illegible] x [illegible] were developed employing [illegible] marker assisted selection. The hybrids are characterized by cocoon yield of 60-70 kg/100 dfls, shell (22-23%), reelability (80-85%), raw silk (17-18%).
- Two improved crossbreeds, [illegible] x [illegible] and [illegible] x [illegible] tolerant to high temperature and BmNPV were developed with a pupation rate of >90%, shell (20-21%) and raw silk (14-15%).
- Field evaluation of [illegible] x [illegible], productive bivoltine single hybrid recorded an average yield of [illegible] kg/100 dfls in Andhra Pradesh, Karnataka and Tamil Nadu. The hybrid is characterized by higher cocoon weight (2.11g), shell (0.50g @ 23.75%), filament length (1175 m), reelability (>80%), neatness (95%) with better raw silk recovery (18.0%) and renditta ([illegible]).
- Field evaluation of [illegible] x [illegible], productive bivoltine double hybrid suitable for favourable conditions ([illegible] dfls/[illegible] farmers) recorded an average yield of [illegible] kg/100 dfls in Tamil Nadu.
- Field evaluation of newly developed improved Crossbreed, Cluster Gold ([illegible] x [illegible]) for cocoon

productivity and silk quality covering [illegible] with [illegible] farmers recorded an average cocoon yield of [illegible] kg/100 dfls.

- Bivoltine hybrids, [illegible] and [illegible] were accepted to [illegible], which recorded an average yield of [illegible] and [illegible] kg/100 dfls, respectively.
- On-Station trials of [illegible] cocoon hybrids [illegible] developed through [illegible] selection showed encouraging results with an average yield of [illegible] kg/100 dfls.
- Multi-location field trials of transgenic [illegible] silkworm [illegible] was [illegible] cocoon yield ([illegible] kg/100 dfls) [illegible] transgenic hybrid [illegible] over control ([illegible]).
- [illegible] and [illegible] were found promising in attracting the uzi fly (Exorista bombycis) through [illegible].
- Biological control agents, [illegible] and [illegible] were [illegible] for uzi fly and [illegible] bug control resulting in the management of pest incidence below [illegible].
- [illegible], a new general disinfectant @ [illegible] was effective for the disinfection of contaminated silkworm eggs, rearing trays and rearing house. The product was jointly developed with M/s [illegible] Limited, [illegible] on consultancy project programme.
- LAMP (Loop-Mediated Isothermal Amplification) method was developed for the detection of Nosema bombycis in silkworms using specific primers without involving PCR and electrophoresis.
- Silkworm disease monitoring revealed an incidence of grasserie ([illegible]), flacherie ([illegible]), muscardine ([illegible]) and pebrine ([illegible]) in Tamil Nadu in the [illegible] and [illegible] in South India. The average incidence in [illegible] was grasserie ([illegible]), flacherie ([illegible]) and muscardine ([illegible]).

Transfer of Technology

- A [illegible] of [illegible] bivoltine [illegible] was produced through Bivoltine Cluster Promotion Programme ([illegible] clusters) in Andhra Pradesh, Karnataka, [illegible], Tamil Nadu, Telangana and Maharashtra from [illegible] dfls rearing with an average cocoon yield of [illegible] kg/100 dfls.
- [illegible] lakh dfls of bivoltine hybrids were reared with an improvement of cocoon yield by [illegible] by [illegible] adoption of [illegible] technologies under [illegible] Model Village Programme in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Maharashtra.
- [illegible] sericulturists were enriched with new technologies through [illegible] extension communication programmes in [illegible] rearing, mulberry and silkworm disease management and quality cocoon production.
- Model CRC [illegible] was involved in training entrepreneurs in chawki rearing. [illegible] dfls were [illegible] in [illegible] batches and supplied to [illegible] farmers covering [illegible] villages resulting in an improvement of [illegible] cocoon yield (average cocoon yield: [illegible] kg/100 dfls).
- Implemented the entrepreneurship development programme sponsored by the National Research Development Corporation (NRDC), Govt. of India and [illegible] to [illegible] beneficiaries.
- PVC [illegible] for late age silkworm rearing were jointly developed with M/s [illegible] Components, Mumbai.
- Regional Consultative Meet on "Sericulture Scenario in SAARC Region – A Re-Emerging Industry for Poverty Alleviation in SAARC Region" ([illegible] August [illegible]) sponsored by SAARC Agriculture Centre (SAC) and International Sericultural Commission (ISC) was organized for a comprehensive review on potentials and challenges in sericultural industries in the region.

- [illegible] Research Council [illegible] was organized to finalize the action plan for [illegible] programmes/activities in mulberry, eri, tasar and muga silkworms to be undertaken in the next [illegible] years.
- A workshop on Innovative Technologies and Best Practices in Sericulture (17 & 18th November 2015) sponsored by Ministry of Textiles was organized [illegible] from [illegible] states and for [illegible] exchange of best sericulture practices.
- Sericulture Farmers' Workshops were organized in [illegible] (Karnataka), Anantapur (Andhra Pradesh), [illegible] (Tamil Nadu) and [illegible] (Maharashtra) and [illegible] farmers were enlightened with improved mulberry sericulture technologies.
- Technical books on Commercial Chawki Rearing, Integrated [illegible] Management for Mulberry Sericulture, Bio-Control of Insect Pests in Mulberry [illegible] were published for the benefit of farmers and officials.

Patents and Commercialization

- Patent application on "Utilization of Sericultural waste biomass - a potential resource for generation of electricity and production of [illegible]" – a joint technology in collaboration with M/s. [illegible] Energy, Bangalore was filed through NRDC (Patent application No. [illegible] dated [illegible]).
- Patents were granted for "A [illegible] and collector" (Patent No. [illegible]), "A pedal operated [illegible] cocoon harvester" (Patent No. [illegible]) and "A mountage used for production of cocoons" (Patent No. [illegible]), which were filed during 2007.
- [illegible] - a new disinfectant was released for commercial production jointly with M/s. [illegible] Hi-Strength [illegible] Ltd., Kurnool, Andhra Pradesh.
- [illegible] - a [illegible] formulation was commercialized to M/s. [illegible] India Private Limited, [illegible], Andhra Pradesh through NRDC for production and supply to sericulture farmers.

Capacity Building & Training

- [illegible] beneficiaries (sericulturists and officials) were trained under Capacity Building & Training (CBT) - Technology Orientation Programme (TOP) in the main institute and its nested units.
- [illegible] beneficiaries (farmers, entrepreneurs and officials) were trained under need-based programmes including [illegible] technology, Chawki Rearing, Bio-Control Agent Production, Integrated Pest & Disease Management.
- [illegible] officials were trained in Silkworm Race Maintenance programme ([illegible] days).
- Foundation training ([illegible] days) in mulberry sericulture for the [illegible] newly recruited [illegible] young scientists and Orientation courses for [illegible] ([illegible] days) and [illegible] students ([illegible] days) were conducted.
- An International Training Programme in [illegible] Sericulture Industry ([illegible] days) sponsored by ITEC, Ministry of External Affairs, Govt. of India, New Delhi was organized for [illegible] trainees from Thailand, Bangladesh, Egypt, Philippines and Uganda.
- Two Egyptian researchers sponsored through ISC (International Sericultural Commission) [illegible] were trained in advanced technology in Silkworm Physiology and Silkworm Pathology ([illegible]).

Achievements of Regional Sericultural Research Stations

RSRS Anantapur, Andhra Pradesh

- [illegible] acres with [illegible] farmers have been covered under mulberry plantation with new varieties.
- Evaluation trials of [illegible] dfls of new silkworm hybrids [illegible] and [illegible] with [illegible] farmers recorded an average cocoon yield of [illegible] kg/100dfls.

- The fortnightly survey of major pests showed [illegible] incidence, [illegible] and [illegible] incidence.
- Uzi infestation was reduced by 45% from 15.5-10% through the supply of bio-control agent, Nesolynx thymus (875 sachets/150 farmers/75 villages).
- Rearing of 10,456 lakh dfls of bivoltine hybrids with 21,021 farmers under CPP recorded an average cocoon yield of 69.54 kg/100 dfls. Under HLP programme 65,500 dfls of bivoltine hybrids were reared with 306 farmers recorded an average yield of 65.24 kg/100 dfls.
- 3014 farmers were sensitized with new sericulture technologies through state level sericulture farmers workshop and 125 extension communication programmes.

REC-Chamarajanagar, Karnataka

- [illegible] V1 mulberry varieties were popularized among 12 farmers covering 28.75 acres of new plantation.
- Seri-Sus Agro System for income augmentation with sericulture farmers was successfully demonstrated realizing upto Rs. 2.3 lakh/acre/year.
- Twenty four farmers planted [illegible] saplings under [illegible] spacing for tree mulberry cultivation. 25 farmers adopted Affordable Micro-irrigation Technology (AMIT) for tree mulberry plantation under HLP programme.
- Uzi fly infestation was limited to [illegible] from [illegible] through the supply of N. thymus. Further, [illegible] infestation was contained to [illegible] from [illegible] [illegible].
- Under CPP programme, 1.88 lakh dfls of bivoltine hybrids were reared with 220 farmers and the average cocoon yield realized was 64.5 kg/100 dfls.

REC-[illegible], Karnataka

- 100 soil samples were analysed and soil correction measures were recommended to the farmers.
- Rearing of 80.51 lakh dfls of bivoltine hybrids with 3016 farmers under CPP recorded an average cocoon yield of 66.77 kg/100 dfls.
- Under HLP programme, 37,400 dfls of bivoltine hybrids were reared with 160 farmers and recorded an average cocoon yield of 65.15 kg/100 dfls.
- Popularization of new bivoltine hybrids (Bivoltine: [illegible] x CSR6, G11 x G19, FC1 x FC4, CSR50 x 51 and Crossbreed: MV1 x [illegible] & [illegible] x CSR2) were undertaken (20,020 dfls/538 farmers).

REC-[illegible], Tamil Nadu

- Soil testing of 355 samples was conducted covering 307 sericulture farmers and suitable soil amelioration for [illegible] were suggested.
- Natural enemy (Chrysoperla zastrowi sillemi) of thrips (21,400 eggs) were released in the farmers mulberry gardens for effective control.
- Biological control measures for papaya mealybug were continued [illegible] through the release (88,266 individuals) of parasitoids covering [illegible] sericulture farmers and [illegible] pest reduction was observed.
- Mass multiplication of bio-control agents viz., Trichoderma [illegible] (114 [illegible]), [illegible] (1,025 packets), Tetrastichus howardi (60 [illegible]), Cryptolaemus montrouzieri (3500 [illegible]), Scymnus coccivora (6000 [illegible]) and Nesolynx thymus (128 pouches) were produced and supplied to the farmers.
- 1.31 lakh dfls of new bivoltine/crossbreed hybrids ([illegible] x CSR6, G11 x G19, FC1 x FC4, CSR50 x 51, [illegible] x [illegible]) were reared with an average cocoon yield of 61.12 kg/100 dfls.
- 71.38 lakh dfls of bivoltine hybrids were reared in 50 clusters under CPP against the target of 68.48 lakh

(105.70 % achievement) and recorded the highest average cocoon yield @ 76.76 kg / 100 dfls in the country.

- 3.78 lakh dfls of bivoltine hybrids were reared under [illegible] programme with [illegible] farmers and recorded an average yield of 74.05 kg / 100 dfls with a productivity improvement of 10-12%.

राजभाषा कार्यान्वयन संबंधी गतिविधियाँ

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, मैसूरु में [illegible] के दौरान राजभाषा नीति का पूर्ण अनुपालन किया गया। राजभाषा अधिनियम की धारा 3(3) का शत प्रतिशत अनुपालन सुनिश्चित किया गया है। संस्थान में हर तिमाही में राजभाषा कार्यान्वयन समिति की बैठक का आयोजन कर राजभाषा प्रगति के बारे में समीक्षा की गई।

हिंदी कार्यशालाओं का आयोजन, हिंदी दिवस और पखवाड़े का आयोजन तथा हिंदी शिक्षण योजना/[illegible] का कार्यान्वयन किया गया है।

संस्थान द्वारा उक्त अवधि के दौरान राजभाषा कार्यान्वयन की विभिन्न गतिविधियों पर की गई कार्रवाई का विवरण निम्नानुसार है:

1. **धारा 3(3) का अनुपालन:** राजभाषा अधिनियम 1963 की धारा 3(3) के अंतर्गत आने वाले सभी कागजात द्विभाषी में जारी किए गए।

2. **नियम 11 का अनुपालन:** सभी फार्म, रजिस्टर, रबड़ मोहरें, नामपट्ट, साइन बोर्ड, विजिटिंग कार्ड, लेटरहेड आदि द्विभाषी है इन्हें सुनिश्चित करने हेतु [illegible] और [illegible] में [illegible] है।

3. **हिंदी पत्राचार:** [illegible] 'क' क्षेत्र [illegible] 'ख' क्षेत्र [illegible] के कार्यालयों/व्यक्तियों को [illegible] हिंदी में [illegible] प्रतिशत [illegible] किया है।

4. **राजभाषा कार्यान्वयन समिति की बैठकों का आयोजन:** संस्थान में हर तिमाही में राजभाषा कार्यान्वयन समिति की बैठक का आयोजन कर राजभाषा प्रगति के बारे में समीक्षा की गई। वर्ष 2015-16 के दौरान दिनांक [illegible].2015, 23.06.2015, 14.12.2015 एवं 22.03.2016 को राजभाषा कार्यान्वयन समिति की बैठकें आयोजित की गई तथा [illegible] के लिए [illegible] कार्रवाई की गई।

संस्थान के अधिनस्थ कार्यालयों के लिए भी दिनांक [illegible] को राजभाषा कार्यान्वयन समिति की बैठक आयोजित की गई और राजभाषा कार्यान्वयन में हुई प्रगति के बारे में समीक्षा की गई।

5. **हिंदी कार्यशालाओं का आयोजन:** संस्थान के अधिकारियों और कर्मचारियों में हिंदी का प्रयोग करने और राजभाषा नीति की जानकारी देने के लिए प्रत्येक तिमाही में हिंदी कार्यशाला का आयोजन किया गया। [illegible] के लिए भी [illegible] के दौरान दिनांक [illegible], [illegible], [illegible] और [illegible] को [illegible] हिंदी कार्यशाला का आयोजन कर कुल [illegible] अधिकारियों व कर्मचारियों को प्रशिक्षित किया गया।

6. हिंदी दिवस,हलन्त संबंधित हलन्तयुक्त पदावली तथा वर्तनीसम्बन्धी समस्याओं को दूसरी अधिकतम हिंदी में व्यवहार अधिकारियों तथा सहायकों को हिंदी में बढ़ावा देने में बाधा बनने की संभावनाओं वाले से जिस महीने पिछड़ा गया के हलन्तयुक्त हिन्दी,अंग्रेजी,संस्कृत,मराठी,गुजराती,बंगला आदि की गई है जिसमें अंग्रेजी शिक्षित,उच्च शिक्षा का स्तर पुनरुत्थान किया जाता है। इस वर्ष के दौरान इस पंक्ति के अनुवादित संस्करण के ; प्रतियोगिता को दिनांक 11.04.2015 को आयोजित राजभाषा पखवाड़ा समापन समारोह में सफल पुरस्कार वितरित किए गए। इसके अलावा अधिकतम कार्यालयों के 12 प्रतियोगियों को भी इस पंक्ति के अनुवाद पुरस्कार प्रदान किए हैं।

7. **हिन्दीदिवस** और में हिंदी का प्रयोग: दिनांक 17 सितम्बर,2015 की संध्या में पंजाब प्रयोगशाला में अधिकतम प्रतियोगिताओं और प्रयास प्रयोग का समारोह आयोजित करेगा के दौरान 11 पीसमर्स को दिलाने में मुद्रित करने पुरस्कार भी वितरित किए गए।

8. हिंदी प्रयोगशाला संस्थान की वार्षिक रिपोर्ट प्रदान हिन्दी में ही अधिकतम हिंदी,हिन्दी में प्रकाशित किए गए।

9. राजभाषा दिनांक 1986 के प्रावधान अनुसार कार्यालयों को अतिरिक्तदिन किया प्रदान दिया कार्यालयों में हिंदी में कार्यालयन तथा स्थायी दर्जे का पीसमर्स्ड पहल है इस कार्यालयों को कार्यालय द्वारा राजभाषा नियम1976 के अधीन अतिरिक्तदिन किया जाता है। इस दिशा में इस संस्थान के प्रयास से अधिकतम कार्यालयों को अतिरिक्तदिन प्रदान का पुरस्कार है।

10. हिंदी प्रतियोगिताओं का आयोजन: संस्थान में दिनांक 11.09.2015 से 15.09.2015 तक राजभाषा पखवाड़ा मनाया गया जिस दौरान 10 विभिन्न हिंदी प्रतियोगिताओं जैसा अधिकतम, मुहावरा, लोकोक्ति, सामान्यज्ञान वर्गों, तथा प्रतियोगिता, दिवस आयोजन एवं व्यावसायिक व्यवहारों, अंग्रेजी व्यवहारों पीछे, व्यापार तथा संस्थानों हिंदी की आवश्यकता प्रतियोगिताओं का आयोजन किया गया। उपरोक्त प्रतियोगिता में विजेताओं को दिवस, पुरस्कार एवं प्रमाणपत्र पुरस्कार प्रदान किए गए हैं जिसे गया।

11. संस्थान का हिंदी में कार्य: दिनांक 01.04.2015 का अनुपालन, व्यवहारप्रयोजन संबंधी,हिन्दी हिंदी तथा मूल्यांकन हिंदी वेबसाईट की कार्यालय आवेदन कार्य संस्थान का मूल्यांकन अब से किया जा रहा है; संस्थान में सभी अधिकारियों से मूल्यांकन की व्यवस्था में विभिन्न हिंदी,संबंधी तथा उच्च शिक्षित व्यवहारों में व्यवहार करने में सुविधा हुई है।

12. प्रशिक्षण तथा प्रतियोगी को विशेष हिंदी प्रशिक्षण प्रदान: नई दिल्ली द्वारा संस्थान राजभाषा में प्रशिक्षित किया गया है।

13. **निष्कर्ष:** अधिकतम कार्यालयों में राजभाषा कार्यान्वयन की प्रगति की समीक्षा करने और संस्थान राजभाषा पुरस्कार और प्रशिक्षण देने के लिए प्रयास विशेषज्ञ किया जाता है; पिछलेवर्ष की तरह ही इस वर्ष भी कार्यालयों का विशेषज्ञ किया गया है।

ACTIVITIES REGARDING OFFICIAL LANGUAGE IMPLEMENTATION

During 2015-16 Official Language policy has been implemented well at Central Sericultural Research and Training Institute, Mysuru. Compliance of section 3(3) of the Official Language Act has been ensured. The progress in implementation of Hindi was reviewed by conducting quarterly meeting of the Official Language Implementation Committee.

Organization of Hindi workshops, Hindi day, Hindi fortnight, Publication of Hindi magazine have been done and Hindi noting drafting incentive Scheme has been implemented.

Action taken on various items of Official Language Implementation during the period is as follows:

1. **Compliance of Section 3(3):** All the papers coming under section 3(3) of the Official Language Act 1963 have been issued in bilingual.

2. **Compliance of Rule 11:** All types of forms, letter heads, Rubber Stamps, Sign Boards, Name plates, Envelopes, Identity Cards, Visiting cards etc. are bilingual. [illegible] Store section, Dispatch section and the concerned officers have been advised to ensure the same bilingual.

3. **Hindi Correspondence:** During the year, the prescribed targets for correspondence of Hindi were achieved by sending [illegible] letters in Hindi to Central Govt. Offices of A, B and C regions respectively and [illegible] letters in Hindi to State Govt. Offices and individuals of A & B regions.

4. **Organization of meetings of the Official Language Implementation Committee:** The progress of implementation of the Official Language was reviewed from time to time by conducting OLIC meeting in every quarter. During the year 2015-16, Official Language Implementation Committee meetings were organized on [illegible] and follow up action was taken on the decisions of the meeting.

   For the subordinate offices also Official Language Implementation Committee meeting was organized to review implementation of Official Language on [illegible].

5. **Organization of Hindi Workshops:** Hindi workshop was organized in every quarter for the officials of the Institute to provide information as to use of Hindi in the official work and updated information about official language Policy. During the year, [illegible] officers and [illegible] staff have been trained in Hindi workshops organized on [illegible] separately for technical and administrative officials and scientists.

6. **Implementation of noting drafting incentive scheme:** To encourage the officers and staff of this Institute and its subordinate offices to do their work originally in Hindi, Hindi noting-drafting incentive scheme was implemented in which cash awards are given for writing prescribed words in Hindi. During the year cash awards were given to [illegible] officials on the valedictory function of Official Language fortnight held on [illegible]. Apart from this, [illegible] officials of subordinate offices were also awarded prizes under this scheme.

7. **Use of Hindi in Scientific Field:** [illegible] pamphlets were released in bilingual and distributed to the farmers during the workshop [illegible] on [illegible].

8. **Publications in Hindi:** Annual report of the Institute was published partly in bilingual and the training calendar was published in bilingual.

9. **Notification of the subordinate offices under 10(4) of the Official Language Rules:** The offices in which 80% of the staff are having working knowledge in Hindi are notified under 10(4) of the official language rules. In this direction, apart from this office, [illegible] sub-ordinate offices have also been notified.

10. Organization of Hindi Competitions: Official Language Fortnight was organized from [illegible] to [illegible] during which 13 different Hindi competitions viz. 1. Correct writing 2. Dictation, 3. Memory test, 4. Group discussion, 5. Elocution, 6. Noting-drafting and administrative glossary 7. Technical glossary 8. Essay, 9. what does the picture speak [illegible] 13. [illegible] competitions were organized. The winners of the competitions were awarded with first, second, third and consolation prizes.

11. Work on Computers in Hindi: Compliance of Section 3(3), forms, standard drafts, quarterly progress report and evaluation report, work related to meetings carried out smoothly on computers. Unicode system is activated in all computers which facilitates to do work in Hindi, English and other Indian languages.

12. Training: One officer has been trained in Prabodh in Central Hindi Training Institute, New Delhi through correspondence course.

13. Inspection: Sub-ordinate offices are inspected for reviewing the progress made regarding implementation of Official Language Policy and extending necessary suggestions & guidance accordingly. During the year under report, 4 offices have been inspected.

Staff position as on 31.03.2016

Category	Sanctioned
Director	[illegible]
Scientific	[illegible]
Technical	[illegible]
Administrative	[illegible]
Support	[illegible]
Total	[illegible]

MULBERRY BREEDING AND GENETICS LABORATORY

Ongoing Research Projects

PIB 3497: Development of disease resistant and productive mulberry genotypes with special reference to root rot and root knot diseases suitable for wet zones of South India (Jan. 2012 to Dec. 2017)

[illegible]

Objective: To identify and select hybrids resistant to root rot and root knot diseases through hybrid [illegible], selection and evaluation in progeny row trial.

In an effort to develop disease resistant varieties, 878 promising hybrids were shortlisted based on response to artificial inoculation of causal organisms of root rot and root knot diseases from a population of 43,000 hybrids raised from controlled crossing among the resistant and the high yielding genotypes. The short-listed hybrids were planted in paired rows (90x60 x150cm) spacing for Progeny Row Trial (PRT). After establishment, the hybrids were pruned and preliminary data on leaf and stem morphology and above ground biomass were recorded. 113 hybrids shortlisted based on biomass data are being multiplied for further evaluation for disease resistance by artificial inoculation.

Cross	Hybrids in PRT	Hybrids short-listed (no)	Above ground biomass (g/ plant)
[illegible]	128	14	[illegible]
[illegible]	186	11	[illegible]
[illegible]	88	9	[illegible]
[illegible]	4	1	[illegible]
[illegible]	38	1	[illegible]
[illegible]	24	1	[illegible]
[illegible]	81	11	[illegible]
[illegible]	80	14	[illegible]
[illegible]	48	2	[illegible]
[illegible]	226	20	[illegible]
[illegible]	19	1	[illegible]
[illegible]	32	2	[illegible]
[illegible]	[illegible]	2	[illegible]
[illegible]	89	1	[illegible]
[illegible]	21	1	[illegible]
[illegible]	28	[illegible]	[illegible]
Total	878	113	

All India Coordinated Experimental Trial for Mulberry (AICEM) – Phase-III (Jul. 2016 to Dec. 2019)

Regional Coordinator: V. Sivaprasad, Director, CSRTI-Mysuru

[illegible]

[illegible]

[illegible]

The experiment is laid out in RBD with four varieties [illegible] along with a regional check (V1) and a National check [illegible] with six replications. The data for five crop seasons of second year of evaluation of the different test varieties in South Zone is detailed below.

Performance of mulberry varieties - MCAM III Phase

Variety	DSP	TSL (cm)	NLPP	LA	MC (%)	MRC (%)	Leaf yield (kg/ha/y)
CSRTI-Mysuru							
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]							
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Variety	DSP	TSL (cm)	[illegible]	LS	LMC (%)	MRC (%)	Leaf yield (kg/ha/yr)
KSRTSI-Thalaghattapura							
C2038	14.2	1148.00	14.05	0.66	75.60	80.00	64.17
G4	12.8	1230.00	16.27	0.65	74.23	85.07	38.08
Suvarna-2	14.2	1197.00	15.79	0.50	74.13	86.83	33.99
Vishala	12.8	1448.00	16.28	0.58	75.65	87.93	83.186
V1	14.8	1190.00	17.03	0.59	75.73	80.39	38.129
CD at 5%	0.96	14.57	0.53	0.05	0.48	NS	14.75
CV%	2.76	10.00	0.45	7.15	0.01	1.85	18.88

DSP - Days to sprout after planting; TSL – Total shoot length (cm); [illegible] - No. of [illegible];
LS – Leaf shoot ratio; LMC - Leaf moisture content (%); MRC - Leaf moisture retention capacity (%)

Bioassay performance of mulberry varieties - [illegible]

Variety	Larval duration (d)	No. of cocoons harvested	wt. of cocoons (g)	SCW (g)	SSW (g)	Shell (%)
CSRTI-Mysuru						
C2038	4.60	4.65	9.15	1.528	0.366	23.73
G4	4.64	4.25	8.58	1.626	0.373	24.00
Suvarna-2	3.81	4.88	9.58	1.607	0.376	23.40
Vishala	3.34	4.65	9.05	1.383	0.330	23.34
V1	3.00	4.60	9.05	1.583	0.387	24.47
CD at 5%	0.11	10.54	11.77	0.08	0.06	0.78
CV%	0.29	2.35	1.58	2.49	4.30	2.02
RSRS-Anantapur						
C2038	3.61	3.55	8.09	1.438	0.300	20.64
G4	3.65	4.05	8.60	1.435	0.303	20.23
Suvarna-2	3.50	3.55	3.55	1.481	0.300	20.24
Vishala	3.55	3.64	8.10	1.403	0.311	19.89
V1	3.59	4.58	8.11	1.454	0.327	19.85
CD at 5%	NS	28.72	33.00	0.084	NS	NS
CV%	0.05	8.55	11.05	3.27	2.87	3.27
REC-Kamalbari						
C2038	3.50	4.60	7.65	1.71	0.33	21.66
G4	3.82	3.78	7.82	1.83	0.35	22.16
Suvarna-2	3.83	3.75	7.53	1.33	0.38	22.34
Vishala	3.33	4.72	7.60	1.35	0.30	22.21
V1	3.51	4.75	7.67	1.71	0.30	22.13
CD at 5%	NS	NS	14.73	0.007	0.080	0.005
CV%	3.31	1.80	1.38	2.83	1.15	2.34

[illegible]						
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna-2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna-2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						
C2038	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
G4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suvarna-2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vishala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
V1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD at 5%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The data on [illegible] and growth parameters for five crop seasons at CSRTI Mysuru were analysed. Bioassay of test varieties was also conducted ([illegible] crop seasons) with [illegible]. Days to sprout after pruning was significantly lower in Vishala ([illegible]), which was on par with V1 in all the test varieties. Significantly higher values for No. of leaves/ shoot length was recorded in G4 ([illegible]) over both the check varieties, while C2038 ([illegible]) and Suvarna-2 ([illegible]) showed significantly higher values over V1. C2038 ([illegible]) and G4 ([illegible]) recorded significantly higher values for leaf shoot ratio over both the check varieties, while Suvarna-2 ([illegible]) showed significantly higher values over V1. Moisture retention capacity ([illegible] after excision) in all the test varieties was on par with the check Vishala. C2038 and G4 recorded significantly higher leaf yield over the check V1. None of the test varieties yielded significantly higher over the check, Vishala. Significant difference was recorded for cocoon shell percentage, where all test varieties showed significantly higher shell % over the check, Vishala.

