वार्षिक प्रतिवेदन
ANNUAL REPORT
2021-22

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय, भारत सरकार, बेंगलूरु - 560 068
Central Sericultural Research and Training Institute
Central Silk Board, Ministry of Textiles, Government of India, Bengaluru - 560 068

CSIRT/Hyvsiry Organizational Set-up

E/No. 38

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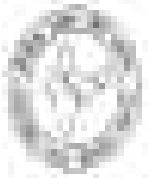

केंद्रीय सेवा अध्ययन अनुसंधान एवं प्रशिक्षण संस्थान

सी-डीआर भवन, पंचम मंजिल, पंचम सेक्टर, पंचकूला - 134 109

Central Servicestaff Research and Training Institute

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Foreword

The Central Sericultural Research and Training Institute, Mysuru has been constantly providing research ahead in enhancing the production and productivity of silk in the South Indian states and the states of Madhya Pradesh and Maharashtra. The institute, in its existence for the last six decades has come out with many new mulberry varieties, silkworm breeds/hybrids, productivity enhancing and new production technologies, ergonomically designed equipment and machinery [illegible]

Through R&D projects and programmes the institute has developed [illegible]

[illegible]

The institute has proposed projects and programmes aiming at devising more simple and effective technologies [illegible]

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के लिए एक गाइड है। यहां हम इस विषय पर विस्तार से चर्चा करेंगे कि कैसे एक प्रभावी प्रशिक्षण कार्यक्रम तैयार किया जाए, उसे लागू किया जाए और उसका मूल्यांकन किया जाए।

प्रशिक्षण की आवश्यकता

प्रशिक्षण की आवश्यकता का पहला संकेत अक्सर कार्यस्थल पर दिखाई देने वाली समस्याओं से मिलता है। जब कर्मचारी बार-बार गलतियाँ करने लगें, ग्राहकों की शिकायतें बढ़ जाएँ, उत्पादन की गुणवत्ता गिरने लगे या दुर्घटनाओं की संख्या में वृद्धि हो, तो ये सभी संकेत इस ओर इशारा करते हैं कि कर्मचारियों को अतिरिक्त प्रशिक्षण की आवश्यकता है। इसके अलावा, जब संगठन नई तकनीक, नई मशीनरी या नई प्रक्रियाओं को अपनाता है, तब भी प्रशिक्षण की आवश्यकता स्वाभाविक रूप से उत्पन्न होती है। इसे हम परिवर्तन-आधारित आवश्यकता कहते हैं।

प्रशिक्षण की आवश्यकता का आकलन करने के लिए तीन स्तरों पर विश्लेषण किया जाता है। पहला स्तर है संगठनात्मक विश्लेषण, जिसमें यह देखा जाता है कि संगठन के लक्ष्यों को प्राप्त करने के लिए किस प्रकार के कौशल और ज्ञान की आवश्यकता है। दूसरा स्तर है कार्य विश्लेषण, जिसमें प्रत्येक पद के लिए आवश्यक दक्षताओं की पहचान की जाती है। तीसरा स्तर है व्यक्ति विश्लेषण, जिसमें यह देखा जाता है कि किस कर्मचारी को किस विषय में प्रशिक्षण की कितनी आवश्यकता है। इन तीनों स्तरों का विश्लेषण करने के लिए विभिन्न तकनीकों का प्रयोग किया जाता है, जैसे कि सर्वेक्षण, साक्षात्कार, अवलोकन और प्रदर्शन मूल्यांकन।

प्रशिक्षण के प्रकार

प्रशिक्षण को उसकी प्रकृति और उद्देश्य के आधार पर कई श्रेणियों में बाँटा जा सकता है। सबसे पहला प्रकार है ओरिएंटेशन प्रशिक्षण, जो नए कर्मचारियों को संगठन की संस्कृति, नियमों और कार्यप्रणाली से परिचित कराने के लिए दिया जाता है। दूसरा प्रकार है कौशल-आधारित प्रशिक्षण, जो किसी विशेष कार्य को करने के लिए आवश्यक तकनीकी कौशल विकसित करने पर केंद्रित होता है। तीसरा प्रकार है व्यवहार-आधारित प्रशिक्षण, जो कर्मचारियों के दृष्टिकोण और व्यवहार में सकारात्मक परिवर्तन लाने के उद्देश्य से दिया जाता है। इसके अतिरिक्त, सुरक्षा प्रशिक्षण, अनुपालन प्रशिक्षण और नेतृत्व विकास प्रशिक्षण भी महत्वपूर्ण श्रेणियाँ हैं, जिन पर अलग-अलग अध्याय में विस्तार से चर्चा की गई है।

प्रशिक्षण पुस्तिकाएँ

- दिव्यदर्शन शिक्षण में उत्तम अनुशासन स्थापित करने हेतु पुस्तिका और कार्यशाली अनुशासन और सौजन्यता।
- सैनिकीय अध्ययनशाला विज्ञानों के शिक्षकों के शिक्षण हेतु मार्ग दिखाने वाला सौजन्यता।
- खानों सौजन्यता शिक्षा मंत्रालय की सहायता हेतु स्थापनों संबंधी सौजन्यता शिक्षा।
- खेती पुस्तकों की पुस्तिकाएँ एवं विज्ञान तथा खानों कर्मचारियों के लेखन के संबंधित करने हेतु सभी पुस्तिकाओं के पुस्तकों तथा प्रकाशन प्रतिनिधियों द्वारा।
- लेखन प्रणाली तिथि प्रकाशन विभागों और अन्य संस्थानों के बल लिखें के संबंध पुस्तिकाओं तथा हेतु विशेष सम्पादन पुस्तिका।
- लेखनपुस्तिका पुस्तकालय के लेखनों के लिए, लेखन लेखन करने संबंधित और कार्य को लेखन प्रकाशित लिखा करने।
- पुस्तकालय विभागों तथा तथा पुस्तिकाएँ तथा लेखन लिखित पुस्तिकाओं के लेखन के संबंध। अनुशिक्षा पुस्तिका पुस्तिकाएँ। पुस्तिका पुस्तिकाएँ पुस्तिका पुस्तिकाओं की पुस्तिका पुस्तिका पुस्तिकाओं की पुस्तिका पुस्तिका पुस्तिकाओं के पुस्तिका पुस्तिका पुस्तिकाओं के पुस्तिका पुस्तिका पुस्तिकाओं के

ABOUT CSTRI-MYSURU

The Central Sericultural Research and Training Institute (CSRTI), Mysuru was established under the aegis of Central Silk Board, Ministry of Textiles, Govt. of India. The institute started functioning at Chintamani in the year 1961, after taking over the Sericulture Research Institute of erstwhile Mysore province and later was shifted to Mysuru in the year 1965. With the inclusion of training programme, the Institute was renamed as Central Sericultural Research & Training Institute (CSRTI), in the year 1982. The Institute has completed 61 years of dedicated service for the development of sericulture industry in the country and has the distinction of being the premier Institution for imparting sericultural research gen ex-alliance with modern facilities and skilled personnel, including state-of-the-art scientific and technical personnel. CSRTI-Mysuru is recognized as a centre for higher learning and doctoral training. It caters to the needs of se from southern and northern states in Karnataka, Andhra Pradesh, Tamil Nadu, Telangana, Kerala, Maharashtra and Madhya Pradesh. CSRTI-Mysuru has conducted training to more than 15,000 persons including 600 foreign nationals in various aspects of sericulture technology. Besides conducting research, industry and extension activities, the Institute also offers consultancy and advisory services in specific and technical aspects.

Vision

To be a model organization for providing R&D services to facilitate the rural development and entrepreneurship generation of human resources and technical domestic and global level with sustainable outcomes in targeted countries.

Mission

- To improve the productivity and quality of silk cocoon ensuring the need of producers
- To generate pro-environment, pro-poor and pro-women technologies for effective resource utilization
- To develop low cost technology technologies for overall improvement of socio-economic conditions of stakeholders
- To promote and popularize the cutting edge technologies in the field to enhance production base of quality silk
- To undertake human resources development at all levels of operations

Mandate

- To develop multigrain sericultural technologies suitable to different agro-climatic conditions/ regions
- To conduct basic and applied research in various disciplines leading to the development of appropriate technologies
- To train mainly the extension technicians of Sericulture Department
- To conduct frontline demonstration of developed technologies in the field
- To conduct human resource development and training programmes
- To serve as a training centre for multiagency extension related training programmes, technologies developed by CSRTI Mysuru or referred by other agencies
- To coordinate with State Govts, Voluntary organizations, NGOs, universities and other National institutes for collaborative research and technology transfer

Organizational Setup

CRRI Mysuru is the largest research organization engaged in agriculture R&D in the country supported by DF scientists of various disciplines including agricultural engineers, technologists and economists. There are several technologies and products developed by the Government of which technologies are transfer through this zone institute and its extension units in the states of Karnataka, Tamil Nadu, Andhra Pradesh, Telangana State, Maharashtra and Madhya Pradesh. R&D activities and technology development are carried out in major divisions: Grain Crops Production & Protection, Horticulture Production & Protection, Extension and Training. CRRI Mysuru has technical and administrative staff to undertake the mandated operations. The Director monitors the progress of R&D activities of Institute and coordinates with the support of Planning, Monitoring, Coordination and Evaluation cell. The PME Cell, Library and ICAR Centers report to the director. Training programmes for empowering farmers needs. The institute is recognized as a model university DST & PGS, New Delhi, for multidisciplinary activities. Institute regularly publishes newsletters, bulletins and technical reports/bulletins for the state farmers. The institute publishes bi-annual peer-reviewed journal, presenting the research papers published in international science across the world.

Extension Network

CRRI Mysuru has a network system of extension network: Regional Agricultural Research Stations (RARS), Krishi Vigyan Kendras (KVKs) and ICAR-Institutes to facilitate validation and transfer of technology efficiently to the field. KVKs are located in major agro-climatic zones of southern states to target region specific, effective and applied research. Technology trials are also conducted to suit the requirements of various farming systems. Training programmes and farmers visits are also conducted by KVKs and extension units for the transfer of technology recently to the state holders and also provide technological inputs and market services. CRRI Mysuru coordinates Tribal Sub Plan (TSP) and Scheduled Caste Sub Plan (SCSP) programmes for the promotion of livelihood opportunities in Southern States and Maharashtra and Madhya Pradesh. Effective transfer of technologies is undertaken in close coordination with officials of Department of Agriculture of respective states.

Training Centers

CRRI Mysuru is recognized as flagship centre for generation of trained human resources in tropical rice in India at national and international level. The institute has conducted training programmes sponsored by DST, UGC and University of Swansea (Govt. of India) for human resources and technological empowerment of rice farmers. Besides training in the IRRI mandate crops, the institute has also conducted training programmes for international candidates through various organizations such as ICAR and Ministry of External Affairs, Govt. of India (GOI). The training has always been well-appreciated assessments with trained facilities for the trainees.

Infrastructure Facilities

- Well-equipped laboratories with specialized multidisciplinary services and research facilities for survey and advanced research
- Large scale rearing houses for biotechnology validation and field level training
- Modern electronic survey system (GIS) to demonstrate the concept of GIS
- Engineering Division with excellent facilities to support designing, development and fabrication of machines/equipment suitable for agriculture

- [illegible] with [illegible] with [illegible]
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- **Library Services** including [illegible] research [illegible] of scientific journals: 8. International Economic Journals; 7 Indian Economic Journals and 10 Indian & International [illegible] journals [illegible]

मुख्यालय

कार्यालयी समय

- सभी कार्यालयों/इकाइयों/क्षेत्रीय कार्यालय कार्यों के लिए कार्यालय समय सोमवार से शुक्रवार, बिना अवकाश के अतिरिक्त दिवसों सहित सोमवार से शनिवार, दिनांक 01 जनवरी से 31 दिसंबर तक सामान्यतः रहेगी।
- मुख्यालय कार्यालयों तथा सभी क्षेत्रीय/जिला कार्यालयों में, जब तक अन्यथा आदेश न हो, सभी कार्यों के लिए कार्यालय समय सोमवार से शुक्रवार तक प्रातः 10:00 बजे से सायं 5:30 बजे तक होगा।
- यह समय सोमवार से शनिवार तक 10:00 बजे, 10:30 बजे, 11:00 बजे, 11:30 बजे तथा 12:00 बजे से मुख्यालय एवं सभी मुख्यालय/क्षेत्रीय/जिला कार्यालयों के लिए लागू होगा। कार्यालय प्रमुख/कार्यालय के अन्य अधिकारी किसी अन्य समय पर भी कार्यालय उपस्थिति निर्धारित कर सकते हैं।
- मुख्यालय एवं सभी मुख्यालय/क्षेत्रीय/जिला कार्यालयों में निर्धारित परिवेदन समय (परिवेदन समय) 11:00 बजे से 12:00 बजे तक होगा। परिवेदन समय दर्शनार्थियों को मुलाकात के लिए नहीं होगा।
- मुख्यालय/क्षेत्रीय/जिला कार्यालयों के कार्यालय समय के दौरान किसी भी व्यक्ति को मिलने की अनुमति नहीं होगी।
- विभाग/कार्यालय-मुखियों के लिए अपने मुख्यालयों में निर्धारित समय पर कार्यालय परिसर में उपस्थित रहना अनिवार्य होगा। वे अपने मुख्यालय से मुलाकात स्वीकृत कर सकते हैं।
- मंत्रालय/विभाग/कार्यालय और ऐसे अन्य कार्यालय जिनका कार्य सीधे जनता से संबंधित है, वहां के कार्यालय समय के संबंध में विशेष अनुदेशों की आवश्यकता होगी।
- कार्यालय प्रमुख/कार्यालय के अन्य अधिकारी अपने मुख्यालय से बाहर जाने से पूर्व अपने कार्यालय में अपने स्थान पर कार्य करने के लिए अधिकृत व्यक्ति को कार्यालय का प्रभार सौंपेंगे। कार्यालय प्रमुख/कार्यालय के अन्य अधिकारी अपने मुख्यालय से बाहर जाने से पूर्व अपने कार्यालय में अपने स्थान पर कार्य करने के लिए अधिकृत व्यक्ति को कार्यालय का प्रभार सौंपेंगे।
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विद्यालय

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- 27 maximum polymorphic fragments (alleles) and 7-14 and 24 polymorphic fragments (alleles) and 7-14 were identified.
- Polymorphic SSR primers were identified for detection of true hybrids (Morus multicaulis (Female) (Male) for genotyping and phylogenetic evaluation.
- Evaluated bacterial antagonistic Bacillus subtilis and Bacillus velezensis and fungal antagonistic **Trichoderma harzianum from the soil samples of Karnataka, Tamil Nadu, Andhra Pradesh and Telangana.**
- T. harzianum isolate was found antagonistic with suppressive activities of 61.1, 57.8, 57.8, 57.8 and 57.8 per cent **over plant pathogenic fungi of S.rolfsii, C.gloeosporioides.**
- **aCBH2 multigene variants recorded higher leaf yield under low input conditions in M5, mulberry and** Kanva-2 varieties.
- Biomass use efficiency was recorded significantly higher value as 2.68, 2.63, 2.62 kg/ha/day achieved by S-1 (51.0%), Y-1 (50.7%) and S-6-1 (51.7%) respectively under low input condition.
- Higher primary metabolites were recorded in Y-1, Morus multicaulis, S-6 and S-1, Morus alba hybrid **metabolites were observed in S-6-1 and Victoria Local.**
- **24 genotypes with high cg-leaf color were screened and 22 genotypes with high stomatal frequency were** identified as physiologically efficient genotypes with high WUE parameters.
- **Secondary metabolites were characterized and 24 compounds were identified in methanol leaves by** LCMS and GCMS.
- Similar and full sequences T genotypes (MT-699, MT-704, MT-713, MT-722, MT-727, MT-1008 and MT-1010) were identified with higher metabolomic pathway between two plants.

M.S.SWAMY

- Modified chemical composition Technology for preparation of silk from pupae was standardized.
- **Standardized manufacturing procedure for preparation of silk powder from pupae, cocoon and reeled.**
- Standardized composite granulations of protein and Biosilk granules from cocoon.
- Polymorphism (AP-PCR) gene sequences of Bacteria isolated from the pupal gut and midgut of Silkworm **degraded on PCR2 cocoons.**
- **Silkworm Diseases and Silkworm reared pupae and cocoon shell powder showing Antimicrobial Activities** were recorded on medium.
- Variation in the crystallinity of Silkfibroin at different stages of cocoon formation was observed.
- Identified SSRs in Fibroin gene (Dpd, Silk) in Sericigenic associated with Pupae/Cocoon and as Markers in Bivoltine/Multivoltine breeds.
- **Reported for the first time a specific major deletion in Fibroin gene in CSR27 BF silkworm breed with characteristic changes.**
- Based on the RT-PCR analysis and validation in eight selected genes related to sericulture were identified as BGIF-1, NGG-2, HAG-6, BGIF-6, NGG-5 and BGIF-8 showing Positive Correlation (Yield) and investigated among the developed hybrid lines in comparison to parental lines (PP-1 and BB-1). Developed Nu (pupal shell) from BGIF-1 (Hybrid).

- Evaluation of the improved Pusa gir Mahendra revealed 12.5% improvement in fruit weight, 9% in number weight and 9% in fecundity. The yield (10000 fruits) in also high compared to the local check of Mahendra.
- The mean basal (Pusa a 1202) has shown 7% improvement in fruit weight, 8% improvement in yield/100 plts and 4% increase in number weight when compared to Pusa a 1202. Parameters like shelf life, percentage, average diameter length, non-formation diameter length, marketable, unmarketable, rate, etc. economic rate of percentage, average over harvest rate, also were better as compared to the traditional cross breed.
- Developed one web page with information on silkworm diseases and their symptoms and silkworm genes and their management which can be used by the stakeholders.
- Bivoltine combined for seven traits identified through multivariate analysis and Bivoltine is identified as a potential source for the management of BmNPV.
- Validated the ELISA methodology in both multivoltine and Tasar cocoon and found that the methodology worked in multivoltine Nistari, Bivoltine and Muga silkworm with a sensitivity of 10 ng/ml in multivoltine silkworm.
- Resolved 12 field problems related to silkworm diseases and provided guidance for the farmers for proper disease management. Follow up action was also done by monitoring the farmers.
- Tested 45 quality analysis reports for the products commercialized by Silkworm Pathology.
- Twenty seven isolates of fungi infecting silkworms were identified morphologically and molecular characterization was also done and submitted the sequences to NCBI.
- Diagnostic monitoring was carried out in the Secondary levels, DFPs, CSSO, Pvt. godowns and CCSP Nagpur.
- A Predictive assessment was developed for easy screening productivity in multivoltine silkworm Antheraea mylitta.
- Silkworm pupae oil was extracted by different conventional methods and quantified oil.
- Food products using Silkworm powder, cookies and nutritional bars were prepared by using silkworm pupae as an ingredient.
- Nutritional formulations have been prepared with silkworm pupae.
- In the validation trial of the three bi-hull resistant hybrids (CTH2), cocoon yield in shell ratio basis and cocoons in weight basis (kg/100 dfls) were observed.
- A total of 1,751 grainages of Bivoltine silkworm were supplied for the management of sericulture.
- For the management of Leaf roller (Diaphania pulverulentalis) supplied 48 packets of egg parasitoid (Trichogramma chilonis) and 10 packets of larval parasitoid (Bracon brevicornis) to mulberry farmers in Karnataka, Tamil Nadu and Andhra Pradesh.
- For the biological control of mulberry thrips (Pseudodendrothrips mori), supplied 31 packets of Blaptostethus pallescens to the farmers of Karnataka and Tamil Nadu. Following the introduction of this predator the thrips incidence reduced from 14 per cent to 4.5 per cent.
- Sericultural waste products of bed refuse and spent substrate (Mushroom as feed supplement (Pleurotus sajor-caju) and vermicompost (Eisenia foetida) (Pleurotus florida) as bedding material, egg boxes and pupae.
- Different combinations of pupae (Antheraea mylitta) powder with wheat flour (Triticum aestivum) and Bengal gram flour (Cicer arietinum) were tried to develop value added products like cookies and nutritional bars.

- Horticultural Crops Nursery, Jamalgondi, Chikmagalur, Karnataka, Arabinagar and Bhadravathi Research Stations and have been made ready for sale in records. Full Control and Sandwiches Green Agro Tech was established for the management of Sandwiches Agricultural Universities.
- Developed new equipment for precise distribution of fluorescent pigment for demonstration has been conducted at ICRISAT Agro Research Station.

EXTENSION

- Mulberry plantation completed on 2700.00 acres in the command area covering 12500 farmers.
- A record quantity of 1000.00 MT Cocoon was silk reeled and produced through Seedlings Quality Improvement Programme implemented in 10 major clusters in districts Prakasam, Karnataka, Tamil Nadu, Telangana, Maharashtra and new regions area from 1014.1 Lakh Rs with an average annual yield of 77.1 kg/100 dfls.
- Krishi Vikram Portal (A Kiosk) was built in every Sericulture to 70000 registered farmers from Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra and UP in Kannada, Telugu, Tamil & Hindi.
- Conducted 250 awareness creation training programmes and enrolled 12,500 participants.
- A new Cocoon Analysing Machine and Information related "Sericulture Success Stories" was published in a collection of 50 individuals covering their saga of sericulture life and appreciation for making it to their respective for sustainable livelihoods.
- A total of 1222 farmers including 522 farmers, 402 residents and 12 others have visited the institute during the year.
- A virtual workshop on Advanced Cocoon management was organized on 1st October 2019.

TRAINING

- A total of 1500 Agriculture Technology Officials from ICC conducted on management, manufacture and employment creation as employment generation were trained under various training programmes including Recruitment and Need Based training, achieving 100% target of 1500 persons.
- Study Tour students from different universities/colleges carried out their project internships as a part of their Masters Degree under the guidance of ICRISAT Scientists.

Partners and research collaborations

- Bio Cocoon granted with Patent No.387758 for the invention "Process for the utilization of agro silkworm rearing waste into promising value added ingredients"
- "Mulberry Supplement Silkworm Feed Development was commercialized through ICRISAT, New Delhi in 10 Cocoon Cocoa Centre and 5 Agro Agro Processing Centers.
- Cocoon was successfully Packaged & Feed Based Formulations for Control of Mulberry Root Rot Diseases (Date of Issuance: 08.04.2019) through ICRISAT, New Delhi in 15 Different Agencies Bangalore.
- Commercialized Product - A Multi-nutrient Formulation for Controlling the Mulberry Deficiencies in Mulberry through ICRISAT, New Delhi in 15 Cocoon Agro Processing Centers.

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ix. समाचार पत्रों में हिंदी में लेख आदि का प्रकाशन, स्मारिका प्रकाशन योजना, हिंदी दिवस तथा पुरस्कार योजना, हिंदी में कार्यालयी कार्यों संबंधी समाचार का प्रकाशन तथा ये विषय क्या हैं, संस्थान में कार्यरत अधिकारियों/कर्मचारियों को इसकी जानकारी होना।

x. निदेशालय, दक्षिण क्षेत्रीय कार्यालयों में राजभाषा कार्यान्वयन की दृष्टि से की जाने वाली प्रगति की समीक्षा हेतु वर्ष में कम से कम दो बार निदेशालय स्तर पर बैठकें, तिमाही रिपोर्टों का पुनरावलोकन तथा संस्थान के निदेशालय स्तर पर।

xi. हिंदी में कार्य करने वाले कर्मचारियों को प्रोत्साहन देने की दृष्टि से नकद पुरस्कार योजना।

xii. हिंदी में कार्य करने, हिंदी माध्यम से हिंदी में प्रशिक्षण देने संबंधी कार्यवाही के लिए संस्थान के कर्मचारियों को प्रोत्साहन देना।

xiii. संस्थान में हिंदी कार्यशालाओं का आयोजन।

ACTIVITIES REGARDING OFFICIAL LANGUAGE IMPLEMENTATION

During 2010-11 Official Language policy was implemented successfully at Forest Technical Research and Training Institute, Mysuru. Compliance of section 3(3) of the Official Languages Act was ensured. The progress in implementation of Hindi was reviewed regularly by conducting quarterly meetings of the Official Language Implementation Committee. Organization of Hindi workshops, Hindi Day Fortnight, Publication of Hindi magazine, Tadavalli Nanjaiah Memorial Lecture were carried out and Hindi Rolling Shield for safety circulars were presented and implemented in the Institute. The details of various issues 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 were issued in bilingual.

2. **Compliance of Rule (1)-** All types of forms, Letter heads, Rubber Stamps, Sign Boards, Name plates, Invitations, Greeting Cards, Tenders etc are printed in bilingual. Check points, Enclosure Registers, Complaint Registers and all permanent official level) have been devised in seven sessions of the same in bilingual.

3. **Hindi Correspondence:** During the year 71 circulars/orders on various subjects were issued in Hindi by sending 894, 304 and 718 letters in Hindi to Central Govt. Offices located in A, B and C regions respectively.

4. **Organization of meetings of the Official Language Implementation Committee:** The progress of implementation of the Official Language was reviewed regularly from time to time by conducting OLIC meetings in every quarter. During the year 2010-11 Official Language Implementation Committee meetings were organized on 30.07.2010, 29.09.2010, 31.12.2010, 31.03.2011 and 30.06.2011 and follow up action were taken on the decisions of the meetings.

5. **Organization of Hindi Workshops:** Hindi workshops was organized on every quarter for the officials of the Institute to provide information related to use of Hindi in the Official work and also to spread information about Official Language Policy. During the year, 47 officers and 21 staff were trained in Hindi workshops organized on 26.07.2010, 26.10.2010, 31.12.2010 and 11.01.2011 for technical and administrative officials and assistants.

6. **Implementation of noting/drafting (secondary schools):** To encourage the officers and staff of the Institute and the subordinate offices to do their work originally in Hindi, CBI's Hindi noting/drafting (secondary schools) was implemented in Hindi and awards are given for working primarily in Hindi. During the year such awards were given to 13 officials in the rajbhasha function of Official Language Fortnight held on 14-02-2020. Apart from this, 2 officials of subordinate offices have also received prizes under this scheme.

7. **Publications in Hindi:** Annual report of the Institute was published early in bilingual and two pamphlets viz., Development of fast cut classes and Hand-hole excavation in machinery and in control room also published in bilingual.

8. **Notification of the sub-ordinate 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 rule 10(4) of the official language rules. In this direction, apart from the offices, 4 sub-ordinate offices have also been notified.

9. **Organization of Hindi examinations:** Official Language Fortnight was organized from 26.01.2020 to 10.02.2020 during which 3 different Hindi competitions viz., 1. Essay writing 2. Dictation, 3. Glossary were 3 glossary competitions were organized. The classes of the competitions were conducted with the assistance of Hindi and non-Hindi knowing officers.

10. **Rajbhasha Shield:** Rajbhasha Shield is awarded to individual in a Hindi officer/employee and by those best performance in official language work. The shield is given to students in the essay on the best performing persons which are used with statues among the subordinate officers/employees and awarded to better performance in implementation.

11. **Hindi as Computer in Hindi:** Computer Operator (CO) Army, received Hindi typewriting programme and 10 duration course work shall be completed successfully by computer. The Hindi version is introduced in all computers which facilitates employees to do work in Hindi, English and other Indian languages.

12. **Training:** 10 Training programmes related to Computers were conducted through Hindi medium.

13. **Inspection:** Sub-ordinate offices were inspected for reviewing the progress made regarding implementation of Official Language Policy and recording necessary suggestions & guidance accordingly. During the year under report 2 offices have been inspected.

14. 10 Bilingual standard drafts were prepared and sent to 5 different Subordinate offices as a reference Hindi correspondence.

15. Website of the Institute has been totally made in bilingual format.

7. MEMBERS REGISTERED AND GRANTED

Undecided Research Project:

PR-2018: Engineering chloroplastome in mulberry for resilience to climate change: A GM approach (Reg. 28 IT-Ser. XXX)

Tentative Institute: (1.) Rajkumarika (Govt. of Hyderabad), 2. Hayat (Govt. Est. 2018), 3. Jamalia (Govt. Est. in Feb. 2018), 4. Rajkumarika (Govt. Est. 2018), 5. Rajakumar, 6. Jamalikumar, 7. 8. Rajkumarika and Rajkumar

Major objectives:

- To develop transgenic mulberry with Cry endo through agrobacterium mediated genetic transformation for climate resilience.

Specific objectives:

1. Construction of gene constructs containing Cry plasmid resistance genes (i.e. PEPC, Cry and EGFP-GUS-Cry) and selectable marker genes to ensure correct functioning and maintenance of transferred genes in mulberry varieties.
2. Genetic transformation and molecular characterization of transgenic Jamalikumar and Rajkumar by expressing Cry plasmid resistance genes and selectable marker genes.
3. Genetic transformation and molecular characterization of transgenic dwarf mulberry by expressing Cry plasmid resistance genes and selectable marker genes.

In this study, a protocol for in vitro regeneration and Agrobacterium tumefaciens mediated transformation of Cry1Ac endotoxin gene was optimized. Genetic transformation was carried out by using LB4404 and hypervirulent derivative of C58 mulberry with EHEPC-PEPC and EHEPC-EGFP-EPEPC gene constructs. Total 150 genetic transformed mulberry shoots containing PEPC, PEPC and EHEPC-EGFP-EPEPC genes were selected on hygromycin containing selection medium. A total of 50 putative transgenic plants with three gene constructs viz., EHEPC-Cry-EPEPC (designated as K-24 variety), PEPC (designated as K-27 variety) and EPEPC (designated as K-168 variety) were hardened in cocopeat pots. Two transgenic mulberry lines were confirmed by PCR using Cry gene-specific primers and two transgenic mulberry lines were confirmed by PCR using EPEPC gene specific primers. Similarly three transgenic mulberry lines were confirmed by PCR using EPEPC gene-specific primers. Quantitative PCR (qRT-PCR) showed 1.4-fold expression of transgene in K-24 transgenic line and 1.6-fold expression of PEPC gene in three transgenic lines. Transgenic lines expressing the EPEPC and EHEPC-Cry-EPEPC genes exhibited resistance to PEPC enzyme activity (0.047-0.06 units/mg). Three EPEPC transgenic lines (K-27-1, K-27-2-3 and K-27-2-4) showed 1.5- to 2.0-fold increased PEPC activity than wild-type (WT) plants. Mean PEPC transgenic mulberry lines showed faster root and shoot growth (20.14 cm to 21.24 cm/g FW) and soluble sugar (14.20 to 16.21 mg/g FW) (Fig. 1C) than wild type (WT) mulberry plants under well-watered conditions. Transgenic mulberry lines showed higher net photosynthesis rate (9.90-11.21 and 12.10 μmol CO_2/m^2/s) (Fig. 1A), stomatal conductance rates and efficiency (1.1 to 1.4 mmol CO_2 mol^{-1} H_2O) and 15-20 % higher than WT plants under 40% RWC supply (WW) (Fig. 1B). The relative water content (RWC) (Fig. 1D) and proline content in transgenic mulberry and WT plants remained the same under 120% FC. Even though, under 80% FC, RWC of transgenic mulberry and WT plants was reduced (Fig. 1D), it was comparatively higher in transgenic plants.

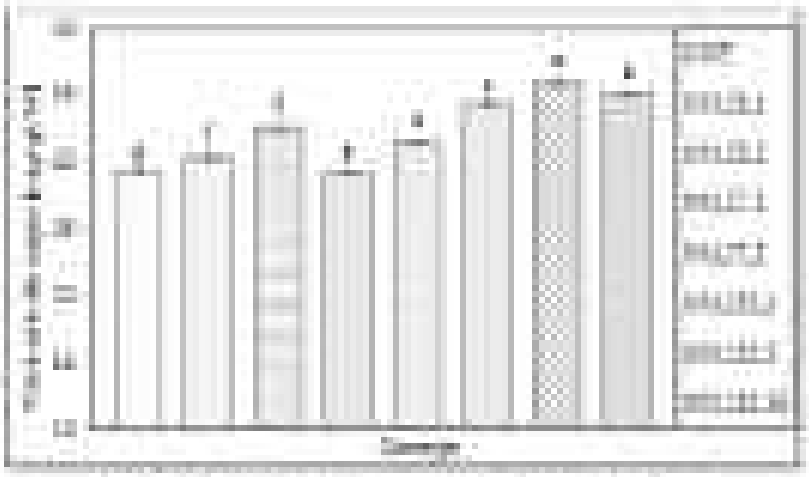

Fig. 1.1: Total soluble sugar in transgenic resilient soy seed [illegible] plants

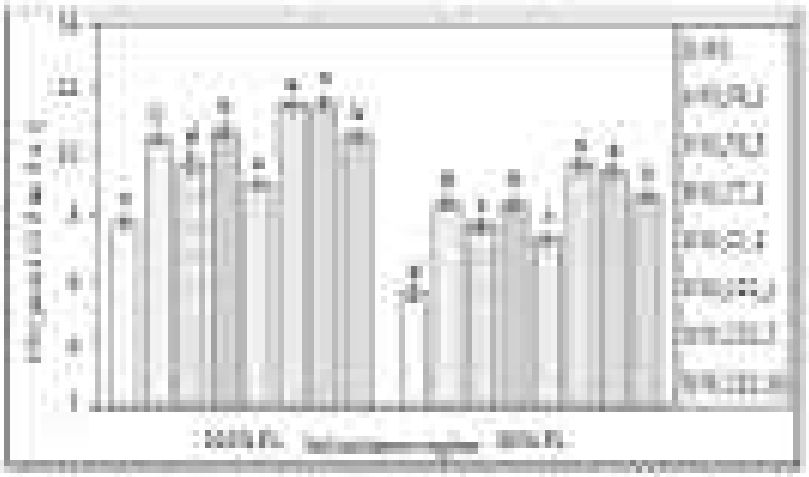

Fig. 1.2: [illegible] rate of transgenic and [illegible] plants under [illegible] and [illegible]

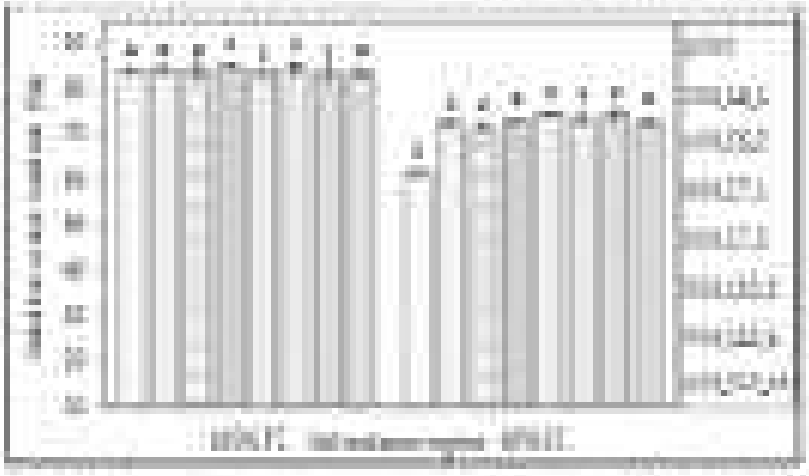

Fig. 1.3: Relative water content of transgenic and [illegible] plants under [illegible] and [illegible]

Conclusions

Based on data analysis it was found that the PGPR transgenic mulberry lines showed higher gas exchange characteristic under salt treatment stress. PGPR enzymes activity, nutrient status and tolerance to abiotic stress than other transgenic lines and wild type plants. Hence these three PGPR transgenic lines could be further characterized at molecular and physiochemical levels under controlled facility and confined field trial for event selection as per BRAI Govt. of India. Data from greenhouse experiments will be submitted to Institutional Biosafety Committee (IBSC).

DST-SERB Sanction Order No. CRG/2019/000000 dated 00.00.2019

Sub-component-1(A): Development of new generation transgenic mulberry for drought stress tolerance and characterization of existing transgenic mulberry for confined field trials (Jan. 2020 - Dec. 2024)

Thirumoy Sarkar, B. Bhadra Reddy (Chief Investigator), S. Gandhi Devi (Joint Chief Investigator), Ramesh Kumar, Ashok Kumar and Rahman

Research objectives

- Development of transgenic mulberry overexpressing transcription factors for drought stress tolerance and characterization of existing transgenic mulberry for confined field trials.

Scientific objectives

- Development of new generation transgenic mulberry expressing stress-responsive regulatory genes to improve drought and salinity stress tolerance traits.
- Molecular characterization and evaluation of new generation transgenic mulberry and analysis of existing transgenic lines for confined field trials.
- Development of proposal/application for event selection/confined field trials of existing transgenic lines.

A total 1011 respective and hygromycin regions were used for genetic transformation experiments using the co-cultivation method (pCAMBIA-1300-35S-nCsMYB3R1-gUBI-GUS-nSbTPS1-nOsTPS1-NOS-PMAS1-hptII-TNOS) (pCAMBIA-1300-35S-nCsMYB3R1) were selected on hygromycin containing selection medium. A total of 48 putative transgenic plants containing three gene constructs were confirmed by various PCR. The transgenic mulberry plants (NL01 & NL02) and NL01 wild) overexpressing nCsMYB3R1 and nSbTPS1 were investigated. These transgenic lines confirmed by PCR. The qPCR analysis showed expression of nCsMYB3R1 genes (1.0-1.2 fold) and nSbTPS genes (1.0-1.2 fold) in these transgenic mulberry lines. Detached leaf dehydration assay of these transgenic lines showed less chlorophyll degradation under 20% PEG (polyethylene glycol), 200 mM NaCl and 10 µM methyl viologen compared to non-transgenic mulberry and less electrolytic leakage under 15% PEG, 200 mM NaCl compared to non-transgenic mulberry. The transgenic lines also showed less membrane damage, accumulation of superoxide radicals and lower chlorophyll degradation capacity than WT under drought (15% PEG), salinity (200 mM NaCl) and oxidative (10 µM methyl viologen) stresses.

The transgenic mulberry lines showed better leaf moisture retention capacity (82.5% to 49.23%) compared to wild type (39.58%), 1 h of after harvest, shorter and less chlorophyll bleaching (12.41 to 45.14%) compared to non-transgenic mulberry plants (47.23 to 97.79%) (Fig. 1-A) and lower relative water content and proline content under 15% PEG induced drought (PIG) compared to non-transgenic mulberry in sections 2.2a (Fig. 1.2 & 1.3). In vivo localization of reactive oxygen species study showed less oxidative damage in transgenic lines compared to non-transgenic plants under 10 µM methyl viologen. Further, these

transgenic lines showed lower gas exchange parameters (net photosynthetic rate, transpiration rate, stomatal conductance and WUE) than non-transgenic check under 800 µC

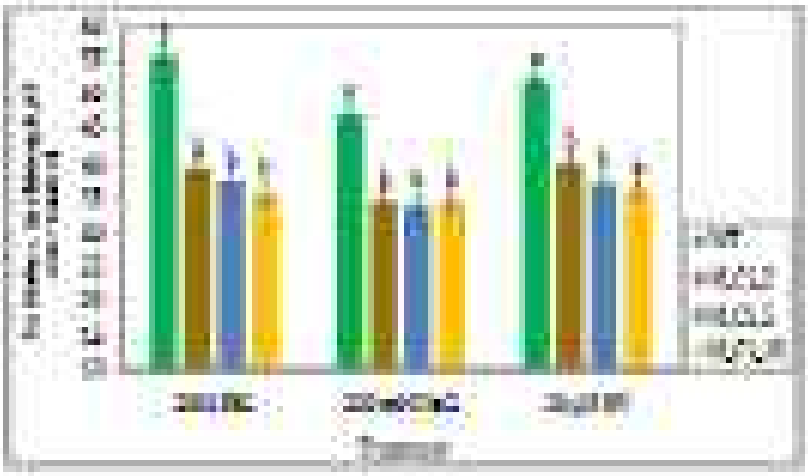

Fig. 3 A Chlorophyll degradation rate in transgenic and WT plants exposed to treatments

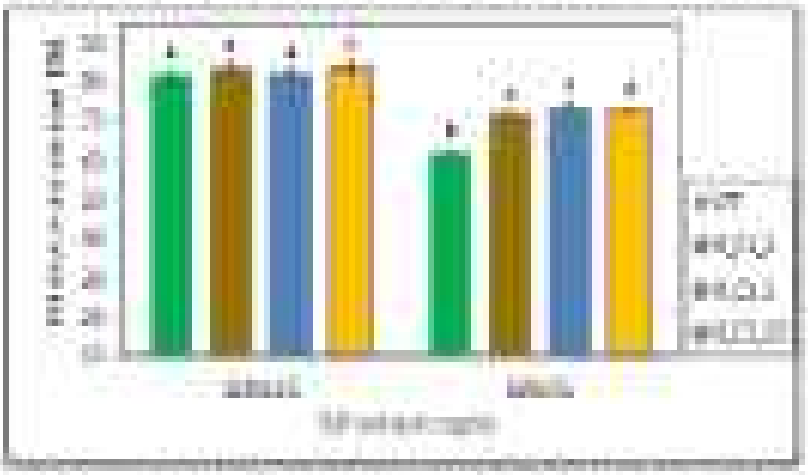

Fig. 4 A Soluble sugar content (SSC) of transgenic and WT plants under 1000 and 800 µC

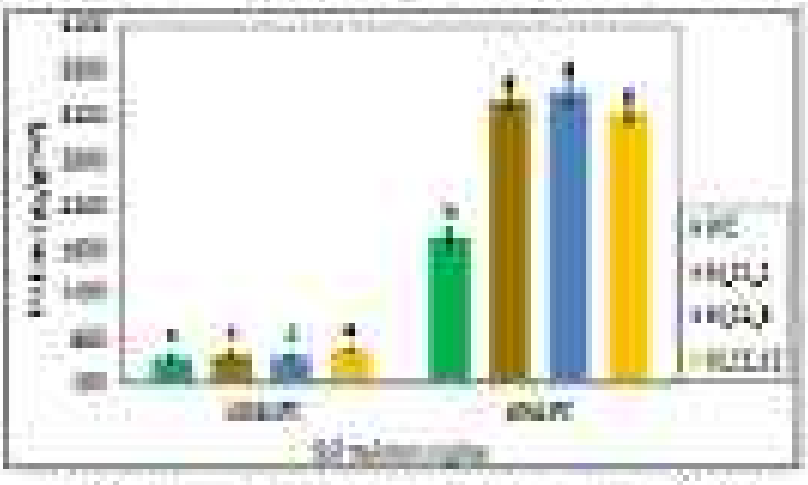

Fig. 5 A Starch content of transgenic and WT plants under 1000 and 800 µC

Conclusion

Based on data analysis it was found that genotypes from [illegible] showed tolerance to drought, salinity and sodicity stress. Hence, these genotypes could be further evaluated under multiple locations and environments before the release of variety in the future in collaboration with other collaborating University, after obtaining all clearances from regulatory bodies such as ICAR, SVRT, India and State Govt.