Continuous/Other activities

Maintenance of mulberry germplasm, mother culture and demonstration plot

[illegible]

A working germplasm with [illegible] accessions was maintained for carrying out hybridization programmes. [illegible] varieties were also maintained in the demonstration plot for the benefit of [illegible], students and other stakeholders. Breeder seed plots of four newly evolved varieties i.e., G4 ([illegible] rearing), [illegible] ([illegible] rearing), [illegible] (soil moisture stress environments) and [illegible] (sub-optimal irrigated conditions) were established and maintained for seed supply. [illegible] transgenic lines of [illegible] ([illegible] hybrid) with [illegible] gene and a transgenic line of V1 with [illegible] and [illegible] genes were maintained under containment facility.

MULBERRY MOLECULAR BIOLOGY LABORATORY

Concluded Research Project

PIG 3522 (SI): Sustaining mulberry yields: Identification of QTLs conferring resistance to root rot disease by Linkage Disequilibrium mapping and trait introgression (Jun. 2013 to Mar. 2016)

V. Girish Naik (PI), V. Mohitha Naik, Manjunath Vincent Pinto, STP (CSR&TI), Soumen Naskar, ML, SSF (USDC RDI), M. S. Ravikumar (JRF), R. Tiwari (JRF) and K. S. Poornima (JRF)

Objectives:

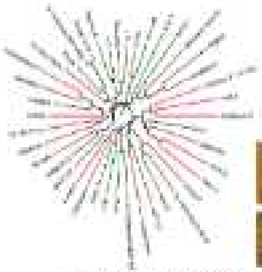
- Resistance response of mulberry germplasm to major causal fungus of root rot disease
- Molecular characterization of germplasm accessions and finally identify the contrasts
- Develop mapping populations

Ninety five fungal isolates associated with the root rot disease in mulberry were collected through field survey in Karnataka, Tamil Nadu, Andhra Pradesh and Telangana (*Macrophomina phaseolina* 35 isolates; *Fusarium* spp. 30 isolates; *Botryodiplodia theobromae* 30 isolates). All the fungal isolates were characterized by cultural and morphological markers. Seventy three isolates were pathogenic to susceptible mulberry variety (V1) in pot grown plants. The major pathogen of mulberry root rot, *M. phaseolina* was characterized using 44 RAPD and 12 microsatellite markers. The minimum Dice dissimilarity index value (0.131) was recorded between MP5 and MP8 isolates and the maximum (0.772) was recorded between MP6 and MP23 isolates, while the mean dissimilarity value was 0.487. Hierarchical clustering (UPGMA) using dissimilarity coefficient matrix separated the isolates into nine clusters. The *Fusarium* spp. and *B. theobromae* isolates were also characterized using 27 and 44 random primers, respectively.

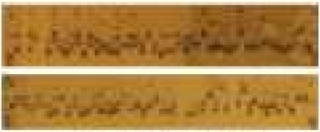
A total of 112 germplasm accessions were screened in an experimental plot and evaluated for root rot disease resistance. Twenty accessions were resistant (with <25% root rot) and fifty one accessions were classified as moderately resistant (26-50% root rot) and forty one accessions were susceptible (51-75% root rot). The remaining 89 accessions were with >75% root rot and considered as highly susceptible. The least root rot (8.33%) was observed in *M. cathayana* (Hybrid), whereas 11 accessions possessed 100% root rot infection. Genetic distances were measured among resistant and susceptible germplasm based on Dice dissimilarity indices on SSR marker data and clustering based on Neighbor-joining (NJ) method to establish divergence and inter-relationships. Trait specific mapping population employing resistant and susceptible parents generation is under progress.

Mulberry specific microsatellite markers (120 nos.) were screened for marker amplification and 36 were found to be polymorphic. Further 69 mulberry specific SSR primers were designed based on sequences archived MorusDB (http://morus.swu.edu.cn/morusdb/) and another twenty five polymorphic markers were also synthesized. So far 44 mulberry germplasm accessions were genotyped using 20 SSR markers.

Acc. No.	Genotype	Sex	Average Root Rot (%)
ME-0164	*M. cathayana* (Hybrid)	M	8.33
ME-0158	*M. multicaulis*	M,F	13.33
MI-0421	Mingra	F	14.29
MI-0047	Mosale	F	15.00
ME-0009	*M. multicaulis*	F	16.67
ME-0066	Thai Pecah	M	16.67
MI-0007	S-799	M,F,B	18.18
MI-0030	ACC.138	M,B	19.05
MI-0221	Kolitha-1	M	19.71
MI-0028	TR8	M,F	20.00
MI-0271	CSRC-101	F	20.00
MI-0030	Kolar-4	F	21.21
MI-0048	RFS-135	M,B	21.43
ME-0130	Hirosei	M	21.58
MI-0013	Sujanpur	M,B	21.88
	G-2	F	22.22
MI-0314	UP-57	M,F,B	23.08
MI-0336	Acc. 1	F	24.07
MI-0279	ENRC-75	F	24.79
MI-0027	Jalgaon-2	F	25.26



A: Clustering of resistant (green) and highly susceptible (red) mulberry germplasm.



Microsatellite marker polymorphism among 96 diverse mulberry germplasm [illegible]

[illegible] (PPV & FAR): Development of Distinctness, Uniformity and Stability (DUS) descriptors for Mulberry (Morus spp.) and their Validation [illegible]

V. Girish Naik (PI), S. Gandhi Doss, Rajashekar K., T. Thippeswamy, [illegible] and
V. Sivaprasad (Coordinator)

Objectives

- Develop and validate descriptors for mulberry
- Identify distinctiveness and specific morphological, biochemical/molecular markers, and suitability
- To characterize the extent of variability
- Develop database for the descriptors of mulberry to add on to [illegible] (India Database for DUS)

Natural variability in morphological characteristics in the germplasm was assessed for identifying the Distinctness, Uniformity and Stability (DUS) descriptors for mulberry and states of expression of each characteristic were determined. Initially, 47 characters were selected for examining the distinctiveness among a set of 38 cultivated varieties. Based on the data analysis for three growth cycles, 33 descriptors were finalized for DUS testing and guidelines were formulated. Besides, 24 example varieties were also identified to represent each state of expression of a characteristic. DUS testing shall apply to all vegetatively propagated varieties, hybrids, mutants, polyploids and transgenics of mulberry (Morus spp.). DUS test should be conducted at two places or one on-site testing. The minimum quantity of planting material required for DUS testing per entry shall be 50 stem cuttings/saplings/grafts. The duration of DUS tests in mulberry shall be minimally two independent growing cycles of 90 days each per year. The test plot design shall be pit system with 180 cm x 180 cm spacing between the plants and rows. Morphological observations shall be made based on the growth stage of the plants from 30 to 60th day of pruning. Reproductive characteristics shall be observed at the natural flowering season. All observations on shoot, leaf, bud

[illegible] characteristics [illegible] Reference [illegible] variety shall be selected based on 3 grouping characteristics such as internodal distance, phyllotaxy, leaf [illegible] and mature inflorescence length. Among the [illegible] identified descriptors for testing, [illegible] are essential and [illegible] are non-essential. Essential characteristics are used for the international harmonization of the variety descriptions and should always be examined for DUS.

Characteristics identified for DUS testing in Mulberry

S. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Dev)	Type of assessment
1	2	3	4	5	6	7
1 (VS) (*)	Plant: height	Low Medium High	3 5 7	[illegible] [illegible] [illegible]	[illegible]	[illegible]
2 (PQ) (*) (+)	Plant: growth habit	Erect Semi-erect Spreading Drooping	[illegible]	[illegible] [illegible] [illegible] [illegible] [illegible]	[illegible]	[illegible]
3 (VS)	Sprouting time	Early [illegible] Medium [illegible] Late [illegible]	3 5 7	[illegible] [illegible] [illegible]	[illegible]	[illegible]
4 (VS)	Survival % of cuttings (rooting)	Low [illegible] Medium [illegible] High [illegible]	3 5 7	[illegible] [illegible] [illegible]	[illegible]	[illegible]
5 (PQ) (+)	Shoot: type	Straight [illegible] Curved	[illegible]	[illegible] [illegible] [illegible]	[illegible]	[illegible]
6 (VS)	Shoot: thickness (cm)	Thin [illegible] Medium [illegible] Thick [illegible]	3 5 7	[illegible] [illegible] [illegible]	[illegible]	[illegible]
7 (PQ)	Mature shoot: color	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (VS) (*)	Internodal distance (cm)	Short [illegible] Medium [illegible] Long [illegible]	3 5 7	[illegible] [illegible] [illegible]	[illegible]	[illegible]
9 (PQ) (*) (+)	Phyllotaxy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Days)	Type of assessment
[illegible]	Leaf: [illegible]	[illegible]	3 5 7	[illegible] Philippines	[illegible]	[illegible]
[illegible]	Petiole: length (cm)	Short [illegible] Medium [illegible] Long [illegible]	3 5 7	[illegible]	[illegible]	[illegible]
[illegible]	Petiole: thickness (cm)	Thin [illegible] Medium [illegible] Thick [illegible]	3 5 7	[illegible] Philippines [illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	1 3 5	[illegible]	[illegible]	[illegible]
[illegible]	Leaf lamina: length (cm)	Short [illegible] Medium [illegible] Long [illegible]	3 5 7	[illegible]	[illegible]	[illegible]
[illegible]	Leaf lamina: width (cm)	Narrow [illegible] Medium [illegible] Broad [illegible]	3 5 7	[illegible]	[illegible]	[illegible]
[illegible]	Leaf: [illegible]	Small [illegible] Medium [illegible] Large [illegible]	3 5 7	[illegible]	[illegible]	[illegible]
[illegible]	Leaf: shape	[illegible]	1 3 5 7 9	[illegible]	[illegible]	[illegible]
[illegible]	Leaf: colour	Light Green [illegible] Green [illegible] Dark Green [illegible]	3 5 7	[illegible] Philippines [illegible]	[illegible]	[illegible]
[illegible]	Leaf: [illegible]	[illegible]	3 5 7	[illegible]	[illegible]	[illegible]
[illegible]	Leaf: [illegible]	[illegible]	3 5 7	Philippines [illegible]	[illegible]	[illegible]
[illegible]	Leaf: [illegible]	[illegible]	3 5 7 9	[illegible]	[illegible]	[illegible]
[illegible]	Leaf: [illegible]	[illegible]	3 5 7 9	Philippines [illegible]	[illegible]	[illegible]

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Day)	Type of assessment
23	Leaf: Margin	[illegible]	3	Philippines [illegible]	[illegible]	[illegible]
		[illegible]	5	[illegible]		
		[illegible]	7	[illegible]		
		[illegible]	9	[illegible]		
24	Leaf: [illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]
		[illegible]	2	[illegible]		
		[illegible]	3	[illegible]		
25	Mature bud size	Small	3	Philippines [illegible]	[illegible]	[illegible]
		Medium	5	[illegible]		
		Large	7	[illegible]		
26	[illegible]	[illegible]	1	Philippines [illegible]	[illegible]	[illegible]
		[illegible]	2	[illegible]		
		[illegible]	3			
27	Mature bud shape	Round	3	[illegible]	[illegible]	[illegible]
		[illegible]	5	Philippines [illegible]		
		[illegible]	7	[illegible]		
		[illegible]	9	[illegible]		
				[illegible]		
28	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]
		[illegible]	9	[illegible]		
29	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]
		[illegible]	2	[illegible]		
		[illegible]	3	[illegible]		
		[illegible]	4			
		[illegible]	5			
		[illegible]	6			
30	Mature [illegible]	Short [illegible]	3	[illegible]	[illegible]	[illegible]
		Medium [illegible]	5	[illegible]		
		Long [illegible]	7	[illegible]		
				[illegible]		
31	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]
		[illegible]	7	Philippines [illegible]		
32	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]
		[illegible]	5	[illegible]		
		[illegible]	7	[illegible]		
		[illegible]		[illegible]		
			9	[illegible]		
33	Mature Fruit: length [illegible]	Short [illegible]	3	[illegible]	[illegible]	[illegible]
		Medium [illegible]	5	[illegible]		
				[illegible]		
		Long [illegible]	7	[illegible]		
		Very long [illegible]	9	[illegible]		
34	Mature Fruit: [illegible]	Narrow [illegible]	3	[illegible]	[illegible]	[illegible]
		Medium [illegible]	5	[illegible]		
		Broad [illegible]	7	[illegible]		
				[illegible]		

Sl. No.	Characteristics	State	Note	Example varieties	Stage of observation (Days)	Type of assessment
33. PQ (+)	Mature fruit: color	Black Group 203 - [illegible] Bluish Black 2 Greyed-Purple Group [illegible] [illegible] [illegible] Purple Group 79 - [illegible] [illegible] Yellow-Green Group [illegible] [illegible] White Green	1 2 3 4 5 6	[illegible], [illegible] Kanva-2, Mysore Local [illegible] Punjab Local, [illegible] [illegible] MR-2 [illegible]	60	VG

Microsatellite marker ([illegible]) profiles of [illegible] mulberry varieties

SSR markers were successfully employed to establish distinction among important mulberry varieties, which can be complemented with morphological descriptors.

Explanations on the table of characteristics utilized in DUS guidelines are provided in the form of photographs and diagrams (www.csrtimys.res.in). DUS test guidelines on mulberry was prepared and submitted to PPV & FRA, New Delhi. DUS testing of mulberry varieties is imperative to protect the IPR associated with development of plant varieties, to recognise the rights of farmers in conservation of genetic resources, to stimulate public and private investment in crop breeding and to ensure high quality planting materials to farmers for the development of sericulture industry.

Continuous/Other activities

Maintenance of Mapping Resources

Traits	Progeny	Nos.
Root and yield contributing	Mysore Local x V1	350
Water use efficiency (WUE)	Himachal Local x MS3	200
	[illegible] x MI	481
	G4 x MS3	182
Root trait	Dudhia White x UP	360
	Punjab Local x Thailand	[illegible]
Alkaline tolerance	Sujanpur-5 x V1	185
Introgression lines (WUE and root trait)		20
Germplasm Backup		[illegible]

SOIL SCIENCE & CHEMISTRY

Continuous/Other activities

Monitoring of soil fertility status of mulberry gardens in Karnataka, Tamil Nadu and Andhra Pradesh

[illegible]

[illegible]

Objective: To monitor the changes in soil fertility status of mulberry gardens in different States.

A total of 762 soil samples from different locations were analysed and based on results, each mulberry garden was provided with fertilizer and manure recommendations to maintain soil health for obtaining quality leaf production.

State	District	No. of Samples	pH	EC (mmhos/cm)	OC (%)	Available P (kg/ha)	Available K (kg/ha)
KAR	Chikballapur	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Chitradurga	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Hassan	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Mandya	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Mysore	20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Tumkur	205	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AP	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TN	Coimbatore	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Dindigul	23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Erode	51	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Krishnagiri	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KER	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Wayanad	33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Others	108	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Quality testing of Disinfectants and inputs used in sericulture

[illegible]

Analysis of various disinfectants/products' samples was conducted to monitor the quality of critical inputs for the benefit of stakeholders in sericulture industry.

Product	Samples	Product	Samples
[illegible]	22	[illegible]	1
[illegible]	1	Water	207
[illegible]	20	[illegible]	22
[illegible]	6	[illegible]	11
[illegible]	1	Mulberry Leaf	54
[illegible]	1	Soil	168
[illegible]	1		

AGRONOMY

Ongoing Research Projects:

PPA 3552: Development of technology for production of organic silk (Jan. 2015 to Dec. 2018)

Dasappa (PI), [illegible]

Objectives:

- To produce the mulberry leaf and cocoon through organic practices
- To study the rearing parameters in organic silk
- To work out the economics for production of organic silk

Organic farming practices have assumed paramount importance due to several reasons and challenges like decline in productivity, degradation of soil fertility and water resources, diminishing biodiversity and increased environmental pollution for increasing crop productivity and soil fertility. Studies on organic farming of mulberry are initiated in an area earmarked for further utilization in the organic production of cocoon crop. First crop completed. Soil profiles were obtained through an accredited agency. Inspection and certification of process for the production of organic silk was initiated through [illegible].

PPS 3553: Carbon sequestration in mulberry cultivation and strategies to enhance carbon sequestration
(Jan. 2016 to Dec. 2018)

U. [illegible] (PI), [illegible] and [illegible]

[illegible], Tumkur

Objectives

- Assessment of carbon sequestration efficiency of mulberry cultivated under irrigation conditions
- To develop strategies to enhance carbon sequestration in irrigated mulberry plantation

Mulberry cultivation package of practices include intensive tillage, large inputs of inorganic and organic nutrients. To determine the contribution of irrigated mulberry in carbon sequestration, experiments were initiated with two types of irrigation (furrow and drip). The nutritional status of the experimental plot was homogenized (maize sowing) and initial soil profile was analysed as per standard procedure.

PPA 3540: Evaluation of modified spacing with special reference to planting geometry for sustainable mulberry leaf production (Jan. 2016 to Dec. 2018)

Vinod Kumar Yadav (PI) and Dasappa

Objectives: Identification of appropriate planting geometry for facilitating mechanization and quality mulberry leaf production

Survey was conducted in Ramanagara, Kolar and Chikkaballapura Districts in Karnataka for identification of different crop geometry adopted by farmers. The data collection is under progress.

MULBERRY PHYSIOLOGY

Pilot Study

Efficacy of different ameliorants on moisture retention capacity and mulberry productivity under deficit irrigation condition (Feb. 2016 to Mar. 2017)

M.G. [illegible], [illegible] and M. [illegible] Reddy

Objectives: To identify suitable ameliorants for improving moisture retention capacity and productivity under deficit irrigation

Physiological parameters viz., photosynthetic rate, transpiration rate, relative water content, moisture percentage, growth, and yield parameters were recorded for the first crop with different ameliorants. [illegible] recorded higher values followed by [illegible] as compared to other two ameliorants, PMA (phenylmercuric acetate) (stomata closing type), [illegible] (reflectant type). Further studies are under progress.

MULBERRY PATHOLOGY

Ongoing Research Projects

PRP 3535: Popularization of Nemahari – a botanical nematicide for management of root knot disease in mulberry (Mar. 2013 to Feb. 2017)

V. Sivaprasad, H. Jayaram[1], S. Raja Kumar[2] and M. A. Shankar Babu[3]

[1]REC, Kanakapura, [2]RSRS Salem, [3]RSRS Anantapur

Objectives

- To develop and operationalize model for application and commercial production of Nemahari
- To demonstrate effective crop protection through Nemahari for management of root knot disease
- To popularize Nemahari among sericulturists

Nemahari, an eco-friendly formulation was developed for the management of root knot disease (gall formation) of mulberry caused by nematode, *Meloidogyne incognita*. Large scale field trial of Nemahari was undertaken in Karnataka and Tamil Nadu. Root knot disease was observed in all types of mulberry gardens irrespective of soil type, farming system and age of the plantation (Karnataka: 31.35% and in Tamil Nadu: 41.80%) and the disease severity ranged between mild to moderate. Field trials on efficacy of Nemahari was initiated in Karnataka (30 farmers) and Tamil Nadu (25 farmers). Nemahari (@ 144 g/ 1:10 ratio & 1kg/[illegible]) was applied near the root zone by making trenches. Nemahari application reduced disease severity to a considerable extent (78-82%) and improved the leaf yield (10-12%). Technical brochures in English, Kannada, Hindi, Telugu and Tamil were prepared and distributed to create awareness and popularization among sericulturists. Nemahari was commercialized by licensing the technical knowhow to M/s. [illegible] Agro [illegible] Technologies, [illegible] through ABI.

PRP 3540: Development of a broad spectrum formulation for management of mulberry root rot disease (Jan. 2015 to Dec. 2016)

K. M. Prakash Kumar (PI) and T. Thirupathaiah (up to Feb. 2016)

Objective: To develop a broad spectrum formulation for effective management of root rot disease of mulberry.

Fungal pathogens viz., *Rhizoctonia bataticola*, *Fusarium oxysporum*, *Fusarium solani* and *Botryodiplodia theobromae* are implicated in causing root rot of mulberry in South India. The difficulties in the management of root rot at farmer's level with the recommended package lead to initiate studies on the development new formulation for the management of root rot. Selected antimicrobials including chemicals (12), fungicides (10) and plant based products (12) were screened against four mulberry root rot associated pathogens by poison food technique in solid and liquid media. There was significant (P<0.05) difference in suppression of mycelia growth by these antimicrobials. *In vitro* studies against pathogenic fungi showed that three chemicals, four fungicides and three plant products suppressed the mycelia growth and were highly effective even at low (100 ppm) concentration.

Five formulations were prepared with these effective molecules in various combinations and tested in potted mulberry plants under simulated conditions of root rot by artificial inoculation. The formulation, F3 was found highly effective and controls 88.21% root rot and 90.20% with in comparison to existing recommendation (71.21% and 62.74%, respectively). Mulberry[illegible]

BIVOLTINE SILKWORM BREEDING LABORATORY

Concluded Research Projects

AIT [illegible]: Development of robust bivoltine hybrids of silkworm, *Bombyx mori* L. tolerant to high temperature environment of the tropics through DNA marker assisted selection ([illegible] to Dec. [illegible])

S. Manthira Moorthy, [illegible] and [illegible]

Objectives

- Identification of DNA markers (SSR) linked to thermo-tolerance in silkworm
- Development of thermo-tolerant silkworm breeds / hybrids through DNA marker assisted selection

Identification of DNA markers (SSR) linked to thermo-tolerance in silkworm

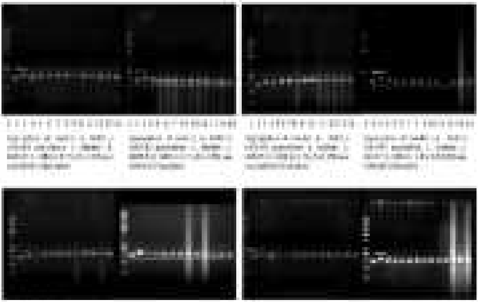
Twenty silkworm breeds collected from different institutes [illegible]

Eighty five SSR markers from different linkage groups were screened for the detection of polymorphism in selected breeds. [illegible] showed distinct polymorphism between the thermo-tolerant and susceptible breeds. Four F2 combinations were raised from selected breeds [illegible] and the F2 progeny was exposed to high temperature [illegible] and tolerant & susceptible populations were selected. DNA from tolerant and sensitive bulk was prepared by pooling aliquots containing equivalent amounts of total DNA [illegible]. Five SSR markers [illegible] showed polymorphism between the tolerant and susceptible F2 progeny. However, [illegible] generated polymorphic fragments for the four genetic backgrounds and [illegible] generated polymorphic fragments in three genetic backgrounds only indicating the association with thermo-tolerance in silkworm. Further, [illegible] was identified as the most probable marker associated with thermo-tolerance due to highly significant [illegible] value [illegible] in stepwise regression analysis.

Development of thermo-tolerant silkworm breeds/hybrids through marker assisted selection

In order to select donor parents for breeding programme, [illegible] silkworm breeds from [illegible] R&D institutes (CSRTI-Mysuru, CSRTI-Berhampore, CSRTI-Pampore, CSGRC-Hosur, [illegible] and [illegible]-Bengaluru) were screened with SSR markers [illegible] for thermotolerance. [illegible] (oval) and [illegible] (dumbbell) were selected as donor parents based on SSR marker presence, high survival and shell content at high temperature. [illegible] (oval), [illegible] and [illegible] (dumbbell) were selected as recurrent parents for high productivity and breeding plans were initiated to develop silkworm breeds with thermo-tolerance through SSR marker assisted selection.

The selected parents were crossed and four F1 crosses were prepared [illegible] and these F1s were crossed with respective recurrent parents and eight back cross (BC) lines were raised. Back crossing was continued for six generations [illegible] followed by sib-mating for three generations [illegible]. The marker analysis of progeny [illegible] in each generation was determined and the polymorphic genotypes linked to thermo-tolerance were utilised for further generations. During back cross generations, the progeny with heterozygous pattern was selected for next generation rearing, while dominant pattern [illegible] during sib-mating generations. In each generation, the [illegible] were exposed for [illegible] daily at [illegible] (in [illegible] instar) to confirm phenotypic expression.



Amplification of SSR marker [illegible] in recurrent, donor parents, F1 and BC segregating population of [illegible] and [illegible] crosses. Arrow shows 100 bp DNA marker; [illegible] bp for resistance/tolerance and [illegible] bp for susceptible allele.

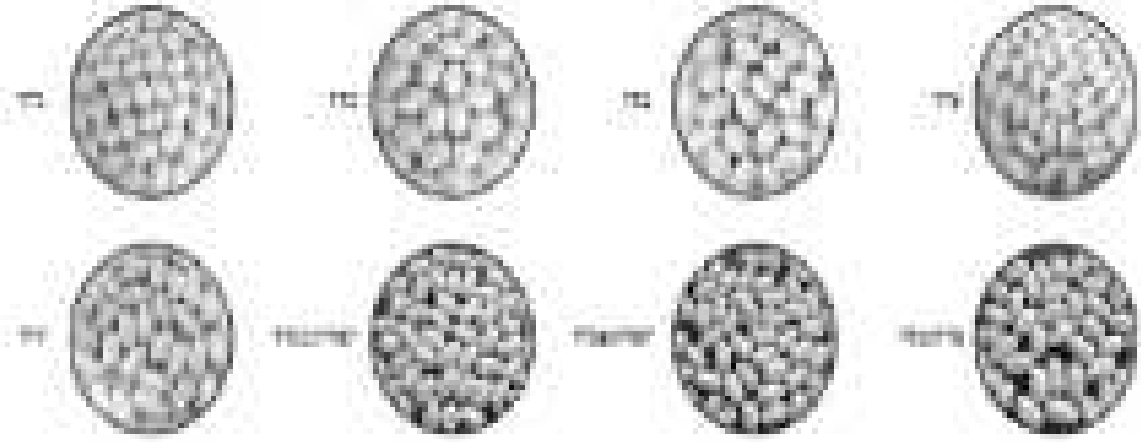
Amplification of SSR markers [illegible] in back cross lines [illegible] at [illegible] generation. [illegible] represents the heterozygous pattern of the [illegible] selected for next generation.

Marker-assisted selection resulted in developing eight thermotolerant *Bombyx* silkworm lines (Oval: TT1, TT2, TT3, TT4; dumbbell: TT5, TT6, TT7, TT8) exhibiting higher survival at high temperature (36°C) and the improvement in survival was [illegible] increase over the recurrent parents, indicating introgression of thermo tolerance trait. Similarly, these lines showed one-fold increase in cocoon yield/10000 larvae at high temperature over the recurrent parent and [illegible] over donor parent. The other economic characters were comparable to their recurrent parents. 22 single hybrid combinations were prepared from developed lines and other productive breeds. Based on mean evaluation index (EI), TT3 x TT6 was found superior with EI value of 56.17 followed by CSR50 x TT6. Similarly, evaluation of [illegible] double hybrid combinations through foundation crosses (FC) developed from the thermo tolerant breeds and others showed that [illegible] and [illegible] were superior with an EI value of [illegible] and [illegible], respectively.

Performance of thermotolerant breeding lines, donor parents and recurrent parents (High temperature (HT): Mean T. g. (Tmax) ≥ 34°C and Normal temperature (NT): Mean T. g. (Tmax) < 34°C)

Lines/ Parents	Days to 50% flowering		Plant height (cm)		Number of productive tillers/ plant		1000 grain weight (g)		Grain yield per plant (g)	
	HT	NT	HT	NT	HT	NT	HT	NT	HT	NT
L1	80.00	77.67	94.67	98.33	5.67	6.33	24.67	26.67	22.34	25.34
	±1.00	±1.53	±2.08	±2.89	±0.33	±0.88	±0.33	±0.33	±0.33	±0.58
L2	82.00	79.00	94.67	98.67	5.00	5.67	24.67	26.67	22.33	25.33
	±1.53	±1.73	±1.45	±1.45	±1.53	±1.53	±1.33	±1.33	±1.33	±1.33
L3	80.67	77.67	93.67	97.67	5.67	6.67	24.67	26.67	23.34	26.67
	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L4	81.00	78.00	93.67	97.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±1.00	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L5	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L6	80.00	77.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L7	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L8	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L9	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L10	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L11	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L12	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L13	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L14	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L15	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L16	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L17	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L18	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L19	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33
L20	81.00	78.00	94.67	98.67	5.67	6.67	24.67	26.67	22.67	25.67
	±0.58	±0.58	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33	±0.33

CD(0.05) for comparison between any two lines = 0.96 and CD(0.05) for comparison between any two parents = 0.96



Evaluation of thermo-tolerant single hybrids

Hybrid	Yield/10000 larvae		SCW (g)	SSP (%)	Pupation rate (%)	FL (m)	NBFL (m)	Raw silk (%)	Reelability (%)	[illegible]
	No.	Wt (kg)								
TT2 x TT6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TT2 x TT5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] (Control)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Evaluation of thermo-tolerant double hybrids

Hybrid	Yield/10000 larvae		SCW (g)	SSP (%)	Pupation rate (%)	FL (m)	NBFL (m)	Raw silk (%)	Reelability (%)	[illegible]
	No.	Wt (kg)								
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FC1 x FC2 (Control)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Conclusion

Two SSR markers ([illegible], [illegible]) linked with the thermo tolerance in silkworm were identified and validated through marker assisted selection. MAS was successful in integrating the thermo-tolerant traits into popular breeds of different genetic backgrounds. Newly developed single and double hybrid combinations showed better tolerance against thermal stress and suitable for summer seasons of tropics. The identified single hybrids ([illegible]) and double hybrids ([illegible]) would be subjected to on station trial (OST) followed by evaluation at farmer's level.