Publication: Primary yield evaluation for identification of superior mulberry hybrids with drought adaptive traits under sub-optimal irrigation conditions (Plan. 2018-19 to 2020)

Training Series: 1. Mulberry Cultivation (1st, 2018); 2. Silkworm Rearing (1st to 5th age) (2nd to 5th, 2018); 3. Silkworm Disease and Pest Management (1st to 5th age) (2nd to 5th, 2018); 4. Silkworm Rearing (2nd to 5th age) (1st to 5th, 2019); 5. Silkworm Disease and Pest Management (2nd to 5th age) (1st to 5th, 2019); 6. Mulberry Cultivation and Rearing

Extension

- To identify superior genotypes with drought adaptive traits suitable for sub-optimal irrigation conditions
- Evaluation of Integrative Technology practices developed for drought adaptation using molecular markers, capture sensors and remote sensing

Experimental plot with 21 mulberry genotypes along with varieties check varieties was maintained in 3 replications under optimal and sub-optimal conditions. Recorded the data on growth, leaf yield, leaf moisture content and leaf moisture retention capacity. **Based on the data, it was found that out of 21 test genotypes, seven genotypes such as S146, S20, S30, S35, S36, S38 and S54 showed leaf yield, above ground biomass and plant shoot height on par with the check varieties (Tolerant, RC-1, S54-3) under sub-optimal irrigation conditions.** Mulberry genotypes S146 with a leaf yield improvement (1.730 to 2.156 kg) over check variety, Tolerant under sub-optimal conditions. Similarly, out of 21 test genotypes, eight genotypes S30, S35, S36, S38, S54, S35, S54 and S47 showed leaf yield, above ground biomass, shoot height on par with check varieties (Tolerant, S-6, V1) under optimal irrigated conditions (Table 4.2) and showed SLWC to be 30.43% could [illegible] Tolerant.

Relative canopy index (RCI) is having a strong positive relationship with water use efficiency (WUE). Hence, it is considered as an indirect selection criterion for water use efficiency (WUE). In this study mulberry check variety Tolerant showed least mortality (0.0, values (-0.0.0.2) among genotypes S146, S20, S30, S35, S36, S38 and S54) and other two check varieties (S1708 and RC-1) maintained under sub-optimal conditions. The RCI value of (0.1-0.3 kg) is on par with Tolerant. The RCI values of six mulberry genotypes S146, S20, S30, S35, S36 and S54 were better than that of the check variety RC-1 (-0.2 to -0.3 kg). Likewise, seedling root interval that most of the seedling parameters were higher in case of all seven test genotypes S146, S20, S30, S35, S36, S38 and S54) than the check variety Tolerant but sub-optimal leaf moisture conditions. Under optimal conditions, five mulberry genotypes S20 and S38 showed recording performance on par with check varieties V1 and S1. Total sugar, protein and chlorophyll content of five leaf genotypes S20 and S38 were on par with S1708 and V1 under sub-optimal and optimal conditions.

Table 1.1: Growth and yield parameters of selected mulberry genotypes and their environmental variation under sub-isolated tropical semi-arid zone

Genotype	TT (cm)	LAI (cm²)	Leaf shoot ratio	TL	Leaf yield	TY (mt)	DM (%)	MC (%)
S1	1407.7	5427.61	0.47	8.94	1911.61	9.11	19.61	80.39
S14	1614.33	6813.79	0.51	9.61	2322.73	11.07	19.68	80.32
S11	1534.33	6347.24	0.49	9.78	2177.61	10.37	19.74	80.26
S12	1388.67	5760.89	0.49	10.44	1977.61	9.42	19.83	80.17
S13	1423.33	5983.21	0.49	10.61	2042.73	9.73	19.79	80.21
S15	1487.67	6257.79	0.48	11.11	2137.61	10.18	19.73	80.27
S16	1509.67	6353.33	0.48	11.22	2168.18	10.33	19.73	80.27
S17	1462.33	6111.99	0.48	9.94	2022.95	9.63	19.67	80.33
S18	1501.78	6323.84	0.48	9.83	2103.46	10.02	19.71	80.29
S19	1468.33	6142.78	0.48	9.83	2039.39	9.71	19.72	80.28
S20	1477.66	6204.47	0.48	9.78	2059.95	9.81	19.73	80.27
S21	1501.33	6353.89	0.47	10.33	2103.95	10.02	19.83	80.17
S22	1477.33	6213.67	0.47	11.33	2125.39	10.12	19.83	80.17
S23	1503.67	6344.84	0.48	9.83	2103.95	10.02	19.68	80.32
S24	1484.33	6253.94	0.47	9.61	2104.68	10.02	19.74	80.26
S25	1501.33	6403.81	0.47	9.94	2140.91	10.19	19.76	80.24
S26	1487.33	6275.33	0.48	9.83	2116.83	10.08	19.81	80.19
S27	1508.33	6393.44	0.47	9.94	2142.24	10.20	19.83	80.17
S28	1512.33	6403.73	0.48	9.94	2113.17	10.06	19.84	80.16
S29	1493.66	6343.01	0.48	10.44	2164.95	10.31	19.83	80.17
S30	1517.33	6423.44	0.47	9.89	2137.73	10.18	19.77	80.23
TVB-4(ck)	1503.33	6324.89	0.47	9.83	2144.95	10.21	19.78	80.22
V1(R)	1452.33	6132.24	0.49	9.78	2012.73	9.58	19.83	80.17
S31	1511.33	6423.44	0.47	9.89	2137.73	10.18	19.77	80.23
C.D (p=0.05)	19.22	37.27	0.02	0.28	28.29	0.13	0.07	0.06
C.V(%)	0.74	0.31	2.73	1.64	0.79	0.79	0.21	0.15
Significance	**	**	**	**	*	**	**	**

Table 1.2: Growth and yield parameters of selected mulberry leaf genotypes and their environmental variation under farmers' irrigated conditions

Genotype	LY (kg/ha)	LLAI (kg/ha)	Leaf shoot ratio	SR	Leaf Yield	TDL Yield	MC (%)	DM (%)
S1	2824.61	8512.99	0.47	9.061	2124.73	9.96.24	19.39	80.61
S14	3420.33	10716.33	0.53	9.94	2.9.33	14.07.79	19.61	80.39
S11	3201.61	9956.83	0.51	9.944	2.8.06	13.111.69	19.63	80.37
S12	3040.83	9121.14	0.49	10.33	2.9.33	12.161.97	19.38	80.62
S13	3094.33	9283.69	0.49	10.44	2.9.33	12.378.02	19.84	80.16
S15	3277.33	9833.99	0.48	10.83	2.9.39	13.111.96	19.77	80.23
S16	3201.33	9603.99	0.48	10.94	2.9.39	12.811.96	19.77	80.23
S17	3201.33	9603.99	0.48	9.94	2.9.39	12.811.96	19.77	80.23
S18	3201.33	9603.99	0.48	9.83	2.9.39	12.811.96	19.77	80.23
S19	3201.33	9603.99	0.48	9.83	2.9.39	12.811.96	19.77	80.23
S20	3201.33	9603.99	0.48	9.78	2.9.39	12.811.96	19.77	80.23
S21	3201.33	9603.99	0.47	9.94	2.9.39	12.811.96	19.77	80.23
S22	3201.33	9603.99	0.47	11.33	2.9.39	12.811.96	19.77	80.23
S23	3201.33	9603.99	0.48	9.83	2.9.39	12.811.96	19.77	80.23
S24	3201.33	9603.99	0.47	9.61	2.9.39	12.811.96	19.77	80.23
S25	3201.33	9603.99	0.47	9.94	2.9.39	12.811.96	19.77	80.23
S26	3201.33	9603.99	0.48	9.83	2.9.39	12.811.96	19.77	80.23
S27	3201.33	9603.99	0.47	9.94	2.9.39	12.811.96	19.77	80.23
S28	3201.33	9603.99	0.48	9.94	2.9.39	12.811.96	19.77	80.23
S29	3201.33	9603.99	0.48	10.44	2.9.39	12.811.96	19.77	80.23
S30	3201.33	9603.99	0.47	9.89	2.9.39	12.811.96	19.77	80.23
TVB-4(ck)	3201.33	9603.99	0.47	9.83	2.9.39	12.811.96	19.77	80.23
V1(R)	3201.33	9603.99	0.49	9.78	2.9.39	12.811.96	19.77	80.23
S31	3201.33	9603.99	0.47	9.89	2.9.39	12.811.96	19.77	80.23
C.D (p=0.05)	19.22	37.27	0.02	0.28	28.29	0.13	0.07	0.06
C.V(%)	0.74	0.31	2.73	1.64	0.79	0.79	0.21	0.15
Significance	**	**	**	**	*	**	**	**

Genotypes	[illegible]	[illegible]	Leaf sheath ratio	[illegible]	[illegible]	[illegible]	CCS (%)	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CV%	[illegible]	[illegible]	[illegible]	11.44	[illegible]	[illegible]	[illegible]	[illegible]
Significance	**	**	**	**	**	**	**	**

Conclusion

Based on analysis of growth and yield parameters, six genotypes [illegible] were identified as suitable varieties for sub-optimal and optimal conditions. Similarly, seven genotypes [illegible] were identified as suitable varieties for cultivation in optimal condition.

[illegible]: Evaluation of superior sugarcane genotypes for yield and adaptability under varied agro-climatic conditions [illegible]

[illegible]

Objective

- Evaluation of identified sugarcane genotypes for development of superior variety with high yield and quality for optimal agro conditions.
- Evaluation of identified sugarcane genotypes for development of superior variety with high yield and quality for sub-optimal agro conditions.

[illegible]

[illegible]

[illegible]	[illegible]	[illegible] (cm)	[illegible] (cm)	[illegible] (g)	[illegible] (g)	[illegible] (%)	[illegible] (%)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**	NS	**	**	**	*	**

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible] (%)	[illegible] (%)	[illegible]	[illegible] (g)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**	**	**	*	*	**	**

[illegible]

[illegible]

[illegible] All India [illegible] (Apr. [illegible] Mar. [illegible])

[illegible]

[illegible]

[illegible]

[illegible]

- [illegible]

[illegible] (Table 1.3)

Table 1.3: [illegible]

([illegible])

Genotype	[illegible]	[illegible]	[illegible]	Leaf [illegible]	[illegible]	Leaf [illegible]
[illegible]	841	20.??	8.44	76.3	73.4	30.8
[illegible]	838	18.19	6.23	76.3	71.2	25.3
[illegible]	485	15.19	8.72	74.3	69.5	11.8
V1	789	20.02	3.56	78.4	71.3	17.8
S36	803	21.45	3.86	78.4	73.3	18.8
CD at 5%	3.8	0.88	0.82	0.60	5.24	1.6
CV (%)	15.0	5.4	8.2	1.2	3.6	10.7
Significance	**	**	**	**	**	**

**Significance at 0.05 level of probability

[illegible]

Table 1.4: [illegible]

Genotypes	[illegible] (%)	[illegible]	[illegible]	[illegible]
[illegible]	94.7a	72.1a	7.2a	10.57ab
[illegible]	86.4	69.2b	7.6	8.8b
[illegible]	76.8	65.14	4.54	13.89
S36	88.9a	80.7a	7.2a	12.36ab
V1	89.9	84.79	4.5a	10.89
CD 5%	3.7	12.2	19.4	10.3
Significance	**	**	**	**

**Significance at 0.01 level of probability; [illegible]

PBS 1(2021): Evaluation of promising multidisciplinary genotypes for higher fruit yield and resistance to root rot and fruit fly diseases in primary yield trial (Rabi 2020 | Kharif 2021)

Principal Scientist and Head

Objectives:

- Identification of fruit fly genotypes with higher yield, quality and resistance to fruit rot & fruit fly diseases
- Identification of resistance donors in segregating populations under artificial inoculation conditions.

Multidisciplinary trial of 12 fruit fly genotypes and 3 checks (PC, SH and DBR) was taken by planting the genotypes in the primary trial.

Experimental Details (Materials and Methods):

Experiment conducted in Multidisciplinary Research Farm and Laboratory plot.

Kharif 2020 (from July 2020), Rabi (from Oct. 2020), Summer (from Jan. 2021), Kharif (from May 2021), Summer (from Jan. 2021)

A multidisciplinary genotypes with 20 genotypes was maintained for future hybridization programmes. Observations were also recorded in the recommended plot. Observations on fruit fly incidence, fruit rot incidence, yield (kg/ha), 100 seed weight (g), Oil content (%), Protein content (%), Oil yield (kg/ha), Protein yield (kg/ha), Fatty acid composition (%), Palmitic acid (%), Stearic acid (%), Oleic acid (%), Linoleic acid (%), Linolenic acid (%), Iodine value, Saponification value, Oil stability index (hours), Oil colour, Oil clarity, Oil odour, Oil taste, Oil texture, Oil appearance, Oil shelf life (months), Oil rancidity, Oil viscosity, Oil density, Oil refractive index, Oil smoke point, Oil flash point, Oil fire point, Oil acid value, Oil peroxide value, Oil iodine value, Oil saponification value, Oil unsaponifiable matter, Oil free fatty acid, Oil moisture content, Oil impurities, Oil volatile matter, Oil ash content, Oil sediment, Oil sludge, Oil deposit, Oil residue, Oil carbon residue, Oil sulphur content, Oil phosphorus content, Oil iron content, Oil copper content, Oil lead content, Oil arsenic content, Oil mercury content, Oil cadmium content, Oil chromium content, Oil nickel content, Oil zinc content, Oil manganese content, Oil magnesium content, Oil calcium content, Oil sodium content, Oil potassium content, Oil aluminium content, Oil silicon content, Oil boron content, Oil molybdenum content, Oil cobalt content, Oil vanadium content, Oil tungsten content, Oil titanium content, Oil zirconium content, Oil hafnium content, Oil niobium content, Oil tantalum content, Oil rhenium content, Oil ruthenium content, Oil rhodium content, Oil palladium content, Oil silver content, Oil gold content, Oil platinum content, Oil iridium content, Oil osmium content, Oil mercury content, Oil thallium content, Oil bismuth content, Oil polonium content, Oil astatine content, Oil radon content, Oil francium content, Oil radium content, Oil actinium content, Oil thorium content, Oil protactinium content, Oil uranium content, Oil neptunium content, Oil plutonium content, Oil americium content, Oil curium content, Oil berkelium content, Oil californium content, Oil einsteinium content, Oil fermium content, Oil mendelevium content, Oil nobelium content, Oil lawrencium content, Oil rutherfordium content, Oil dubnium content, Oil seaborgium content, Oil bohrium content, Oil hassium content, Oil meitnerium content, Oil darmstadtium content, Oil roentgenium content, Oil copernicium content, Oil nihonium content, Oil flerovium content, Oil moscovium content, Oil livermorium content, Oil tennessine content, Oil oganesson content.

Weather/Agro-Climatic Observations:

Observer Agrometeorologist:	G.K. Raghavendra Rao (from Apr. 2021)
Observers:	Kadappa, V.S. (from Jan. 2020)
	Ramesh, M.P. (from Jan. 2020)

The Agrometeorological Observatory of India Meteorological Department (IMD) has been functioning at the Institute and recording weather and environmental data since IMD Bangalore (Table 1.1).

Table 1.1: Meteorological data for the year 2021

Month	Temperature (°C)			Humidity (%)			Rainfall (mm)	Sunshine hours (h)
	Max	Min	Mean	Max	Min	Mean		
January	32.14	21.03	26.59	88.00	48.00	74.00	20.00	6.91
February	33.19	23.02	28.11	94.00	54.00	74.00	23.00	7.24
March	35.11	23.03	29.07	92.00	44.00	73.00	0.00	8.61
April	36.00	24.00	29.99	89.00	49.00	74.00	45.00	8.03
May	35.21	23.00	29.11	92.00	58.00	82.00	61.00	7.01
June	33.02	23.00	27.51	96.00	79.00	89.00	284.00	3.00
July	29.89	23.00	25.95	96.00	87.00	92.00	241.00	1.00
August	31.13	23.00	26.99	95.00	83.00	89.00	83.00	2.00
September	32.00	23.00	27.50	96.00	77.00	86.00	89.00	3.01

October	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
November	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
December	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean	[illegible]	[illegible]		[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
							Total rainfall (mm)	[illegible]
							No. of rainy days [illegible]	[illegible]

3. MULBERRY MOLECULAR BIOLOGY

Concluded Research Projects

PIC301L: Mapping QTLs for alkalinity tolerance in Mulberry (Morus sp.) (Aug. 2017 – Dec. 2021)

[illegible]

Objectives

- To validate the [illegible] of accessions [illegible] for alkalinity stress and development of mapping population
- Identification of QTLs controlling alkalinity tolerance in mulberry
- To validate the [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] under alkaline treatment (Fig. 2.3). SPAD value of susceptible check 7-1 ([illegible]) is [illegible] under pH 9. The significant reduction in the SPAD value indicates susceptibility of genotypes to the alkaline stress.

Significant increase in glycine betaine content under alkaline treatment compared to control, indicates tolerance of these genotypes to alkaline stress. The genotypes identified are: [illegible] (Fig. 2.4). The genotypes tested for alkalinity stress [illegible] leaf weight [illegible], which indicates that the leaf weight reduction was less in these genotypes under alkaline stress.

Development of mapping populations by crossing contrasting genotypes for alkalinity stress tolerance

Parents were selected based on performance under alkaline stress, [illegible] of genotypes [illegible] and Jalisco were selected as a female tolerant parents; 7-1 as a male susceptible parent. After repeated hybridization, two mapping population namely, [illegible] × 7-1 ([illegible]) with [illegible] F2 progenies, Jalisco ([illegible]) × 7-1 ([illegible]) with [illegible] F2 progenies were developed and established in the field. In addition to that [illegible] seedlings in [illegible] × 7-1 cross and [illegible] seedlings in Jalisco × 7-1 cross were developed.

Identification of SSRs controlling alkalinity tolerance in sunflower

[illegible] SSR markers were synthesized out of [illegible] primers from [illegible].

Isolation of genomic DNA from the parents and mapping population

Isolated genomic DNA from leaf samples of parents ([illegible], Jalisco and 7-1) and [illegible] F2 progenies of Jalisco × 7-1 cross and [illegible] F2 progenies of [illegible] × 7-1 cross.

Identification of polymorphic markers between the parents

A total of [illegible] SSR markers were used for identification of polymorphic markers. [illegible] markers were found polymorphic between [illegible] and 7-1 viz., [illegible]. [illegible] markers were found polymorphic between Jalisco and 7-1 viz., [illegible]. These polymorphic markers were used for genotyping of mapping population.

Table 2.[illegible]: List of accessions showing contrasting alkalinity stress

Alkaline tolerant accessions	Alkaline susceptible accessions
[illegible]	[illegible]
[illegible] (Tolerant check)	7-1, [illegible] (Susceptible check)

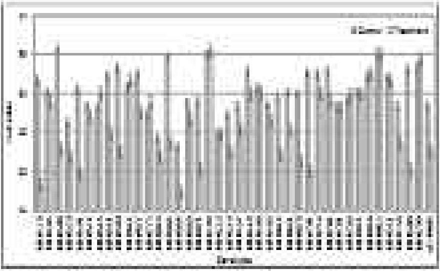

Fig. 2.1: SPAD (chlorophyll content reading) of 48 mulberry genotypes in control and alkaline treatment

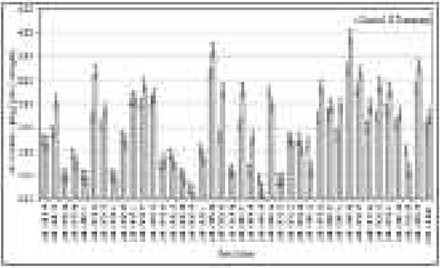

Fig. 2.2: Glycine betaine (GB) content in leaves of 48 mulberry genotypes under control and alkaline treatment

Conclusion

The study revealed that AR-12, MR2, [illegible], Bhodakhopa, TR-?, [illegible] and [illegible] were alkaline tolerant genotypes and [illegible] and other genotypes were alkaline susceptible genotypes. In this study 28 novel SSR markers were identified which can be used for molecular characterization, DNA finger printing, linkage map development, QTL identification and gene mapping in mulberry. [illegible] between [illegible] and [illegible] ([illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible], [illegible]

[illegible] and [illegible]. Seventeen polymorphic markers found between Kanva 2 and [illegible] [illegible] Two different mapping population of [illegible] and [illegible] were developed which can be used for development of QTLs for disease resistance traits.

PROJECT [illegible]: Validation of a high density SNP genotyping array for QTL discovery by association mapping and bi-parental analysis in Mulberry ([illegible])

[illegible]

Objectives:

- SNP genotyping of panel of diverse germplasm and mapping population
- Construction of a genetic linkage map using SNP markers
- QTL discovery by association mapping and linkage mapping using phenotypic data for different traits.

A collection of [illegible] indigenous and exotic mulberry germplasm is being conserved at [illegible]. Among them, 173 accessions were genotyped using twenty SSRs markers.

Genetic diversity and cluster analysis

Genetic diversity parameters such as percentage of polymorphic loci, effective allele number (Ne), gene diversity (H), Shannon's information index (I), gene frequency, and gene flow (Nm) were computed.

Results

The genomic DNA of 173 mulberry germplasm was amplified with [illegible] pairs of SSR markers and these markers revealed [illegible] different SSR bands. Out of [illegible] markers used in the study, 20 markers ([illegible]) have been polymorphic between the diverse mulberry germplasm.