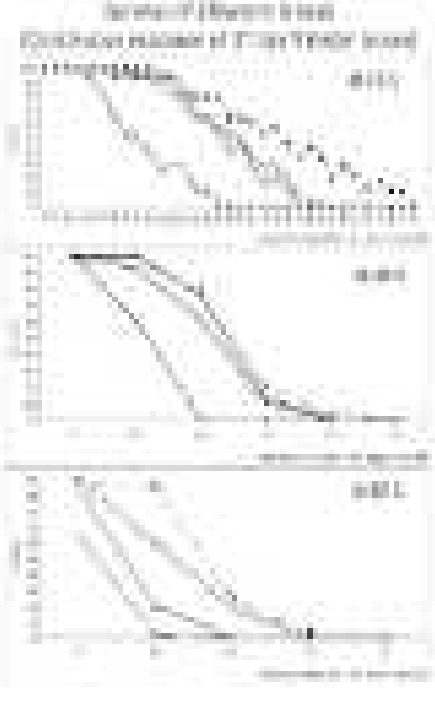
Life cycle (Jul'14-Dec'15) Studies on thermal tolerance, heat shock Protein synthesis during thermal shock and interacting bt Silkworm, Bombyx mori L. (Jan. 2014 to Dec. 2015)

S. Vijaya Lakshmy and N. Chandrakanth (SRF)

Objectives:

- Identification of critical thermal maximum in silkworm
- Analysis of hsp profiles in silkworm under thermal stress

Two indigenous multivoltine breeds (Kolar- B Pure Mysore and Hosur- Bivoltine (CSR2 & CSR4)) were selected for determining the thermo-tolerance mechanism in silkworm. Two sets of conditions were maintained to discern critical thermal maximum in silkworm (I- 1st day IV & V life instar larvae exposed to 30, 32, 34, 36 & 38°C for 2, 4, 6 & 12h every day; II- 3rd day V instar larvae continuously exposed at 36, 38, 40 & 42°C till death). High reduction in pupation rate was observed in all the breeds exposed to longer duration (4 & 12h) irrespective of temperature treatment. The larvae exposed from IV instar onwards suffered heavily than V instar larvae, a condition of treatment was longer. The pupation rate (%) varied between 88 & 80, 82 & 64.4, 76 & 48, 72 & 44 in the V instar larvae exposed to 30°C for 4, 6, 8, 12h, respectively. Whereas, the same varied between 71.6 & 8, 61.6 & 4, 46.6 & 0, 32 & 0 in the IV instar larvae exposed to 40°C for 4, 6, 8, 12h, respectively. No pupation was observed in CSR2 after 4h and 2h of exposure. Hosur was able to survive 2.13 to 3.19h. PM (4h) in 30h; CSR2 (12h) in 32h and SH4C (24h) in 40h in case of V instar larvae exposed continuously to 30°C. It was also observed that Hosur was able to survive (1.6h) in 1st, PM (10h) in 12h, CSR2 (48h) in 6th and SH4C (12h) in 12hr in case of V instar larvae exposed to 40°C continuously from 1st day. Interestingly at 42°C, Kolar was able to survive (2.30) in 7h, PM (180) in 6h, CSR2 (2h) in 4h and SH4C (30h) in 4h.



Analysis of Hsp profiles

The hsp profiles of tissue lysates of silkworm larvae exposed to heat shock were analysed through one-dimensional (1D) and two-dimensional electrophoresis (2DE). 1DE of whole larvae revealed eleven polypeptides and significant changes were observed in expression of 83kDa, 73kDa, 66kDa, 70kDa and 60kDa in all the treatments/breeds. 2-DE profiles of CSR2 larvae exposed at 0°C revealed 146 electrostatic spots (1-6 days/IV) due to thermal stress. The proteins expressed ranged between ~18kDa to >100kDa and several unique expression patterns were also observed (either up- or down-regulated). In general, up-regulation of 90-100kDa and small (18-28kDa) family and down regulation of 66kDa family was observed during thermal shock. The lowered threshold limits of sensitivity of ~22.8kDa (pI 6.5) and ~50kDa (pI 5) in normal grades by in duplex exposure over a period of time and its recoveries on Silkworm grades also pinpoints role of hsp22 and hsp50 spot was noticed. New protein spots (~75kDa/pI 6 & ~48kDa pI 6.5) appeared after 1st day and 2nd day exposure, respectively, while ~48kDa (pI 4) spot disappeared.

Two dimensional (2DE) hsp profiles of CSR2 exposed to high temperature (0°C)

[illegible] profile of CSR2 larvae exposed to [illegible] continuously revealed [illegible] protein spots after [illegible] of exposure due to thermal stress and 300, 289, 258, 288 and 282 in samples of recovery phase (2h, 14h, 10h, 31h and 58h) [illegible], respectively. Significant observations include up-regulation of 32.35, 34.41, 86, 88, 100 kDa proteins and down-regulation of 46, 50, 54, 62, 66 and 100 kDa proteins. Mass spectrometry of seven unique protein spots revealed that 70kDa & 30kDa (spot 2, 4) corresponds to stress proteins; 24.28kDa & 30.96kDa (spot 1, 3) with protein involved in [illegible]. Two other spots were predicted as [illegible] protein [illegible] (spot 5: [illegible]) and [illegible] (spot 6, 32.05kDa) of *Drosophila* [illegible] and *Drosophila* [illegible], respectively. Another protein (spot 7, 8.46kDa) was classified as an uncharacterized protein from *Drosophila* [illegible].

Characterization of Unique 2DE silkworm thermotolerant [illegible] proteins in response to prolonged heat stress

Classification	Spot No.	Protein Description	Accession No.	MW (kDa)/pI	Coverage (%)
Protein modification	1	Ribosomal protein P0 [Bombyx mori]	[illegible]	34.28/5.81	[illegible]
Response to stress	2	Heat shock protein 70 [Bombyx mori]	[illegible]	73.23/5.38	[illegible]
Protein modification	3	[illegible] [Bombyx mori]	[illegible]	30.96/7.32	[illegible]
Response to stress	4	Heat shock protein [illegible] [Bombyx mori]	[illegible]	[illegible]	[illegible]
[illegible] (Predicted)	5	Drosophila [illegible]	[illegible]	[illegible]	[illegible]
[illegible] (Predicted)	6	Drosophila [illegible]	[illegible]	32.05/[illegible]	[illegible]
Uncharacterized	7	Drosophila [illegible]	[illegible]	8.46/[illegible]	[illegible]

Conclusion

High [illegible] in [illegible] was observed in [illegible] exposed to thermal stress for longer duration [illegible], indicating the [illegible] impact of [illegible] on survival of [illegible] irrespective of [illegible]. Silkworm can also survive continuous exposure to high temperature (40°C) even up to [illegible]. However, significant reduction in fertility and fecundity was noticed. [illegible] expression of [illegible] of hsp[illegible], [illegible] and [illegible] during prolonged stress period and [illegible] expression of several proteins during stress [illegible]. The [illegible] expression of hsps throughout stress [illegible] to survive at [illegible] temperatures. [illegible] analysis [illegible] expression of stress proteins [illegible] and [illegible] period might have helped the larvae to survive and also facilitate the [illegible] development. High induction of hsps might enhance the [illegible] survival of silkworm during the first exposure to high temperature, but further [illegible] of heat shock protein production might lead to losses of survival due to chronic exposure.

Ongoing Research Projects

AIB 3508: Development of productive bivoltine silkworm breeds/hybrids of *Bombyx mori* L. tolerant to nuclear polyhedrosis virus (Jul. 2014 to [illegible] 2018)

[illegible]

Objective: Development of productive bivoltine silkworm breeds tolerant to nuclear polyhedrosis virus

Silkworm breeding lines [illegible], Oval × Oval: CSR[illegible], CSR[illegible], CSR[illegible], CSR[illegible], CSR[illegible], [illegible], Dumbbell × Dumbbell: CSR[illegible], CSR[illegible], CSR[illegible], CSR[illegible], CSR[illegible] and CSR[illegible] were raised by crossing [illegible] bivoltine parental breeds with donor parents [illegible] (Oval type) and [illegible] (Dumbbell type). The second moult larvae of were exposed to BmNPV inoculation [illegible].

Lines	Survival (%)	[illegible]	[illegible]	SR (%)
Oval lines				
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dumbbell lines				
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CSR[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The survival rate was calculated based on live pupae and cocoons were selected from lines with high survival and continued for further generations. The NPV inoculation was continued from [illegible] to [illegible]. The data indicates that among [illegible] lines, highest pupation was observed in [illegible] ([illegible]%) and lowest in [illegible] ([illegible]%), whereas highest pupation was observed in [illegible] ([illegible]%) and lowest in [illegible] ([illegible]%) among [illegible] lines. The crossing lines are presently at [illegible] generation.

AIB [illegible]: Development of bivoltine silkworm hybrids for commercial exploitation ([illegible])

C.M. Kishor Kumar, N. Mal Reddy and S. Manthira Moorthy

Objective: To develop improved bivoltine hybrids for sustainable productivity

The bivoltine breeds developed by different Research Institutions for productivity and silk quality, and disease, stress and thermo-tolerance were collected for large scale combining ability test. Foundation crosses ([illegible]), single ([illegible]) and double hybrids ([illegible]) were evaluated. Based on the performance with respect to important economic traits, ten single hybrids for productivity & silk quality, 5 single hybrids for robustness & silk quality and 10 double hybrids for productivity & silk quality have been short-listed for further evaluation.

Hybrids	[illegible]		SCW (g)	SSW (g)	SR (%)	[illegible]
	By No.	By wt. (kg)				
Productive Single Hybrids						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Robust Single Hybrids						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Productive Double Hybrids						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

AIT 09/48: To conduct multi-locational field trials on transgenic BmNPV resistant silkworm strains to establish their efficacy and generate data for their regulatory approval (DBT-RCGM) in collaboration with CDFD Hyderabad, APSSRDI Hindupur) (Dec. 2015 to Nov. 2017)

V. Sivaprasad and S. Manthira Moorthy

Objective: Testing of transgenic silkworm hybrids to establish their efficacy and generate data for regulatory approval

Two trials of transgenic silkworm hybrid for BmNPV tolerance, CSR2(T) x CSR4 was completed. Necessary arrangements were made as per Standard Operating Procedure (SOP) and Biosafety measures for rearing transgenic silkworm hybrids (Recognition Committee of Genetic manipulation, RCGM, New Delhi). Non-transgenic batch (CSR2xCSR4) was maintained as control. The average cocoon yield/100 dfls recorded was 64.20kg in transgenic hybrid against 58.2kg in control.

Season	Hybrid	Yield/100 dfls (kg)	SCW (g)	SSW (g)	Shell (%)	Reelability (%)	Renditta	[illegible] (m)	[illegible]
Oct. 2015 to Jan. 2016	CSR2 (T) x CSR4	64.20	1.480	0.308	20.81	80.75	6.11	9?	04
	CSR2 x CSR4	58.20	1.553	0.322	21.23	88.89	7.27	97	8
Feb. to Mar. 2016	CSR2 (T) x CSR4	58.24	1.603	0.336	20.93	80.7	6.13	88	10
	CSR2 x CSR4	57.21	1.598	0.308	21.18	78.87	7.04	85	9

Conventional/Other activities

Maintenance of bivoltine silkworm breeds

N. Bala Reddy, C. M. Kishor Kumar, S. Manthira Moorthy, P. N. Sowmya, L. Rukmini and T. C. Rajashekara

Objective: To maintain productive, robust, thermotolerant and sex-limited bivoltine breeds conforming to the original breed characteristics.

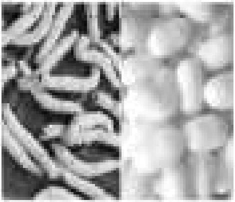
Productive bivoltine breeds (10), robust bivoltine breeds (11), thermotolerant bivoltine breeds (2) and sex-limited breeds (5) were maintained for conservation and evaluation. The values obtained for the traits were in conformity with the original breed characteristics.

Category	Breeds		Fecundity (Nos)	Pupation Rate (%)	Cocoon wt. (g)	Shell Ratio (%)	Fil. Length (m)	Raw Silk (%)	Denier
Productive	CSR2 CSR3 CSR4 CSR5 CSR6	CSR12 CSR16 CSR17 CSR18 CSR19	>500	>90	1.70-2.00	22-24	>1000	>18.0	
Robust	CSR13 CSR15 CSR46 CSR47 CSR50 CSR51	CSR21 CSR22 SK CC HB	>500	>90	1.60-1.80	21-23	>800	>16.0	
Thermo-tolerant	CSR3	JPN7	>500	>90	1.20-1.70	20-22	>1000	>20.0	2.0-2.4
Sex-limited	CSR2 (SL) CSR4 (SL)	CSR6 (SL) CSR27 (SL) CSR101 (SL)	>500	>90	1.80-1.90	20-21	>900	>18.0	

Development of highly productive bivoltine hybrid, SB x CSR16

V. Sreenivasa, N. Mal Reddy and S. Manthira Moorthy

Objective: Development of productive bivoltine [illegible] hybrid



The breeding programme was undertaken to develop highly productive bivoltine [illegible] hybrid [illegible] cocoon yield production among the farmers. Accordingly, the cocoon and silk quality traits of bivoltine breed [illegible] SB was improved [illegible] crossing with the productive breed, CSR17 followed by [illegible] selection for high productive traits. Hybrid evaluation studies with the [illegible] breed (SB) were conducted with bivoltine [illegible] breeds. The hybrid, SB x CSR16 was identified based on overall performance for cocoon yield [illegible], higher [illegible] for productive traits and hybrid vigour. The hybrid is characterized for higher cocoon weight (2.12 g) and shell (0.[illegible] g) [illegible] 22.7[illegible]%, better fibre characteristics (filament length: 1170 m; reelability: 80%; [illegible]) with better [illegible] ([illegible]) and [illegible] ([illegible]).

Performance of SB x CSR16 in the laboratory

Breeds	Pupa-tion (%)	Yield/10000 larvae (kg)	SCW (g)	SSW (g)	SR% (%)	Reelability (%)	Filament length (m)	Raw silk (%)	[illegible]	Neat-ness (p)
SB × CSR16	90.1	21.8	2.11	0.397	23.9	87	1170	13.0	2.36	92
(CSR2 × CSR4) (Control)	88.1	19.1	2.01	0.371	22.4	86	1050	17.6	2.30	90
% improvement	1.6	3.9	3.1	7.4	3.7		11.3	21.4		

Transfer of Technology (TOT) Programme

Field testing of new bivoltine silkworm hybrids

N. Mal Reddy, [illegible], S. Manthira Moorthy and C. M. Kishor Kumar

Several bivoltine hybrids developed by CSRTI-Mysuru and some of them have been authorized for different parts of India. However, very few hybrids are commercially exploited. To determine the yield potentiality of these hybrids, systematic evaluation of [illegible] ([illegible]; (CSR50 x CSR51) x (CSR52 x CSR53) & Chamaraja (CSR50 x CSR51)) and pipeline (SB x CSR16) bivoltine hybrids at farmer's level is undertaken through TOT programme with the farmers of Karnataka, Tamil Nadu and Andhra Pradesh.

Field Performance of Bivoltine Hybrids - TOT Programme

State	Dfls	No. of farmers	Yield/100 dfls	Dfls	No. of farmers	Yield/100 dfls	Dfls	No. of farmers	Yield/100 dfls
	[illegible]			CSR50 x 51 (Chamaraja)			SB x CSR16		
Karnataka	44600	277	85.20	11200	109	80.30	55230	374	73.47
Tamil Nadu	61200	111	78.64	10850	75	73.16	33290	130	75.00
Andhra Pradesh	73600	164	85.75	14600	80	88.69	18900	51	87.50
Total	181000	552	83.20	33200	263	87.12	1,10,000	555	74.89

MULTIVOLTINE BREEDING LABORATORY

Ongoing Research Projects

AIB 3548: Development of productive polyvoltine breeds of the silkworm, *Bombyx mori* L. tolerant to high temperature and BmNPV (Oct. 2011 to Sep. 2015)

[illegible]

Objective: Development of polyvoltine breeds tolerant to high temperature and BmNPV and to identify productive cross breeds.

Four short listed breeds tolerant polyvoltine lines viz., L2, HB1, HB4 & HB5 along with Pure Mysore (PM) and MN1 were evaluated for the overall performance in the laboratory. Two new polyvoltine lines, L2 and HB4 [illegible]

Laboratory performance of stress tolerant polyvoltine lines (Average of 3 trials)

Breeds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MN1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HB4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HB5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HB1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Laboratory performance of crossbreeds (Average of 3 trials)

Crossbreeds	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

AIB 3524: Improvement of Pure Mysore race for productivity and silk quality [illegible]

[illegible]

Objective: To develop Pure Mysore lines for improved hybrid vigour and fibre quality

Pure Mysore lines maintained [illegible] were evaluated for all the morphological, growth and economic traits. Two sources of PM lines were selected and the base population of selected sources with cocoon shape (rounded end), pupation [illegible], cocoon weight [illegible] and shell content [illegible] through application of directional selection pressure continuously for three generations. The selection procedure followed is cellular brushing, selection of lays based on cocoon shape and uniform and selection of female cocoons of high cocoon weight and males of high shell weight.

Improvement of PM lines of selected sources (3rd generation)		
Parameter	Source 1	Source 2
Fecundity (no.)	[illegible]	[illegible]
Survival (%)	[illegible]	[illegible]
Single cocoon weight (g)	[illegible]	[illegible]
Single shell weight (g)	[illegible]	[illegible]
Shell ratio (%)	[illegible]	[illegible]

[illegible]: Development of improved cross breeds of [illegible], *Bombyx mori* L. suitable for south India ([illegible])

[illegible]

Objective: To develop crossbreeds with high cocoon productivity and improved silk quality

[illegible]

Continuous/Other activities

Maintenance of polyvoltine [illegible] breeds of *Bombyx mori* L.

[illegible]

Objective: Maintenance of polyvoltine breeds conforming to their original character.

[illegible]

[illegible]									
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Multiplication of [illegible] breeds

[illegible]

Objective: [illegible]

[illegible]

[illegible]									
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

sunlow, silk content, renditta, neatness, size deviation, tenacity, cohesion and elongation. MV1 x 38 was tested through BAVY cocoons produced international grade quality silk (3A-3A) and is suitable for power looms and mechanised hand looms as both warp and weft. 22750 dfls of MV1 x 38 were reared by 128 farmers yielded at an average of 50.62 kg/100 dfls.

Field Performance of Seasonal Breed MV1 x 38			
State	Dfls brushed (No.)	Farmers (No.)	Avg yield/100 dfls (kg)
Karnataka	17000	105	49.20
Andhra Pradesh	3000	15	53.85
Tamil Nadu	2750	8	48.00
Total/Avg.	22750	128	50.62

SILKWORM GENETICS LABORATORY

Ongoing Research Projects:

AIB 3528: Evaluation of G11 x G19 : A new bivoltine double hybrid for sub-optimal conditions (Jan. 2013 to Dec. 2016)

K. S. Sharma (PI), C. M. Kishor Kumar, T. C. Rama Lakshmi, [illegible] and Ramesh Babu[1]

[1]BSPC, [illegible], NSSO, Bengaluru

Objective: To evaluate the field performance of newly evolved bivoltine double hybrid, G11 x G19 for productivity and silk quality

A total quantity of 3400 dfls of foundation crosses (G11 & G19) were distributed to adopted seed rearers for generating seed cocoons for the production of double hybrid, G11 x G19. The yield/100 dfls of G11 ranged from 55-60 kg with higher pupation rate (90%) and G19 yielded an average cocoon of 74 kg with 91% pupation rate. The egg yield for the double hybrid ranged from 63 to 70g/kg seed cocoon. A total quantity of 333000 dfls were produced at BSPCs of NSSO (April-July 2015) and kept for 4, 6 and 10 months hibernation schedule.

Field Performance of Bivoltine double hybrid G11 x G19						
Place	Farmers (No.)	Dfls (No.)	Yield (kg/100 dfls)	SCW (g)	SSW (g)	SR (%)
Karnataka	735	104000	68	1.738	0.307	20.07
Tamil Nadu	313	35000	77	1.806	0.370	20.51
Andhra Pradesh	504	101250	59	1.600	0.319	20.00
Maharashtra	310	62450	64	1.605	0.328	20.11
Total/Avg.	1862	403000	66.5	1.735	0.337	20.26

A total quantity of 403000 dfls was distributed to 1862 farmers of Southern India against the target of 3 lakh dfls. The average cocoon yield recorded was 66.5 kg/100dfls and the consistency in cocoon yield was observed throughout the season in Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra.

Location-wise/Other activities:

Maintenance of breeds developed through oriplast marker assisted selection, NPV tolerance and morphological mutant stocks

K. S. Sharma (PI)

Objective: Maintenance of silkworm stock conforming to their original characters.

Nine near and seven isomaleal breeds developed through DNA marker assisted selection, four BmNPV tolerant breeds, and mutant stocks (56) were maintained conforming to their original characteristics for two generations. The performance of these genetic stocks were documented.

Performance of items by department through purchase method and bid selection							
Item		Frequency (Time)	1997 / 10000 Series		SCSI (E)	3Q9 (E)	SF (%)
			No.	KC (kg)			
Sun	0.0%	3.76E04.22	3.02E+11.30	1.4 3.0E+09	1.05E+07	0.20E+00.00	11.03E+00
	3.4%	1.84E+08.67	9.84E+11.71	1.1 1.4E+14	1.71E+05.04	0.16E+00.00	11.19E+14
	5%	5.74E+08.31	3.87E+11.15	1.4 3.9E+14	1.71E+05.04	0.16E+00.00	11.17E+17
	8%	9.57E+08.00	3.87E+11.15	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.13E+18
	12%	4.91E+07.28	3.54E+11.54	1.4 3.0E+14	1.28+05.04	0.34E+05.00	11.13E+18
	5%	4.84E+08.48	9.83E+11.00	1.4 3.9E+14	1.05E+05.04	0.30E+05.00	11.93E+43
	8%	5.42E+08.00	4.84E+11.11	1.4 1.9E+14	1.28E+05.04	0.11E+05.00	11.44E+14
	10%	4.84E+07.00	3.83E+11.00	1.4 3.9E+14	1.05E+05.04	0.34E+05.00	11.13E+18
	5%	5.42E+08.00	3.83E+11.00	1.4 3.9E+14	1.05E+05.04	0.30E+05.00	11.13E+11
		3.83E+08.00	3.83E+11.00	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.93E+04
Semi-wild	4.0	5.04E+08.00	9.83E+11.00	1.4 3.9E+14	1.28E+05.04	0.17E+05.00	11.14E+18
	6%	5.74E+07.00	3.83E+11.00	1.4 3.9E+14	1.28E+05.04	0.17E+05.00	11.14E+14
	8%	9.57E+08.00	3.83E+11.00	1.4 3.9E+14	1.28E+05.04	0.17E+05.00	11.14E+13
	10%	4.91E+08.00	3.83E+11.00	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.13E+13
	5%	5.42E+08.00	3.83E+11.00	1.4 3.9E+14	1.05E+05.04	0.33E+05.00	11.93E+41
	8%	4.84E+08.00	9.83E+11.00	1.4 3.9E+14	1.44E+05.04	0.34E+05.00	11.13E+43

Performance of SBP Solvent Goods						
Brand	Accuracy (Hrs)	1997 / 10000 Series		SCSI (E)	3Q9 (E)	SF (%)
		No.	KC (kg)			
3M	3.04E+08.0	3.83E+11.11	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.93E+41
3M	4.84E+08.0	3.83E+11.11	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.93E+41
3M	4.84E+08.0	3.83E+11.11	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.93E+41
3M	4.84E+08.0	3.83E+11.11	1.4 3.9E+14	1.28E+05.04	0.33E+05.00	11.93E+41

Linkage	Description	Linkage	Description
ac [10]	Adds egg 1, yellow or white eggs	f [21]	Avoid bad thermal precautions was
fa [2]	Tall egg, access a [a-z]	fb [2]	Fail Cloud
ac, ac, [a]	Fill each item [a]	i [14]	Line, don't bonus against or on domed & helped also
ab [10]	Allowed egg	af [3]	Many bonus body hard & compact
ba [1]	Bowl egg	bab [11]	Nobility bonus or the hard Chinese & also 1 abbreviate
bn [3]	Bonus egg	b [3]	Data abnormal bus
ac [24]	Scientific chemical egg	nb [18]	Harmful [24] and, short Brown & chinese and [a-z]
ch [12]	Chamber room, hot and 3 bonus	c [3]	Mongolian abnormal together
ch [2]	Elegant, blank, Intergovernmental banks	ac [3]	Developed, chocolate ready, habitual bonus
ch1 [2]	Mainstream bonus and bridge	bc [18]	Last bonus eye on, healthy
ba [3]	Data science, hardware	ba [24]	Solid energy, park or cells
ch [2]	Common data, not bonus and	ch [2]	Work, pressure, counter
[a]	Nail Brown, park or chinese cells	f [2]	Yellow, bonus

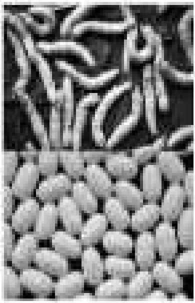
SATELLITE SILKWORM BREEDING STATION-COONOOR

Continuous/Other activities

Evolution of bivoltines for higher productivity under cool temperate conditions of Nilgiris and shuttle breeding to have genetic variations and plasticity

R. [illegible] (PI), S. Nirmal Kumar, P. [illegible] and [illegible]

Objective: To evolve bivoltine breeds for higher productivity under cool temperate conditions of Nilgiris



Seven productive bivoltine breeds have been evolved through systematic breeding programme. The oval breeds are characterized by [illegible] pupation rate, [illegible] cocoon weight, [illegible] shell weight and [illegible] shell ratio, while the dumbbell breeds are characterized by [illegible] cocoon weight, 38-40 cg shell weight and 21-23% shell ratio. Utilizing these productive breeds, a productive bivoltine double hybrid, [illegible] x [illegible] was evolved for further use through [illegible] of hybrids (May-Jun, Jul-Aug and Sep-Oct 2015). [illegible] were [illegible] for seed cocoon generation and hybrid dfls were prepared for the field trials. [illegible] dfls were tested in farmers' field and an average yield of [illegible] kg/100 dfls was recorded.

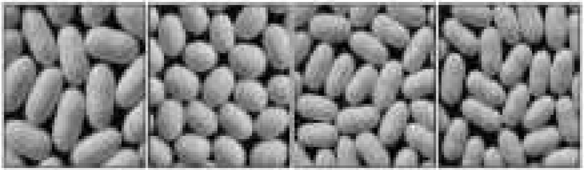
Double Hybrid	[illegible]	[illegible]	[illegible] (g)	[illegible] (g)	SR (%)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Maintenance of bivoltine breeder's stock of germplasm

R. [illegible] and [illegible]

Objective: To maintain evolved breeder's stock of bivoltine silkworm germplasm to its original characters

Maintenance rearing of [illegible] bivoltine germplasm breeds including [illegible] evolved breeds from [illegible] and [illegible] breeds from [illegible].



Performance of Breeder's Blocks : DRR, Dapoli						Performance of Breeder's Blocks: DRR, Jagtial					
Breed	Pop	WH (Tha)	EON (g)	SBA (g)	SP (%)	Breed	Pop	WH (Tha)	EON (g)	SBA (g)	SP (%)
DRR1	210	81.26	1.240	0.210	16.93	DRR1	201	80.89	1.234	0.214	16.52
DRR2	190	80.56	1.240	0.216	16.97	DRR2	200	80.62	1.232	0.221	16.68
DRR3	197	80.01	1.228	0.206	16.66	DRR3	201	80.58	1.230	0.206	16.57
DRR3-1	202	80.47	1.234	0.209	16.82	DRR3-1	201	84.08	1.230	0.209	16.87
DRR3-2	203	84.68	1.235	0.203	16.38	DRR3-2	200	80.18	1.227	0.205	16.78
DL1	404	80.38	1.227	0.205	16.55	DRR3-3	201	80.85	1.234	0.208	16.65
DL2	196	80.27	1.214	0.218	17.27	DRR3-4	199	80.81	1.234	0.205	16.59
DL3-1	197	80.88	1.201	0.248	20.81	DRR3-5	201	80.28	1.230	0.205	16.68
DL3-2	201	80.87	1.202	0.208	16.88	DRR3-6	201	80.88	1.234	0.246	19.47
DL3-3	404	84.78	1.213	0.208	16.96	DRR3-7	201	80.28	1.238	0.207	16.74
DL3-4	197	80.48	1.201	0.208	16.38	DRR3-8	201	80.18	1.240	0.209	16.79
DL	404	80.88	1.240	0.248	16.98	DRR3-9	201	80.82	1.238	0.202	16.68
DL	204	80.87	1.234	0.274	18.17	DRR3-10	201	80.88	1.239	0.207	16.48
DL	402	81.28	1.218	0.248	16.97	DRR3-11	201	80.87	1.239	0.248	19.87
DL2-DL3	402	80.41	1.234	0.203	16.18						
DL3-DL4	404	80.78	1.200	0.240	19.78						
DL1	203	80.28	1.214	0.208	16.98						
DL2	202	80.48	1.242	0.202	16.48						
DL3	402	80.28	1.414	0.208	16.92						
DL4	197	80.78	1.234	0.234	18.74						
DRR3-1	191	80.88	1.207	1.276	18.47						
DRR3-2	206	80.88	1.201	0.280	18.28						
DRR3-3	207	80.88	1.217	0.277	18.78						
DRR3-4	201	80.88	1.230	0.254	16.88						
DRR3-5	402	84.28	1.210	0.234	16.48						
DRR3-6	201	80.48	1.218	0.201	16.88						
DRR3-7	201	80.88	1.202	0.208	16.28						
DRR3-8	210	80.48	1.200	0.208	16.87						
DRR3-9	196	80.88	1.202	0.208	16.18						

IN RBF - RAISSUM

Studies to assess Rice Maintenance and Yield Stability

S.K. Kalpana and S.S. Chandra Shekar

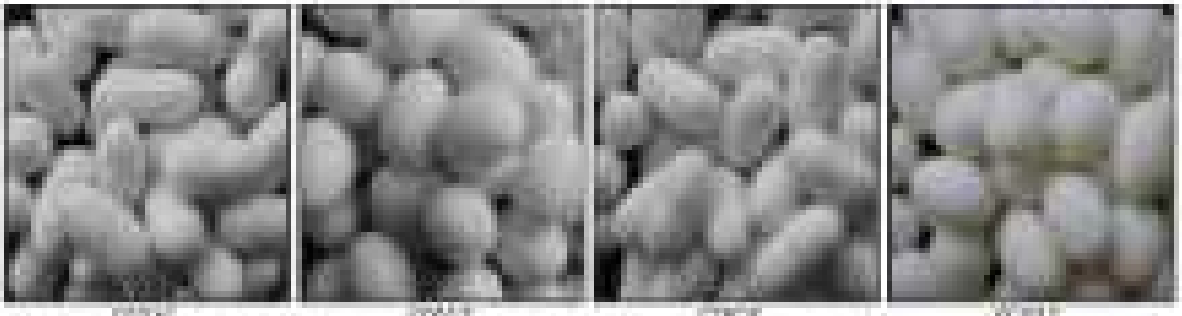
Objective: To breed high yielding maintainer, B-stable rice maintainers and lastly to quickly disperse eggs to commercial multiplication centers.

Seven breeding lines were raised in two crop seasons, Kharif, 2018 and Rabi/Kharif, 2018 to study agronomic characters and maintenance characters.

Breed	Panicles/ Plant (No)	Grain yield/ 20000 Sq.m area (kg)	EON (g)	SBA (g)	Yield/ Plant (kg)
DRR1	07.1±0.8	10.8±1.07	1.21±0.12	0.42±0.01	10.1±0.1
DRR2	07.1±0.8	11.2±1.1	1.23±0.12	0.07±0.01	11.7±0.1
DRR3	07.0±0.7	17.6±1.8	1.77±0.18	0.83±0.01	11.6±0.1
DRR3-1	07.0±0.7	10.7±1.1	1.07±0.11	0.87±0.01	11.1±0.1
DRR3-2	07.1±0.8	10.7±1.1	1.07±0.11	0.47±0.01	11.3±0.1
DRR3-3	07.1±0.8	11.8±1.2	1.19±0.12	0.83±0.01	11.6±0.1
DRR3-4	07.0±0.7	10.7±1.1	1.07±0.11	0.47±0.01	11.3±0.1

...ssium bromide using mantle set in conformity with the cross or accordance and hybrid ...ogen was also recorded for the estimated combinations. The crosses were method-wisely ...ecombined for seminal ...oductive. A total of 2500 gms of pure black cells were prepared for supply to ...ll ...ec ICI reproductive centres. The percentage of recovery of cells ranged from 84% (CBR) to 88.4% (CBR27).

CBR4 CBR5



CBR26 CBR27 CBR28 CBR37

SELWIN GEORGE MOLECULAR BIOLOGY LABORATORY

Location wise/Other activities

On station trial (OST) of BmNPV tolerant hybrids developed through BmNOX marker system

Virendra Kumar, Dr. Satyanarayana Raju T. A. Mary Rona and R. Makesh

Objectives: To evaluate BmNPV tolerant bivoltine hybrids developed using BmNOX marker system

BmNPV tolerant bivoltine cocoons and shade worms developed through BmNOX marker system was conducted at RSRS Hindupur, RSRS Salem and RSRS Channarayapatna. Ten cells of each hybrid were reared and the data on rearing and reeling performance was recorded.

Performance of tolerant hybrids (pooled) – OST										
Agency	Hybrid	No. of cocoons	Cocoon weight (g)	Shell weight (g)	Shell ratio (%)	Yield/100 dfls (kg)	Pupation rate (%)	Filament length (m)	Raw silk recovery (%)	Reeling time (h)
Hindupur	CBR5 × CBR4 / CBR5 × CBR7	454	1.998	0.402	20.08	90.68	93.08	1148.00	24.58	80.00
	CBR4 × CBR5 / CBR5 × CBR7	445	1.889	0.405	21.04	87.13	91.34	1018.00	23.15	80.00
	CBR4 × CBR5 / CBR5 × CBR7	453	1.897	0.398	20.98	89.34	93.07	1080.00	24.18	80.00
	CC1 × CC2 (Tol)	448	1.828	0.388	21.28	82.08	92.14	1020.00	24.02	80.00
	PM2 × PM1 (Control)	398	1.678	0.408	24.31	66.78	79.40	878.00	23.58	84.00
Salem	CBR5 × CBR4 / CBR5 × CBR7	468	1.798	0.378	21.02	84.20	89.28	1028.00	24.61	80.00
	CBR4 × CBR5 / CBR5 × CBR7	460	1.797	0.388	21.57	82.73	90.38	1000.00	23.42	80.00
	CBR4 × CBR5 / CBR5 × CBR7	502	1.807	0.382	20.53	94.00	94.28	1087.40	24.15	80.00
	CC1 × CC2 (Tol)	398	1.484	0.303	20.77	75.08	89.50	1006.75	24.78	80.00
	PM2 × PM1 (Control)	411	1.899	0.403	21.23	89.70	92.50	1018.00	24.80	85.00
Channarayapatna	CBR5 × CBR4 / CBR5 × CBR7	448	1.868	0.388	20.88	87.80	93.20	1004.00	24.73	80.00
	CBR4 × CBR5 / CBR5 × CBR7	340	1.888	0.393	20.87	82.08	90.84	1074.00	23.88	80.00
	CC1 × CC2 (Tol)	388	1.897	0.398	20.98	86.08	92.80	1098.00	24.80	80.00
	PM2 × PM1 (Control)	411	1.778	0.374	21.04	100.00	84.00	940.00	24.01	85.00

SILKWORM PHYSIOLOGY LABORATORY

Continuous/Other Activities

Maintenance of silkworm diet silkworm breeds for original breed characteristics

M. [illegible] Reddy and [illegible]

Objective: To maintain diet silkworm breeds conforming to the original breed characteristics.

Five rearings of diet bivoltine breeds were conducted with semi-synthetic diet for overall performance conforming to the breed characteristics. Feed response ranged between [illegible] and pupation rate was [illegible]. Similarly, six rearings of diet multivoltine breeds were also conducted and the feed response ranged [illegible] with the pupation rate of [illegible].

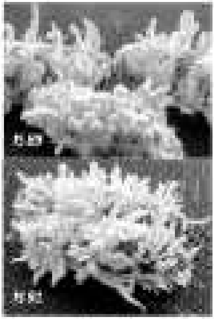
	Breeds	Feed Response (%)	Pupation Rate (%)	Cocoon wt (g)	Shell wt (g)	SR (%)
Bivoltine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Polyvoltine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

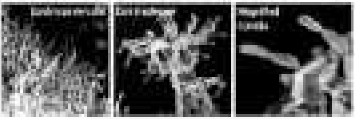
Maintenance of mother cultures of *Cordyceps* spp.

M. [illegible] Reddy, [illegible] and [illegible]

Objective: To maintain and characterize *Cordyceps* spp. cultures

Mother cultures of 12 isolates of eight *Cordyceps* spp. from different sources were maintained and multiplied on potato dextrose agar (PDA) and sabouraud dextrose agar yeast (SDAY) media periodically by incubating at [illegible]. The *Cordyceps* stock cultures were in vitro and in vivo subcultured for its viability. For *Cordyceps* fruiting body formation, mycelium in potato dextrose broth was injected into the [illegible] silkworm pupae and incubated at [illegible] for [illegible] days. Among the isolates of *Cordyceps* spp., [illegible] were found to produce fruiting body on silkworm pupae as well as in vitro culture. Better fruiting body formation was observed on live silkworm pupae and fruiting body of [illegible] was club shaped with whitish cream colour (2-3cm long & [illegible] wide). The mycelial and fruiting body morphology and growth was analysed by SEM.





REARING TECHNOLOGY & INNOVATION

Ongoing Research Projects

AIB 3552: Identification of robust bivoltine silkworm hybrids suitable for different regions of high temperature and high humidity conditions (Mar. 2016 to Mar. 2018)

S. Purushotham, D. S. Somaprakash, N. Mal Reddy, Vinoth Kumar, Barbaruah and T.K.B.ari

Team: Chennai

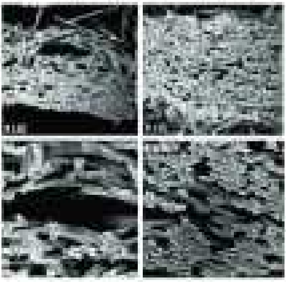
Objectives

- To evaluate silkworm breeds/hybrids under high temperature and high humidity
- To determine factors influencing post-cocoon parameters under high temperature and high humidity

Breed	32°C Temperature & 85±5% RH					25°C Temperature & 70±5% RH				
	Cocoon Yield (kg)	SCW (g)	SSW (g)	Shell Ratio (%)	Pupation Rate (%)	Cocoon Yield (kg)	SCW (g)	SSW (g)	Shell Ratio (%)	Pupation Rate (%)
CSR2	113	1.39	0.22	21.35	80	98	1.08	0.22	20.37	83
CSR27	88	1.35	0.31	23.08	88	98	1.05	0.23	21.78	75
CSR6	120	1.09	0.23	21.10	98	119	1.13	0.22	20.03	90
CSR4	160	1.34	0.21	23.48	94	44	1.06	0.18	20.76	52
CSR50	161	1.28	0.27	21.40	87	141	1.18	0.18	15.67	88
CSR52	184	1.27	0.27	21.26	85	115	1.11	0.27	22.81	88
B1	173	1.28	0.22	23.27	94	143	1.13	0.22	20.20	90
CSR53	87	1.08	0.23	21.1	88	99	1.08	0.22	20.77	75
CSR51	111	1.1	0.21	14.08	88	40	1.06	0.21	19.08	85
CSR55	188	1.12	0.21	23.02	94	111	1.08	0.21	18.59	85
CSR28	88	1.05	0.22	22.88	84	101	1.05	0.27	22.18	88
CSR57	121	1.35	0.22	23.02	88	140	1.08	0.22	20.77	80

The bivoltine parental breeds were screened for their tolerance to high temperature (32°C) and high humidity (85±5%) for 8 hours daily till harvesting which is a major factor influencing cocoon yield. The larvae were reared as per standard rearing technology. 300 larvae per batch were maintained in each treatment. The cocoons were harvested on 6th day and assessed for rearing and post cocoon parameters.

The cocoons generated in each treatment were subjected for SEM analysis and a representative image of cross section of CSR2 cocoons reared at high temperature and high humidity reveals that the cocoon filaments are loosely packed (left top and bottom in figure). However, the cocoons reared at optimum temperature and humidity showed that cocoon filaments are closely packed indicating the good quality of cocoons (Right top and bottom).



Continuous/Other activities

Large scale in-house evaluation of newly developed ICBs and multiplication of parental silkworm breeds

R. C. Sandra

Objective: To evaluate new silkworm breeds/hybrids under large scale in-house rearing

Under the large scale in-house evaluation programme, 80 (batches), four silkworm rearings (800 dfls) were conducted with P/C breeds and improved crossbreeds (ICBs). A total quantity of 2,000 kgs cocoons was generated and the seed cocoons were utilized for DFLs production through NSPC-SM network (NSSO).

Breed/Hybrid	Crop Period	Dfls (nos.)	[illegible]	Actual Yield [illegible]	[illegible]		SCW (g)	SSW (g)	SR (%)	[illegible]	Yield/100 dfls (kg)
					[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Multiplication of parents / stocks of newly developed bivoltine hybrids

[illegible]

Objective: To multiply stocks of newly evolved silkworm hybrids

[illegible]

[illegible]	Crop Period	Dfls (nos.)	Actual Yield (nos.)	[illegible]	SCW (g)	SSW (g)	SR (%)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

GRAINAGE

Continuous/Other activities

Evaluation of reproductive performance of newly developed silkworm breeds/hybrids

[illegible]

Objective: To evaluate reproductive performance of newly developed silkworm breeds/hybrids

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

PEST MANAGEMENT LABORATORY

Ongoing Research Projects:

[illegible]: Survey and surveillance of major pests and their natural enemies in mulberry eco-system
([illegible] to Dec. [illegible])

[illegible]

[illegible], [illegible], [illegible] Chamarajanagar, RSRS, Salem, RSRS, Anantapur

Objectives:

- To monitor the incidence of insect pests and their natural enemies in mulberry ecosystems
- To construct life tables and study trophic interaction of new pests, [illegible] and their natural enemies
- To establish cultures of new potential natural enemies for mulberry pests

Ten selected mulberry gardens each were surveyed in the seven selected places covering three southern states of Karnataka, Tamil Nadu and Andhra Pradesh for major pest incidence. Average mealybug incidence was highest in Salem (12.9%) followed by [illegible] and in other places it was <5%. Similarly, thrips incidence was also highest in Salem ([illegible]/leaf) followed by [illegible] ([illegible]/leaf) and [illegible] ([illegible]/leaf). Whitefly incidence was quite conspicuous only at Mysore ([illegible]/leaf). The seasonal pest, leaf roller was also highest in Mysore ([illegible]%) followed by Anantapur ([illegible]%) and Salem ([illegible]%). However, no new pests were reported from any of the places. Important natural enemies were also recorded in the mulberry gardens.

Important natural enemies recorded in the mulberry gardens ([illegible])				
Natural Enemies	Host	[illegible]	TN	AP
Cryptolaemus montrouzieri	Mealybugs	+	++	+
Scymnus coccivora	Mealybugs	++	++	+
[illegible]	Thrips	++	+	+++
[illegible]	Mealybugs/ Papaya mealybug	+	++	-
Acerophagus papayae	Papaya mealybug	-	++	-
[illegible]	Papaya mealybug	-	+	-
[illegible]	Leaf roller	++	++	-

Centres	Mealybug (%)	Thrips (nos./leaf)	Whitefly (nos./leaf)	Leaf roller (%)	Papaya mealybug (%)
CSRTI-Mysore	[illegible]	[illegible]	[illegible]	[illegible]	-
[illegible]	[illegible]	[illegible]	-	[illegible]	-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-
RSRS-Chamarajanagar	[illegible]	-	-	-	-
RSRS-Salem	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]
RSRS-Anantapur	[illegible]	[illegible]	-	[illegible]	-

[illegible]: Investigation on semio-chemicals of the silkworm uzi fly, *Exorista bombycis* (in collaboration with [illegible], Bangalore; [illegible] to Dec. [illegible])

[illegible]

[illegible], [illegible], Bangalore

Objectives:

- To isolate and identify the substances from mulberry leaf, silkworm larva, faecal matter and [illegible] eliciting behavioural response in uzi fly
- To isolate and identify the sex pheromones of *E. bombycis*
- To determine the bio-efficacy of kairomones (mulberry) and sex pheromones (uzi fly)
- To formulate suitable semio-chemical based trap for uzi fly and its application

A total of 16 compounds were isolated from the abdominal extracts of virgin female of [illegible]. Of these, three compounds namely Tricosane (major), Tricosene & Pentacosane (minor) were [illegible] for attracting adults. Tricosane was found effective in attracting uzi flies [illegible] and [illegible]. Similarly, two [illegible] compounds namely [illegible] acid & 1,2-benzenedicarboxylic acid (BEDA) were identified from first instar silkworm larvae and the former only was identified in [illegible] instar larvae. From third instar silkworm larvae, three compounds viz., hexadecanoic acid, BEDA & [illegible] were identified. BEDA and [illegible] acid were identified from IV & V instar silkworm larvae, respectively. The characterization of these compounds is under progress.

PRE 3548: Identification, characterization, synthesis and field evaluation of sex pheromone of the mulberry leaf roller, *Diaphania pulverulentalis* (Lepidoptera: Pyralidae) (In collaboration with NBAIR, Bengaluru) (Jan. 2016 to Dec. 2017)

Vinod Kumar (PI), [illegible] Kumar, [illegible], [illegible] and [illegible]

[illegible], NBAIR, Bengaluru

Objectives

- To isolate and identify the sex pheromones of the leaf roller, *D. pulverulentalis*
- To determine the [illegible] of sex pheromones against leaf roller
- To develop suitable pheromone based trap for the leaf roller

[illegible] was isolated from the abdominal extract of virgin female of mulberry leaf roller, *Diaphania pulverulentalis*.

Continuous/Other activities

Maintenance of mother culture for production of bio-control agents and mass release

Vinod Kumar (PI) and [illegible] Kumar

Nucleus cultures of the [illegible] parasitoids of uzi fly viz., *Nesolynx thymus*, [illegible], [illegible] spp. and [illegible] and two predators of mealy bug [illegible] and *Cryptolaemus montrouzieri* besides host culture of housefly and [illegible] mealy bug were maintained throughout the year. The bio-control agents were produced and supplied to sericulturists, [illegible] and [illegible] on commercial basis. [illegible] the release of bio-control agents in the field was effective and kept the uzi fly & [illegible] incidence [illegible].

Production of *Nesolynx thymus*: A total of [illegible] pouches ([illegible] lakh numbers) of *Nesolynx thymus* were produced and [illegible] pouches were supplied to sericulturists of southern states (Karnataka: [illegible]; Tamil Nadu: [illegible]; AP & Telangana: [illegible]; Maharashtra: [illegible]; CSRTI-Mysuru: [illegible]) covering [illegible] DFLs ([illegible] pouches/100 DFLs). Further, [illegible] pouches worth Rs. [illegible] lakhs were supplied on commercial basis to poultry farms of [illegible] region, [illegible] and [illegible] for the reduction [illegible] of housefly and other filth fly populations and effectively maintain the [illegible] populations in the [illegible].

Production of ladybird beetles: A total of [illegible] of [illegible] beetles ([illegible] numbers) were produced and supplied to [illegible] covering [illegible] acres of mulberry gardens [illegible] CSRTI-Mysuru gardens.

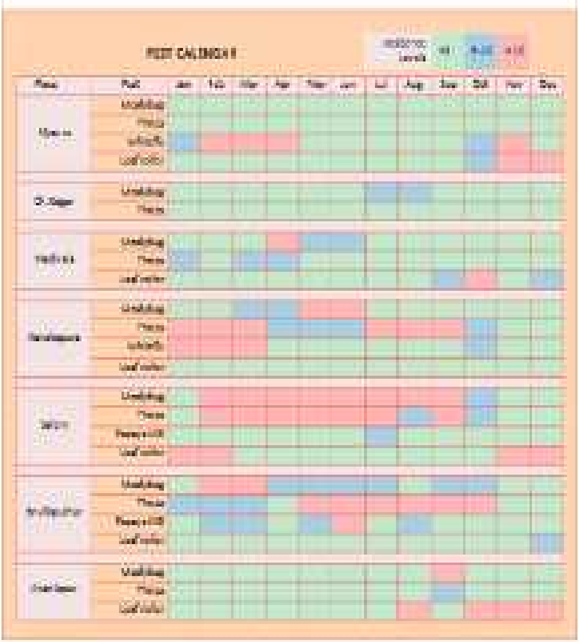
Forewarning and forecasting of mulberry pests

[illegible] Kumar (PI), [illegible], [illegible], [illegible] and [illegible]

[illegible]

Fortnightly survey on incidence of pests in mulberry gardens at CSRTI-Mysuru campus and by [illegible] units ([illegible], [illegible], [illegible], [illegible], [illegible] & [illegible]) was conducted. Further, consolidated survey and data is presented below.

States	Season	Mealybug (%)	Thrips (No./leaf)	[illegible] (No./leaf)	Leaf Folder (%)	[illegible] (%)
[illegible]	Summer	[illegible]	[illegible]	[illegible]	[illegible]	-
	Rainy	[illegible]	[illegible]	[illegible]	[illegible]	-
	Winter	[illegible]	[illegible]	[illegible]	[illegible]	-
Tamil Nadu	Summer	[illegible]	[illegible]	-	-	[illegible]
	Rainy	[illegible]	[illegible]	-	[illegible]	[illegible]
	Winter	[illegible]	[illegible]	[illegible]	[illegible]	-
Andhra Pradesh	Summer	[illegible]	[illegible]	-	[illegible]	-
	Rainy	[illegible]	[illegible]	-	[illegible]	-
	Winter	[illegible]	[illegible]	-	[illegible]	-



SILKWORM PATHOLOGY

Ongoing Research Projects

[illegible]: Silkworm Disease Monitoring of Seed and Commercial Crop Rearing of South Indian States (Oct. 2016 to Mar. 2018)

M. [illegible] (PI), [illegible] and [illegible]

[illegible], Bengaluru

Objectives

- To estimate the prevalence of silkworm diseases at selected Basic Seed Farms and Commercial Crop rearings (CRP clusters) in the South Indian states.
- To suggest remedial measures on spot to the farms/farmers to manage the silkworm diseases and to prevent disease outbreak.

Silkworm Disease Monitoring - BSFs					
State	BSF	Disease incidence (%)			
		Grasserie	Flacherie	Muscardine	Pebrine
Karnataka	P3 BSF-[illegible]	-	[illegible]	-	-
	P4 BSF-[illegible] (Cat)	-	-	-	-
	P3 BSF-Mysuru	-	[illegible]	-	-
	P3 BSF-[illegible] (Cat)	-	-	-	-
	P3 BSF-[illegible] (Cat)	-	-	-	-
	P3 BSF-[illegible]	[illegible]	[illegible]	[illegible]	-
	P3 BSF-[illegible] (Cat)	-	[illegible]	-	-
	P3 BSF-[illegible] (Cat)	-	-	-	-
	P3 BSF-[illegible] (Cat)	-	-	-	-
	P3 BSF-[illegible] (Cat)	-	[illegible]	[illegible]	-
Tamil Nadu	P3 BSF-[illegible] (Cat)	[illegible]	[illegible]	-	-
	P3 BSF-[illegible] (Cat)	[illegible]	-	-	-
	P3 BSF-Nilagiri Hills	-	-	[illegible]	[illegible]
Andhra Pradesh	P3 BSF-[illegible] Hills (Cat)	[illegible]	[illegible]	[illegible]	-
	P3 BSF-[illegible] (Cat)	[illegible]	[illegible]	[illegible]	-
	P3 BSF-[illegible] Hills	[illegible]	[illegible]	[illegible]	-

Silkworm disease monitoring was conducted in every crop of selected basic seed farms (BSFs) of Karnataka, Tamil Nadu and Andhra Pradesh and also in the selected clusters (10 crops/month) of Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala and Maharashtra. The data was uploaded on website specially designed [illegible]. The monitoring teams also uploaded information on disease monitoring, remedial measures suggested and follow-up actions undertaken. The incidence of grasserie was [illegible], flacherie ([illegible]) and muscardine ([illegible]) in the BSFs of Karnataka, Tamil Nadu and Andhra Pradesh. Pebrine incidence was not recorded in any of the BSFs crops, except in P3BSF-Nilagiri Hills ([illegible]) at [illegible]. In the [illegible] clusters, grasserie incidence was [illegible], flacherie ([illegible]) and muscardine ([illegible]). The advisories were given for the concerned crops for the management of diseases.

[illegible]											
State	Hybrid	DFLs Covered (nos)	Yield / 100 dfls (kg)	[illegible]				[illegible]			
				Gra	Fla	Mus	Peb	Gra	Fla	Mus	Peb
KAR	BV	25808	66.11	1.29	2.80	0.17	–	1.47	2.62	0.09	–
TN	BV	137900	74.02	0.38	2.14	0.08	–	0.42	2.09	0.08	–
	CB	4480	73.07	0.04	0.12	–	–	0.16	0.18	0.12	–
AP	BV	225184	68.85	1.02	1.34	0.08	–	1.18	1.29	0.12	–
	CB	2977	35.30	1.00	1.90	0.81	–	0.11	1.07	0.08	–
TEL	BV	14209	78.41	2.99	2.50	0.09	–	4.17	5.15	0.08	–
	CB	800	88.87	0.02	0.20	–	–	1.46	1.84	–	–
MAH	BV	8000	82.84	0.80	0.80	0.80	–	1.02	1.00	0.12	–
	CB	400	36.85	0.66	0.37	–	–	1.00	0.13	–	–
ORI	BV	23049	78.90	0.90	1.50	0.00	–	0.86	0.17	0.16	–

APR 3530: Validation trials of automated disinfection of silkworm rearing house (Jan. 2016 to Mar. 2017)

A.R. Narasimha Nayaka (PI), G. Vijayakumari, [illegible], C. A. Mary Josepha, [illegible] and V. Lakshmanan

[illegible]

Objective: To evaluate the effectiveness of automated disinfection system of rearing house.

Automated disinfection units were installed at Technology Validation and Demonstration Centre (TVDC) at CSRTI-Mysuru, [illegible] and [illegible]. The trials (TVDC, CSRTI-Mysuru) showed that disinfection of rearing house with automated disinfection unit is effective in comparison to the existing method (control). Increase in yield [illegible] was recorded in automated disinfection method as compared to control [illegible].

LAMP (Loop Mediated Isothermal Amplification) technique for the detection of *Nosema bombycis* infection in silkworm, *Bombyx mori* L.

V. Sivaprasad, [illegible], [illegible], G. Vijayakumari, [illegible] and A. V. Mary Josepha

[illegible], CSRTI-Mysuru

Objective: To develop molecular diagnostic method for pebrine detection

[illegible] PCR (mPCR) method employing [illegible] of *Nosema bombycis* was standardized by CSRTI-Mysuru for the detection of pebrine by amplifying target DNA from [illegible]. During [illegible] pebrine monitoring meet, CSRTI-Mysuru was entrusted to develop field oriented molecular diagnostic method for the detection of pebrine as [illegible] practical difficulties at field level to utilize PCR based diagnostic method.

Accordingly in pursuit of easier molecular diagnostic method for the pebrine detection, a simple, cost-effective, less time consuming and efficient detection method employing LAMP (Loop Mediated Isothermal Amplification Reaction) primers was developed by CSRTI-Mysuru. The original method was modified to suit field conditions in seed production centres and basic seed farms. The principle involves amplification of DNA in an isothermal reaction using crude samples without DNA isolation and purification and amplification visualized employing specific dyes. The samples were prepared by grinding tissues with specially designed lysis buffer and the supernatant is taken for the LAMP reaction. In [illegible] high amplification efficiency (target DNA can be amplified [illegible] in 60 minutes). The LAMP reaction tubes appear violet and if primers get amplified, the colour of reaction mixture changes to light blue colour indicating the presence of DNA of *N. bombycis*.