Genetic diversity parameters and Polymorphism Information Content (PIC)

In total, 20 SSRs were amplified to measure genetic diversity inferences among 173 mulberry accessions which were indigenous and exotic from Korea, France, Indonesia, Japan, China, etc. Among 173 accessions, a total of [illegible] SSR alleles were detected in marker [illegible] with an average of [illegible] alleles per SSR ranging from 2 ([illegible]) to 7 ([illegible] and [illegible]) alleles. The value of PIC ranged from [illegible] to [illegible] with a mean of [illegible] on average. [illegible] markers such as [illegible] and [illegible] were highly informative with PIC value [illegible] indicates their utility for diversity analysis. Mean Shannon's Information index (I) value of [illegible] was observed for all the markers ranging from [illegible] to [illegible]. The value of Nei's index for each marker ranging from [illegible] to [illegible] with a mean of [illegible] was observed, while the value of expected heterozygosity varied from [illegible] to [illegible] with a mean of [illegible]. A summary of marker statistics for 173 mulberry accessions is listed in Table [illegible].

Table 3.2: Genetic diversity of [illegible] using the selected [illegible] primers

#	Marker name	No. of alleles	Effective no. of alleles	Expected heterozygosity (gene diversity)	Shannon's index	Polymorphism	PIC
1	[illegible]	6	1.43	0.31	0.88	0.57	0.54
2	[illegible]	6	2.04	0.51	1.05	0.84	0.78
3	[illegible]	3	1.51	0.34	0.48	0.52	0.50
4	[illegible]	4	1.95	0.49	0.96	0.69	0.67
5	[illegible]	6	2.03	0.51	1.09	0.80	0.81
6	[illegible]	3	1.24	0.19	0.29	0.32	0.28
7	[illegible]	6	1.61	0.37	1.04	0.61	0.60
8	[illegible]	5	1.81	0.44	0.78	0.42	0.47
9	[illegible]	5	2.04	0.51	1.05	0.80	0.81
10	[illegible]	7	1.51	0.34	1.02	0.69	0.67
11	[illegible]	6	1.61	0.38	1.00	0.61	0.60
12	[illegible]	3	1.74	0.43	0.71	0.56	0.53
13	[illegible]	6	1.82	0.71	1.02	0.74	0.80
14	[illegible]	7	1.83	0.83	1.08	0.69	0.87
15	[illegible]	5	2.01	0.76	1.08	0.80	0.80
16	[illegible]	6	1.85	0.59	1.09	0.74	0.77
17	[illegible]	8	1.91	0.61	1.18	0.91	0.86
18	[illegible]	3	1.81	0.53	0.79	0.62	0.59
19	[illegible]	8	1.46	0.71	1.02	0.91	0.74
20	[illegible]	7	1.88	0.49	1.08	0.71	0.88
	Mean	5.65	1.813	0.482	1.0206	0.693	0.67

Marker value marked as [illegible] and valid are highlights of [illegible]

Genetic variation in [illegible] was evaluated by [illegible] genotyping and assignment of both diploid and tetraploid genomes of [illegible] and [illegible] genotypes [illegible] through restriction fragment at [illegible]. Figure 3). The results revealed that [illegible] alleles at [illegible] and [illegible] were observed in genotypes [illegible] [diploid] and [illegible] [tetraploid] respectively. Similarly, with [illegible] developed alleles were at [illegible] and [illegible] diploid but while the same marker alleles at [illegible] and [illegible] remained for [illegible] tetraploid. Previously with [illegible] alleles at [illegible] and [illegible] for [illegible] diploid and [illegible] detected at [illegible] and [illegible]. Whereas for [illegible] showed the alleles were [illegible] and [illegible] and [illegible] for [illegible] tetraploid. [illegible] marker values used against the genotypes, [illegible] diploid allele size was [illegible] and [illegible] whereas for [illegible] tetraploid it was [illegible] and [illegible]. For the marker [illegible], [illegible] and [illegible] were alleles obtained. Same result was with [illegible]. In analysis, all the markers didn't show any variation between [illegible] and tetraploids. However the marker [illegible], reported the alleles at the same base pair in case of diploid and tetraploid genotypes at [illegible] and [illegible] which is presently assumed that the variation is mainly associated with chromosome doubling, with no other effect on the genetic structure. Moreover, non finding on the disappearance of certain DNA markers in tetraploids when compared to the diploid progenitors leads to the assumption that genetic changes may take place in evolutionary timeframe.

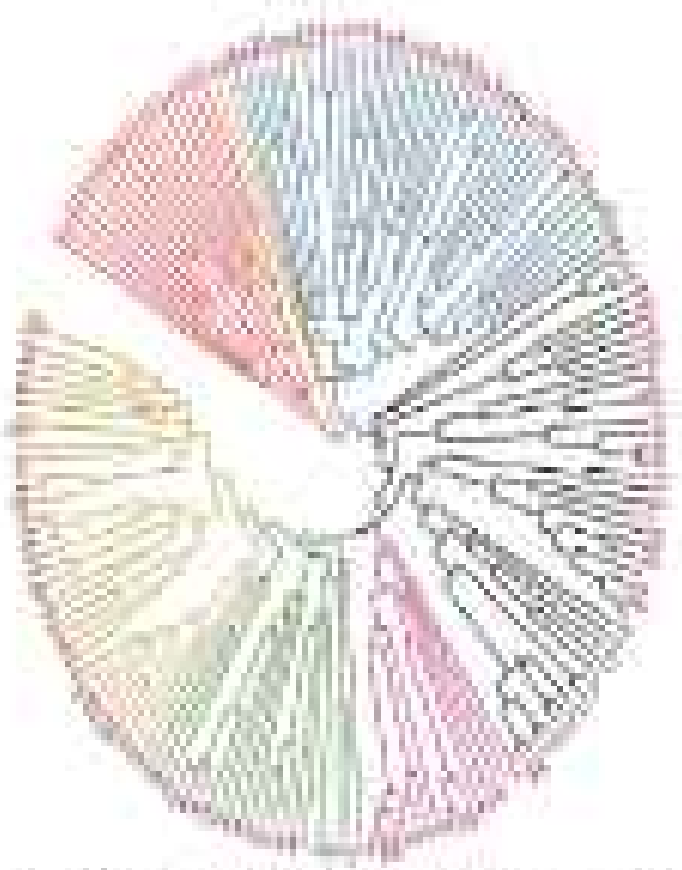

Fig 2.2: Distribution of the studied 272 mulberry germplasm generated from [illegible] confirmed by using SSR data

In the phylogeny model, the branching delineated the germplasm into two major clusters. Cluster I with two sub clusters (sub cluster IA and IB), cluster II with two sub clusters (sub clusters IIA and IIB) exclusively sub cluster IIB divided into IIB-1 and IIB-2, also IIB-1 sub cluster having several major subclusters where abundance of different [illegible] and developed by [illegible] of [illegible] distributed within the cluster (Fig 2.2). The details about the germplasm in sub cluster are mentioned in Table 2.2. Different species are existed but IIBa contains the majority of species *M. indica* (34), *M. alba* (20), *M. laevigata* (24) and *M. bombycis* (42), remaining species are existed from other species. *M. australis*(24), *M. serrata* and IIB1, *M. rotundiloba* (IIB2, *M. cathayana* (IIB2, *M. sanicula* (IIB1) and others species of 22 mulberry germplasm also included.

Mulberry variety C776 has been obtained by crossing *M. multicaulis* and Black Cherry. The relationship is depicted by the crossing of the parents and the offspring or the descendants. On the other hand, Variety V1 was developed by crossing two highly diverse germplasms C776 (Male parent) and V20 (Female parent). The genetic variation observed in this study revealed that V1 and V20 have very little variation and are from common ancestor in sub cluster IIB (Local) and C776 has a genetic distance from V1 and V20. These results confirm the markers that are used for this study and stress their ability to illustrate the genetic relationship among the selected Genetic Resources germplasm. Mulberry varieties V1 was developed from the cross *M. multicaulis* × C-776 and V-2 from the cross *M. multicaulis* × V-20. All these individual germplasm are placed under sub cluster IIB-2a. Here though V1 and V2 are developed from the same female parent, they are in great variation because of the different male parents.

Table 1.1: Clustering pattern of 11 mulberry genotypes using 100 markers

Cluster/ Subcluster number		No. of genotypes	Name of the genotypes
Cluster I	Cluster IA	10	[illegible]
	Cluster IB	11	[illegible]
Cluster II	Cluster IIA	10	[illegible]
	Cluster IIB	-	
Cluster III	Sub cluster IIIA-i	20	[illegible]
	Sub cluster IIIA-ii	42	[illegible]
	Sub cluster IIIB-i	19	[illegible]
	Sub cluster IIIB-ii	11	[illegible]
	Sub cluster IIIB-iii	18	[illegible]

Population structure of selected mulberry germplasm

Assessment of the genetic diversity and population structure of a species is essential to evaluate the mechanisms involved in new germplasm formation. An admixture model based approach was implemented to investigate the population structure of 172 mulberry germplasm.

The present study corroborates overall assessment of the genetic diversity and structure of 172 Morus germplasm. Medium and high level of genetic diversity and genetic variation was present within and between the species accordingly. The population structure of 172 germplasm revealed that the assignment of species and non admixture between the groups, suggesting that these Morus mulberry may maintaining a high level of heterozygosity due to the reproductive breeding mechanism system and also germplasm may

have undergone gene exchange between the species. Germplasm was collected from different sources and they are continuously used for making breeding programs and these results in novel combinations. Furthermore, these results can be considered as a potential tool for exploring genetic diversity, as well as a new source for efficient conservation and breeding programs of mulberry in the future.

SNP genotyping

A total of 478 genotypes were finalized for SNP genotyping, which includes 450 diverse accessions collected under different eco-tracts (Zones), Yield and Nutrient use efficiency) for association analysis and GWAS, exploring the linkage mapping for root architecture traits. Among 450 accessions for different eco-tracts, 50 are common across the three different traits and 50 accessions are common between drought and yield traits. Whereas, 33 accessions were common between yield and Nutrient use efficiency. Similarly, 100 accessions for drought, 200 accessions under yield and 150 accessions under Nutrient use efficiency were finalized for SNP genotyping. Genotype DNA's were shredded in 12 accessions based on the reference 50 and analyzed with 96 reliable data.

Field Studies

A total of 12 (All accessions were used against 12 mulberry germplasm and they evaluated diversity with family between the mulberry germplasm. The genetic DNA of 12 mulberry germplasm was analyzed with BioMAP, Hello (MGT) and MGSP system of 96 accessions and these accessions carried 96 different SSR bands. Among 12 accessions, a total of 24,105 alleles were detected, as number but with an average of 4.2 alleles per SSR marker locus (1 MGMMS1116 to 1 MGMMS1148, MGMMS1153 and MGMMS1) alleles. The value of PIC ranged from 0.12 to 0.87 with a mean of 0.77 on average. These markers were highly informative with PIC values > 0.5 that indicates their ability for diversity analysis.

The genetic similarities and phylogenetic relationship existing among the genotypes were analyzed. The pairwise similarity sequence in this study revealed that 1-5 and 6-10 have very little variation and are distinguished together by sub cluster (B) 1a and C) 1 b) (A) Mulberry dendrogram showing the 1-5 and 6-10. These results confirmed enough about the efficiency of the markers that are used for this study and these data ability to illustrate the genetic relationship among the advanced breeds (these genotypes).

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Identification of QTLs for yield associated traits in mulberry (Sep. 2016-Dec. 2021)

[Author Name], [author initials]. [Author Name], [author initials]. and [Author Name], [author initials].

Objectives

1. To evaluate the panel of diverse germplasm (~300 accessions) for yield and associated traits

The 300 germplasm accessions including checks (V-1 and Kanva) were planted in an augmented randomized block design (experimental plot consists of 3 blocks with 7 checks) with 4 feet inter and intra row spacing. Recommended cultivation practices followed as per block. Each as in a RCBD experimental treatments (where genotypes including checks) were made in one block as each block was a different set of unreplicated accessions. After two months of establishment survival, bush based pruning was completed. Subsequent crop harvest was taken up in 75 days interval and observations were recorded on 5 plants in each plot/plot for growth and yield associated traits viz. Number of shoots (shoots/plant), Length of longest shoot (cm), Average shoot length (cm), Number of leaves in longest shoot (nos/shoot), Internodal length (cm), Shoot yield/plant (g), Leaf yield/plant (g), Hundred leaf weight (g), Leaf moisture (%), Moisture retention capacity (%) and SPAD.

Analysis of variance was carried out for growth and yield contributing traits. The adjusted block effects were non-significant for all traits except SCMR indicating homogeneity of evaluation blocks. Mean sum of squares of genotypes exhibited highly significant differences for number of leaves on the longest shoot, terminal length, weight of bunch of leaves, leaf area, relative chlorophyll content, stability and SCMR which indicates presence of significant variations for these traits among the genotypes.

In this study the number of shoots raised ranged from 3.6.6 to 31.6.6 and mean is 16.6.6. High PCV (40.6.6), moderate GCV (28.6.6) and heritability (54.6.6) coupled with high genetic advance as per cent mean (42.6.6) was noticed for number of shoots per plant. Length of longest shoot ranges from 15.6.6 cm to 33.6.6.6 cm and mean is 27.6.6.6 cm. Moderate values of GCV (14.6.6.6) and PCV (16.6.6.6), moderate heritability (76.6.6.6) coupled with high genetic advance as per cent mean (25.6.6.6) was noticed for number of leaves on longest shoot ranges from 15.6.6.6 to 36.6.6.6 and mean is 25.6.6.6. Number of leaves in longest shoot ranges from 15.6.6.6 to 36.6.6.6 and mean is 25.6.6.6. High PCV (24.6.6.6), high GCV (20.6.6.6) and heritability (84.6.6.6) coupled with high genetic advance as per cent mean (34.6.6.6) was noticed for number of leaves. Internodal length ranges from 4.6.6.6 cm to 9.6.6.6 cm and mean is 6.6.6.6 cm. Moderate values of GCV (11.6.6.6) and PCV (14.6.6.6), high heritability (83.6.6.6) coupled with high GAM (24.6.6.6) was recorded for internodal length. Plant yield per plant ranges from 1.6.6.6 kg to 12.6.6.6 kg and mean is 6.6.6.6 kg. Leaf yield per plant ranges from 0.6.6.6 kg to 2.6.6.6 kg and mean is 1.6.6.6 kg.

Bunched leaf weight ranges from 1.6.6.6 kg to 6.6.6.6 kg and mean is 3.6.6.6 kg. High PCV (30.6.6.6), high GCV (21.6.6.6) and heritability (76.6.6.6) coupled with high genetic advance as per cent mean (32.6.6.6) was noticed for bunched leaf weight. Leaf area ranges from 0.6.6.6 cm to 2.6.6.6 sq.cm and mean is 1.6.6.6 sq.cm. High PCV (31.6.6.6), high GCV (26.6.6.6), high heritability (70.6.6.6) coupled with high genetic advance as per cent mean (46.6.6.6) was noticed for leaf area. Relative chlorophyll ranges from 35.6.6.6 to 75.6.6.6 and mean is 75.6.6.6. Low PCV (3.6.6.6), low GCV (3.6.6.6), low heritability (20.6.6.6) coupled with high genetic advance as per cent mean (3.6.6.6) was noticed for relative content of leaf. Moisture retention capacity ranges from 61.6.6.6 to 92.6.6.6 and mean is 76.6.6.6. Low PCV (7.6.6.6), low GCV (4.6.6.6), high heritability (30.6.6.6) coupled with medium genetic advance as per cent mean (5.6.6.6) was noticed for moisture retention capacity of leaf. SLA ranges from 11.6.6.6 to 16.6.6.6 and mean is 13.6.6.6. Low PCV (7.6.6.6), low GCV (6.6.6.6), high heritability (87.6.6.6) coupled with medium genetic advance as per cent mean (11.6.6.6) was noticed for SLA. Chlorophyll index ranges from 0.6.6.6 to 1.6.6.6 and mean is 0.6.6.6. Low PCV (7.6.6.6), low GCV (6.6.6.6), high heritability (87.6.6.6) coupled with medium genetic advance as per cent mean (11.6.6.6) was noticed for chlorophyll index.

Higher estimates of GCV and PCV were observed for bunched leaf weight, leaf area and number of leaves in longest shoot. The high estimates of GCV and PCV for the traits suggests the presence of higher magnitude of variations and narrow differences between the PCV and GCV implies lesser degree of environmental influence in the expression of characters. Thus selection can be considered for these characters. Low to moderate estimates of PCV and GCV were recorded for internode number, internode diameter, specific leaf area (SLA), chlorophyll index and relative water content. This indicates lower magnitude of variations for these traits. High estimates of heritability accompanied with high genetic advance as per cent mean was recorded for number of leaves in longest shoot, internodal length, leaf area and bunched leaf weight. This indicates that most likely the heritability is due to additive gene effects and there is lot of scope for improvement of these traits in future breeding programme and selection will be effective and may readily contribute to yield. High heritability accompanied with low to moderate genetic advance as per cent of mean was recorded for traits like relative water capacity and SLA, chlorophyll index and relative water content. This indicates the presence of non-additive gene action and narrow range of variations for these traits. This suggests that limited scope for further improvement of these characters.

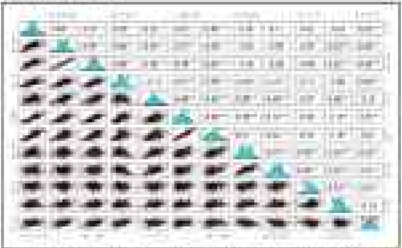


Fig. 2.[illegible]: Phenotypic correlation coefficient for growth and yield attributing traits in mulberry along with scatter plot and frequency distribution

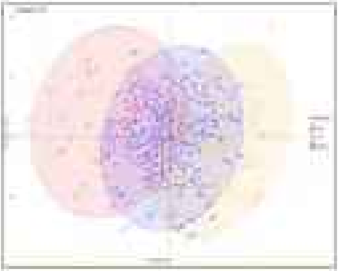


Fig. 2.[illegible]: Two-dimensional graph showing relative positions of [illegible] mulberry genotypes based on PCA scores

Conclusion

Traits namely hundred leaf weight, leaf area and number of leaves in longest shoot recorded high PCV and GCV, high heritability and high genetic advance over mean. This indicates presence of higher magnitude of variation, lesser impact of environment in the expression of characters and heritability is due to additive gene effects. These traits [illegible] scope for improvement of these traits in future breeding programmes and selection based on these traits will be effective and may rapidly contribute to yield. [illegible] genotypes recorded high leaf yield per plant [illegible] than population mean [illegible] standard deviation. The genotypes viz., [illegible] were selected based on optimum combination of hundred leaf weight, leaf area and number of leaves in longest shoot among high yielding genotypes. These genotypes can be used directly as a variety after bioassay and further confirmation for yield and quality traits. Contrasting genotypes for [illegible] length of the longest shoot and [illegible] length can be used in breeding programs for production of desirable transgressive segregants.

[illegible]: [illegible] Mulberry [illegible]: Identification of QTLs Conferring Resistance to Root Rot Disease by Linkage Mapping and [illegible] (Oct. 2018 - Nov 2021)

[illegible]

Objectives

- To develop mapping population [illegible] for root rot resistance [illegible]
- [illegible] for disease resistance phenotype.
- QTL analysis for disease resistance by linkage mapping [illegible]

Three mapping populations were developed for resistance mechanism using divergent screening, recorded data by selecting crosses that cross strategy for balancing phenotypic and allelic. Contrasting male [resistance (R) and susceptible (S) the most recommended] inc. [1] (A. resistance) [2] (Cashew Nuts, [3] M. multicaulis DAE-0985 • [2] Thailand Mail and [3] Punjab Local • [3] M. corbynia [Hybrid] of resistant genotype were selected based on the key genetic divergence and plenty the hybridization. Ultimately, about [4] crossings involving different genetic connecting for the male were carried out. The seeds were collected after crossing. As segregating progenies were raised in the glasshouse conditions. Seedlings of four months old were transferred for acclimatization to the field. After one year of establishment, screened the best established mapping populations developed from the cross [3] M. multicaulis [DAE-0985] • [2] Thailand Mail for further evaluation against new and pathogenic and genotyping.

Three highly pathogenic isolates of F. solani [MRSS-R1004] and a check isolate [MRS-1] and [MRS-5] causing dry root rot were separately were used in this study for inoculation [DAS-2A]. Briefly, the morphological, microscopic and cultural characteristics of the selected isolates molecular characterization was conducted using primer pairs ITS1 and ITS4 [Table 3.1].

Table 3.1 Molecular characterization of fusarium species isolates from cashew orchards

Name of isolates and codes used	NCBI GenBank accession numbers	Name of the pathogen
Kulbarga Rose_[MRS]	MH544454	Fusarium solani
Kulbarga Rose_[MRS]	MH544455	Fusarium solani
Kulbarga Rose_[MRS]	MH544457	Fusarium solani
Kulbarga Rose_[MRS]	MH572454	Fusarium solani
Kulbarga Rose_[MRS]	MH572455	Lasiodiplodia theobromae
Kulbarga Rose_[MRS]	MH572457	Lasiodiplodia theobromae
Kulbarga Rose_[MRS]	MH572458	Lasiodiplodia theobromae

Methods of inoculation

Thirty days old seedlings of F. solani grown on potato dextrose agar plates were ground in a mortar and pestle. Inoculum was mixed in the 10g sterile sandy loam pots filled with 2 kg sterilized soil mixture (Sandy loam, Sand, 1:1). The [30] days old seedlings were transplanted in pots and remaining part of the pots were filled with sterilized soil mixture. Uninoculated control treatments were also maintained by planting 2 [2] seedlings in each pots and six pots.