The modified LAMP method was found effective with N. bombycis DNA, pool of infected larvae samples and egg stock (transovarial transmission), samples infected with pebrine (subclinical/sporadic infection) and the method is also effective in the early detection of N. bombycis infection in silkworm. It is superior to immunoassay methods and PCR methods, which are time consuming, costly and require high concentration of spores. The Modified LAMP method developed is very convenient and field-oriented as it does not involve DNA isolation, Polymerase Chain Reaction and electrophoresis of PCR products and hence requires no costly equipments.

Consultancy Project

[illegible]: Validation and refinement of SanPS, an inorganic compound for effective sanitation (Apr. 2016 to Nov. 2016)

M. Balasubramanian, A. V. Mary Josepha, A. R. Pradeep Nayaka and V. Sivaprasad

Objective: To validate and refine the SanPS as an effective disinfectant for disinfection of silkworm rearing house and rearing appliances for use in sericulture.

A consultancy project was undertaken for validation and refinement of SanPS, an inorganic chlorine compound for effective sanitation of silkworm rearing house for [illegible].

Germicidal activity of SanPS - in vitro tests							
Pathogen	SanPS conc. (%)						
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B. thuringiensis	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B. bassiana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Control	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Efficacy of SanPS as general disinfectant				
Exposure Time	% mortality / infection			
	SanPS	Nosema bombycis	Bacillus thuringiensis	Beauveria bassiana
30 min	[illegible]	[illegible]	[illegible]	[illegible]
24 h	[illegible]	[illegible]	[illegible]	[illegible]
Untreated control	+	+	+	+

Standard experimental protocols/procedures were followed to determine the efficacy of SanPS against known silkworm pathogens (BmNPV, Nosema bombycis, Bacillus thuringiensis & Beauveria bassiana) and its effectiveness as general disinfectant for the disinfection of rearing house and appliances.

Efficacy of SanPS - in vivo tests (% mortality / infection)				
Conc. of SanPS	30 min exposure			
	% mortality / infection due to			
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	+	+	+	+
[illegible]	+	+	+	+
Control	[illegible]	[illegible]	[illegible]	[illegible]

In vitro studies on efficacy of different concentrations of SanPS against B. thuringiensis and B. bassiana indicated the effectiveness of SanPS as a germicide at lower concentration. In vivo studies on efficacy of different concentrations of SanPS against silkworm pathogens indicated that SanPS was found effective against BmNPV polyhedra, spores of N. bombycis and B. thuringiensis and conidia of B. bassiana at 0.20% and above concentrations. The disinfectant solution was effective for surface disinfection of contaminated silkworm eggs, rearing trays and rearing house. 0.20% SanPS was less corrosive than 2% Bleaching powder in 0.3% slaked lime solution. SanPS (0.20%) was effective as a disinfectant for rearing house disinfection and hygiene maintenance as per laboratory tests.

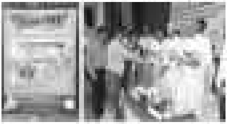
SanPS (0.20%) was tested both at laboratory and at farmers' level (field trials). [illegible] for the disinfection of rearing house and appliances. A total of [illegible] crops were tested with SanPS as general disinfectant and crops of [illegible] farmers with existing popular disinfectants were maintained as control. The results indicated an improvement of [illegible] kg / 100 dfls in cocoon yield with SanPS over the existing disinfectants besides improved cocoon characteristics.

Seriff Disinfectant – Rearing Performance (No. of larvae kept after III moult/Treatment = 300; Values are an average of 3 replications)								
Treatment	Pupation Rate (%)	SCW (g)	SSW (g)	SR (%)	Disease Incidence (%)			
					Grasserie	Flacherie	Muscardine	Total
Seriff (5%)	93.00	1.800	0.408	22.37	1.50	0.00	0.00	3.00
Control	84.00	1.600	0.360	21.87	4.00	6.00	0.00	9.00

Field Performance of Seriff as General Disinfectant												
Disinfectant	Area	Farmers (Nos.)	DFLs (Nos.)	Yield/100 DFLs (kg)	SCW (g)	SSW (g)	SR (%)	Disease Incidence (%)				
								[illegible]	[illegible]	[illegible]	[illegible]	Total
Seriff	KAR	30	8,020	80.33 (23.46)	1.87 (10.03)	0.32 (10.03)	20.45 (15.93)	0.03	0.03	0.03	0.00	0.09
	TN	30	5,876	76.27 (10.29)	1.80 (10.04)	0.40 (10.00)	20.33 (10.33)	0.03	0.18	0.03	0.00	0.30
	AP	30	10,070	73.41 (45.45)	2.00 (45.33)	0.40 (10.26)	20.26 (10.15)	0.03	1.03	0.40	0.00	1.03
	Total/Avg.	100	20,000	76.73 (27.30)	1.89 (20.33)	0.40 (10.00)	20.40 (11.05)	0.02	0.40	0.33	0.00	0.77
Control	KAR	50	6,580	66.41 [illegible]	1.74 [illegible]	0.32 [illegible]	18.27 [illegible]	0.10	0.10	0.34	0.00	0.58
	TN	30	5,875	70.17 [illegible]	1.66 [illegible]	0.36 [illegible]	20.23 [illegible]	0.00	0.10	0.03	0.00	0.03
	AP	30	10,078	70.22 (24.29)	2.02 (20.09)	0.40 (10.00)	20.10 (20.77)	0.00	1.03	0.80	0.00	2.40
	Total/Avg.	100	22,540	71.86 (47.70)	1.60 (45.33)	0.37 (10.00)	20.15 (10.27)	0.07	0.14	0.84	0.00	1.15

Recommendation

Based on field results in the laboratory and at farmers' level, "Seriff" is recommended as a general disinfectant for effective sanitation and hygiene in sericulture. The product was commercialized through the MoU with M/s Sree Ramalingeswara Bhargavi Mica Ltd., Kurnool, Andhra Pradesh and licensed for large scale production and commercial supply to the farmers. Seriff was released for the benefit of sericulturists during the Sericulture Farmers' Workshop held on 29-06-2016 at [illegible], inaugurated by Sri. A. Manju, Hon'ble Minister for Sericulture & Animal Husbandry, Govt. of Karnataka.



Continuing Projects/Other activities

Pebrine monitoring in breeders' stock and seed multiplication units

M. Balasaraswathi (PI), [illegible] Mary Josepha and A. R. [illegible]

Objective: To monitor pebrine disease in breeders' stock and seed multiplication units

Both units of Breeder's stocks of CSRTI-Mysuru and Seed multiplication units of CSB at Silkworm Breeding Laboratories (Silkworm & Pomelo lines), P4 BSF-Hassan, P3 BSF-Mysuru and other rearings of CSRTI-Mysuru is monitored regularly for pebrine incidence. The pebrine monitoring team involves scientific personnel from CSRTI-Mysuru and NSSO-Bengaluru, CSTL-Bengaluru and SSPL-Bengaluru and the activities are reviewed once in six months. Infected batches were eliminated systematically following prescribed procedures and the infected lots were rejected accordingly.

Pebrine Monitoring in Mysore Seed Area: Similar to the pebrine monitoring at institutional level, as per the request of the [illegible], Mysore seed area crops were monitored for pebrine incidence by CSRTI, Mysore. The team also involved scientific personnel of [illegible]-Bangalore and [illegible]. The pebrine infected lots were rejected and suitable disease management measures were suggested to the field staff in seed area. Awareness/ demonstration programmes were conducted to educate the field staff/registered seed producers/registered chawki rearers/seed farmers in training programmes, group discussions and workshops on pebrine, its monitoring and management.

POST COCOON EVALUATION UNIT

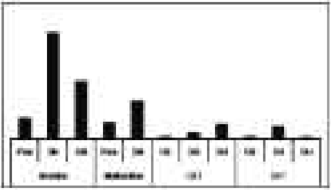
Continuous/Other activities:

Evaluation of newly developed silkworm breeds/hybrids for post cocoon parameters

Y. C. Radhalakshmi and Kamappa

Objective: To evaluate post cocoon parameters of newly developed breeds/hybrids.

[illegible] post cocoon lots of bivoltine and polyvoltine pure races, hybrids and [illegible] from different laboratories were assessed for post cocoon parameters. The reeling performance of each lot was analyzed and the data were communicated to the concerned scientific personnel.



Reeling performance of commercial cocoons under Cocoon Promotion Programme (CPP)

Kamappa and Y. C. Radhalakshmi

Sixty two [illegible] cocoon lots from [illegible] clusters were processed and the reeling performance was ascertained. The data reveals that reelability ranged [illegible], average filament length ([illegible] m), denier ([illegible]), raw silk recovery ([illegible]), raw silk ([illegible]) and neatness ([illegible] points).

State	Lots	SCW (g)	SSW (g)	Shell (%)	Reelability (%)	AFL (m)	NBFL (m)	Ave. denier	RE (%)	RSR (%)	Neatness (p)
KAR	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	CV%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WB	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MAH	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Pooled	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Param-eters	SCW (g)	SPW (g)	Shell (%)	Pupa-tion (%)	AFL (m)	NBFL (m)	Renditta	RI (%)	[illegible] (%)	[illegible]
SCW	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SPW	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Shell	[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pupa	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AFL	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NBFL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Renditta	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000

STRUCTURAL ENGINEERING DIVISION

[illegible]: Design and development of silkworm rearing house models for hot and dry and hot & humid areas of peninsular India (Jan. 2015 to Dec. 2016)

[illegible]

[illegible]

Objectives: To design and develop silkworm rearing house models for non-traditional areas for sericulture which have hot & dry and hot & humid climates

A detailed analysis of climatic conditions in terms of maximum, minimum and average temperatures, rainfall, relative humidity (RH) of non traditional areas (Kerala & Northern Karnataka, Andhra Pradesh and Telangana) of sericulture based on meteorological data obtained from Indian Meteorological Department (IMD) Pune was conducted. The study revealed that climatic conditions of these areas are very much different from that of traditional ones and for the major part of the year, atmospheric temperatures are higher and RH is much low than the optimal conditions and are classified as hot & dry areas. The non-traditional areas of Andhra Pradesh include coastal areas, where high temperatures and high humidity levels prevail for the major part of the year and are classified as hot & humid areas.

For management of optimum environmental conditions inside a silkworm rearing house, the enthalpy (total heat content) of the air comprising of sensible heat of air, sensible heat and latent heat of moisture present in the air have been determined. The overall enthalpy of moist air of [illegible] at 25°C temperature and 75% RH are considered as ideal and optimum environmental conditions for late age silkworms for the production of good quality

Combinations of Temp. and RH for Optimal Environmental Conditions in Silkworm Rearing House [illegible] kJ/kg of moist air				
Temp (°C)	RH to be maintained in rearing house	Sensible heat of air (kJ)	Sensible + Latent heat of moisture in air (kJ)	Enthalpy (Total heat) (kJ)
20	100	[illegible]	[illegible]	[illegible]
21	100	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

cocoons. Based on these calculations, estimates of air at ambient temperatures and relative humidity are matched with the comfort zone i.e., light blue, yellow, pink and red. For the comfort of silkworms and personnel working in the rearing house, the entire air in the rearing houses should be maintained around 65 % by of moisture, which is represented by the yellow zone with ambient air just above normal humidity. It could be observed that with an increase in the air temperature, the sensible heat of air increases, whereas the latent heat of air decreases due to lower moisture availability in the air. It can be inferred that at low temperatures, high RH, at high temperatures, low RH should be maintained in the rearing house to maintain optimal enthalpy (heat) levels. The tari tutaris in hot & dry areas should have arrangements for converting sensible heat of air into latent heat of moisture through forced air nature. No modification to reduce ambient temperature and enhance RH. Similarly, the similarity of moist air at high temperature and high RH (red zone) is very high in coastal areas of Andhra Pradesh, which might be detriment to the silkworm rearing. The rearhouses in hot & humid areas should have adequate ventilation, exhaust air blower, and supplementary arrangements for evacuation of moisture from the silkworm rearing house.

Temperature	Air Enthalpy of moist air (kJ/kg of air)															
	Air RH															
	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85
20	23.04	28.8	34.56	40.32	46.08	51.84	57.6	63.36	69.12	74.88	80.64	86.4	92.16	97.92	103.68	109.44
21	24.36	30.45	36.54	42.63	48.72	54.81	60.9	66.99	73.08	79.17	85.26	91.35	97.44	103.53	109.62	115.71
22	25.74	32.18	38.61	45.05	51.48	57.92	64.35	70.79	77.22	83.66	90.09	96.53	102.96	109.4	115.83	122.27
23	27.18	33.98	40.77	47.57	54.36	61.16	67.95	74.75	81.54	88.34	95.13	101.93	108.72	115.52	122.31	129.11
24	28.68	35.85	43.02	50.19	57.36	64.53	71.7	78.87	86.04	93.21	100.38	107.55	114.72	121.89	129.06	136.23
25	30.25	37.81	45.37	52.93	60.49	68.05	75.61	83.17	90.73	98.29	105.85	113.41	120.97	128.53	136.09	143.65
26	31.89	39.86	47.83	55.8	63.78	71.75	79.72	87.69	95.66	103.63	111.6	119.58	127.55	135.52	143.49	151.46
27	33.61	42.01	50.41	58.81	67.21	75.61	84.01	92.41	100.81	109.21	117.61	126.01	134.41	142.81	151.21	159.61
28	35.41	44.26	53.11	61.96	70.81	79.66	88.51	97.36	106.21	115.06	123.91	132.76	141.61	150.46	159.31	168.16
29	37.29	46.61	55.93	65.25	74.57	83.89	93.21	102.53	111.85	121.17	130.49	139.81	149.13	158.45	167.77	177.09
30	39.25	49.06	58.87	68.68	78.49	88.3	98.11	107.92	117.73	127.54	137.35	147.16	156.97	166.78	176.59	186.4
31	41.3	51.62	61.94	72.26	82.58	92.9	103.22	113.54	123.86	134.18	144.5	154.82	165.14	175.46	185.78	196.1
32	43.44	54.3	65.16	76.02	86.88	97.74	108.6	119.46	130.32	141.18	152.04	162.9	173.76	184.62	195.48	206.34
33	45.68	57.1	68.52	79.94	91.36	102.78	114.2	125.62	137.04	148.46	159.88	171.3	182.72	194.14	205.56	216.98
34	48.03	60.04	72.05	84.06	96.07	108.08	120.09	132.1	144.11	156.12	168.13	180.14	192.15	204.16	216.17	228.18
35	50.49	63.11	75.73	88.35	100.97	113.59	126.21	138.83	151.45	164.07	176.69	189.31	201.93	214.55	227.17	239.79
36	53.07	66.34	79.61	92.88	106.15	119.42	132.69	145.96	159.23	172.5	185.77	199.04	212.31	225.58	238.85	252.12
37	55.78	69.73	83.67	97.62	111.56	125.51	139.46	153.41	167.36	181.31	195.26	209.21	223.16	237.11	251.06	265.01
38	58.63	73.29	87.94	102.6	117.25	131.91	146.57	161.23	175.89	190.55	205.21	219.87	234.53	249.19	263.85	278.51
39	61.62	77.03	92.43	107.84	123.24	138.65	154.05	169.46	184.86	200.27	215.67	231.08	246.48	261.89	277.29	292.7
40	64.77	80.96	97.16	113.35	129.54	145.73	161.93	178.12	194.31	210.5	226.69	242.89	259.08	275.27	291.46	307.66

SEM box limit | Comfortable zone | 90% comfortable zone
95% comfortable zone | Discomfort limit

NSDC Nave Skill Hub: Developing Entrepreneurship for Silk Cocoon Harvesting

Ashok Varma and K. Sivaprasad

Objectives

- Demonstration and practical application of cocoon harvesting for silk cocoons
- Development of custom tooling system/agency for cocoon harvesting

To enhance the personnel productivity and reduce drudgery involved in cocoon harvesting, besides saving expenditure incurred by the farmers, endeavors to develop rural entrepreneurs to provide cocoon harvesting to the farmers on

cocoons during 2015, the present study was taken up with financial support from NABARD/Apex Bank. Ten cocoon harvesters were procured from local manufacturer and distributed to sericulture farmers (2 each in Andhra Pradesh & Tamil Nadu, 6 in Karnataka). Demonstrations and on-farm training imparted to over 100 farmers at CSRTI Mysore and villages. There was lot of enthusiasm among farmers about the virtues of the machine.

Development of New Technologies

PVC stands for late age silkworm rearing

Shoot rearing for late age silkworm rearing has gained popularity among farmers in peninsular India due to distinct advantages. Farmers generally use wooden or metal stands for late age rearing. To save wood used for making rearing stands and to prevent corrosion of metal stands, CSRTI Mysore in collaboration with M/s. Concept Components, Mysuru designed and developed PVC stands on the lines of PVC stands for Chawki rearing developed earlier. The PVC stands for late age rearing are durable, light in weight, termite free, easy to clean and disinfect, easy to erect, dismantle.

Development of a Device for Trapping Silkworm Moth Scales & Chemical Dusts

The scales discharged by silkworm moths in egg production units and bed disinfectants released into ambient air in silkworm rearing houses are health hazardous. To mitigate this problem, design and development of a device for trapping the silkworm moth scales and dusts in rearing houses was undertaken. A prototype device has been developed and fabricated. The initial trials gave encouraging results with trapping 85% air-borne particles and the improvements are under progress.

Coordination/Other activities

Fabrication and supply of machines for mechanization in sericulture

Sericulture equipments and machines (Mulberry cutting preparation machine, High pressure sprayer, High capacity defloxer) were fabricated and supplied on commercial basis to the farmers, stakeholders, Govt. R&D organizations by the units as per the requirement.

SERICULTURAL EXTENSION, ECONOMICS & MANAGEMENT DIVISION

S. Thippaswamy, S. B. Nagaraju, R. Gangadhar, Mahima Santhi, G. S. Geetha, D. Joshy Raj

Ongoing Research Projects

MOE 3618: Study on Drought Management practices in Mulberry Sericulture (Jan. 2014 to Dec. 2016)

A. Mahima Santhi, K. [illegible][1], M. P. [illegible][2], S. [illegible][3], A. R. [illegible][4], S. [illegible][5], M. N. [illegible][6]

[1][illegible], [2][illegible], [3][illegible], [4][illegible], [5][illegible], [6][illegible]

Objectives

- To analyse the different management practices adopted by farmers to overcome the crisis of drought in mulberry cultivation and silkworm rearing.

- To study the adoption level of the scientific drought management techniques propagated by the research institutes and to identify the gaps
- To elicit the preferences and expectations of farmers from research and extension scientists to overcome the crisis effectively

Three hundred farmers (30 farmers/cluster) from different villages ([illegible]) were selected for determining the adoption level of drought management practices. The data was collected through interview schedule followed by pretesting and finalization schedule. Awareness programmes (10) were conducted for the selected farmers to motivate and reduce the adoption gap and adopt drought management technologies. Handbook on "Integrated Drought Management for Mulberry Sericulture" was published for farmers and extension officials in English and translated to Kannada, Telugu and Tamil languages.

Adoption Category	Adoption Index	Farmers (No.)	%
Very low	<20	[illegible]	[illegible]
Low	20-40	104	34.67
Medium	40-60	112	37.33
High	60-80	[illegible]	[illegible]
Very High	>80	2	0.67

[illegible]: A Study on the impact of pest and disease management practices in sericulture among the farmers under cluster promotion programme in South India ([illegible])

[illegible]

[illegible]

Objectives

- To study the impact on the adoption level of management practices for pest and disease of mulberry and silkworm under CPP area
- To study the constraints in adoption of pest and disease management practices

The study was conducted in Andhra Pradesh, Karnataka and Tamil Nadu with a designed schedule for eliciting field data from [illegible] sericulturists spread over [illegible] selected clusters. The incidence of pests and diseases of mulberry and silkworm were recorded and the levels of adoption of control measures were recorded. The major pests of mulberry recorded were mealy bugs, leaf roller, thrips, white fly, other hairy caterpillar, while the important diseases were leaf spot, leaf rust, powdery mildew, root rot and root knot. Uzi fly was the major pest of silkworm, while the important diseases affecting silkworm included grasserie, flacherie and muscardine.

Impact of [illegible] on incidence of Silkworm Diseases & Pest						
Silkworm Dis./Pest	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
Flacherie	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grasserie	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Muscardine	[illegible]	[illegible]	[illegible]	[illegible]		
Uzi fly	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Adoption (%) of control measures for mulberry diseases & Pests												
Control Measures	Andhra Pradesh				Karnataka				Tamil Nadu			
	BA		AA		BA		AA		BA		AA	
	No.	Perc.	No.	Perc.	No.	Perc.	No.	Perc.	No.	Perc.	No.	Perc.
Mechanical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chemical	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biological	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Impact of CSB Package on incidence of Mulberry Diseases (BA: Before adoption; AA: After adoption)						
Mulberry Disease	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
C. moricola	2.20		8.13	4.20		
L. Rt	1.20		8.80	2.20		
P. mildew	2.97	1.50	12.20	2.20	3.40	1.20
[illegible]			13.00	4.20		
Total	20.19	1.80	14.10	0.30	7.80	4.50

Impact of CSB packages on incidence of Mulberry Pests						
Mulberry Pests	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
M. hirsutus	13.36	2.20	15.10	8.30	7.80	1.30
[illegible]					3.75	1.40
D. pulverulentalis	8.81	4.10	6.10	4.00	10.40	3.40
[illegible]	5.50		23.25	3.10	14.20	3.20
[illegible]	8.11	1.20	5.00	1.80		
[illegible]	11.80		2.80	1.50		

Cluster Promotion Programme (CPP)

V. Sivaprasad, A. Mahima Santhi and [illegible]

Cluster Promotion Programme is being implemented by Central Silk Board in collaboration with the Department of Sericulture (DoS) of the respective states in the Southern Zone viz., Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Kerala, Maharashtra and Madhya Pradesh states since 1st April, 2014 in 106 clusters (55 mother & 51 satellite clusters). The main objective of establishing the clusters is to promote bivoltine silk production and production of 5000 MT of bivoltine raw silk by the end of XII plan. Clusters are organised in the respective states based on terrain profile and potentiality. Each cluster is closely monitored by two Cluster Development Facilitators (CDFs) nominated by Central Silk Board and Department of Sericulture.

State	Clusters		
	Mother	Satellite	Total
Karnataka	27	19	46
Tamil Nadu	11	17	28
Andhra Pradesh	11	2	13
Telangana		4	4
Maharashtra	4	3	7
Kerala	2		2
Madhya Pradesh		6	6
Total	55	51	106

Cluster Development Facilitators (CDFs)

Andhra Pradesh		
Cluster	CSB	DoS
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]
Chittoor	Dr. [illegible], Chittoor	Mr. [illegible], Chittoor
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]
Kalyandurg	Dr. [illegible], Kalyandurg	Mr. [illegible], Kalyandurg
Madakasira	Dr. [illegible], Madakasira	Mr. [illegible], Madakasira
Palamaner	Dr. [illegible], Palamaner	Mr. [illegible], Palamaner
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]
[illegible]	Dr. [illegible]	Mr. [illegible]

Barracks		
Quarters	OIC	2nd
Ambalavayal	Shri N. Philomena, Sr. T. ICFRE-KAUFRI	Mr. P. Sunilan Raj, ACO, Ambalavayal
Anand	Mr. Ishwar, SO-C, TSC-Anand	Mr. Dhruv Mishra, SSO, Anand
Ankleshwar	Mr. M. Nagaraja, SO-C, CIFT-Vizag	Mr. V. Venkata Kumar, ACO, CIFT-Vizag
Bamboojuri	Dr. J.K. Laxmanrao Nayaka, Sr.S., CIFT-Cochin	Mr. S. Subramanya, ACO, Bamboojuri
Belgaum	Dr. D.P. Angadi, Sr.S.T., CFR-Belgaum	Mr. S.D. Naik, ACO, Belgaum
Benson	Dr. S. Gangadhar, Sr.S., CIFT-Mysuru	Mr. N. Lingaraja, ACO, Channapatna
Bilaspur	Mr. Bhaskar Rao, TA, RRSU-Kolkata	Mr. M. Venkateshwara Reddy, ACO, Mohanpur
Bijapur	Mr. Shreenivas Kulkarni, TA, RRSU-Bijapur	Mr. Ravi Naik, ACO, Bijapur
Chalakkudy	Mr. K.K. Vinayakumar, Sr.S., RRC-Chalakkudy	Mr. Biju Mathew, ACO, Chalakkudy
Channarayapatna	Dr. M. Mahesh, Sr.S., CFR-Calicut	Mr. S. Basavaraja, SSO, Channarayapatna
Chintamani	Dr. S. Murugesan, SO-C, CIFT-Kolkata	Mr. M. Mallika Gunasekhar, ACO, Mohanpur
Dehradun	Mr. A. Arnulfo, SO-C, TSC-Dehradun	Mr. Ravi Kapil, ACO, Dehradun
Devrukh-II	Dr. Gadpale, Sr.S., CIFT-Vizag	Mr. Sri Lakshmi Kumar, ACO, Kandukuru
Digboi-I	Dr. V.V. Sarkar, Sr.S., CFR-Jorhat	Mr. M. Mallikarjunarao, ACO, Digboi-II
Dimbhurney	Dr. Devananda Reddy, Sr.S., CIFT-Hassan	Smt. S. Nagalakshmi, ACO, Dimbhurney
Dulanga	Mr. Ishwar, SO-C, RRC-Bilaspur	Mr. S. Prakash Babu, ACO, Dulanga
H.D. Kote	Dr. Narayana Hedigatti, Sr.S., RRSU-Hubli	Mr. V. Sudhir, ACO, H.D.Kote
H.D. Kote	Dr. M. Ramulu, Sr.S., CIFT-Vizag	Mr. K. Venkateswarlu, ACO, H.D. Kote
Harohalli	Dr. P. Sudhakara Rao, Sr.S., RRC-Bilaspur	Mr. N. Dharmappa, ACO, Harohalli
Harohalli	Dr. M. Ramakrishna, TA, CIFT-Thrissur	Mr. Sri Harinatha Kumar, ACO, Kandukuru
Hassan	Mr. Shrikant, SO-C, RRC-Bilaspur	Mr. Nadkarni Hari, ACO, Hassan
Hosur	Dr. M. Kumara, Sr.S., RRC-Dehradun	Mr. D. Nagaraj Appa, ACO, Dharwad
Hunsekatti	Mr. Ishwar, SO-C, RRC-Bilaspur	Mr. S. Mallikarjuna, SSO, Hunsekatti
Jharsuguda	Dr. M. Nadia Hasnain, Sr.S., RRC-Bhubaneswar	Mr. B.S. Srinivasan, SSO, Bangarpet
Jorhat-Kaziranga	Mr. Shri Ram Kumar, TA, RRSU-Jorhat-Kaziranga	Mr. D.B. Kalita, ACO, Jorhat-Kaziranga
K.R. Nagar	Dr. B. Somashekhar, Sr.S., CIFT-Vizag	Mr. V. Ramesha, ACO, K.R. Nagar
Kandukuru	Dr. K. Nagaraja, Sr.S., RRSU-Kandukuru	Mr. Sri Harinatha Kumar, ACO, Kandukuru
Kodagu	Dr. Narayana Hedigatti, Sr.S., RRSU-Kodagu	Mr. V. Sudhir, ACO, Kodagu
Kolkata-Salt Lake	Dr. M. Nadia Hasnain, Sr.S., RRC-Kolkata	Mr. M. Kolkata, ACO, Kolkata
Lingampalli	Mr. M. Anil Kumar, TA, RRSU-Lingampalli	Mr. Laxmi Rao, ACO, Lingampalli
Mandhumala	Dr. Anil Raghunath, Sr.S., RRSU-Thiruvananthapuram	Mr. Shaikh Hanif, ACO, Kollam
Mangalore	Dr. B.Tata Bhaskar, Sr.S., CIFT-Bangalore	Mr. D. Balaji, SSO, Mangalore, Gangavati
Mathania	Mr. B.N. Krishnappa, TA, RRSU-Bhatinda	Mr. Nagaraja Bhadar, ACO, Mathania
Mayuri (Hotel)	Dr. P. Sudhakar, SO-C, RRC-Kolkata	Mr. D. Krishnaiah, ACO, Hotel
Mohanpur	Mr. Jaya Shankar Murthy, TA, RRSU-Mohanpur	Mr. M. Venkateshwar Rao, Sr.Hindi
Mokokchung	Mr. Hill Thanang, Sr.S., CIFT-Vijayawada	Mr. M.C. Dhanikonda, ACO, Mokokchung
Nowgong	Mr. D. Nakkeeran, Sr.S., CIFT-Mysuru	Mr. Bijit Kakoti, ACO, Nowgong
Odisha	Mr. A. Arnulfo, SO-C, TSC-Bhubaneswar	Mr. N. Parameshwara Reddy, ACO, Bhubaneswar
P. Venkatapuram	Dr. C. Srikanth Reddy, Sr.S., CIFT-Vizag	Mr. Laxmipathi, ACO, P. Venkatapuram
Pune	Mr. Hari Shankar, Sr.S., CIFT-Mysuru	Mr. M. Ramakrishna, ACO, Pune
Thanakuthiri	Dr. B.S. Annapurnaiah, Sr.S., CIFT-Vizag	Mr. N. Narasimhamurthy, ACO, Thanakuthiri

Quarter	Old	New
Bangalore	Dr. M. Lakshmi, Sr. G, KSRTC, Bangalore	Mr. Chandramouli, IAS, Chief Executive Officer
Mumbai	Mr. P. Vaidyanathan, Sr. G, BEST, Mumbai	Dr. M. Balakrishnan, AAS, Mumbai
Ahmedabad	Dr. Pankaj Patel, Sr. G, TCP, Ahmedabad	Mr. Jayanti Ravi, IAS, Ahmedabad
Kolhapur	Mr. Vinay Kulkarni, Sr. G, KDCC, Kolhapur	Mr. Shivanand, AAS, Kolhapur
Indore	Mr. Atul Bhandarkar, Sr. G, MPEB, Bhopal	Mr. Ajay Tirkey, IAS, Commissioner
DEHRADUN		
Dehradun	Dr. Pradeep Kumar, Sr. G, IDPT, Mussoorie	Mr. Balvir Kumar, AAS, Dehradun
Haridwar	Shri Sanjay, Sr. G, SDO, Haridwar	Ms. Anjali, AAS, Haridwar
HARYANA PRADESH		
Rohtak	Dr. M. Khan, Sr. G, MDU, Rohtak	Mr. Laxman Singh, PCS, Rohtak
Gurgaon	Dr. Pradeep Kalia, Sr. G, TCP, Gurgaon	Mr. Mukul Sahai, IAS, Commissioner
Kurukshetra	Dr. M. Khan, Sr. G, KDCC, Kurukshetra	Mr. Ravinder Singh, PCS, Kurukshetra
Sirsa	Dr. Pradeep Kalia, Sr. G, TCP, Gurgaon	Mr. Sanjiv Sharma (Choudhary), PCS, Sirsa
HIMACHAL PRADESH		
Shimla	Mr. P.V. Vaidyanatha, Sr. G, TCP, Ahmedabad	Mr. S. Shukla, CEO, Shimla
Mandi	Mr. Rahul Singh, Sr. G, TCP, Aurangabad	Mr. P.K. Dhangda, SDO, Mandi
Solan	Mr. P.V. Vaidyanatha, Sr. G, TCP, Ahmedabad	Mr. P.S. Dhiman, CEO, Solan
Una	Mr. Rahul Singh, Sr. G, TCP, Aurangabad	Mr. Parmod Sharma, SDO, Una
Nainital	Mr. Ajit Ranade, Sr. G, IIM, Kashipur	Mr. Rahul, SDO, Nainital
Dehradun	Mr. Ajit Singh, Sr. G, TCP, Aurangabad	Mr. Rahul Singh, SDO, Dehradun
Bengal	Dr. Dilip Gupta, Sr. G, IDC, Belgaum	Mr. Dilip Saxena, IDC, Bengal
Jalore	Mr. Ramprasad, Sr. G, PHC, Jamshedpur	Mr. Anil Pawar, CEO, Mr. Jalore
Nainital	Mr. P.V. Vaidyanatha, Sr. G, TCP, Ahmedabad	Mr. J.V. Pawar, CEO, Nainital
TAMIL NADU		
Nallakkaruthan	Mr. S. Gokul, Sr. G, TCP, Tiruchirappalli	Mr. Gokul, AAS, Nannagaram
Ganghayam	Dr. Thirumalai, Sr. G, IDC, Tiruppur	Mr. S. Jayakumar, IAS, Ganghayam
Madurai	Mr. Hitendra Soni, Sr. G, TCP, Delhi	Mr. Siddharth Jain, IAS, TCP, Puducherry
Salem	Dr. S. Vallinayagam Babu, Sr. G, TCP, Chennai	Mr. A. Ravi, IAS, Salem
Anthiyur	Mr. T. Thirumalaikolundu, Sr. G, TCP, Chennai	Mr. N. Thangaraj, IAS, TCP, Chennai
Nagapattinam	Dr. Jagadeeshwaran, Sr. G, IDC, Chennai	Mr. Shekhar, IAS, TCP, Nagapattinam
Erode	Mr. T. Thirumalai Vasan, Sr. G, TCP, Erode	Mr. Vijay Kumar, IAS, Erode
Dharapuram	Mr. T. Thirumalaikolundu, Sr. G, TCP, Delhi	Mr. N. Thangaraj, IAS, TCP, Dharapuram
Dharmapuram	Dr. P. Ramachandran, Sr. G, TCP, Chennai	Mr. M. Muthusamy, IAS, Dharmapuram
Dharmapuri	Dr. V. Chinnadurai, Sr. G, TCP, Dharmapuri	Mr. S. Jayakumar, IAS, TCP, Dharmapuri
Tirupattur	Dr. N. Shankar Rao, Sr. G, TCP, Delhi	Mr. V. Ravichandran, IAS, TCP, Delhi
Tuticorin	Mr. K. Arulkrishnan, Sr. G, TCP, Chennai	Mr. N. Nagarajan, IAS, Tuticorin
Tiruvannamalai	Mr. S. Muthukumaran, Sr. G, TCP, Ahmedabad	Mr. C. Thangavelu, IAS, Tiruvannamalai
Tiruppur	Dr. Jagadeeshwaran, Sr. G, IDC, Chennai	Mr. Shekhar, IAS, TCP, Nagapattinam
Tuticorin	Mr. S. Ravikumar, Sr. G, TCP, Tiruchirappalli	Mr. A. Nagarajan, IAS, Tuticorin

Cluster	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
TELANGANA		
[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]

[illegible]			
State	Raw Silk Production (MT)		Achievement (%)
	Target	Achieved	
Karnataka	[illegible]	[illegible]	[illegible]
Andhra Pradesh	[illegible]	[illegible]	[illegible]
Telangana	[illegible]	[illegible]	[illegible]
Tamil Nadu	[illegible]	[illegible]	[illegible]
Kerala	[illegible]	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]	[illegible]
Total	[illegible]	2773.08	111.59

South Zone clusters achieved record bivoltine raw silk production of 2773.08MT (111.59% achievement) [illegible]

Raw Silk Production in South Zone Clusters			
Year	Target (MT)	Prod. (MT)	Achieved (%)
2013-14	[illegible]	[illegible]	[illegible]
2014-15	[illegible]	[illegible]	[illegible]
2015-16	[illegible]	2773.08	111.59

Performance of Clusters

The performance of each cluster was [illegible] [illegible] [illegible] [illegible]

Performance of Clusters											
Cluster	[illegible]			[illegible]	[illegible]				[illegible]	[illegible]
	Target [illegible]	[illegible]	Ach.		Target	Ach.	[illegible]	[illegible]		
Andhra Pradesh										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Total/Avg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Karnataka										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]			[illegible]	[illegible]				[illegible]	[illegible]
	Target [illegible]	[illegible]	Ach.	[illegible]	Target	Ach.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Total/Avg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total/Avg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Madhya Pradesh										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total/Avg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Maharashtra										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]			[illegible]	[illegible]					
	Target (Rs. Lakh)	Drive (Rs. Lakh)	Ach.	Ach. (%)	Target	Ach.	Ach. (%)	Ach. (Rs. Lakh)	[illegible]	[illegible]
[illegible]	0.40	1.00	0.1000	25.00	0.50	0.13	25.00	0.13	[illegible]	[illegible]
[illegible]	1.70	0.50	0.1000	29.41	1.70	0.50	29.41	0.50	[illegible]	[illegible]
[illegible]	1.40	0.50	0.1000	35.71	1.40	0.50	35.71	0.50	[illegible]	[illegible]
[illegible]	1.00	0.50	0.1000	50.00	1.00	0.50	50.00	0.50	[illegible]	[illegible]
[illegible]	1.40	1.00	0.1000	71.43	1.40	1.00	71.43	1.00	[illegible]	[illegible]
[illegible]	1.00	0.50	0.1000	50.00	1.00	0.50	50.00	0.50	[illegible]	[illegible]
[illegible]	10.40	4.00	0.4000	38.46	6.30	2.63	41.75	2.63	[illegible]	[illegible]
[illegible]										
[illegible]	1.00	1.00	0.1000	100.00	1.00	1.00	100.00	1.00	[illegible]	[illegible]
[illegible]	0.00	1.00	0.1000	0.00	0.00	0.00	0.00	0.00	[illegible]	[illegible]
[illegible]	1.00	1.00	0.1000	100.00	1.00	1.00	100.00	1.00	[illegible]	[illegible]
[illegible]	0.00	1.00	0.1000	0.00	0.00	0.00	0.00	0

Cluster	DFL Distribution			Total BV dfls (%)	Raw Silk Production (MT)				[illegible]	[illegible]
	Target (lakhs)	Cross (lakh)	Ach.		Target	Ach.	Ach. (%)	[illegible]		
Telangana										
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sub-total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In order to increase the silk production in the clusters, more emphasis was given on horizontal expansion and 7980 farmers were motivated to plant improved mulberry varieties to the extent of [illegible] acres in the 206 clusters. During the year, various 877 EOPs (group discussion, awareness, enlightenment, & training programmes, exposure visits, exhibitions) were conducted and [illegible] farmers were sensitized on new technologies in the clusters. These programmes helped in changing the attitude of farmers and improved the technology adoption level for improved productivity in cluster silk production.

Cluster	Horizontal Expansion		EOPs	
	Farmers (Nos)	Area (acres)	Events (Nos)	Farmers sensitized (Nos)
Karnataka	[illegible]	[illegible]	[illegible]	[illegible]
Andhra Pradesh	873	[illegible]	[illegible]	[illegible]
Telangana	271	[illegible]	34	[illegible]
Tamil Nadu	[illegible]	[illegible]	[illegible]	[illegible]
Kerala	[illegible]	[illegible]	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]	[illegible]	[illegible]
Total	7980	[illegible]	877	[illegible]

The clusters in the south zone are coordinated and monitored by Director, CSRTI-Mysuru and the nodal officers (RSRSs) for effective implementation of CPP. The cluster/state-wise monthly progress is collected from the CDPs and analysed.

A total of [illegible] lakh dfls were distributed to the farmers against the target of [illegible] lakh ([illegible]% achievement) and the brushing capacity of farmers increased by [illegible]% due to continuous and effective monitoring. A total of [illegible] MT bivoltine cocoons were produced by harvesting [illegible] lakh dfls with an average cocoon yield of [illegible] kg/100 dfls and the average cocoon yield per 100 dfls increased [illegible].

Performance of South Zone Clusters - State-wise Raw Silk Production [illegible]									
Cluster	Target (lakhs)	No. of [illegible]	DFLs (lakh)	Achievement (%)	Increase (%) over [illegible]	Average Cocoon Yield/100 dfls (kg)			
						[illegible]	[illegible]	[illegible]	[illegible]
Karnataka	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Andhra Pradesh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Telangana	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]
Tamil Nadu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kerala	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Institute Village Linkage Programme (Seri Model Village)

Objective: Transfer of technology through Institute / Village Linkage Programme (IVLP) for sustainable/stable bivoltine cocoon production

IVLP was implemented in eleven clusters through CSRTI Mysore and its nested units [illegible] in the states of Karnataka (4), Andhra Pradesh (2), Tamil Nadu (2), Maharashtra (2) and Madhya Pradesh (1) with [illegible] identified farmers covering nearly [illegible] acres of mulberry plantation. Based on bench mark survey of identified farmers before implementation, existing status of technology adoption and technology need in mulberry cultivation and silkworm rearing were identified for implementation.

State	District	Scientist
Karnataka	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	Chamarajanagara	[illegible]
Tamil Nadu	[illegible]	[illegible]
	[illegible]	[illegible]
Andhra Pradesh	[illegible]	[illegible]
	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]
	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]

Further, awareness programmes on various technologies were conducted through demonstrations and ECPs. A total [illegible] lakh dfls of bivoltine hybrids were reared with an average yield of [illegible] kg/100 dfls and improvement recorded in cocoon yield against the bench mark was [illegible]%. Through this programme, the crossbreed rearing farmers were encouraged to rear bivoltine hybrids and a quantity of [illegible] MT of bivoltine raw silk production was achieved through IVLP.

Technologies implemented under IVLP	
Mulberry Cultivation	Silkworm Rearing
Methods for maintaining soil health	Disinfection and hygiene maintenance in silkworm rearing house
Soil fertility management	[illegible]
Popularisation of improved mulberry varieties	Application of bed disinfectants for control of silkworm disease
Management of mulberry pests	Mounting and spinning [illegible] for production of quality cocoons
Application of [illegible] to correct nutrient deficiency	Control of uzi fly through integrated approach

State	DFLs Brushing (No.)		Cocoon Yield (kg/100 dfls)			Raw silk production (MT)
	Target	Achievement	Benchmark	Avg. Yield/100 dfls (kg)	Improvement (%)	
Karnataka	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tamil Nadu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Andhra Pradesh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Maharashtra	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Madhya Pradesh	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Performance of RSP Sections							
State	DFLs Brushing (lakh)		Cocoon Yield/100 DFLs (kg)			Raw Silk Production (MT)	
	Target	Achieved	Benchmark	Avg. Yield/100 DFLs (kg)	Improvement (%)	Annual Target	Achieved
Karnataka	128700	150900	55.00	62.70	8.35	11.00	14.20
Tamil Nadu	80000	74600	60.00	61.30	8.6	8.00	7.27
Andhra Pradesh	60000	31600	60.00	66.13	10.22	4.00	4.78
Ch. Nagar	7000					0.30	0.23
[illegible]	70000	107511	55.00	74.20	22.8	3.70	14.47
[illegible]	30000	148900	55.00	74.50	22.3	5.67	17.22
[illegible]	40000	40120	65.00	68.00	18.0	5.00	4.30
[illegible]	80000	46500	65.00	71.27	45.0	3.00	3.28
[illegible]	20000	24200	60.00	65.70	7.8	4.80	3.20
[illegible]	60450	25000	55.00	62.55	9.3	3.75	7.44
[illegible]	70000	44000	60.00	47.18		5.40	5.08
Total	707000	610000	60.13	66.00	10.00	65.80	90.02

Extension and Other activities

Extension Communication Programmes (ECP)

Extension Communication Programmes (ECP) were conducted in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Maharashtra and Madhya Pradesh. Farmers were sensitized on newly developed technologies through ECPs and major topics covered were popularization of new mulberry varieties, soil testing & its importance in mulberry cultivation, popularization of new mulberry, IPM practices for mulberry, IPM, integrated disease management practices, disinfection & hygiene in silkworm rearing, popularization of new silkworm hybrids, [illegible].

ECP	Events	Farmers benefited
[illegible]	160	10442
[illegible]	100	10800
Technology Demonstration	20	300
Exhibitions	1	1500
[illegible]	22	660
[illegible]	38	4790
[illegible]	22	270
Total	300	30940

Visitors' Service

CSRTI-Mysuru being the premier research institute draws the attention of sericulture farmers across the country. Every year sericulture farmers, students from all over the country and foreign nationals visit. 2011 farmers, 3138 students and 332 foreign nationals visited the institute for an update on the latest innovations in sericulture.

State	Farmers	Students	Officials	Total
Karnataka	1034	899	146	2080
Kerala	14	152	45	211
Tamil Nadu	133	187	82	302
Maharashtra	21	32	3	33
Madhya Pradesh	18	1	3	22
Andhra Pradesh	61		10	61
Telangana	23		3	26
West Bengal	61		6	67
Jammu & Kashmir		2	3	3
Uttarakhand	11		1	11
Total	2011	3138	332	[illegible]

Sericulture Farmers' Workshops

CSRTI-Mysuru organized a Sericulture Farmers Workshop on "Sericulture for sustainable income - Bivoltine for Quality Silk" on 12th March, 2016 at Shri [illegible] Bhavana, [illegible], [illegible] Taluk, Haveri District in coordination with Department of Sericulture, Govt. of Karnataka. Around 1,000 farmers across northern and southern districts of Karnataka besides scientists and personnel from CSRTI-Mysuru & Nested Units and DoS-K attended the programme. The thrust of workshop was to create awareness on new sericulture technologies for boosting production and encourage farmers. A sericulture exhibition was also organized wherein new technologies/products/machines/equipments/publications developed by the Institute were exhibited for the benefit of farmers/officials. [illegible] (CSB-Bengaluru), [illegible], [illegible], CSRTI-Mysuru [illegible] and Private agencies also displayed their exhibits.

[illegible]
• [illegible] - New improved [illegible] ([illegible]) [illegible] producing international grade silk [illegible] industry. Suitable for all regions and seasons with [illegible] and [illegible] yield [illegible] kg/100 dfls)
• [illegible]
• [illegible] integrated [illegible] management, management of [illegible] through the [illegible]
• [illegible] Chitradurga [illegible]
[illegible]

The workshop also witnessed awarding of progressive sericulture farmers (18 women & [illegible] men) for their achievements across sericulture under different categories sponsored by DoS-Govt. of Karnataka. The workshop also witnessed the release of technical literature, [illegible] and [illegible] for the benefit of sericulturists.

Activities of RECs attached to Seed Division, CSRTI-Mysuru

The performance of RECs in Karnataka, Maharashtra and Madhya Pradesh and attached to Seed Division, CSRTI-Mysuru with regard to the supply of seed cuttings/saplings of improved mulberry varieties for expansion of mulberry, [illegible] performance of [illegible] and extension communication programmes conducted for creating awareness on new technologies is summarised below:

Centre	Area (acres)	Farmers (nos)	DFLs (nos)	Avg. yield/100 dfls (kg)	[illegible]	[illegible]	[illegible]	[illegible]	Others
REC [illegible]	70	884	1085.20	58.45	22	3	25		
REC [illegible]	85	140	80440	55.14	1				
REC [illegible]	435	518	150100	55.58	14	8	9	18	
REC [illegible]	376	707	130000	66.63	7	2		100	
REC [illegible]	18.50	280	40000	54.73	12	1			
REC [illegible]	470	380	110000	65.25	17		25		
REC [illegible]	172	485	114000	54.50	8	1			2
REC [illegible]	804	1300	101200	60.00	2				
REC [illegible]	380	600	152000	60.73	7	11	1	18	2
REC [illegible]	80	100	78820	60.00	1	4			

CAPACITY BUILDING & TRAINING

S. S. Sharma (up to 30-06-2016), R. S. Katiyar, A.S. Sinha and C. Paramasivam

Several officials of the state departments of sericulture, students, researchers and practitioners including cocoon producers and chawki rearers were trained under different programmes (TOP: Technology Orientation Programme; FST: Farmers Skill Training; NBT: Need Based Training; CC: Certificate Course; IMT: [illegible] Training; PMT: [illegible] Training). Further, certain trainees from Egypt, Thailand, Philippines, Bangladesh and Uganda were also trained under ITEC. Of the 2172 persons trained during the year by CSRTI-Mysuru, 46.80% were trained at main Institute and the rest at RSRSs and its nested units.

Prog	Course	Number trained
[illegible]	Chawki Training	10
	Mulberry Sericulture Technology	10
	Silk Agri Business Training	10
	Mechanization in Sericulture	3
	[illegible]	2
	Integrated Pest Management	3
	Mulberry cultivation & Organic Farming	3
	Orientation Programme	2
[illegible]	Chawki Training	20
	Silk agri-business training	20
	Mulberry Cultivation & Organic farming	3
	Integrated Pest & Disease management	3
[illegible]	Training in Sericulture	28
	Orientation Training	20
	[illegible]	22
	Mechanization in Sericulture	4
	Orientation for [illegible] Students	3
	Foundation Training	8
[illegible]	Chawki Training	8
	[illegible]	8
	Intensive Training in Mulberry Sericulture	80
	[illegible] Programme	8
	[illegible]	30
	[illegible] Training	29

Prog	Location	No. of Prog	State						Total
			KA	AP	TS	TN	WB	OT	
TOP	CSRTI-Mysuru	10	140	30		35	90		295
FST	CSRTI-Mysuru	4	180	1	70	44	74		369
FOP	RSRS & REC	3	80	60		35			175
NBT	RSRS & REC	9	333	170		300	270	30	1103
[illegible]	CSRTI-Mysuru	[illegible]						35	35
[illegible]	CSRTI-Mysuru	10	80	1			1	65	98
		8	80		1	3	8	111	203
CC		5	8						8
IMT		3	3		3	6			12
PMT		3	6	4		1		3	14
		Total	960	280	74	433	443	234	2172
		%	44	13	3	20	18	11	

KA: Karnataka; AP: Andhra Pradesh; TS: Telangana; TN: Tamil Nadu; WB: West Bengal; OT: Others (incl. international)

Persons trained at Nested Units of CSRTI-Mysuru			
Unit	FST	TOP	Total
RSRS-Kodathi	200	80	280
RSRS-Chamarajanagar	70	10	80
RSRS-Anantapur	170	40	210
RSRS-Salem	500	40	540
REC-[illegible]	40		40
REC-[illegible]	60		60
REC-[illegible]	40		40
REC-[illegible]	30		30
REC-[illegible]	30		30
Total	884	170	1054

International Training Programmes: International Technical & Economic Cooperation (ITEC) programme sponsored by the Ministry of External Affairs, GoI with fourteen participants from Egypt, Uganda, Bangladesh, Philippines and Thailand. Another program sponsored by [illegible] was conducted for [illegible] from Egypt in the field of [illegible] Physiology & [illegible] Technology for [illegible] days.

Need Based Training Programmes: These programmes are tailor made to suit the specific requirements of the State governments, [illegible], [illegible] youth, personnel from NGOs, universities etc. particularly at [illegible].

Name	Organization	Country
Md. Mahbubur Rahman	[illegible]	Bangladesh
[illegible]	[illegible]	
Mrs. Dr. [illegible]	Department of Horticulture, Plant Protection Research Institute, [illegible], Dokki	Egypt
Mrs. Dr. [illegible]		
[illegible]	The [illegible] University, [illegible] Ministry of Agriculture & [illegible], Bangkok	Thailand
[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]	Horticulture Research & [illegible] Institute, [illegible] State University, [illegible]	Philippines
[illegible]		
[illegible]		
[illegible]	[illegible] District Local Government, [illegible]	Uganda
[illegible]	[illegible] District Local Government, [illegible]	
Dr. [illegible]	[illegible], Plant Protection Research Institute, Dokki, Giza, Egypt	Egypt
Dr. [illegible]	Senior Researcher, Plant Protection Research Institute, Dokki, Giza, Egypt	

	Programme	[illegible]					Total
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	Training in Horticulture		1				1
	Orientation Training	1					1
	[illegible]	3					3
	[illegible]				1		1
	Orientation for [illegible] students					11	11
	Foundation Training	28			1	92	[illegible]
	Total	[illegible]	1		1	[illegible]	[illegible]
[illegible]	[illegible] Training				16	7	[illegible]
	Production of Bio Control Agents			1			1
	Intensive Training in [illegible]	6					6
	[illegible] Programme				12	[illegible]	127
	Commercial [illegible] Training	37		2		4	[illegible]
	[illegible] Training	4			1		5
	Integrated Pest & Disease Management				12		12
	Total	67		3	[illegible]	[illegible]	[illegible]

[illegible] Rearing: The Institute also conducts chawki and late age [illegible] rearings for skill development as a part of training programmes. A total of [illegible] dfls were chawki reared and distributed to [illegible] and late age [illegible] rearings were conducted in [illegible] batches ([illegible] dfls) and an average cocoon yield of [illegible] kg/100 dfls was recorded.

[illegible] Training - Training Statistics						
Period	dfls (Nos)	[illegible]	[illegible]	[illegible]	[illegible] (%)	Yield (100 dfls / kg)
Apr-May [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jun-Jul [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jul-Aug [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sep-Oct [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oct-Nov [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dec-Jan [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jan-Feb [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total / Avg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] - Training Statistics			
Month	dfls Reared (Nos)	[illegible] (Nos)	Yield (100 dfls / kg)
Apr-[illegible]	[illegible]	[illegible]	[illegible]
May-[illegible]	[illegible]	[illegible]	[illegible]
Jun-[illegible]	[illegible]	[illegible]	[illegible]
Jul-[illegible]	[illegible]	[illegible]	[illegible]
Aug-[illegible]	[illegible]	[illegible]	[illegible]
Sep-[illegible]	[illegible]	[illegible]	[illegible]
Oct-[illegible]	[illegible]	[illegible]	[illegible]
Nov-[illegible]	[illegible]	[illegible]	[illegible]
Dec-[illegible]	[illegible]	[illegible]	[illegible]
Jan-[illegible]	[illegible]	[illegible]	[illegible]
Feb-[illegible]	[illegible]	[illegible]	[illegible]
Mar-[illegible]	[illegible]	[illegible]	[illegible]
Total / Avg.	[illegible]	[illegible]	[illegible]

Feedback & Assessment

Post-training feedback is collected after each of the training programmes and the responses in respect of four important factors are recorded. The details of the responses and variance over the benchmark value ([illegible]) are recorded. The average values of responses ranged from [illegible] (training course coverage) to [illegible] (training facility index) and the variance in training management index (TMI) varied from [illegible] (structured programmes) to [illegible] (international training programmes).

Feedback Analysis						
Course	Training [illegible] index (A)	Training efficiency index (B)	Training facilities index (C)	Course Coverage index (D)	TMI [illegible]	Variance
International Training	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Structured	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Technology Orientation	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Skill Based Training	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Knowledge Improvement Analysis			
Course	Pre-Test Score (%)	Post-Test Score (%)	Improvement (%)
Structured	[illegible]	[illegible]	[illegible]
Technology Orientation	[illegible]	[illegible]	[illegible]
Skill Based Training	[illegible]	[illegible]	[illegible]

The knowledge improvement among the participants is analysed based on pre- and post-training responses to structured questionnaires and ranged from [illegible] ([illegible] programmes) to [illegible] ([illegible]).

BIOINFORMATICS CENTER (Sub-DIC under BTISNET)

V. Girijaprasad (Coordinator), [illegible] (Co-Coordinator) and [illegible]

The Bioinformatics Centre at CSRTI-Mysuru was established in November, 1999 as Sub-DIC under BTISNET, DBT, GoI, to provide access to scientists, researchers, teachers and students involved in sericulture, seri-biotechnology and seri-bioinformatics in India, thus contributing significantly for the HRD in the field of Biotechnology and Bioinformatics with computer infrastructure facilities. [illegible] University, [illegible] Dissertation : Ms. K. Lakshmi Prasanna (Identification of transcription factors in mulberry, Morus notabilis), Ms. S. [illegible] (Identification of G-protein coupled receptors and Opsosin signaling pathway in mulberry, Morus notabilis) works were carried out. One each of Studentship & Traineeship sponsored by DBT was provided. A workshop on Bioinformatics & its applications ([illegible] 2016) was organized for scientists from CSRTI-Mysuru & its nested units and [illegible] persons have been trained in Bioinformatics [illegible].

Database & Software (Developed/maintained)	
Database	Utility
[illegible]	An integrated genetic database for silkworm
[illegible]	Silkworm specific transcription factor database ([illegible] protein sequences)
Mulberry Genome Database	Marker data on mulberry genome (DNA fingerprints & molecular IDs, binary matrix similarity & dissimilarity indices, marker based clustering etc.)
[illegible]	Information on traits of soils in South India including physico-chemical properties, micro-nutrient status etc.
[illegible]	Predicting values of [illegible] in silkworm, Bombyx mori
[illegible]	Mulberry microsatellite marker database (M. notabilis) associated with tools for primer design ([illegible]) and mapping of markers on chromosomes ([illegible]) integrated with [illegible]
[illegible]	Software for drawing [illegible]
[illegible]	Construction of growth indices to [illegible] silkworm, Bombyx mori in relation to nutritional applications

Regional Sericultural Research Stations (RSRS)

Regional Sericultural Research Stations (RSRS) are established to address the regional problems of sericulturists through research & extension support of sericulture technologies in varied agro-climatic regions. The main objective includes undertaking on station trials & demonstration of new sericulture technologies evolved by the main institute. The proven technologies are transferred to the stakeholders through Research Extension Centres (REC) and sub-units.

RSRS-KODATHI

RSRS & Sub-units
RSRS-Kodathi
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]
REC-[illegible]

Staff	
In-charge Officer	[illegible]
[illegible]	
Scientists	[illegible]
Technical Staff	22
Administrative Staff	8

Farm/Seed Units		
Unit	Area (Acres)	Mulberry Acreage
RSRS-Kodathi	[illegible]	[illegible]
REC-[illegible]	7.00	1.07
REC-[illegible]	7.00	1.41
REC-[illegible]	[illegible]	[illegible]
REC-[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]

Research Projects

[illegible]: Impact of CPP on sericulture development in North Karnataka ([illegible] 2018 to Aug. 2019)

[illegible]

[illegible]

Objectives:

- To study the impact of CPP on technology adoption and productivity improvement in sericulture in North Karnataka
- To study the impact of CPP on socio-economic development of sericulturists in North Karnataka
- To study the technological efficiency as impact of CPP

Based on literature survey and discussions with the subject experts as per the milestones, questionnaire for data collection has been finalized.