The [30] days old plants were inoculated carefully, the roots were slightly damaged and dipped in the conidial suspension of F. oxysporum overnight with the count [10] at 1×10⁶ CFU/plant. Each treatment has plants were transplanted in sterilized pots filled with sterile soil mixture. Similarly, the control plants were slightly damaged, dipped overnight in sterile water and transferred to sterile pots.

The evaluation of the mapping population for resistance mechanism was carried out in sterilized pots under glasshouse conditions. Four months old seedlings of F. oxysporum were transplanted in sterilized pots and arranged in Completely Randomized Design [CRD]. Five replications of each progeny were maintained. The fungal pathogen was inoculated as detailed above. Three uninoculated seedlings were maintained for the root rot symptoms and observations were recorded up to [30] days after inoculation. The data on seed germination, healthy and lethal root rot plants were recorded. The wilting [%], rotting [%] and shoot survival [%] were calculated. Based on the wilting and rotting indices, the disease reaction of the germplasm accessions were categorized.

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

Based on the disease assessment, the resistant and susceptible progeny were categorized for genetic analysis.

Results

Development of mapping populations for resistance to pseudostem weevil damage

Out of 200 F1 progenies developed by crossing (♂) *M. malaccensis* (MC-1000) × (♀) Dwarf Kola for distribution of resistance and susceptible were evaluated in two seasons, results showed that 2 progenies were found highly resistant (1.0 %), 28 progenies as resistant (14.0 %), 74 progenies as moderately resistant (37.0 %), 63 progenies as susceptible (31.5 %) and 33 progenies as highly susceptible (16.5 %) to *Rhynchophorus* weevil. The results for highly resistant (MR=1.00) and highly susceptible (MR=5.00) were consistent in each experiment.

The evaluation of F1 progenies against *Rhynchophorus* weevil in two seasons showed almost similar disease reaction in frequency distribution, as shown in Fig. 2A & 2C. Similarly it was observed that polynomial distribution of progenies in each reaction was as Fig. 2B.

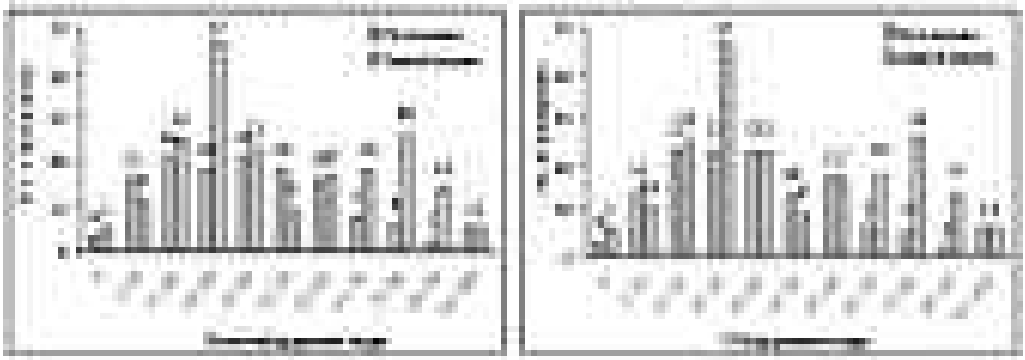


Fig. 2A: [illegible]

Fig. 2C: [illegible]

Fig. 2B: Polynomial distribution of F1 progenies against *Rhynchophorus* weevil in five disease reaction grades. HR: Highly resistant, R: Resistant, MR: Moderately resistant, S: Susceptible, HS: Highly susceptible

The progenies were observed high rate of segregation and resulted in good number of highly resistant and highly susceptible segregants along with other moderate disease reaction grades. It was also observed that highly segregants (R+S+S) produce correlations between wilting and rotting percent (Fig. 2.3). There is [illegible] was considered only two disease reaction grades as resistant and susceptible. It was noticed that the segregation ratio is more or less 1:1 in several crosses (Fig. 2.4).

Fig. 2.3: Correlation coefficient between data on wilting and rotting

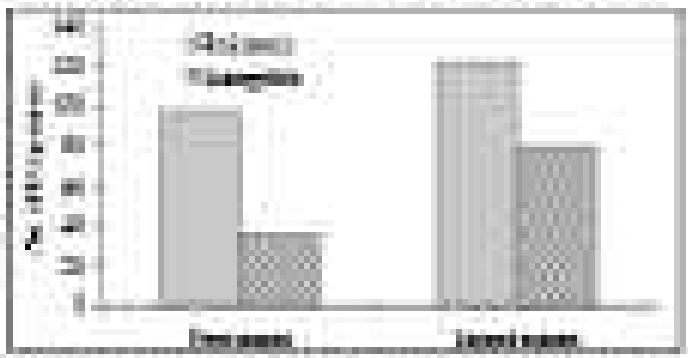


Fig. 2.4: Comparison of genome distribution of F2 progenies among resistance and susceptible disease reactions in both the crosses

Out of 300 F2 progenies evaluated in two crosses against *Sclerotium rolfsii*, 11 progenies were found highly resistant (3.67 %), 80 progenies as resistant (26.67 %), 77 progenies as moderately resistant (25.67 %), 85 progenies as susceptible (28.33 %) and 27 progenies as highly susceptible (9.33 %) disease reaction to *Sclerotium rolfsii* inoculation. The chi-square for highly resistant (HR+MR) and highly susceptible (MS+HS) was [illegible]

The evaluation of 300 F2 progenies against *Sclerotium rolfsii* inoculation in two crosses showed more or less similar disease reaction as shown in Fig. 2.11 & 2.12. Similarly it was observed that segregation distribution of progenies in each crosses (Fig. 2.13).

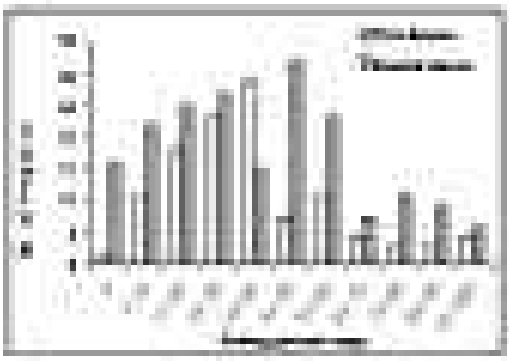


Fig 1.1: Comparison of first and second season

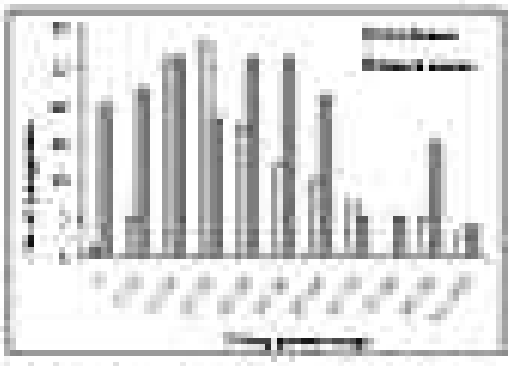


Fig 1.2 Comparison of first and second season data on yielding genotypes

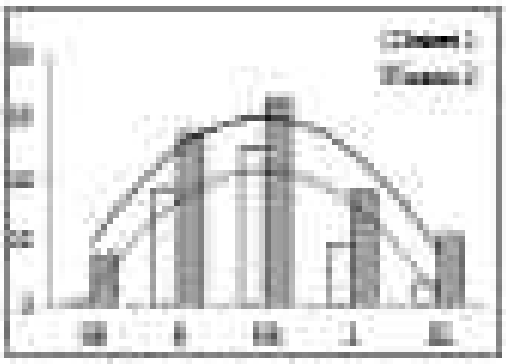


Fig 1.3: Polynomial distribution of [illegible] against [illegible] resistance in five disease reaction groups. HS: Highly resistant, S: Resistant, MS: Moderately resistant, I: Susceptible, HS: Highly susceptible

The progenies were observed high rate of segregation and resulted in good number of highly resistant and highly susceptible progenies along with intermediate disease reaction grades. There it was considered only two disease reaction grades as resistant and susceptible. It was noticed that the segregation ratio is more or less 1:1 in all the crosses.

Yield and growth parameters obtained with rust on Swasi susceptible host. The variation in the yield and growth parameters with respect to rust resistance grouped were collected among two plots. There was no significant variation observed between yield and growth parameters viz. longest shoot length (LSL, cm), number of leaves in longest shoot (LLS), number of shoots per plant (NS), shoot yield (SY, g), cane weight (CW, g) and Leaf yield (LY, g) with rust resistance reaction groups namely resistant (R), moderately resistant (MR), moderately (M) and highly susceptible (S). The descriptive statistics for growth and yield parameters were given in table 1.1

Statistical data analysis

The positive and highly significant correlations were observed between yield and growth parameters. The yield and growth characters like LSL, LLS, NS, shSW and SW were highly significant and positively correlated with each other.

Of the total 78 SSR primers used for parental polymorphism, 15 produced polymorphic bands between parents and these were used to screen the mapping population consisting 200 progenies.

Maximum polymorphic SSRs were produced more alleles than minimum number of alleles produced by the parents due to high heterozygosity of the parents.

Table 4.4: Descriptive statistics for pooled data on growth and yield parameters

Growth and yield parameters	Min.	Max.	Mean	SEM±	CV	CV%	F value
Length of longest shoot (cm)	10.00	450.00	170.00	1.84	45.02	26.61	*
No. of leaves in longest shoot	7.00	42.00	21.50	0.84377	10.30	48.01	NS
No. of branches	1.00	11.00	7.00	0.17	1.91	44.75	**
Shoot weight (g)	24.00	1800.00	1000.00	48.00	587.00	58.70	***
Root weight (g)	8.00	1200.00	700.00	20.14	387.42	57.30	***
Seed weight (g)	10	1000	600.00	16.00	440.00	61.00	***
Survival percentage	8.00	100.00	77.00	0.00	21.00	34.00	*

Two hybrids were acquired depending on the banding pattern produced in agarose gel and selected markers used in the genotyping of 200 DNA samples of F1 progenies showed specific banding patterns and identified the true hybrids. The number of alleles varied in the range of 1-4. Marker MPSTR029 and SSR0035 revealed the maximum number (four) of alleles while the marker MPSTR0049 and SSR0020 produced three alleles per locus and MPSTR0044, MPSTR0045, MPSTR0048, MPSTR0051, SSR0036-1, SSR0041 and SSR0042 revealed two alleles each one being MPSTR0044 band observed the least number of alleles per locus.

The complementary banding pattern of both gametes made a very significant role in hybrids. The marker MPSTR0044 obtained the allele size at 120 bp for female parent (A) maternal and allele 110 bp and 130 bp for male parents (Thailand male). SSR0041 obtained the allele size at 220bp in 'A' by the female parent and 140bp the male parent. SSR0021 obtained the allele size as 210 bp and 220 bp the female parent and 210bp the male parent. SSR0042 obtained the allele size at 240 bp and 250 bp for the female parent (A) and 230 bp for male parent. SSR0020 obtained the allele size the female parent as 220 and 230 bp similarly the male parent were alleles produced with 190 and 200 bp. MPSTR0054 revealed the allele size as 140 bp female and 150 bp for male parent. The marker SSR0042 obtained the allele size at 240bp, 250bp, 260bp for female parent and allele 210bp the male parent. SSR0034 obtained the allele size at 200bp in 'A' the female parents and 180bp the male parents. SSR0020 obtained the allele size at 140bp in 'A' by the female parents and 160bp the male parents. SSR0041 obtained the allele size at 220bp for female parents and 210bp in 'A' the male parents. SSR0021 obtained the allele size at 210bp and 230bp for females and 210bp and 230bp for male parents and MPSTR44 generated 120bp in females 110bp and 130bp in males.

The male and female alleles combination of different markers has been expressed in different progenies. The DNA has been maintained in male F1 allele was expressed by specific polymorphic markers. Based on the alleles produced on the agarose gel was scored also the presentation of male, female and hybrid plants have been distributed. The distribution differentiating progenies on recombinants have been shown in Fig. 2.1A

Table 2.[illegible] [illegible]

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

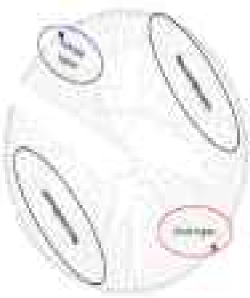


Fig. 2.[illegible] [illegible]

[illegible]

Conclusion

Dividend Gap met its fitness resistance mapping populations and confirmed in the field. **Evaluated the advanced mapping population containing 200 F2 progenies against Turcicum wilt and Lasiodiplodia stalkrot rot in two seasons under glasshouse conditions. Identified F2 resistant progenies to both the pathogens based on the wilting and rotting rates. Identified random genomic polymorphic SSR markers and completed the genotyping of the mapping populations. Additionally, 200 F2 progenies were advanced for progeny row trial (PRT) and harvested five ears data on growth and yield parameters and found six progenies with higher yield and growth parameters among 47 resistant progenies. These progenies can be further evaluated under Stationary Yield trial (SYT).**

On going research projects

PDC (MAS): Development of highly productive and widely adapted maintainer young varieties and wild germplasm (Jul. 2018 - Jun. 2021)

S.K. Gireesh Babu and M.S. Shanthi

Objectives

- To generate divergent hybrid populations using varieties with inbred connection and advanced maintainer varieties.
- To develop highly productive and adaptive varieties as CMV.

Field experiments

The experimental genetic with 2x2 F1 hybrids developed from six cross combinations and 200 CMV from C2 and C4 maintainer were maintained separately. Assessed fourth, fifth ears of three row data and four ears data of several row on the growth and yield parameters viz., length of longest ear, ear girth, number of grain rows, ear weight, stem weight, etc. all formulae as per hybrid combinations. During the cropping growth stress viruses and root CMV F1 hybrids were established in the experimental field. It was found that morphological variation between hybrids very high in Maize Gene (2 × 2 F1) (Fig. 2.12).

Experimental Design and recording observations

Two resistant and susceptible evaluated observed about 30 hybrids have more than 70 percent of susceptibility and nine hybrids were found above 18 per cent length among Maize (2 × 2) crops. Similarly, 24 hybrids observed more than 70 percent of susceptible and 12 hybrids were found above 21 per cent length among (2×2 F1) (Table 2.7).

Table 2.7: Details of susceptibility and correspondence

Replica	Observed range	Number of hybrids		Length of ear (cm)	Number of hybrids	
		Maize (2 × 2)	(2×2 F1)		Maize (2 × 2)	(2×2 F1)
1	0-10	3	7	0-5	11	7
2	10-40	7	20	5-10 cm	17	23
3	70-90	11	42	10-15 cm	22	31
4	>90	30	28	above 15	7	11

Grand national harvest

Stronger seedbed harvest

Lower seedbed disturbed harvest

Fig 3.4A. Morphological variability of C3 hybrids in the second season (2 = 3).

PIP 010149: Development of Biotechnological, Biodiversity and Stability guidelines for Mulberry (*Morus* sp.) and their validation (Phase III: Oct. 2020 - Mar. 2023)

Submitted (Form No. XXX) by M. S. Bhatnagar and P. Senthilvel

Objectives

- Establishment and maintenance of germplasm and advanced mulberry breeding lines in RCS Hosur/Kodur.
- Morphological and molecular characterization of mulberry and reference varieties using SSR markers and SNP/SSR markers, molecularly and genetically of mulberry cultivar identification diagnosis.
- SSR marking and registration of mulberry varieties (CSR, MR-2, Kanva, RS-1 and MR-10) under IPR & PBR.
- Indian and international mulberry varieties (other than CSR released varieties) from South India (Hosur, Kodur, Karnataka, Andhra Pradesh, Tamil Nadu, Kerala, etc.)
- Establishment of [illegible] nurseries at CSRTI, Berhampore.

Thirty-four Kanva-2 genotypes were DUS characterized for 28 descriptors (candidate varieties viz., S-13, S-36, S-1054, S-1, S-1007, S-1 and Kanva-2) were planted in three replications with 5 plants in each replication at RCS test plot. Data recorded on DUS testing of candidate (S-13, S-36, S-1, S-1054, Kanva-2 and S-1007) and reference varieties at demonstration plot for 28 DUS characteristics was completed. The dendrogram divided the genotypes into three main clusters at a standard distance of over 25 based on 28 DUS characteristics (Cluster I: consists of 17 genotypes, cluster II consists of 8 genotypes and Kanva-2 is cluster III (Fig. 3.4A). The classification of genotypes into different clusters indicates the presence of diversity and distinctiveness among 25 varieties (reference and candidate varieties). Based the scores for 28 reference and 4 candidate varieties in DUS trials, 5 replications for recording survival %, and vigour % of genotypes. Recorded survival data of genotypes after 30 days of growth. Highest genotype CSG from 12 accessions which indicate strength genotypes reference and candidate varieties. Reference and candidate varieties were characterized with 5 SSR markers.

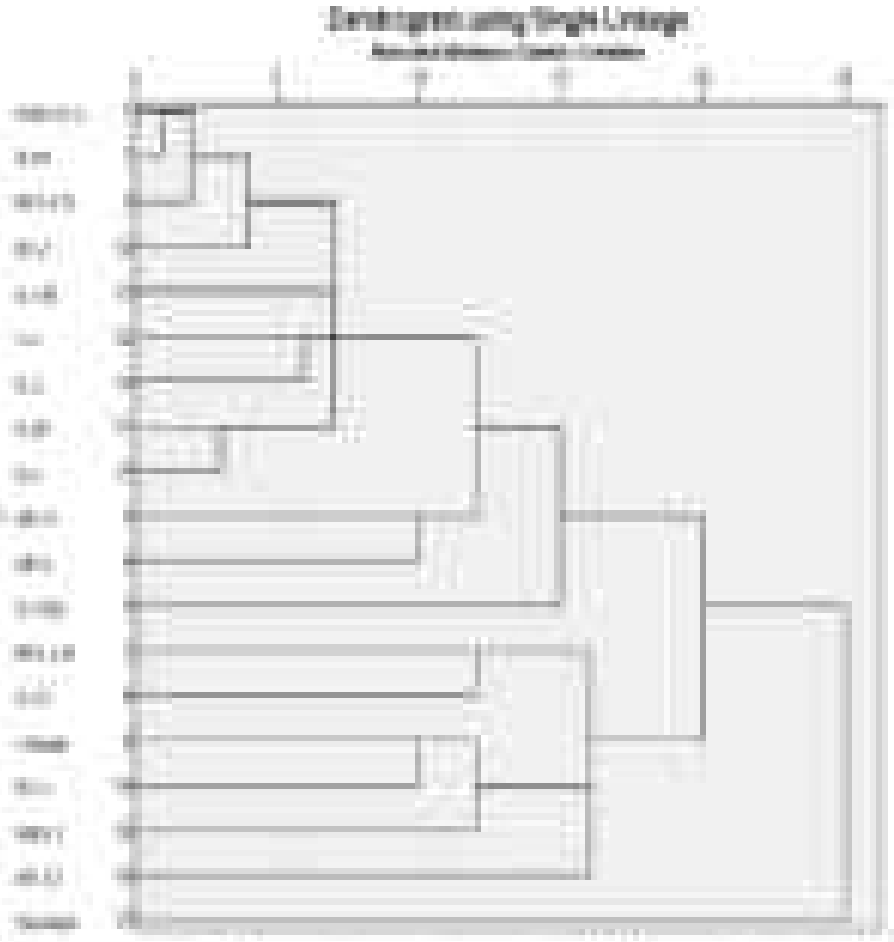


Fig. 2.6.b Dendrogram for resiliency quantities using nearest neighbor cluster analysis generated by SAS Hierarchical cluster analysis based on 30 CSS characters

Maintenance/Other Activities

- Regular maintenance of AES Yard of Bhimavaram
- New Equipment and Intermediate Staging Lockers

3. VISUAL SCIENCE & INFORMATICS

Completed Research Project:

RP 01005 PR: Remote enhancement of Resiliency through Electronic approaches

Sub Component: Identification of KPIs for Restricted Eye Efficiency (RPE) (Exp. 2018 - Dec. 2021)

P. Adhikari, Rochelle and Bhimavaram Facilities

Objectives:

- To evaluate the seed of diverse wolfberry genetic resources for uptake and utilization efficiency of Nitrogen, Phosphorous, Zinc and Sulphur

Diverse wolfberry germplasm accessions maintained were collected from CSIRC Base and the nursery was raised at CSIRC, Pedong for phenotypic evaluation of nutrient uptake and utilization efficiency with respect to nitrogen, phosphorus, sulphur and zinc for two crops. Four month old saplings were transplanted in the pots for phenotypic evaluation of nutrient use efficiency. In the experiment, 100 accessions were considered for pot study. Two levels of fertilizer dosages were imparted – one with recommended dose of fertilizers (RDF) and another was with zero dose of fertilizer (ZDF) while 25% of recommended dose by maintaining basic replication. Growth and yield parameters were recorded for phenotypic evaluation of diverse germplasm accessions for nutrient use efficiency. Nitrogen use efficiency and its components (NUpE and NUtE) were calculated as follows (Dobermann, 2005 and Xu, 1998)

$$\text{Nitrogen Uptake Efficiency (NUpE)} = \frac{\text{Total plant N}}{\text{Soil N}}$$

$$\text{Nitrogen Utilization Efficiency (NUtE)} = \frac{\text{Dry matter or yield}}{\text{Total plant N}}$$

$$\text{Nitrogen Use Efficiency (NUE)} = \text{NUpE} \times \text{NUtE}$$

Similarly Phosphorus use efficiency also was calculated.