Collaborative Research Projects/ Programmes

RSRS-Kodathi is involved in collection of data on the following collaborative projects with the main institute and other RSRSs.

- [illegible]: Studies on pest status and [illegible] management of thrips [illegible] in mulberry in Tamil Nadu and Karnataka
- [illegible]: Survey and surveillance of major pests and their natural enemies in mulberry ecosystem
- [illegible]: Study on Drought Management practices in Mulberry Sericulture
- [illegible]: Silkworm Disease Monitoring of Seed and Commercial Crop Rearing of South Indian States
- [illegible]: A study on the impact of Pest and Disease Management practices in sericulture among the farmers under Cluster Promotion Programme in South India
- [illegible]: Popularization of Nematode – A bio-pesticide for management of root knot disease in mulberry
- [illegible]: All India Coordinated Experiment for Mulberry (Phase II)

Cluster Promotion Programme (CPP): [illegible] sericulture technologies were disseminated in [illegible] clusters across Karnataka. A total of [illegible] lakh bivoltine hybrid dfls with [illegible]% achievement against the target [illegible] lakh dfls were brushed with an average yield of [illegible] kg/100 dfls and [illegible] MT bivoltine cocoons was produced against the target of [illegible] MT.

On-Station Trials

Evaluation of NPV tolerant bivoltine hybrids

[illegible]

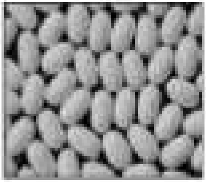
Objective: To evaluate the NPV tolerant bivoltine hybrids

Identified [illegible] NPV tolerant bivoltine hybrids [illegible] were reared along with control during [illegible] 2016. [illegible] recorded higher survival ([illegible]) with lower incidence of NPV ([illegible]) as compared to control, while [illegible] recorded higher filament length ([illegible]) as compared to control ([illegible]).

Hybrid	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Control	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Field testing of [illegible] developed [illegible] hybrids [illegible] with [illegible] farmers [illegible] with an average yield/100 dfls recorded being [illegible] kg [illegible], [illegible] kg [illegible], [illegible] kg [illegible], [illegible] kg [illegible] and [illegible] kg for [illegible].



Unit	Hybrid	dfls	Farmers	Yield/100 dfls (kg)	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total	[illegible]	[illegible]		

Extension Communication Programmes: Various kinds of ECPs ([illegible] farmers benefited with [illegible] programmes) were conducted for the transfer of technologies developed by the main institute and [illegible].

Extension Communication Programme (Values represent farmers participated & figures in parenthesis indicate number of events)							
Centre	[illegible]	Group Disc.	[illegible]	Field Day	[illegible] Prog.	[illegible]	Study Tour
[illegible]		[illegible]		[illegible]			[illegible]
[illegible]		[illegible]		[illegible]			
[illegible]	[illegible]	[illegible]		[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]				[illegible]
[illegible]		[illegible]			[illegible]		
[illegible]		[illegible]	[illegible]				
[illegible]		[illegible]		[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]		[illegible]	[illegible]	[illegible]			
[illegible]		[illegible]	[illegible]	[illegible]			
[illegible]		[illegible]	[illegible]	[illegible]			
[illegible]		[illegible]					
[illegible]		[illegible]				[illegible]	
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Popularization of Improved Mulberry Varieties: A total of [illegible] acres of new mulberry plantation was taken up by [illegible] farmers with V1 variety and new varieties ([illegible]) were popularized among [illegible] farmers ([illegible] acres).

Unit	Farmers (Nos)	V1 (Acres)	Farmers (Nos)	New Varieties (Acres)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
Total	[illegible]	[illegible]	[illegible]	[illegible]

Production of Biological Control Agents: A total of [illegible] of *Nesolynx thymus* were produced and supplied to [illegible] for the management of uzi fly.

Establishment of [illegible]: Affordable Micro Irrigation Technology ([illegible] Technology) and drip irrigation system was installed at [illegible] to irrigate [illegible] situation.

Seed Rearings: A total quantity of [illegible] dfls were reared and generated [illegible] lakh cocoons ([illegible] kg) with an average yield of [illegible] kg/100 dfls at [illegible] and its linked units viz. [illegible], REC-Chitradurga & REC SU-Koppal. Further, a total of [illegible] multi×bi hybrid dfls were chawki reared and distributed to [illegible] farmers through REC Chitradurga & REC SU Koppal.

Farm maintenance: A total of [illegible] acres of mulberry garden was maintained by RSRS and farm based nested units and produced [illegible] MT mulberry leaf for farm rearing. Farm waste was recycled and [illegible] MT compost and [illegible] MT vermicompost were produced and utilized for mulberry gardens.

Capacity Building Training Programme (CBT): A total of [illegible] farmers Skill Training Programmes (STP) were conducted by RSRS and its nested units in respective clusters and a total of [illegible] farmers were trained on different technologies. A total of [illegible] officials/students were trained under Technology Orientation Programme (TOP) in three programmes conducted by REC-Chitradurga & REC-Madivala.

Visitors service: A total of [illegible] agricultural farmers, students and officials visited the RSRS-Kodathi, REC-Chitradurga and REC Madivala.

Unit	STP		TOP	
	Prog.	Farmers	Prog.	Trainees
RSRS-Kodathi	5	[illegible]		
REC-Chintamani	1	[illegible]		
REC-Chitradurga	[illegible]	[illegible]	1	[illegible]
REC-Madivala	3	[illegible]	1	[illegible]
REC SU-[illegible]	1	[illegible]		
REC SU-Koppal	1	[illegible]		
REC SU-[illegible]	1	[illegible]		
REC SU-[illegible]	1	[illegible]		
Total	[illegible]	[illegible]	[illegible]	[illegible]

RSRS-CHAMARAJANAGAR

REC & Sub Unit
[illegible]

Staff	
In-charge Officer	Dr. [illegible]
Scientists	3
Technical Staff	8
Administrative staff	4

Farm Based Units		
Unit	Total Area (Acres)	Mulberry (Acres)
RSRS-Chamarajanagar	[illegible]	[illegible]
SU-[illegible]	[illegible]	[illegible]

Ongoing Research Projects:

[illegible]: Development of farm-based units as model for income augmentation ([illegible] Institutional Project with [illegible], Ranchi; [illegible] to [illegible])

[illegible] (Project Coordinator), [illegible]

[illegible], Ranchi; RSRS Chamarajanagar

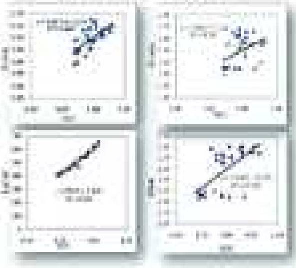
Objectives:

- To work out the additional income generation out of lac production and its economics in relation to mulberry leaf production.
- [illegible]
- To generate employment for rural people and improve their livelihood.
- To study the pest & disease incidence, [illegible] studies in mulberry [illegible]

The mulberry plantation with widely spaced mulberry trees (S13 variety; 8' × 8' spacing @ 680 plants/acre) facilitates intercropping with lac host plant (Flemingia semialata) and is being currently explored in changing usage of Flemingia during the last two years (2014-2016). Affordable micro irrigation technology (AMIT) was utilized for irrigating mulberry and lac host plants and the soil moisture was maintained nearer to field capacity resulting in >90% survival, higher total shoot length, no. of leaves, LA (cm^2), LAI (m^2) and leaf yield. However, no significant difference was noticed, except in LAI (%), indicates that lac host plants do not compete with mulberry for nutrients and water. Mineral composition of mulberry leaf with respect to nitrogen (4.2%), phosphorus (0.8%) and potassium (1.22%) have shown higher levels over single mulberry plantation. Soil organic carbon, nitrogen content, microbial biomass carbon and nitrogen, and dehydrogenase enzyme activity significantly increased over the control, whereas soil pH reduced significantly. Regression analysis of pooled data indicates that the SQI is positively and significantly associated with respect to microbial biomass carbon and nitrogen, and dehydrogenase activity by showing high R^2 values. Bioassay showed the improvement in cocoon production (57 kg/acre/year) with higher returns. About 150 kg stick lac was harvested and resulted in an additional income of Rs.46750/acre/year). The land equivalent ratio (LER) recorded was close to 1.78 indicating complementarity nature of two crops, while supporting lac production. The cost benefit ratio was high in seri-lac culture (1:3.04) than mulberry (1:1.76). The present study suggests that Seri-lac culture model could be vital for income augmentation for rural folk.

Soil Characteristics in Seri-Lac Plantation			
Parameters	Mulberry with Lac	Mulberry	t-value
pH	7.50	7.57	**
Organic carbon content (%)	0.62	0.54	**
Available nitrogen (kg/ha)	318	265	**
Microbial biomass carbon (Bmc x 100 g per 1 soil)	2.07	1.88	**
Microbial biomass nitrogen (Bmn x 100 g per 1 soil)	1.48	1.08	**
Dehydrogenase enzyme activity (mg TPF/g/24h)	1.72	1.30	**
Available soil moisture (%)	18.6	20.30	**

Correlation of SQI - Seri-Lac Plantation



Economic viability of Seri-Lac culture farming model				
Parameters	SERI-LAC CROP		SOLE MULBERRY CROP	
	Mulberry Production	Lac Production	Mulberry Production	Lac Production
A) Expenditure (Rs)				
FYM Rs 2/MT	3000	3000	3000	3000
Ammonium sulphate 20 kg		330	330	330
Single super phosphate 20 kg	150		150	
MOP 10kg	180		180	
Labor charges	3000	3000	3000	3000
Production materials		1200		1200
Miscellaneous charges	1500	4500	4500	1500
Rearing/ brood culture cost		4000		4000

Rearing cost	60000		60000	
Sub-total	[illegible]	11250	[illegible]	[illegible]
Leaf Produced (Kg/acre/year)	[illegible]		[illegible]	
No. of dfls brushed	[illegible]		[illegible]	
ER/Cocoons (%)				
Cocoon produced	[illegible]		[illegible]	
Amount realized @ Rs.[illegible]/kg /annum	[illegible]		[illegible]	
Leaf production (Qtls/ha)		[illegible]		[illegible]
Amount realized @ Rs.[illegible]/kg /annum		[illegible]		[illegible]
Profit B-A	[illegible]	[illegible]	[illegible]	[illegible]
Net profit	[illegible]		[illegible]	[illegible]
BC Ratio	[illegible]		[illegible]	

PPR 3593: Determination of Yield Potential of Newly developed Bivoltine Hybrids under Tree Type Mulberry Plantation with Protective Irrigation (Jan. 2013-Dec.2015)

[illegible]

Objective: To determine the productivity of newly developed silkworm hybrids under tree mulberry cultivation and protective irrigation

New silkworm hybrids ([illegible]) were evaluated with two control hybrids ([illegible]) by feeding [illegible] tree mulberry [illegible]. The data indicates that hybrids recorded significant improvement over the control hybrids for commercial characters. [illegible] farmers with tree mulberry plantation were identified ([illegible] villages) for experimental testing with the test hybrids.

Hybrid	Yield/10000 larvae		Cocoon wt. (g)	Shell wt. (g)	Shell Ratio (%)	[illegible]
	No.	Wt. (kg)				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] (Control)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] (Control)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD 5%	[illegible]	[illegible]	[illegible]	NS	NS	[illegible]

Collaborative Research Projects/Programmes

- [illegible]: Silkworm disease monitoring of seed & commercial crop rearing of south Indian states
- [illegible]: Evaluation of [illegible] hybrid for sub optimal conditions

- [illegible] survey & surveillance of major pests and their natural enemies in mulberry ecosystem

Cluster Promotion Programme (CPP): [illegible] technologies were disseminated in [illegible] clusters and [illegible] achievement) were brushed with an average yield of [illegible].

Institute Village Linkage Programme (IVLP): Formation of mulberry tree plantation using [illegible] has been undertaken in [illegible] acres [illegible] farmers). Tree plantation with [illegible] maintained soil moisture nearer to field capacity resulting significant improvement in biomass production (total no. of shoots, shoot length, no. of leaves, LA, LAI and leaf yield), leaf quality with respect to leaf moisture ([illegible]), nitrogen ([illegible]), phosphorus ([illegible]) and potassium ([illegible]) improved significantly over control. Leaf yield was significantly high in tree mulberry plantation ([illegible]/acre/year) over the traditional practice ([illegible]/acre/year).

Continuous/Other activities

In situ green manuring through [illegible] and urban planting

[illegible], S.N. [illegible] and [illegible]

[illegible] biomass has been harvested at four months schedule and quantified [illegible] and the green biomass was retained as surface mulch ([illegible]) to build soil organic matter. [illegible] has been installed to provide protective irrigation for better establishment of mulberry tree. Three mulberry varieties ([illegible] & [illegible]) were pruned after six months of establishment. Soil samples were collected from treated and control plots and analysed for SOC content and the in situ green manuring plot showed higher SOC ([illegible]) as against the control ([illegible]).

Forecasting and forewarning of mulberry pests

S.N. [illegible] and [illegible]

Survey has been conducted at [illegible] farmer's field covering [illegible] villages. Pest incidence was recorded in relation to weather parameters. [illegible] incidence was noticed in majority of the mulberry fields; however [illegible] incidence was recorded in [illegible] farmers' fields ([illegible]) and [illegible] incidence was noticed in [illegible] farmers' field ([illegible]).

[illegible] trials of new [illegible] hybrids

[illegible] and [illegible]

[illegible] trials were conducted with [illegible] hybrids along with the control hybrid ([illegible]). The [illegible] incidence recorded varies from [illegible] and double hybrids were comparatively more tolerant to [illegible] than single hybrids.

Multiplication of Mulberry Varieties ([illegible]): A quantity of [illegible] and [illegible] seed cuttings were supplied to [illegible] and a nursery with [illegible] seed cuttings ([illegible]) was raised.

Multiplication of [illegible]: [illegible] seed of [illegible] and [illegible] were reared and [illegible] were produced for [illegible] production.

Technology	Results of Technology Programmes/Impact Analysis
[illegible]	Reduction of [illegible] ([illegible]) by release of [illegible]
[illegible]	Reduction of [illegible] ([illegible])

[illegible]	Extension Communication Programmes (ECP)				Training Programmes	
	Group Discussion	Field Days	Farmers' Visits	Exhibition	Farmers' Skill Training	Technology Orientation
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]				[illegible]	

RSRS-SALEM

RSRS & Sub-units
Tamil Nadu
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Jurisdiction / Area	Staff	
	Officer-in-charge	Dr. [illegible] (upto 29-02-2016) Dr. [illegible] (from 01-03-2016)
Tamil Nadu, Kerala	[illegible]	[illegible]
	[illegible] Staff	[illegible]
	Administrative Staff	[illegible]

Nested Units		
Unit	[illegible]	[illegible]
RSRS-Salem	[illegible]	[illegible]
REC-[illegible]	[illegible]	[illegible]
REC-[illegible]	[illegible]	[illegible]

Concluded Research Project

PIB [illegible]: Studies on pest status and community management of thrips (*Pseudodendrothrips mori*) (Thysanoptera: Thripidae) on mulberry in Tamil Nadu and Karnataka (In collaboration with NBAIR, Bangalore; Apr. 2014 to Mar. 2016)

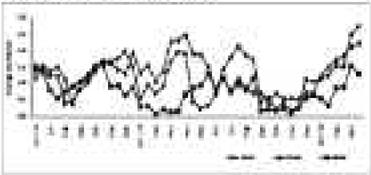
[illegible]

[illegible]

Objectives

- Survey on infestation of thrips on mulberry in selected sericultural areas of Tamil Nadu and Karnataka
- Collection of different natural enemies available in the mulberry ecosystem
- Laboratory evaluation of predatory potential of selected natural enemies

Thrips, *Pseudodendrothrips mori* (Thripidae: Thysanoptera) is a serious pest on mulberry in Tamil Nadu. Thrips incidence occurs throughout the year, especially severe in summer and the estimated loss is about 20-40% of total leaf yield. Fortnightly fixed plot survey was carried out in three farmers' field each covering Salem & Erode districts (Tamil Nadu) and Kolar district (Karnataka) with an objective to determine the pest frequency and its distribution. Thrips population (nymphs/adults) was calculated based on grading of thrips population as 0, 1, 2, 3 & 4 (Nil: 0; low: 1-10; moderate: 10-20; high: 20-40; very high: >40) on ten individual mulberry plants (top three leaves from different directions, N, S, E and W) in the centre of each plot. During the period from June 2014 to March 2016, highest thrips incidence was reported in Erode and Salem districts of Tamil Nadu and highest incidence (11-20 thrips/leaf) was recorded during March to June. During the same period, very low incidence of thrips population (1-10 thrips/leaf) was recorded in Kolar district of Karnataka.

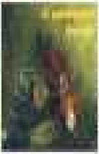


Karl Pearson correlation coefficient was determined for correlating the thrips population with weather parameters. The correlation (three sets of pooled data) between climatic parameters and thrips abundance was found to be significant and negatively correlated with rainfall. Thrips population was not influenced by the weather parameters in Kolar; negatively significant with rainfall in Salem and significant positive correlation with minimum temperature in Erode.

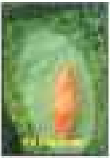
Parameters	Salem	Erode	Kolar	Overall
Max. Temp.	-0.254ns	0.168ns	0.168ns	0.248*
Min. Temp.	0.283ns	0.325*	0.022ns	0.485**
Max. Humidity	-0.294ns	0.202ns	-0.113ns	-0.320**
Min. Humidity	0.298ns	0.145ns	-0.023ns	0.071ns
Rainfall	-0.485**	0.110ns	-0.366ns	-0.280*

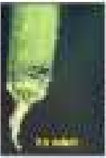
* significant at 0.05 level
** significant at 0.01 level
ns: non significant at 0.05 level

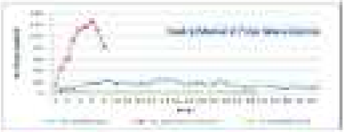
Natural Enemies against Thrips	
Predatory thrips identified by [illegible]	Franklinothrips vespiformis Crawford (Thysanoptera: Aeolothripidae)
	[illegible] Ramakrishna Ayyar & Margabandhu (Thysanoptera: Aeolothripidae)
	[illegible] Ramakrishna Ayyar & Margabandhu (Thysanoptera: Aeolothripidae)
	[illegible] Ramakrishna Ayyar & Margabandhu (Thysanoptera: Thripidae)
Predatory anthocorids (Hemiptera: Anthocoridae) identified by [illegible] Bangalore	Orius maxidentex Ghauri
	Orius [illegible]
	Montandoniola indica Yamada
Predatory Mites identified by UAS Bangalore	[illegible]



Predatory Potential of Natural Enemies		
Predator	Predatory Thrips Potential (larva/adult/day)	Longevity (days)
Orius maxidentex Ghauri	88	3-12
Blaptostethus pallescens	[illegible]	40-45
Franklinothrips vespiformis	34	10-20







Laboratory Evaluation of Predatory Potential of C. zastrowi, B. pallescens & A. [illegible] on P. [illegible] nymphs

The predatory potential of *C. zastrowi sillemi*, *B. pallescens* and *A. [illegible]* on mealybug thrips was studied under laboratory conditions at TNAU Salem and the predators were obtained from National Bureau of Agricultural Insect Resources (NBAIR), Bangalore. The prey density (300 *P. [illegible]* nymphs/adults) was maintained initially and the density was increased gradually based on consumption. The experiment was replicated 30 times/ larvae/nymph separately. A control was also maintained without predators to determine the normal mortality. *C. zastrowi sillemi* could feed on a total of 848 nymphs of *P. [illegible]* and its predatory potential was higher as compared to *B. pallescens* ([illegible]) and *A. [illegible]* ([illegible]).

Field Evaluation

- Thrips populations at pre-release and post release 1, 2 & 3 of *C. zastrowi sillemi* and *B. pallescens* were compared using Kruskal Wallis ANOVA followed by Mann Whitney U test for pair wise comparison and Wilcoxon signed rank test. Chi-square statistic computed in this case was found to be significant and the results of the pair wise comparisons are presented. Z-value computed in the Wilcoxon signed rank test for the pair wise comparison was also provided. The results show that in Salem, T2 shows significant difference in the thrips populations after 1st and 2nd release. Significant reduction in count was observed under T4 and T5 after 3rd release in Salem. If 1.5 lakh of CZS are released/plant, 2nd release might not be required as significant reduction was observed in thrips population after 1st release of CZS in Salem and [illegible].

Cultures Supply (NBAIR Bangalore)		
Insect Cultures	2015-16	2016-17
C. zastrowi sillemi (eggs)	[illegible]	[illegible]
B. pallescens nymphs	[illegible]	[illegible]

Thrips Population/leaf in control and predator released plots (Salem)							
Group	Pre Count (A)	7 days after 1st release (B)	7 days after 2nd release (C)	7 days after 3rd release (D)	Z-value		
					B vs A	C vs B	D vs C
T1: 1 no. of CZS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T2: 2 nos. of CZS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T3: 3 nos. of CZS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Control	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T5: 1 no. of Bp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T6: 2 nos. of Bp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T7: 3 nos. of Bp	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chi square value	[illegible]**	[illegible]**	[illegible]**	[illegible]**			
p-value	[illegible]	[illegible]	[illegible]	[illegible]			

** significant at 0.01 level; * significant at 0.05 level; NS: Non Significant

Thrips Population/Leaf in Control and Predator Released Plots [illegible]							
Details	Pre Count [illegible]	7 Days after 1st release [illegible]	7 Days after 2nd release [illegible]	7 Days after 3rd release [illegible]	[illegible]		
					[illegible]	[illegible]	[illegible]
T1:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T2:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T3:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Control	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T5:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T6:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T7:[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

** Significant at [illegible] level; * Significant at [illegible] level; NS: Non Significant

Inference: Two releases of [illegible] Nos. of [illegible] /plant and [illegible] Nos. of [illegible] /plant at weekly intervals are recommended for the management of thrips in mulberry plantations.

Ongoing Research Projects:

[illegible]: Socio-economic impact of Cluster Promotion Programme on Bivoltine seri farmers in Tamil Nadu (Mar. [illegible] to Aug. [illegible])

[illegible]

Objectives:

- To analyse the impact of CPP on technology adoption and productivity improvement in sericulture in the study area of Tamil Nadu.
- To estimate the socio-economic impact of CPP on [illegible] sericulturists in the study area.
- To evaluate the cost and returns from bivoltine sericulture among different farm size holdings.
- To elicit the constraints in [illegible] of technologies faced by farmers and suggestions.

  Based on literature survey and discussions with the subject experts as per the milestones, questionnaire for data collection has been finalised.

Collaborative Research Projects/Programmes:

- [illegible]: Studies on Disease forecasting and forewarning model [illegible]
- [illegible]: Studies on Disease forecasting and forewarning for Mulberry pests, diseases and Silkworm pests
- [illegible]: Studies on Drought Management practices in Mulberry Sericulture
- All India Co-ordinated Experiment for Mulberry [illegible]

Continuous/Other activities:

Cluster Promotion Programme: Bivoltine sericulture technologies were disseminated in [illegible] clusters across Tamil Nadu and [illegible] in Kerala. A total of [illegible] lakh [illegible] and [illegible] lakh [illegible] dfls were distributed and harvested an average cocoon yield of [illegible] and [illegible] kg/100 dfls, respectively in Tamil Nadu and Kerala.

[illegible]: A total of [illegible] lakh dfls of bivoltine [illegible] were reared with [illegible] farmers in [illegible] clusters ([illegible] & [illegible]) and the average yield recorded was [illegible] kg/100 dfls, which is [illegible] improvement in productivity against the [illegible].

Monitoring of soil fertility status of mulberry gardens in Tamil Nadu

J. Ravikumar

[illegible] soil samples were analyzed and given recommendations to the farmers from 4 districts of Tamil Nadu for improvement of soil health.

Fertility Ratings of Soil Samples (figures in parenthesis indicate % of samples)			
Parameter	Status		
pH	Acidic	Neutral	Alkaline
	[illegible]	[illegible]	[illegible]
EC Ratings (mmhos/cm)	Normal	High	Toxic
	[illegible]	[illegible]	[illegible]
OC Status (%)	Low	Medium	High
	[illegible]	[illegible]	[illegible]
Available P (kg/ha)	Low	Medium	High
	[illegible]	[illegible]	[illegible]
Available K (kg/ha)	Low	Medium	High
	[illegible]	[illegible]	[illegible]

Studies on Disease forecasting and forewarning model for Mulberry Pests & Silkworm Pests

[illegible] and J. Ravikumar

Objectives:

- To forecast and forewarn the mulberry and silkworm pests
- To record the incidence of mulberry and silkworm pests and to recommend IPM packages for the mulberry and silkworm pests

Incidence of pest survey conducted fortnightly in [illegible] selected farmers' field and data collected including weather parameters have been analysed. Pest incidence of [illegible] (leaf webber), [illegible] (thrips), [illegible] (tukra), [illegible] (papaya mealy bug), [illegible] [illegible] (whitefly) & [illegible] was recorded.

Pests		Leaf webber	Thrips	Tukra	[illegible]	[illegible]	[illegible]	[illegible]
Overall Avg.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Range	Min	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Max	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

On Station Trials

[illegible]

Testing of [illegible] Tolerant Bivoltine Hybrids: Two trials [illegible] of four [illegible] tolerant bivoltine hybrids were conducted with FC1xFC2 as control. [illegible] performed better in terms of fecundity [illegible], ERR No. [illegible], ERR Wt. [illegible], yield/10000 eggs [illegible], [illegible] followed by [illegible] in the first trial.

Hybrid	Fec.	Yield/10000 eggs (kg)	SCW (g)	SSW (g)	SR (%)	Reelability (%)	NBFL (m)	Raw silk (%)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FC1 x FC2 (Control)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

On Farm Trials: Newly developed bivoltine hybrids [illegible] were [illegible] with the farmers [illegible]

Centre	Hybrid	Dfls (Nos.)	Farmers (Nos.)	Yield/ 100 Dfls (kg)
[illegible] (Salem)	[illegible]	18000	40	68.00
	[illegible]	20000	78	70.00
	FC1 x FC2	24200	38	71.00
	[illegible]	16700	60	73.00
	[illegible]	5000	18	71.00
[illegible]	[illegible]	300	1	30.00
	[illegible]	300	2	34.20
	[illegible]	4000	24	33.33
[illegible]	[illegible]	300	2	62.00
	FC1xFC2	2800	10	60.00
	[illegible]	5000	10	68.80
	[illegible]	4900	34	64.00
[illegible]	[illegible]	300	3	38.00
[illegible]	[illegible]	3100	22	74.00
	FC1 x FC2	2000	13	77.00
	[illegible]	300	8	77.80
[illegible]	[illegible]	8750	50	48.13
	[illegible]	750	6	51.40
	FC1xFC2	1800	7	58.10
	[illegible]	5800	38	58.00
[illegible]	[illegible]	2800	7	60.11
	[illegible]	300	2	66.00
	[illegible]	40000	174	63.11
	[illegible]	26000	97	68.11
	[illegible]	7400	38	71.18
	[illegible]	11800	72	72.04
	FC1xFC2	20750	118	71.20
Total / Avg.		125000	480	59.07

Production of bio-control agents: [illegible] Acerophagus papayae and [illegible] Pseudleptomastix mexicana and [illegible] were produced and supplied to [illegible] farmers through [illegible] units and released in the mulberry gardens infested with papaya mealybug [illegible] in Tamil Nadu and Kerala. About [illegible]% reduction in the papaya mealybug population was achieved after release of these exotic parasitoids.

Establishment of AMIT: Affordable Micro Irrigation Technology (Drum Kit Technology) and drip irrigation system covering 1.2 acre was installed in REC Salem (1.40 acre) & REC Krishnagiri (0.80 acre) for effective utilization of irrigation water in mulberry garden.