Zinc efficiency was calculated as follows:

$$\text{Zinc Efficiency} = \frac{\text{Biomass (or) Yield}}{\text{Available Zn}} \times 100$$

Phenotypic evaluation for Nitrogen use efficiency

Overall, accessions grown in ZDF were shorter with less green leaves and thinner stems compared to the ones grown in RDF. However, differences between accessions varied. Fig. 3.1 shows an example of the observed morphological differences under recommended dose of nitrogen and zero dose of nitrogen.

Fig 3.1: Morphological differences between plants grown under recommended and zero dose nitrogen supply

The mulberry germplasm accessions performed differently in terms of growth, yield and nutrient use efficiency parameters both under RDN and LDN. Under LDN high variability was observed among the mulberry accessions for biomass yield ([illegible]), nitrogen uptake efficiency ([illegible]), nitrogen utilization efficiency ([illegible]) and nitrogen use efficiency ([illegible]) indicating the differential ability of the genotypes in utilizing applied nitrogen (Table 3.2). Recommended dose of nitrogen enhanced the shoot length, root weight, biomass yield and harvest index in comparison to plants grown under low dose of nitrogen conditions. But the highest nitrogen uptake efficiency, nitrogen utilization efficiency and nitrogen use efficiency were recorded with LDN (Table 3.2). The distribution of diverse mulberry germplasm accessions with respect to nitrogen use efficiency under low dose of nitrogen is given in Fig 3.2.

Table 3.2: Nitrogen use efficiency among [illegible] mulberry accessions

Parameters	Range		Mean		SD		CV (%)	
	RDN	LDN	RDN	LDN	RDN	LDN	RDN	LDN
Shoot length (cm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Root length (cm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Root weight (g/plant)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biomass yield (g/plant)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Harvest Index (%)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SPAD value	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total chlorophyll (mg/g)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nitrogen content (%)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NUpE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NUtE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NUE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NUpE: Nitrogen uptake efficiency; NUtE: Nitrogen utilization efficiency; NUE: Nitrogen use efficiency

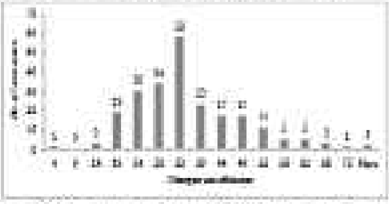


Fig. 3.2: Distribution of mulberry germplasm accessions with respect to nitrogen use efficiency under LDN

Phenotypic evaluation for phosphorus use efficiency

Genotype×nitrogen×phosphorus (GNP) interaction for shoot length, root weight, biomass yield, harvest index and phosphorus use efficiency in diverse mulberry germplasm as compared to plants grown under low phosphorus conditions (LSD (Table 3.2). The mean biomass yield of 90.2 and 72.7 g/plant were recorded with HSP and LSP respectively (more than 18% reduction in biomass yield was observed with LSP). The phosphorus content in total plant ranged from 0.125 to 0.956 with HSP and 0.11 to 0.456 with LSP. The average value of phosphorus uptake efficiency and phosphorus utilization efficiency was 0.56 g P uptake/g P applied and 0.714 g dry matter yield/g P uptake with HSP and 0.44 g P uptake/g P applied and 0.616 g dry matter yield/g P uptake with LSP respectively. The distribution of diverse mulberry germplasm accessions with respect to phosphorus use efficiency under low dose of phosphorus is given in Fig. 3.2.

Table 3.2. Phosphorus use efficiency among 201 mulberry accessions

Parameters	Range		Mean		SD		CV (%)	
	HSP	LSP	HSP	LSP	HSP	LSP	HSP	LSP
Shoot weight (g/p)	20.0-143.0	15.0-111.0	84.4	68.8	19.0	17.0	22.5	24.6
Root length (cm)	12.0-29.0	9.0-22.0	21.8	17.3	3.8	3.0	16.9	17.0
Root weight (g/plant)	3.0-6.0	2.0-4.0	4.2	3.4	0.7	0.6	16.8	16.4
Biomass yield (g/plant)	30.0-155.0	15.0-110.0	90.2	72.7	21.0	22.7	23.0	31.0
Harvest index (%)	24.0-56.0	24.0-57.0	44.5	38.6	6.70	9.10	14.9	23.4
Phosphorus content (%)	0.125-0.95	0.11-0.46	0.46	0.27	0.22	0.12	47.0	45.0
PUpE	0.20-0.83	0.20-0.69	0.56	0.44	0.08	0.08	14.4	18.0
PUtE	0.4-0.82	0.11-0.71	0.71	0.62	0.05	0.05	7.00	8.70
PUE	0.24-0.67	0.2-0.44	0.38	0.27	0.04	0.03	10.4	11.7

PUpE: Phosphorus uptake efficiency; PUtE: Phosphorus utilization efficiency; PUE: Phosphorus use efficiency

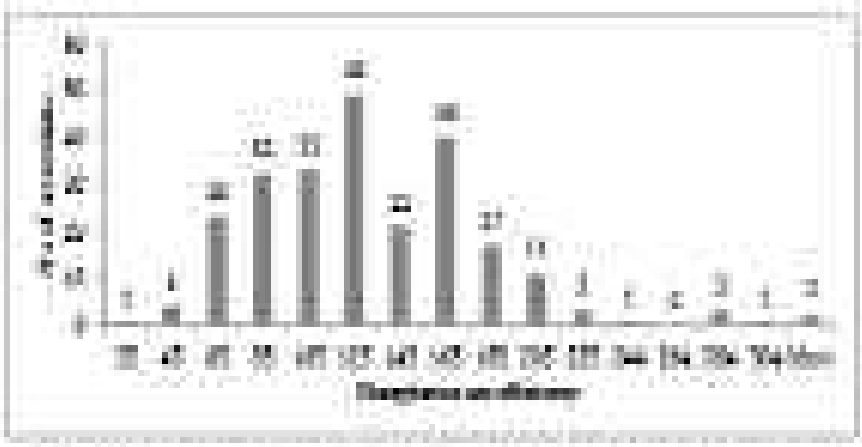


Fig. 3.2. Distribution of mulberry germplasm accessions with respect to phosphorus use efficiency under low dose of phosphorus

Phenotypic evaluation for cocoon efficiency:

Considerable variations in cocoon yield (in Kg) per 10 Dfs were observed among the diverse mulberry germplasms. The cocoon filament yield of 50.3 and 50.7 were recorded with 10 Dfs and 15 Dfs respectively (Table 3.8). The cocoon efficiency of diverse mulberry germplasms ranged from 20.7 -40.3 with a mean value of 30.5 %. The distribution of diverse mulberry germplasms accessions with respect to cocoon efficiency is given in Fig. 3.4.

Table 3.5. Cocoon efficiency among 150 mulberry accessions

Parameters	Range		Mean		CD		CV (%)	
	10Dfs	15Dfs	10Dfs	15Dfs	10Dfs	15Dfs	10Dfs	15Dfs
Shoot length (cm)	222.0-322	250.0-350.0	288.4	407.7	22.9	40.7	27.5	13.9
Leaf length (cm)	20.0-34.0	20.0-34.0	25.9	28.3	0.6	0.6	10.0	2.9
Leaf weight (g/shoot)	3.0-5.0	3.0-5.0	3.8	5.0	0.7	0.7	9.8	17.5
Shoot weight (g/shoot)	30.0-50.0	50.0-82.0	39.5	58.1	12.0	24.1	15.0	20.7
Harvest index (%)	20.0-40.0	20.0-40.0	28.0	37.0	0.0	0.0	0.0	0.0
Cocoon efficiency (%)	20.7-40.3		30.5		0.05		10.7	

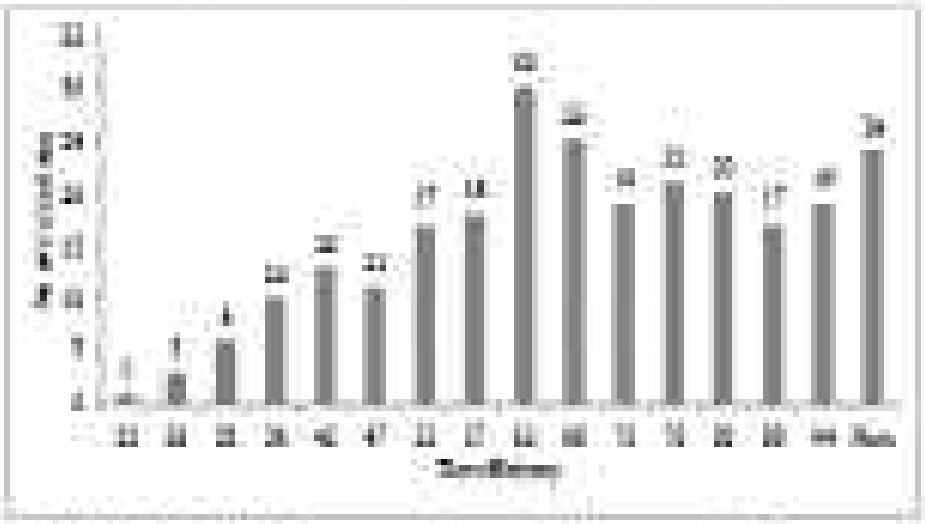


Fig. 3.4. Distribution of mulberry germplasm accessions with respect to cocoon efficiency

Phenotypic evaluation for Reeling efficiency:

The reeling efficiency of diverse mulberry germplasms ranged from 22.7-50.7 with a mean value of 35.0 % (Table 3.6). The distribution of diverse mulberry germplasms accessions with respect to reeling efficiency is given in Fig. 3.5.

Table 5.x: [illegible] among [illegible] mulberry accessions

Treatments	Range		Mean		SD		CV(%)	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Shoot length (cm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Leaf length (cm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Root weight (g/plant)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biomass yield (g/plant)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Survival index (%)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sulphur efficiency (%)	[illegible]		[illegible]		[illegible]		[illegible]	

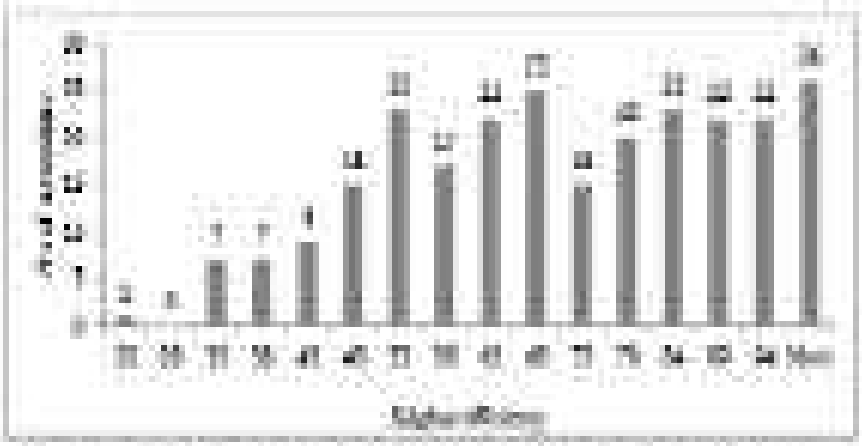


Fig 5.X: Distribution of mulberry germplasm accessions with respect to Sulphur efficiency

The diverse mulberry germplasm accessions preferred differently in terms of growth, yield and nutrient use efficiency parameters both under recommended dose of nutrients and low dose of nutrients. A good variation in growth parameters was observed in diverse mulberry accessions both under recommended dose of nutrients and low dose of nutrients. The lower preferring genotypes under low nitrogen stress/stress can not solely be used in the crop improvement programmes to develop mulberry variety with high nutrient use efficiency.

On-going research projects

PIC 01987 Sl. No. 1: Development of protocol for production of medicinally important milk bacteria (*Bacillus coagulans*) for animal nutrition (Feb. 2020 to Jan. 2023)

Researchers: Dhanashree Nadaf, Divya Singh, S. Thangavelu, P. Geethanjali, S. Sandeep and A. M. Shankara

Specific objectives:

- Purification and characterization of antibiotic and fibrinolytic enzyme isolates

Objectives:

- Production of multiforms bulk through organic substrate fermentation by Hydrogen Peroxide culture

- Screening of silicones for using the best produced under such process and production of organic manures and gifts.
- Investigation of potential the production of heavy metal and other waste from pesticide limit in common gifts.

Production of manure through organic management practices

The organic machinery garden was maintained through organic management practices. The data on shoot height, no of shoots, shoot weight, no of fruit, fruit weight per cluster were recorded for three crop during the year. Biochemical characters (total carotenoids, proteins, carbohydrates and chlorophyll contents) and heavy metals and pesticide residues were estimated in the organically produced machinery fruit. The results showed that Pb, Cd, As, Hg and Cr are below detection limit, whereas Ni, Zn, and Cu are within the permissible limit. The organically produced fruit were collected for different seasons during Jan-Aug 2020, Oct-Dec 2020 and Jan-Feb 2021. The season detail was used for the estimation of carbon and chlorine. Carbon and Chlorine present were estimated with ml/[l] values and tested for the presence of heavy metals and pesticide residues if any. The results showed that Cd, As, Hg and Cr are below detectable limit whereas Ni, Cu and Cu are within the permissible limit in carbon dioxide, carbon and chlorine samples (Table 3.1). Similarly the samples were tested for pesticide residues if any and no organophosphorus, organochlorines and carbamates were observed.

Table 3.1: Analysis of heavy metals and pesticide residues in carbon dioxide samples for heavy metals and pesticide residues

Parameters	Limit of detection (permissible limit) mg/kg	Organic Carbon dioxide mg/kg	Carbon dioxide mg/kg	Chlorine mg/kg
Heavy metals				
Pb	BDL	0.02	0.03	0.79
Cd	BDL	BDL	BDL	0.03
As	BDL	BDL	BDL	BDL
Hg	BDL	BDL	BDL	0.01
Cu	BDL	BDL	BDL	BDL
Ni	4.71	5.01	5.01	4.79
Cr	4.71	0.01	0.03	0.01
Cu	3.01	5.01	4.01	0.01
Pesticide residues				
Organochlorine	BDL	BDL	BDL	BDL
Organophosphorus	BDL	BDL	BDL	BDL
Carbamates	BDL	BDL	BDL	BDL

BDL- Below detection limit

Hydroponics Nutrient Film Technique (NFT)

One hundred and twenty one TC machinery plants were grown on hydroponic method in the polyhouse. The hydroponically grown machinery fruit was tested for heavy metals and pesticide residues and it was found that Pb, Cd, As, Hg and Cr are below detection limit, whereas Ni, Cu and Cu are within permissible limit. Similarly it was also observed that pesticides such as organophosphorus, carbamates and organochlorines were not detected in hydroponically grown fruit.

Table 3.6: Growth and yield parameters of mulberry plants grown on hydroponic system

Longest shoot length (cm)	Avg. plant height (cm)	No. of shoots/ plant	No. of leaf/ shoot	Shoot weight/ plant (g)	Leaf weight/ plant (g)
154.6 ± 3.2	89±2.5	7.2 ± 0.34	75 ± 1.2	45.4 ± 1.1	19.7 ± 1.4

Table 3.7: Analysis of hydroponically grown mulberry leaf for heavy metals and pesticide residues

Heavy metals		Pesticide residues	
Pb	BDL	Organophosphorus	BDL
Cd	BDL	Organochlorines	BDL
As	BDL	Carbamates	BDL
Hg	BDL		
Cr	BDL		
Ni	0.24		
Cu	5.45		
Fe	4.89		

BDL: below detection limit

Soil-less culture

Mulberry plants (MS) of 75 cm/m grown in soil-less culture substrate was harvested and growth and yield parameters were recorded (Table 3.8). Heavy metals and pesticide residues were analysed in 75 mulberry leaf produced through soil-less experiments and it was observed that heavy metals viz. Pb, Cd, As, Cr and Hg and pesticides were below detection limit, whereas Ni, Cu and Co are within the permissible limit. Similarly, manure shoot was analysed for heavy metals if any and it was observed that Cd, As, Cr and Hg were below detection limit (Table 3.9).

Table 3.8: Growth and yield parameters of mulberry plants grown through soil-less culture

Longest shoot length (cm)	Avg. shoot height (cm)	No. of shoots/ plant	No. of leaf/ shoot	Shoot weight/ plant (g)	Leaf weight/ plant (g)
98.0±6.8	87.0±6.7	6.2±0.51	73.0±6.8	42.8±4.2	46.0±4.2

Table 3.9: Analysis of mulberry leaf and manure shoot produced by soil-less culture

Parameters	Leaf (ppm)	Manure shoot (ppm)
Heavy metals		
Pb	BDL	BDL
Cd	BDL	BDL
As	BDL	BDL
Hg	BDL	BDL
Cr	BDL	BDL
Ni	0.24	0.8
Cu	5.45	4.4
Co	4.8	7.4
Pesticide residues		
Organophosphorus	BDL	Not done
Organochlorines	BDL	Not done
Carbamates	BDL	Not done

Location wise/Other activities

Quality Analysis and Sample Testing

Various value added products developed by CIFT Kochi were analysed in the laboratory to check the quality parameters. Samples of water and fish from various locations were tested for microbiological quality based on the test results, technical suggestions were provided to the farmers and trade bodies.

Table 1. Details of analysis of products/samples and revenue generated

Products/Samples	No. of samples	Revenue generated (Rs.)
Salt	1124	[illegible]
Water	19	[illegible]
Fish	22	[illegible]
Shrimp	13	[illegible]
Curing	18	[illegible]
Fishery supplements	11	[illegible]
Seafoods	16	[illegible]
Others	11	[illegible]
Biofeeds	29	[illegible]
Minerals	6	[illegible]
Packing	14	[illegible]
Ice	11	[illegible]
Consultancy	11	[illegible]
Shrimp growout	11	[illegible]
Total (Rs.)		[illegible]

*All results were communicated against samples

6. ACCOUNTS

Consolidated Statement & Projects

PEN 2016: Evaluation of improved mudbarry genotypes for small perennial ponds/pens system and nitrogen use efficiency under varied salinity/water quality conditions [Feb. 2016-Mar. 2021]

Shamshad Ahmed, P. Vaidyanathan, K. Ravindranath and P. Thangavelu

Objectives

- [illegible]
- [illegible]
- [illegible]

The study was taken up in CIFT, Kochi to evaluate the improved mudbarry genotypes viz., Kuthiravali (Line 1), Line 4 and Line 5 for their growth performance and system and nitrogen use efficiency under varied salinity/water conditions. The experiment was laid out in an split-split plot design with three replications assessing three levels of nitrogenous [low (50%) and low (50%)] and three levels of fertilizer doses [low (50%),

[illegible] kg/ha (on N_2) and [illegible] kg/ha and P_2 [illegible] kg/ha) was applied uniformly to all the treatments.

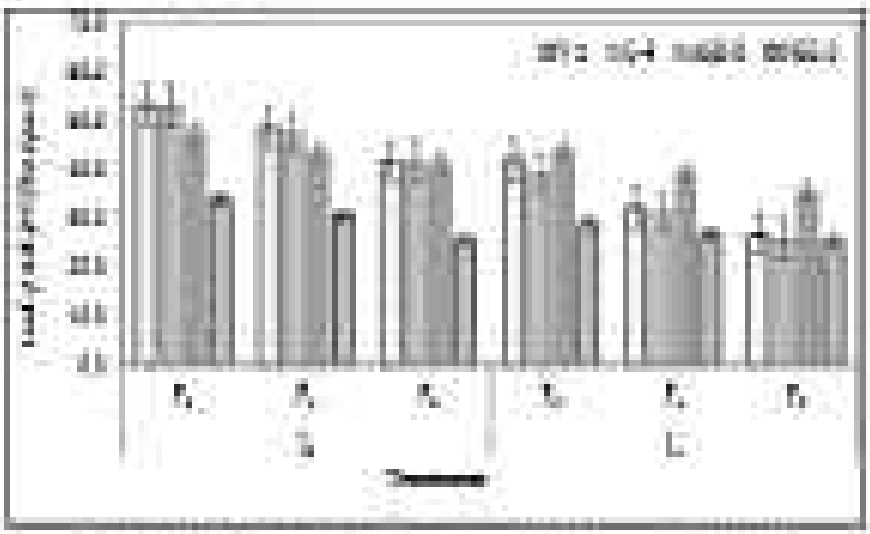
The analysis of pooled data for the three years revealed that AZM-1 variety recorded significantly higher leaf area [illegible] /ha/pot in the treatment [illegible] kg, AZM mitigation and AZM fertilizer followed by [illegible] [illegible] and [illegible] [illegible]. However, there was no significant difference in the leaf yield among the two genotypes viz., [illegible] and [illegible] under low-input conditions. The data revealed that [illegible] and [illegible] preferences were higher and sold in the treatment [illegible] + more recommended package and practices (Fig. 4.1).

The soil samples were analysed for the physical and chemical properties and the data revealed that there were no significant changes in soil pH and organic carbon content over the period of three years (Table 4.1). However, there was significant depletion of available nitrogen and potassium in all the treatments compared to initial level. In the summary there was noticeable build up in the case of available phosphorus in the soil (Table 4.2).

Leaf nitrogen uptake was calculated and the highest level of nitrogen uptake was found in AZM-1 variety [illegible] kg/ha/year) followed by [illegible] [illegible] kg/ha/year) and [illegible] [illegible] kg/ha/year) under low-input conditions (treatment [illegible]) (Fig. 4.2). Similarly the nitrogen use efficiency was estimated for all genotypes showed significantly higher use efficiency in AZM-1 [illegible] under low-input conditions (Fig. 4.3). The data on the bioassay study also confirmed the quality performance of AZM-1 under low-input conditions.

Conclusion

The AZM-1 multiassay polymer was an adequate for multiharvest system low-input conditions due to its high nitrogen use efficiency and high yield.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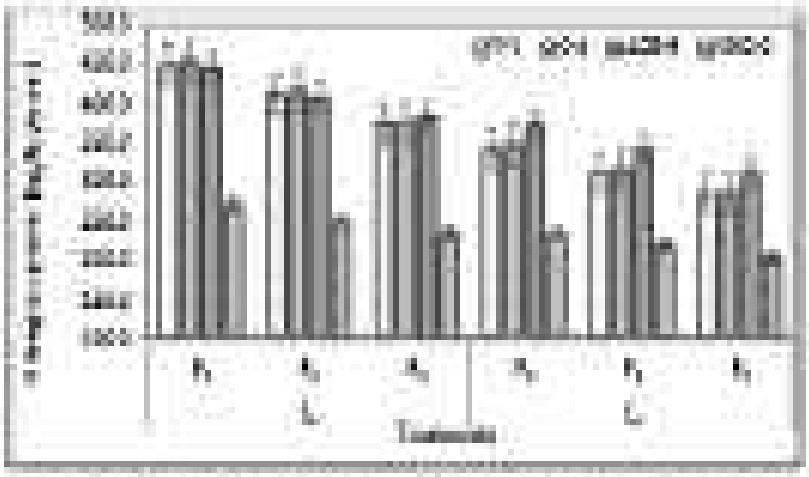


Fig. 4.a. Leaf chlorophyll index of different cultivars in various water regime treatments

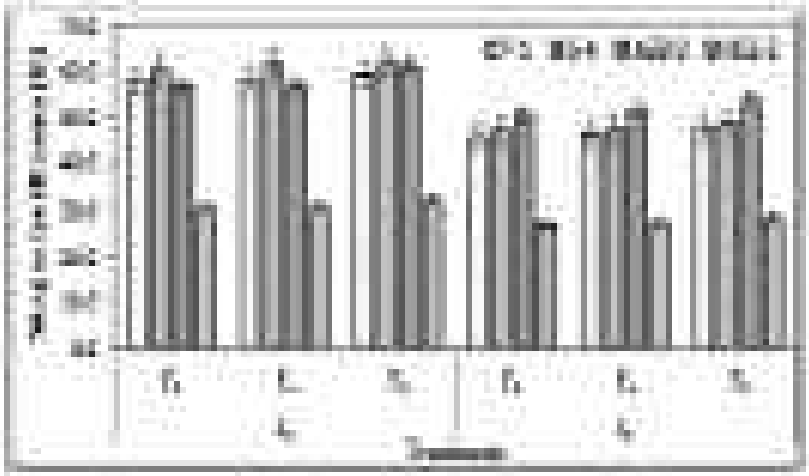


Fig. 4.b. Chlorophyll index of different cultivars in various water regime treatments

Table 4.1. Impact of irrigation and fertilization on the chlorophyll index in different cultivars

Treatments		2019		2020		2021		2022	
		pH	OC	pH	OC	pH	OC	pH	OC
I1	I1	6.55	7.10	6.58	7.20	6.56	6.95	6.66	6.90
	I2	6.62	6.80	6.61	6.75	6.60	6.84	6.63	6.82
	I3	6.68	6.62	6.69	6.66	6.68	6.71	6.67	6.66
Irrigation mean		6.62	6.84	6.63	6.87	6.61	6.83	6.65	6.79
I2	I1	6.56	6.91	6.59	6.88	6.57	6.91	6.63	6.91
	I2	6.60	6.74	6.61	6.71	6.60	6.73	6.64	6.74
	I3	6.66	6.66	6.67	6.62	6.66	6.68	6.66	6.66
Irrigation mean		6.61	6.77	6.62	6.74	6.61	6.77	6.64	6.77
I3	I1	6.57	7.00	6.54	7.05	6.58	6.91	6.66	6.87
	I2	6.61	6.80	6.60	6.73	6.62	6.80	6.62	6.78
	I3	6.68	6.62	6.68	6.68	6.67	6.72	6.67	6.67
Fertilizer mean									

[illegible]

Table 4.7: [illegible]

[illegible]

Ongoing Research Projects

[illegible]

[illegible]

Objectives

- [illegible]
- [illegible]

[illegible]

Table 4.3: Effect of different doses of fertilizers on growth and yield attributes of Lucerne (Variety)

Treatments	Longest shoot length (cm)	No. shoots/plant	No. leaves/shoot	Leaf weight (kg/3 plants)	Shoot weight (kg/3 plant)
T1	154	24	99	0.71	1.92
T2	166	22	98	0.67	1.93
T3	155	23	97	0.67	1.88
T4	174	24	93	0.86	1.98
T5	167	22	97	0.68	1.84
SEm	11	0.84	0.61	0.076	0.063
CD at 5%	34	2.60	1.84	0.23	0.191

Table 4.4: Effect of different doses of fertilizers on growth and yield attributes of Lucerne (Variety Chetna sprayed)

Treatments	Longest shoot length (cm)	No. shoots/plant	No. leaves/shoot	Leaf weight (kg/3 plant)	Shoot weight (kg/3 plant)
T1	159	27	98	0.82	2.03
T2	172	24	97	0.87	2.01
T3	162	25	98	0.86	1.93
T4	179	26	92	0.93	2.13
T5	172	24	97	0.88	2.00
SEm	8.70	1.11	2.57	0.056	0.111
CD at 5%	27.0	3.44	8.01	0.174	0.345

Table 4.5: Effect of different doses of fertilizers on growth and yield attributes of Lucerne (Variety)

Treatments	Longest shoot length (cm)	No. shoots/plant	No. leaves/shoot	Leaf weight (kg/3 plant)	Shoot weight (kg/3 plant)
T1	208	31	97	0.97	2.08
T2	177	28	91	0.76	1.98
T3	203	31	97	0.97	1.97
T4	178	28	91	0.81	1.77
T5	205	32	97	0.91	2.04
SEm	14.4	2.13	3.04	0.100	0.184
CD at 5%	44.6	6.62	9.41	0.309	0.569

NBC 2021-22: Evaluation and standardization of improved technologies developed in the field of multicut cereals for North India (Nov 2021-Oct 2022)

Component: Impact of drip irrigation on multicut grass productivity

S. Mukhadkar, S. Mahesh, T. Vinodhkumar, I.P. Kakani, K. Bhakta Keni and P. Sudhakar

Objectives

- To validate the drip irrigation technology for multicut grass cultivation

The experiment was undertaken to evaluate the crop management on growth and yield of mulberry cv. DD progenitor in the EB-III and also to study the effect of drip irrigation system in the transplanted mulberry garden of Kolhan as well as of diffusion type system. The experimental garden is maintained as per the protocol.

Collaborative Research Project (CTTRI, Bengaluru)

CIT 070122: Non-methods of recycling of dissected silk worm(s) waste for sustainability (Oct. 2010-Dec. 2014)

I. Hussain, P. L. Pathakumar, Sumit P. Mahali, A. A. Ojha, P. A. Nair and L.B. Saha

Objectives

- To develop field grown mulberry for quality cocoon production and characterization there.
- To prepare value added products like silk beddings and silk powder from silk worm fibres and explore their applications.
- To study the compostability of dissected silk worm and its chemical value.

The silk waste samples received from the CTTRI, Bangalore were subjected for composting under 3 different treatments in the composting yard to study the composting feasibility of silk waste for a period of 3 months. It was observed that the silk waste is not fully decomposed in any of the treatments. However, in treatment T2 (Mixture of leaf + partially decomposed cocoon + cowdung slurry) it was observed that 70% by of silk waste was decomposed followed by 51.2 % in T3 (Mixture of leaf + cowdung waste + cowdung slurry). A microcomposting technology was standardized for the efficient conversion of the unusable silk waste into organic rich manure.

Similarly the bio-composting experiment on silk waste was undertaken to evaluate the waste feed with fresh mulberry leaf and silk waste in the ratio of 3:1 (w/w). A pit measuring 6 x 3 x 3 feet was made in an elevated area and measured the surface to avoid the stagnation of rainwater. The area was protected from sunlight and rain by making a thatched shed over the pit. The waste was prepared in the pit by making a layer of fresh mulberry leaf of 6-8 inches. This layer was followed by spreading of cocoon waste over. These layers of silk waste and mulberry were spread alternately till the final layer of fresh mulberry leaf was reached to the ground level. The microbial culture used for microcomposting was the mixture culture of Paenibacillus macerans, Bacillus megaterium and Pseudomonas fluorescens. The final cover was made with dry leaves and mulberry twigs. The pits were sprinkled with water to maintain moisture. The silk waste was completely decomposed within a period of 2.5 months. The nutritional status of the vermicompost was assessed (Table 4.6).

Table 4.6: Nutritional status of bio-composting prepared out of silk waste

Sl. No.	Parameter	Quantity
1.	Nitrogen (%)	1.4 - 1.6
2.	Phosphorus (%)	0.8-1.0
3.	Potash (%)	0.7 - 0.9
4.	Calcium (mg/g)	0.75 - 0.85
5.	Iron (ppm)	234 - 248
6.	Sulphur (ppm)	340 - 360
7.	Zinc (ppm)	0.14 - 0.18

[RS: 07021: Development of bovine polyvoltine recombinant breeder for crop management and growth (Jul. 2015-Dec. 2020)]

B. N. Shankar (The Principal and Chairman, Institute [CTRI], Bengaluru, Karnataka [CTRI], Bengaluru), C. R. Babu Abhishek (CTRI, Bengaluru) and K. K. Kumaresh (CTRI, Bengaluru)

Objectives

- Development of bovine / polyvoltine recombinant breeder for maximization of fertilizer.
- Study the effect on plant growth for encouraging farming activity along with fertilizer.

A pot experiment has been undertaken to study the effect of bovine recombinant fertilizers on the growth and yield of mulberry. The mulberry plants were supplied by using the NPK fertilizer @ (50:25:25) kg/ha for both bovine recombinant fertilizer as well as for control. The data revealed that there was no significant difference in the growth and yield of mulberry plants with bovine recombinant fertilizers as well as with the conventional fertilizers.

Locations/Other centres:

- Regional test centres for assessing treatment under different farming programmes
- Multiplication of bovine recombinant mulberry garden under 2-3 centres
- Maintenance of the recombinant plant and management activities in the research station

6. MULBERRY PHYSIOLOGY

Long-term research project:

[PC-01/2020: Genetic enhancement of mulberry by genomic approaches, Multi Commercial Research Institute]

Laboratory trial on effect of EBA on drought tolerance traits in mulberry genotypes under rainfed condition, CTRI, Bengaluru (Sept. 2018 to Dec. 2021).

M. V. Sreelakshmi [CTRI, Bengaluru] and P. Gayathri

Objectives

- To assess physiological characterization of the plant of bovine germplasm for drought adaptive traits.
- To identify QTLs for drought adaptive traits for association mapping.

[2021] Progress

Laboratory observations characterization of the overall germplasm for drought tolerance traits

Phenotyping for drought adaptive traits and QTL parameters were completed in 200 germplasm accessions during the season (Oct. 2020) and in 204 germplasm accessions during summer season (March 2021). Saplings of germplasm accessions were raised in nursery (2 nos) and transplanted the saplings in normally developed pots (6 nos) and maintained for recording observations on drought adaptive traits and under non-stressed conditions. Observations were recorded using standard procedures in all these germplasm accessions viz., chlorophyll, specific leaf weight, pore and number of stomata. Growth parameters (plant height, shoot weight, leaf weight, etc.) and root traits (number of roots, root weight, length and weight of longest root, etc.) were recorded in all these germplasm during 3 seasons.

Table 8.1. [illegible] among diverse germplasm accessions

Season	Leaf position	Mean [illegible]	SE	SD	CV%	Sample Variance	Minimum	Maximum
[illegible]	Top Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Middle Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bottom Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Top Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Middle Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Bottom Leaves	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

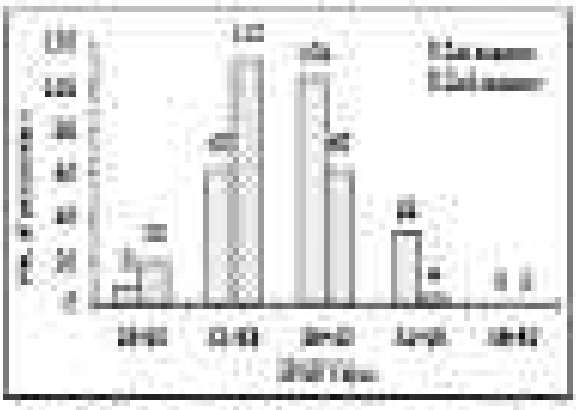


Fig. [illegible] Chlorophyll content (SPAD value) of diverse germplasm accessions

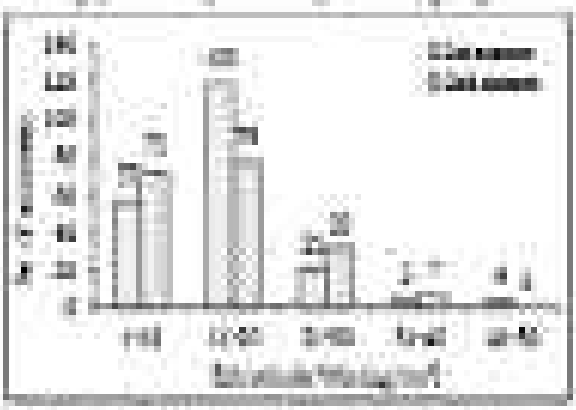


Fig. [illegible] Epicuticular wax content of diverse germplasm accessions

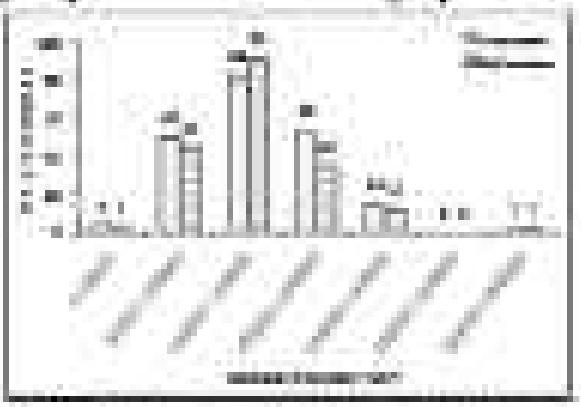


Fig. [illegible] Stomatal frequency of diverse germplasm accessions

Table 1.1: Some weather observations

Season	Rainfall (mm)	RH	ET	SSH	Growth Temperature	Maximum	Minimum
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

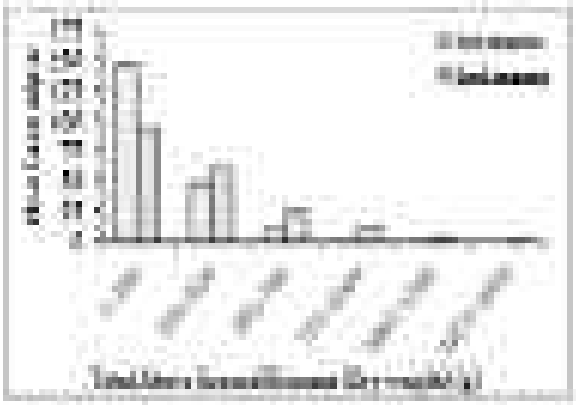


Fig. 1.1: Total days to 50% flowering of diverse genotypes in summer

Diverse set of sorghum germplasm accessions were screened and phenotyped for drought adaptive traits and water use efficiency parameters during 3 seasons and based on phenotyping data 10 germplasm accessions were shortlisted for field phenotyping experiments. These 10 germplasm accessions showed moderately contrasting root traits were evaluated under irrigated and rainfed conditions at IIMR, Hyderabad as part of field phenotyping experiments. These genotypes showed significant differences in root shoot growth biomass and total root system and root/shoot traits under irrigated and rainfed conditions. Among the 10 genotypes, under rainfed conditions, the genotypes IS 11216, IS 10656, IS 4755, IS 11333, IS 10577, IS 11133 and IS 11138 showed higher total shoot biomass per plant. Phenotyping data of drought adaptive traits and WUE parameters collected in this project would serve the most crucial inputs for genotyping and crop improvement programs in drought stress tolerance breeding. Root system phenotyping data on architecture traits viz. seminal and nodal root angle and number also provide a crucial input for screening drought stress tolerant genotypes. Core root phenotyping data on cytoarchitecture viz. cortical and stelar area fraction also provide a crucial input for screening drought stress tolerant genotypes. Among the 100 germplasm accessions screened, 12 genotypes were identified with higher stomatal conductance and 14 genotypes were identified with high cytochrome oxidase physiologically efficient genotypes.

PD-11/2020: Genetic enhancement of sorghum for previous accessions: Multi-Component Phenotypic Program

Submitted: IIMR, Hyderabad to undertake trait and molecular analysis of secondary metabolites for identification of biomarkers responsible for fruit quality in sorghum. Collaborations with ICAR-National Bureau Laboratory (NBAIL), Pune (Govt. ICAR in Dec. 2021)

P. P. Thakarey (ICAR-NBAIL, Pune), T. Gajanbi and K. Bhowmick

Objectives

- To develop knowledge with respect to secondary metabolites responsible for nutritive quality of mulberry for identifying easy selection of the genotypes with desired traits responsible for high nutritive quality.

Metabolomic approach for selection and low selection mulberry traits responsible for the secondary metabolites responsible for the selection behaviour in the biogeochemistry of the second world provides a strong tool for selection of desired genotypes in breeding programmes aimed at developing mulberry with high yield and leaf quality. A very few secondary metabolites have been identified in mulberry and no reports are available till now for the leading production of diverse mulberry varieties depending on their secondary metabolites. So the background the present study undertaken to an ecosystem analysis and identify the primary and secondary metabolites as direct control for mulberry genotypes and to correlate the metabolites with different leaf-efficiency parameters for identifying the nutritious mulberry genotypes and the metabolites present in this superior varieties.

Ten mulberry genotypes namely S1, S4, S13, ET, Y1, S36, MR2 (S9-M2) C, UBT, Mysore Local and Kanva-2 selected (S4-S13) were selected for biochemical analysis of metabolites and silkworm rearing experiments. All these genotypes raised with [illegible] spacing in the experimental plot of Mulberry Physiology Laboratory, CSRTI, Mysore in RBD layout and all these genotypes were grown under optimal growth conditions (Fig. 12). Fresh leaves were collected from the healthy plants of ten genotypes at 45th-60th day after pruning (6 crops) and used for biochemical analysis of metabolites and silkworm rearing experiments.

Primary metabolites (total proteins, carbohydrates, total free amino acids, ascorbic acid and reducing sugars) were analysed on the basis of ten genotypes using standard procedures. Quantification of micronutrients (Zinc, Copper, Magnesium, Iron) was carried out to find out levels of ten genotypes by Atomic Absorption Spectroscopy.