Information Communication Programmes (Figures in parentheses indicate the number of programmes conducted)						
Centre	Tech. Seminar	Group Dis.	Aware. Prog.	Field Day	Orient. Prog.	Study Tour
RSRS-Salem		30 (1)	228 (6)			77 (1)
RSS-Krishnagiri		[illegible]	[illegible]			
RSS-Samayanallur		[illegible]	[illegible]			
RSS-Udumalpet		[illegible]	[illegible]			
RSS-[illegible]		[illegible]	[illegible]	[illegible]		
REC-[illegible]	[illegible]	[illegible]	[illegible]			
REC SU-[illegible]		120 (8)	[illegible]	[illegible]		
REC SU-[illegible]		120 (8)	[illegible]			
REC SU-[illegible]		[illegible]	[illegible]			
REC SU-[illegible]		[illegible]	[illegible]			
REC-[illegible]		[illegible]	[illegible]		[illegible]	[illegible]

[illegible] (figures in parentheses denote number of farmers covered)							
Centre	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RSRS-Salem	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	
RSS-[illegible]	2	[illegible]	[illegible]	[illegible] saplings [illegible]			
REC SU-[illegible]	4	[illegible]	[illegible]				
RSS-Udumalpet		[illegible]	[illegible]				[illegible]
RSS-Samayanallur		[illegible]	[illegible]	[illegible]			
RSS-Krishnagiri		[illegible] saplings	[illegible] saplings			1	

Popularization of Improved Mulberry Varieties & Silkworm Hybrids

A total of [illegible] acres were planted with improved mulberry varieties ([illegible] farmers). A total of [illegible] lakh dfls of CSR single and double hybrids ([illegible] farmers) were distributed to the farmers in [illegible] area and the average yield recorded was [illegible] kg/100 dfls.

Improved Mulberry Varieties		
Unit	Farmers	Acres
RSRS-Salem	[illegible]	[illegible]
RSS-Krishnagiri	[illegible]	[illegible]
RSS-Samayanallur	[illegible]	[illegible]
RSS-Udumalpet	[illegible]	[illegible]
RSS-[illegible]	[illegible]	[illegible]
REC SU-[illegible]	[illegible]	[illegible]
REC SU-[illegible]	[illegible]	[illegible]
REC SU-[illegible]	[illegible]	[illegible]
REC SU-[illegible]	[illegible]	[illegible]
REC SU-[illegible]	[illegible]	[illegible]
REC-[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]

[illegible]	
[illegible]	[illegible]
[illegible] farmers attended a seminar on "Advanced Technologies in [illegible]" [illegible]	[illegible] farmers attended [illegible] on "Improved technology for silkworm seed production", "Pest management in mulberry & silkworm" & "Integrated Nutrient Management in mulberry cultivation"

Training Programmes				
Unit	[illegible]		[illegible]	
	Batch	Farmers	Batch	Reelers
RSRS-Salem	2	20	1	2
REC-Krishnagiri	2	20	1	3
REC-Dharmapuri	1	10	1	1
REC-Udumalpet	2	20	1	2
REC-Erode	1	10	1	1
REC-Srivilliputhur	1	20	1	2
REC-[illegible]	2	20	1	3
REC-[illegible]	1	10	1	1
REC-[illegible]	2	20	1	3
REC-Palakkad	2	20		
Total	[illegible]	[illegible]	9	[illegible]

Centre for Higher Studies in Botany and Sericulture, RSRS-Salem

Ph.D Students: RSRS-Salem is recognised as Centre for Higher Studies in Botany and Sericulture for doing M.Phil and Ph.D by Periyar University, Salem. One student was awarded Ph.D. Degree by Periyar University, Salem (2018-19) and all present eleven students are pursuing Ph.D (Periyar University, Salem) and one pursuing Ph.D (Manonmaniam Sundaranar University, Tirunelveli).

Student Name / Ref.	Research Supervisor	Year	Ph.D Title
Dr. S. [illegible]*	Dr. [illegible] Scientist-D [illegible]	2018	A Comparative Study on Technology Adoption and Economic Performance of sericulturists in Salem District of Tamil Nadu
[illegible]			Studies on the incidence, biology, ecology and management measures against [illegible] in mulberry
[illegible]			Studies on [illegible] of Commercial Chawki Rearing Centres and its impact on bivoltine cocoon production
[illegible]	Dr. [illegible] Scientist-D	2018	Evaluation of [illegible] and development of [illegible] quantification and molecular methods
[illegible]	Dr. [illegible] Scientist-D	2018	Socio-economic factors contributing to the level of diffusion of improved sericulture technologies among [illegible]
[illegible]**			Studies on sericultural technologies dissemination and the [illegible] of bivoltine cocoon production in traditional areas [illegible] district of Tamil Nadu
[illegible]**		2018	Evaluation of different [illegible] performance in [illegible] district of Tamil Nadu, India
[illegible]	Dr. [illegible] Scientist-D	2018	Studies on identification of [illegible] under [illegible] conditions of [illegible]
[illegible]		2018	Studies on the [illegible] of natural [illegible] in the incidence of major pests of mulberry in Tamil Nadu, [illegible] and feasibility of [illegible] measures
[illegible]*			Evaluation of different [illegible] on primary and secondary host plants for [illegible] in Tamil Nadu
[illegible]			Impact of adoption of [illegible] sericulture technologies and [illegible] economic analysis in [illegible] district of Tamil Nadu

M. Rajasekhar	Dr. S. Balasubramani, Scientist-D	2018	Impact of training programmes on sericultural technologies in traditional and non-traditional districts of Tamil Nadu
K. [illegible]**	Dr. [illegible], Asst. Professor	2018	Survey and studies on seasonal incidence of diseases and [illegible] with special reference to [illegible] and its impact on economics
* Ph.D. Degree awarded during 2017-18, ** Thesis submitted during 2017-18 [illegible] University [illegible]			

RSRS-ANANTAPUR

REC & Sub-units
Andhra Pradesh
REC [illegible]
REC [illegible]
REC [illegible]
REC [illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
SU-[illegible]
Telangana
SU-[illegible]
SU-[illegible]
Karnataka
SU-[illegible]

Command Area	Staff	
	Category Officer	No. [illegible]
Andhra Pradesh, Telangana, Karnataka	Scientists	12
	Technical staff	[illegible]
	Administrative staff	18

Farm Based Units		
Unit	Total Area (Acres)	Mulberry (Acres)
RSRS-Anantapur	40.75	4.00
REC [illegible]	5.00	1.00
REC [illegible]	3.00	1.00
REC [illegible]	11.00	3.00

Ongoing Research Projects

AIB [illegible]: Studies on yield gaps in silkworm cocoon production in the states of Andhra Pradesh and Telangana (Mar. 2018 to Aug. 2017)

S. Rajakumar (PI), J. Ravikumar, R. [illegible], A. G. K. [illegible], N. G. [illegible], G. [illegible] and [illegible]

Objectives

- To identify the yield gaps in silkworm cocoon productivity at farmers' level in Andhra Pradesh and Telangana states.
- To study the impact of new technologies on silkworm cocoon production.

  Based on literature survey and discussions with the subject experts as per the objectives, questionnaire for data collection has been finalised.

Collaborative Research Projects/Programmes:

- ARP [illegible]: Studies on Disease forecasting and forewarning model (Mulberry pests and Silkworm pests)
- [illegible]: Studies on Disease forecasting and forewarning for mulberry pests, diseases and silkworm pests
- [illegible]: Studies on Drought Management practices in mulberry cultivation

- All India Coordinated Experiment for Mulberry (AICEM) at [illegible], [illegible] and [illegible]

Coordination/Other activities

Cluster Promotion Programme

[illegible] sericulture technologies were disseminated in 12 clusters in Andhra Pradesh State and 4 clusters in Telangana State. [illegible] lakh dfls of bivoltine hybrids were brushed ([illegible]% achievement) against the target of 27.20 lakh dfls and recorded the cocoon yield of [illegible] kg/100 dfls. The raw silk production achievement was [illegible] MT against the target of [illegible] MT.

Adoption Gram (AG)

[illegible] dfls of [illegible] hybrids were reared [illegible] in two clusters ([illegible] and [illegible]) and average yield recorded was [illegible] kg/100 dfls, which is an improvement of 12.8% against the bench mark.

On station trials:

Testing of [illegible] bivoltine hybrids: Two trials ([illegible] 2016 & [illegible] 2016) at [illegible] ([illegible] bivoltine hybrids) were conducted with FC1×FC2 as control. (CSR50×CSR53) × (CSR51×CSR27) performed better followed by (CSR51×CSR27) × (CSR50×CSR53).

Performance of new bivoltine hybrids											
Hybrids	Yield		SCW (g)	SSW (g)	SR (%)	Reelability (%)	AFL (m)	NBFL (m)	Raw Silk (%)	Raw Silk Rec. (%)	Neatness (p)
	No.	Wt. (kg)									
(CSR50 × 27) × (53 × 26)	9036	18.83	2.06	0.479	22.98	86.76	1090.67	916.82	16.78	73.17	89
	9503	19.89	1.98	0.460	23.05	83.21	994.23	825.23	16.78	73.94	90
(CSR51 × CSR27) × (53 × 27)	9546	18.80	1.99	0.456	22.50	86.09	990.79	780.77	16.31	72.67	89
	9093	18.88	1.98	0.478	20.97	85.30	908.93	724.23	15.74	77.23	90
21 × 53	8993	18.64	1.80	0.444	22.50	89.93	990.12	897.72	16.91	73.83	90
	9088	19.28	1.78	0.398	22.53	85.68	880.38	768.13	16.51	71.44	89
FC1 × FC2 (control)	9006	17.83	1.99	0.448	22.88	75.28	1078.03	886.73	16.88	80.88	89
	8953	14.83	1.68	0.389	21.87	79.41	878.74	786.88	16.83	73.65	84

On-farm trials:

Unit	Hybrid	dfls (No.)	Farmers (No.)	Yield/100 dfls (kg)
[illegible]	CSR2 × CSR4	20400	98	80.00
[illegible]	CSR2 × CSR4 FC1 × FC2 [illegible] FC1 × FC2	900 4 250 800 2250	1 + 1 + 7	[illegible] [illegible]
[illegible]	CSR2 × CSR4 [illegible]	10400 1650	41 + 6	[illegible]
[illegible]	CSR2 × CSR4	10050	33	73.50
[illegible]	CSR2 × CSR4	1200	5	66.20

[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible]	[illegible] [illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible] [illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible]	[illegible] [illegible] [illegible]	[illegible]	[illegible] [illegible]

Production of [illegible] for control of Uzi fly infestation

[illegible]

[illegible]

[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]		

[illegible]	
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]		
Unit	Farmers	Acres
Andhra Pradesh		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]
Telangana		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]
Karnataka		
[illegible]	[illegible]	[illegible]
Grand Total	[illegible]	[illegible]

Training Programmes				
Unit	[illegible]		[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]
Andhra Pradesh				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
Telangana				
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
Karnataka				
[illegible]	[illegible]	[illegible]		
Total	[illegible]	[illegible]	[illegible]	[illegible]

ADMINISTRATIVE REPORT

Central Sericultural Research & Training Institute, Mysore, Karnataka and its Nested Units

Regional Sericultural Research Stations (RSRS)

1. Kodathi (Kar)
2. Anantapur (AP)
3. Chamarajanagar (Kar)
4. Salem (TN)
5. P4 Basic Seed Farm, Hassan (Kar)
6. Mulberry Silkworm Breeding Station, Coonoor (TN)

Research Extension Centres (REC)

1. Bidaraguppe (Kar)
2. Shidlaghatta (Kar)
3. Mysuru (Kar)
4. Gobichettipalayam (TN)
5. Krishnagiri (TN)
6. Dharmapuri (TN)
7. Udumalpet (TN)
8. Palakkad (Ker)
9. Eluru (AP)
10. Kalyandurgam (AP)
11. Madakasira (AP)
12. Rayachoty (AP)
13. V.Kota (AP)
14. Vaniyambadi (TN)
15. Amaravathi (MH)
16. Baramati (MH)
17. Pohegaon (MH)
18. Hoshangabad (MP)

Sub-units of Research Extension Centre (REC SU)

1. Almatti (Kar)
2. Bidar (Kar)
3. Bijapur (Kar)
4. Lemmandi (Kar)
5. Chintamani (Kar)
6. Chikkaballapur (Kar)
7. Koppal (Kar)
8. Kunigal (Kar)
9. Magadi (Kar)
10. Ranebennur (Kar)
11. Mudhol (Kar)
12. Shirahatti (Kar)
13. Shivamogga (Kar)
14. Tumakuru (Kar)
15. Vellore (TN)
16. Bargur (TN)
17. Trichy (TN)
18. Kallakurichi (TN)
19. Srivilliputhur (TN)
21. Chittoor (AP)
22. Ongole (AP)
23. Palakonda (AP)
24. Mahbubnagar (TS)
25. Suryapet (TS)
26. Aurangabad (MH)
27. Latur (MH)
28. Osmanabad (MH)
29. Burhanpur (MP)

Other Units

Cluster Promotion Centre (CPC) Hindupur

Cluster Development Centre (CDC): 1. Palamaner 2. T.N. Halli 3. Agali

R&D and Administrative Personnel of CSRTI and Nested Units

R & D Personnel

CSRTI Mysore

Director

Sivaprasad V (Dr.)

Scientist-F

Satish Verma (Dr.) (Engineer)

Scientist-D

Ahmadh SA (Dr.) (Rtd. Jun. 15)

Balasubramanian M (Dr.)

Bhagya R (Dr.)

Gaurav Khurana (Dr.)

Harish Das S (Dr.)

Gangadhar B (Dr.)

Harish Kumar J (Dr.)

Gunasekhara J (Dr.)

Kalidas (Dr.)

Kumar KL (Dr.)

Manoj Kumar CH (Dr.)

Mahima Santhi A (Dr.)

Mal Reddy N (Dr.)

Manjunatha Moorthy S (Dr.)

Mary Josepha AV (Dr.)

Mubarack V Umar

Muniraju Reddy M (Dr.)

Nagaraja S (Dr.)

Narasimha Nayaka AR (Dr.)

Narendra Kumar JB

Nirmala Mary Y (Dr.)

Pala Narasimha C

Prakash Kumar PM (Dr.)

Prasad Babu S (Dr.)

Rathnakaran TK (Dr.)

Rajashekar K

Sindhu MG

Sharma SD (Dr.) (Rtd. June, 2015)

Sharmila KK (Dr.)

Somashekar DS (Dr.)

Srinivasa BT (Dr.)

Sunil AN

Thiagarajan T (Dr.) (Rtd. Feb. 16)

Vijaya AB (Dr.) (Rtd. May 15)

Vinod Kumar (Dr.)

Vinod Kumar (Dr.)

Vinaya Kumar (Dr.)

Scientist-C

Neelima BS (Dr.)

Kumar TR

Ramakrishnappa HK

Ramakrishnappa P (Rtd. May 15)

Sarala KC (Dr.)

Sibajan Sen (Dr.)

Vinod Kumar Yadav

Scientist-B

Anil Kumar (Dr.)

Bhuvaneshwari E (Dr.)

Gayathri T (Dr.)
Leela Rani B
Kusuma L (Dr.)
Manjunath G (Dr.)
Seema L (Dr.)
Soumya M
Tanmoy Sarkar (Dr.)
Thirupathaiah Y (Dr.)
Vedavathi KV
Yashodhara BM

Assistant Director (Stat)
Rekha M

Information Officer/DRT Sublotc
Sumathy R (Dr.)

Assistant Librn
Kavitha KS

Scientist-D
Anupama PK (Dr.)
Chandrashekar KB (Dr.)
Hanumanthappa NY (Dr.)
Jayaram H (Dr.)
Kalpana GV (Dr.)
Lakshmanan V (Dr.)
Maheswari M (Dr.)
Mathur VB (Dr.), (Rtd. July, 2015)
Meenal A (Dr.)
Noble Morrison M (Dr.)
Pallavi SN (Dr.)
Raghunath MK (Dr.)
Rajanna KL (Dr.), (Rtd. June, 2015)
Rajendra M Mallagond (Dr.)
Sivaprasad V (Dr.)
Subbarao P (Dr.)
Venkatesh R

Scientist-C
Hanumantharayappa M
Ishwar
Mahalingappa KC
Pradeep N
Sarath Kumar PN
Shivashankar M (Rtd. July, 2015)
Sudhakara Rao P (Dr.)
Umesha A
Vani K Naik
Babu DV (Dr.)
Balasaraswathi S (Dr.)
Chandrashekaran K (Dr.)
Chikkanna (Dr.), (Rtd. Feb, 2016)
Dhahira Beevi N (Dr.)
Gnanakumar Dass J
Gururaj R (Rtd. Jan, 2016)
Neel Joseph
Mani Prabha CA
Manjunatha S (Dr.)
Mohamed Babu A (Dr.)
Mohan B
Poornima MC
Rathi Kumar T (Dr.)
Rajasekhar K
Ravikumar J (Dr.)
Sardhiya B (Dr.)
Sarathchandra P (Dr.)
Sreenivas BT
Thirumalaiswamy P

Scientist-C
Anbazhagan R
Gopinath OK (Rtd. Jan, 2016)
Munirathna Shetty P
Mahiba Helen S (Dr.)
Mohanalakshmi P
Vijayakumar R

Kerala
Scientist-D
Tessie T

Scientist-C
Subramany KV

Andhra Pradesh
Scientist-D
Ch. Satyanarayana Raju
Chowdary NB (Dr.)
Kari Reddy B (Dr.)
Magili T (Dr.)
Narasimha Murthy B (Dr.)
Prasad BN (Dr.)
Raghupathi M (Dr.), (Rtd. Jul, 2015)
Reddy MP (Dr.)
Shanthan Babu MA
Srinivasa Rao TVS
Venkatachalapathy M (Dr.)
Venkataramana P (Dr.)
Venkateswara Rao M (Dr.) (Rtd. Sep, 2015)
Venugopal A (Dr.)
Vidyunmala S (Dr.)
Vijaya Naidu B

Scientist-C
Reddy YS (Dr.)

Telangana
Scientist-D
Sampath Rao BM
Shashidhar Reddy P (Dr.)
Sreedhar G (Dr.)

Maharashtra
Scientist-D
Kamble AJ
Rushikesh PN
Ram Prakash

Scientist-C
Ragini KP
Rahul Singh

Madhya Pradesh
Scientist-D
Khare BK

Scientist-C
Pradeep Shukla

ADMINISTRATIVE PERSONNEL

Mohan Rao Inakota, JD
Manoharan A, DD (F)
Jayaramulu K, DD (Dr.) (Rtd. Jun, 2016)
Krishnappa V, DD (E)
Telkar DC, JD
Nagarajaraja S, AD (A&A)
Jayashree N, AD (SL)
Pooja KK, AD (Tab)
Girijamma, AD (A&A)
Mohan, AD (A&A)

Budget (Rs. in lakhs)

Particulars	Grant Released	Expenditure
Non-Plan	[illegible]	[illegible]
Plan-Gen/21	1,228.24	1,228.24
Plan-Capital	[illegible]	[illegible]
Total	[illegible]	[illegible]

RESEARCH ADVISORY COMMITTEE

Chairman
Prof. [illegible]
Former Vice Chancellor, UAS, Bangalore
[illegible]
[illegible], Bangalore - [illegible]

Members
Dr. [illegible] Kumar
Principal Scientist, [illegible]
[illegible]
Agricultural Farm, PO
Bangalore - [illegible]

Dr. [illegible]
Professor ([illegible]), Dept. of Agronomy
Tamil Nadu Agricultural University
Coimbatore - [illegible], Tamil Nadu

Dr. [illegible]
Project Coordinator ([illegible])
Indian Institute of [illegible] Research
[illegible]
India

Dr. [illegible]
Principal Scientist & Head
Division of Plant Physiology & Biochemistry, [illegible]
Hessaraghatta Lake Post
Bangalore - [illegible]

Prof. [illegible]
Department of Sericulture
University of Agricultural Sciences
GKVK, Bangalore - [illegible]

Dr. [illegible] (Retd.)
Central Silk Board
[illegible]
[illegible], Mysore - [illegible]
Karnataka

Dr. [illegible]
Pr. Scientist, Division of [illegible]
National Bureau of Agriculturally Important Insects
P. Bag No. [illegible], H.A. Farm Post
Bellary Road, Bangalore - [illegible]

Prof. [illegible]
Former Dean (Ag. Engg.) & Professor and Head,
Dept. of Farm Machinery and Power Engineering
College of Agricultural Engineering, UAS
P.B. No. [illegible], Raichur - [illegible]

Invitees
Commissioner for Sericulture
[illegible] Floor, M.S. Building
Dr. B.R. Ambedkar Veedhi
Bangalore - [illegible], Karnataka

Director of Sericulture
Govt. of Tamil Nadu
Department of Sericulture
[illegible]
Salem - [illegible], Tamil Nadu

Commissioner of Sericulture
Govt. of Andhra Pradesh & Telangana
Road No. [illegible], Prashasan Nagar
Adjacent to Andhra Bank, Jubilee Hills
Hyderabad - [illegible], Andhra Pradesh

Director of Sericulture
Govt. of Maharashtra
New Administrative Building
[illegible], Civil Lines, [illegible] Floor
Nagpur - [illegible], Maharashtra

The Director
Andhra Pradesh State Sericulture Research & Development Institute
Kirikera, Hindupur - [illegible]
Andhra Pradesh

The Commissioner
Directorate of Sericulture
Govt. of Madhya Pradesh
[illegible]
Bhopal - [illegible]

The Commissioner
Commissionerate of Rural Development
[illegible]
Thiruvananthapuram - [illegible], Kerala

Director (Tech)
Central Silk Board
CSB Complex, BTM Layout
Madivala, Bangalore - 560 068

Director
Central Silk Technological Research Institute
Central Silk Board
BTM Layout, Madivala
Bangalore - 560 068

Director
National Silkworm Seed Organization
Central Silk Board, III Floor, CSB Complex
BTM Layout, Madivala
Bangalore - 560 068

The Director
Central Sericultural Germplasm Resources Centre
Central Silk Board
P.B. No.44, Thally Road
Hosur 635 109, Tamil Nadu

The Director
Seri-Biotech Research Laboratory
CSB Campus, Carmelaram Post
Sarjapur Road, Kodathi
Bangalore-560 035

The Director
Karnataka State Sericulture Research & Development Institute
(KSSRDI)
Thalaghattapura, Bangalore - 560 062

The Deputy Secretary (Tech)
Regional Office of Central Silk Board
Ministry of Textiles, Govt. of India
Flat 18, Vidhi Chambers, Narmam Road
Mumbai-400 001, Maharashtra

The Deputy Secretary (Tech)
Regional Office of Central Silk Board
No.20/11, A.K. Salai, Gandi
Nagar Nagar, Saligramam
Chennai - 600 093, Tamil Nadu

The Deputy Secretary (Tech)
Regional Office of Central Silk Board
Pratibhapuri Nagar, Road No.7
Near New Water Tank, Jubilee Hills
Hyderabad-500 033, Andhra Pradesh

Thiru. Sivasankaran
S/o C.Thangavel, Cocoon Farmer
Ramalingam Gounder Thottam
Kanavai Kajam Post
Udumalpet Taluk - 642 126, TN

Officer-in-Charge
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S/o. Murthy, Silk Reeler, Director [illegible]
Gandhi Nagar, [illegible]
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Member Convener
Dr. V. Sivaprasad
Director
Central Sericultural Research and Training Institute, Srirampura,
Manandavadi Road
Mysore 570 008, Karnataka

Details of Review Meetings

Meeting	Date
Research Advisory Committee (RAC)	21st September 2015
Regional Research Advisory Committee (RRAC)	23rd May 2015 at Chamarajanagar
	18th June 2015 at [illegible]
	23rd June 2015 at [illegible]
	20th January 2016 at [illegible]
	25th February 2016 at [illegible]

METEOROLOGICAL DATA 2015 – CSRTI-MYSURU

Meteorological Observatory

Honorary Superintendent: Rajashekar, K.

Observers: [illegible]

The institute has one of the important meteorological observatories of India Meteorological Department (IMD) rated as 'Very Good'. The observatory, which is manned by institute personnel records and transmits the data on over eleven parameters including temperature, humidity, pressure, dew point, vapour pressure, cloud types and position, wind direction and speed and rainfall every day at 0830 and 1730 hrs. The meteorological data is supplied to scientists, students etc. regularly.

Month	Temperature (°C)			Humidity (%)			Rainfall (mm)
	Max.	Min.	Avg.	Max.	Min.	Avg.	
January	29.00	9.50	22.50	77.00	48.00	62.00	0.00
February	30.00	11.00	20.80	83.00	37.00	60.00	1.20
March	33.00	18.00	28.40	88.00	38.00	58.00	41.60
April	36.00	18.00	27.80	95.00	33.00	80.00	82.50
May	34.00	11.00	28.00	95.00	43.00	64.00	238.70
June	33.00	19.00	25.20	96.00	58.00	77.00	106.10
July	31.00	18.00	25.00	95.00	47.00	76.00	34.40
August	32.00	17.00	23.40	95.00	43.00	72.00	83.20
September	32.00	15.40	23.00	95.00	47.00	71.00	103.00
October	31.00	16.00	26.00	95.00	37.00	71.00	99.20
November	30.00	16.00	23.00	98.00	64.00	79.00	123.60
December	31.00	13.00	23.00	94.00	37.00	67.00	3.80
Mean	32.74	15.03	23.00	91.58	38.00	67.40	
Extreme High	36.00	19.50		98.00	53.00		
Extreme Low	29.00	9.50		77.00	37.00		
						Total Rainfall	695.40
						Rainy days	38

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Narendra Kumar, J.B., Vinod Kumar and [illegible] (20[illegible]) Management of mealy bugs in mulberry. In: Mealy bugs and their Management in Agricultural and Horticultural crops. [illegible] and [illegible]. Springer India, [illegible].

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Highlights of Research Framework Document (RFD)

Sl.	Action	Unit	Target	Achievement
1	Total on-going Projects	No.	22	20
2	Projects concluded	No.	2	9
3	New projects taken up (in-house)	No.	11	10
4	New projects taken up at [illegible]	No.	7	6
5	No. of Technologies / innovations developed	No.	2	5
6	New technologies for field testing	No.	3	8
7	High yielding mulberry varieties developed	No.	1	1
8	Improved Bivoltine / Cross Breeds developed	No.	1	1
9	Bivoltine / Cross Breeds developed	No.	1	2
10	Techniques / solutions developed	No.	1	2
11	Equipments / machines developed for mechanization	No.	1	1
12	Machines / equipment adopted in the field	No.	1	1
13	Technologies commercialized	No.	1	1
14	Technologies patented / applied for patenting	No.	1	4
15	No. of farmers database created for [illegible] portal	No.	8000	10100
16	Preparation of technology directory	Date	[illegible]	[illegible]
17	No. of Bivoltine Villages identified	No.	20	10
18	No. of farmers attached	No.	1000	1000
19	Estimated raw silk output	MT	35	31.37
20	No. of dfls prepared for large scale trial	Lakh Nos.	3.00	0.075
21	No. of Blocks / Districts attached	No.	110	110
22	No. of farmers covered	No.	20000	28000
23	Raw silk output	MT	2400	[illegible]
24	Popularization of [illegible] (Grade 2)	acres	900	[illegible]
25	Farmers covered under 100% adoption of Technology	No.	1800	1900
26	No. of FFS	No.	11	*
27	No. of programmes conducted	No.	235	212
28	No. of farmers covered	No.	5000	[illegible]
29	Beneficiaries trained under educational programmes, need based programmes etc.	No.	1700	2188
30	Beneficiaries placed in sericulture after training	No.	1948	1847
31	Production units for biological inputs, input supply & [illegible] for sericulture units (PPPs)	No.	6	2
32	Establishment of Sericulture Resource Centre	No.	1	1
33	Revenue generation through commercialization of Technology	Rs. in lakh	20	0.20000
34	Revenue generation through other methods	Rs. in lakh	100	112.1
35	Projects taken up for collaborative research ([illegible])	No.	6	8

* [illegible] not available

Patenting and Commercialization

Patenting	
Machine/Equipment	Status of Patent
A [illegible] used for production of [illegible]	Patent Granted No. [illegible] dated [illegible]
A manually operated [illegible]	Patent Granted No. [illegible] dated [illegible]
A [illegible] operated [illegible]	Patent Granted No. [illegible] dated [illegible]
[illegible]	Patent filed Application No. [illegible] Dated [illegible]
[illegible] machine	Patent filed Application No. [illegible] Dated [illegible]
[illegible]	Patent filed Application No. [illegible] Dated [illegible]
A machine for [illegible]	Patent filed Application No. [illegible] Dated [illegible]
A machine for [illegible] and [illegible] of [illegible]	Application submitted to [illegible] for filing Patenting
Commercialization	
Machine/Equipment/Products	Details of Licensee
Manually operated [illegible]	M/s. [illegible]
[illegible]	M/s. [illegible] [illegible] [illegible]
[illegible]	M/s. [illegible]
[illegible]	M/s. [illegible] Private Limited, [illegible]

Inauguration of [illegible]
at Mysore [illegible]

Inauguration of Innovative Farmer's
National Workshop at Mysore [illegible]

Inauguration of Farmer's Workshop
at Mysore [illegible]

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान

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