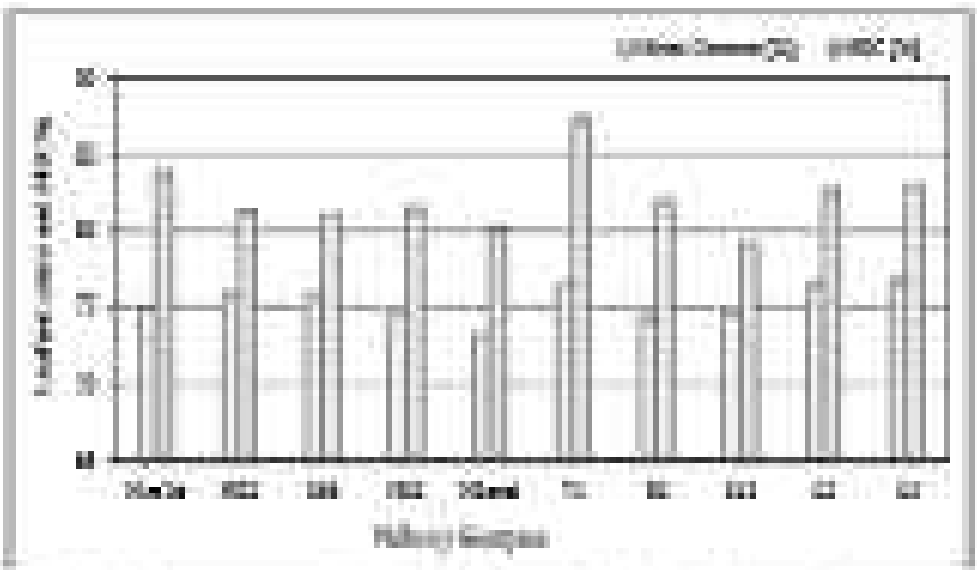
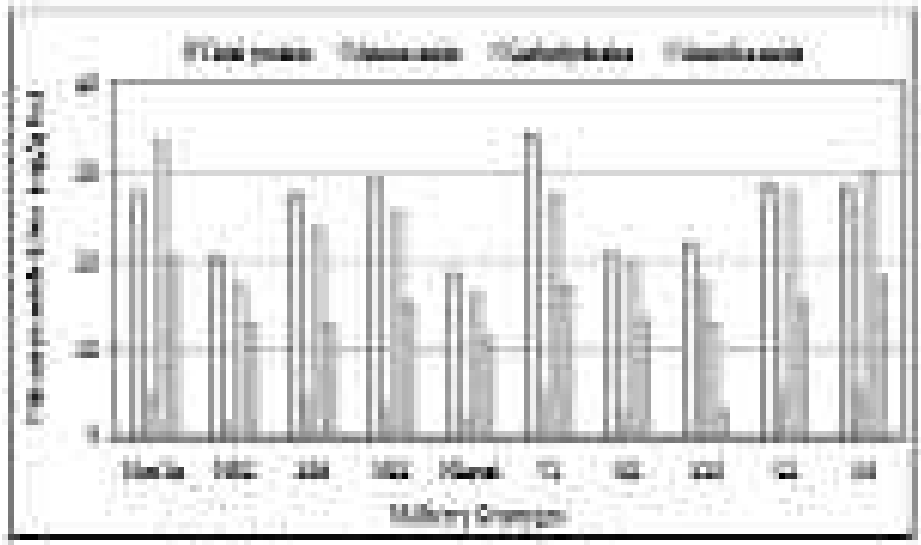


Fig. 12. Leaf moisture content and moisture retention capacity (MRC) in different mulberry genotypes



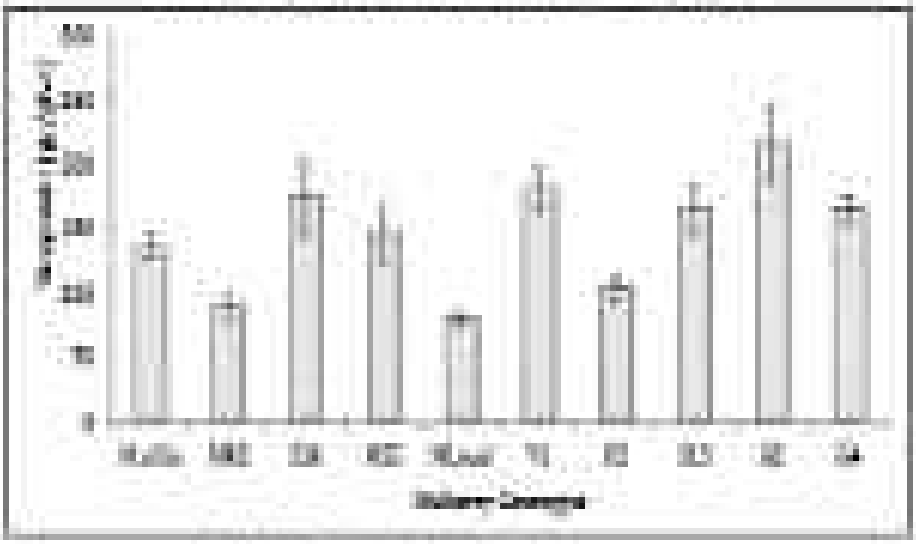
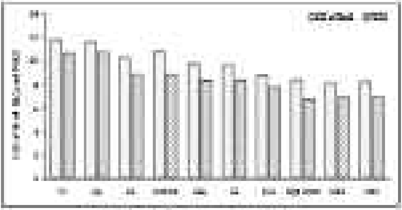
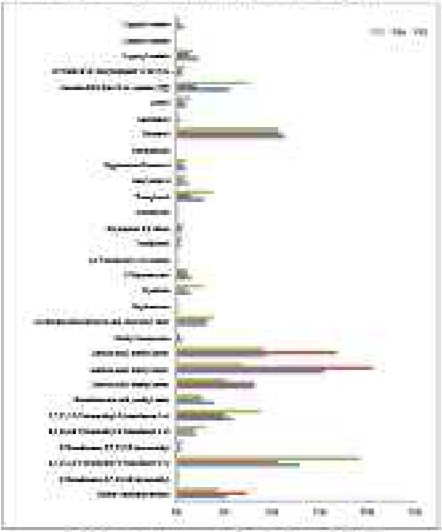


Table 4.1: Chromosome no. in different mulberry genotypes

Genotype	Count (mean)	Frequency (mean)	Total (mean)	Total (mean)
Mysore Local	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S30	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S1	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S13	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S7	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S36	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S30	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
Manasabahuli	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S2	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}
S41	13.00±0.00^{abcd}	26.00±0.00^{abcd}	338.00±0.00^{abcd}	338.00±0.00^{abcd}

Data are the mean value of replicates of six independent analysis (3 viz.[a] and 3 viz.[b]) within a column followed by same letter are not significantly different (p=0.05) as determined by DMRT.





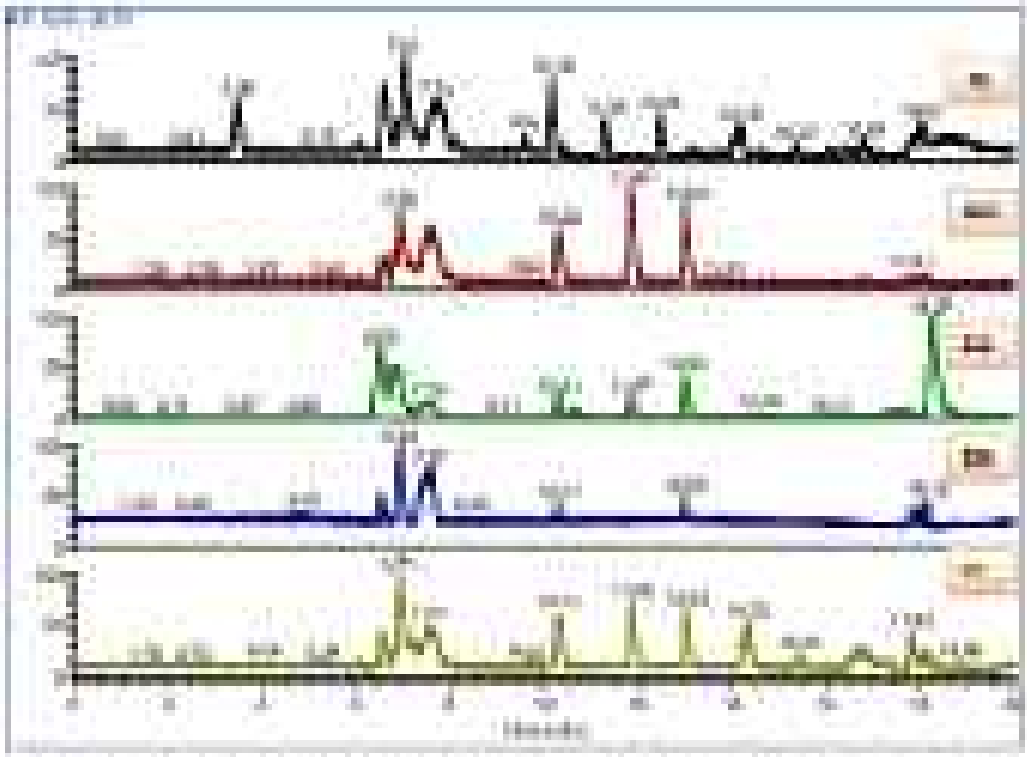


Fig. 2.6 (C-X) Overlaid chromatograms of methanolic leaf (Hyptis Lanata, HSC-2.6, 2.8) and TLC methanolic extract

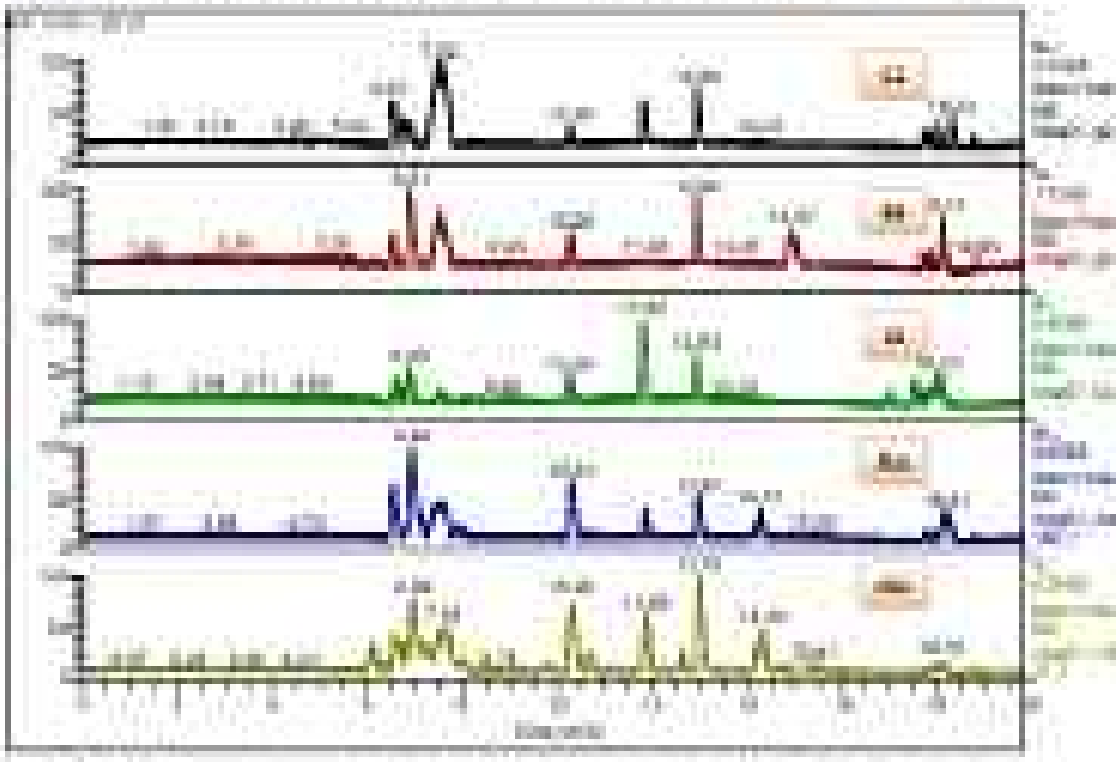


Fig. 2.7 (C-X) Overlaid chromatograms of methanolic leaf (S.L-6.4, S.L-8, methanolic leaf, HQS methanolic extract)

Title of study: Standardization of hydroponics method for multiplication of mulberry (Sept. 2011 to Feb.2012)

Name of Scientist: Dr. Ramakrishna Gadhave

- To standardize nutrient solution and hydroponic system for cuttings rooting
- To evaluate survivability of rooted mulberry cuttings in soil

Three types of hydroponic systems (dip tank, nutrient capacity system and sprinkler type nutrient supply system) were tested. The nutrient solution with rooting hormone was continuously supplied to the cuttings in the type nutrient supply system. cuttings were placed in the nutrient solution (Dil.1 cutting hormone) whereas the overhead solution (Dil.) were sprinkled over the cuttings in sprinkler type nutrient supply system. IBA was supplied in both hydroponics systems at different concentrations (0, 2 and 3 mg/L). Hormone treated cuttings in nutrient solution and IBA was treated as control in both hydroponics systems. The root length, number of roots and survival of cuttings were recorded at regular intervals up to 30 days of cutting (30 days). The survivability of plantlets was evaluated in the soil at regular intervals. The results showed that rooting percentage, number of roots and root length was high in the case nutrient supply system in comparison to sprinkler type nutrient supply system. Its study were observed in control and IBA @ 3 mg/L in both types of hydroponic systems. However, the survivability of rooted cuttings in the soil was comparatively high in sprinkler type nutrient supply system. The maximum survival of mulberry cuttings [illegible]

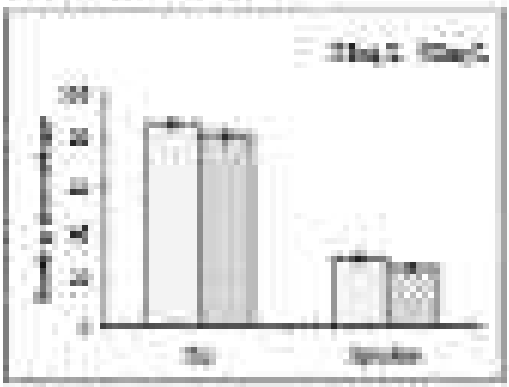


Fig. 4.1.1 Rooting percentage in dip and sprinkler type nutrient supply system

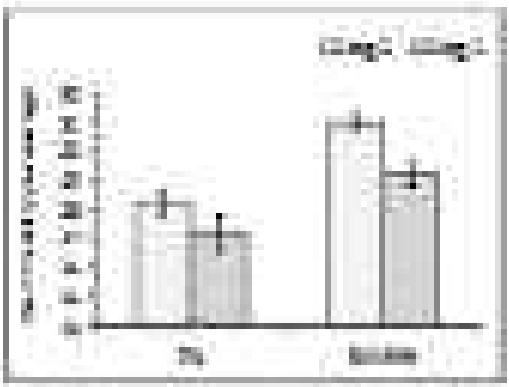


Fig. 4.1.2 Survivability percentage in dip and sprinkler type nutrient supply system

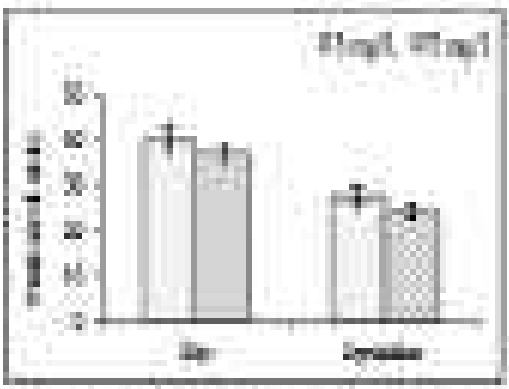


Fig. 4.1.3 Number of roots after 30 days in dip and sprinkler type nutrient supply system

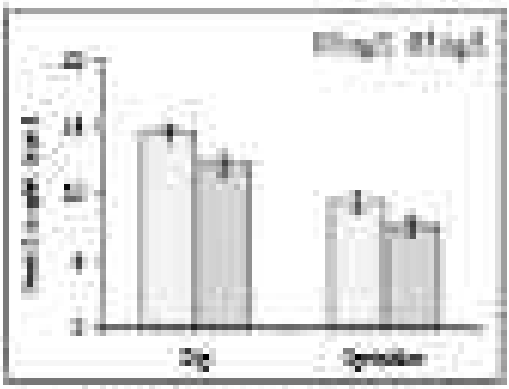


Fig. 4.1.4 Root length after 30 days in dip and sprinkler type nutrient supply system

6. MULBERRY PATHOLOGY

Ongoing Research Project

PRJ-MBP-1: Identification, evaluation and formulation of potential antagonistic microbes in Integrated Root Rot Disease Management in Mulberry (Dec 2022—Dec 2025)

S. S. Jayakumar, L. Lavanya, U. Chaluva Rami, and Tirad Kumar Yadav

Objectives

- Collection, isolation, identification and characterization of potential biocontrol agents available in rhizosphere of mulberry
- In vitro evaluation of potential biocontrol agents available in formulation of multiple organisms against root rot causing pathogens.
- To study compatibility of potential bio control agents for development of antagonistic microbial consortia and in vivo evaluation against root rot pathogens
- In vivo evaluation of compatible potential bio-control agents integration with existing host management practices for formulation of integrated root rot disease management technology.

A total of 200 soil samples were collected from mulberry gardens of south India (Karnataka, Tamil Nadu, Telangana and Andhra Pradesh). The soil samples were collected randomly from rhizosphere of healthy mulberry plants in sterile polythene bags. Isolation and characterization of beneficial bacterial/fungal isolates were done. Twenty seven bacterial isolates were studied for colony colour, shape, size, margin, elevation, opacity and surface characteristics. Growth, staining and biochemical tests were done. Based on these characteristics 10 isolates were identified as Bacillus spp. antagonistic rhizobacteria isolates to the extent of seven Bacillus subtilis, two Bacillus amyloliquefaciens and one Bacillus velezensis.

In the antagonistic study, a total of 20 bacterial isolates and four fungal isolates showed antagonistic activity against four root rot causing fungal pathogens viz., Fusarium solani, F. oxysporum, Rhizoctonia solani, Lasiodiplodia theobromae. The root mycelial inhibition of these isolates on pathogens by isolates of Pseudomonas fluorescens (BARI-MBP) and Pseudomonas aeruginosa (BARI-MBP-01) is given in the Table 6.1. The antagonistic activity of *P. fluorescens* is shown in Fig. 6.1.

Table 6.1. Per cent inhibition of root rot causing pathogens by antagonistic microbes

Pathogens/Biocontrol	*Pseudomonas fluorescens*	*Pseudomonas aeruginosa*
Fusarium solani	80.46 (63.70)	87.85 (69.43)
F. oxysporum	78.52 (62.72)	83.33 (66.05)
Rhizoctonia solani	80.93 (64.15)	85.63 (68.06)
Lasiodiplodia theobromae	76.26 (60.66)	84.81 (66.46)
C.D. (P=0.05)	1.08	3.28
SEm±	0.38	0.83

*Values in parentheses are arcsine transformed values

Fig 4.2: Antagonistic assay of *T. harzianum* against two root rot causing fungal pathogens

Among 23 bacterial isolates, 14 isolates were found to be compatible with Carbendazim (2.0 g Bavistin 47% WP in 1 lit) at recommended dosage. Among 14 isolates, 10 were found compatible with Carbendazim (200 ml), nine were found sensitive with Kasumycin (2.5 g), and nine of the isolates were sensitive with sawyer soy chloride (SSC) and Neomycin at 0.5% concentration. Among 10 isolates, 10 were found compatible with Trichomycin (250 EC, 1.5 ml/litre) while Captan (700 + Propineb (56-70% mil) 14 isolates with Fosetyl-Al (250 EC, 2 ml/litre) formulation was found sensitive with seven soy chloride (SSC) at 0.5, 0.4 & 0.3% concentrations and also with Neomycin at 0.5% concentrations. Thirteen are compatible with other fungicides studied.

Other activities

- Maintenance of different pathogens and biocontrol cultures in the institute
- In vitro evaluation of products (Zhenyu and Jun Jie) screened from manufacturers against root rot causing fungal pathogens in tissue culture seedlings region.
- Sensitized field agronomists of potential diseases by suggesting suitable management practices

7. FARM MANAGEMENT

S. K. Lusweti, Kisima

Continuous/Routine activities

- Maintained 18 acres of mulberry gardens, 3 acres of castor gardens and 1 acres of plantation for production of quality mulberry leaf with recommended package of practices.
- Maintained the farm machineries, implements, power tillers, tractors, pump sets, pruning machines and other equipments for effective management of mulberry gardens.
- Harvested 24 MT kg mulberry leaf and 1.6 MT kg mulberry shoot to different sections of the institute for rearing of silkworms. Different pruning implements were maintained in proper condition.

- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible] LABORATORY

Concluded Research Project

[illegible]

[illegible]

Objectives

- [illegible]
- [illegible]
- [illegible]

[illegible]

[illegible]

[illegible]

Table [illegible]

Breeds	[illegible]	[illegible]	Mean
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Analysis of variance table

Source of Variation	DF	Sum of Squares	Mean Square	F-Calculated	Sig.
Factor A	1	4,096.00	4,096.00	72,828.41	0
Factor B	11	61,475.00	1,327.27	23,593.48	0
Interaction A × B	11	1,092.91	99.36	1,767.29	0
Error	60	3.38	0.06		
Total	83	66,668.29			

Statistical Interpretation

Different dependent (DF), dependent (DF) analysis were used for calculation of choice from different organic matter and north index. Further, the obtained data was converted to percentage using corresponding Chi-Square test.

Root and tooth extraction and Suture was performed on a sterilized instrument set (0.2 % Chlorhexidine solution) and was noted

↓

Proximal tooth extraction was successfully transferred to the socket, upon surgical wound creation provider administered an dose 2×2 days of corticosteroid

↓

Proximal extraction was marked 0.5 hours with artificial suture, Augmentation was done in the socket and Chlorhexidine was administered for 72 hours for the recuperation.

↓

The dominant extract was marked 2.5 hours with artificial suture and dried and the Chlorhexidine was administered

↓

Dominant tissue was transferred to Platelet Rich Fibrin solution and 2.5 days of wound healing treatment was completed and kept for 72 hours of termination

↓

The extraction was completed 24 hours with artificial suture and dried and Chlorhexidine treatment was administered

Fig. 4.1. Flow chart for isolation of chitin and chitosan for eight microbial fermentation medium

Table 4.1. Comparison of extraction of chitin using different extraction from gingival root tips

	DR-1	DR-2	DR-3	DR-4
DP-1	60.00	64.84	68.78	9.0
DP-2	66.58	72.58	71.57	10.13
DP-3	72.61	74.22	74.06	10.22
DP-4	70.38	70.58	70.53	10.34
DP-5	70.19	72.34	72.59	9.45
DP-6	72.19	74.81	75.08	10.19

Where Degree of Deproteinization, DP-Deproteinization, DR-Demineralization

[illegible]

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

The maximum recovery of data from enzyme was recorded in [illegible] and [illegible] combinations followed by [illegible] and [illegible] combinations.

Table 5.4: Comparison of estimates of calcium among different secretory from mixed oyster

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

*[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

Analysis of variance

Source of Variation	DF	Sum of Squares	Mean Square	F Calculated	Significance
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]			

The maximum recovery of data from spore paper was recorded in [illegible] and [illegible] combinations followed by [illegible] and [illegible] and [illegible] and [illegible] combinations.

Table 5.5: Comparison of estimates of biotite among different secretory from Greek oysters

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

*[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

Analysis of variance

Source of Variation	DF	Sum of Squares	Mean Square	F Calculated	Sig.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]			

The maximum recovery of nitrate from north waters was recorded in 30:1 and 50:1 combination followed by 50:1 and Fe3 3 and 50:1 and TiO2 combinations

Table 3.5: Conversion of nitrate into nitrogen using two hydrazine bases in

Source	Precipitating factor 1	Precipitating factor 2
Sources	32.5	65.65
Fluorine	31.56	70.55
Purines	34.2	24.68
Water	43.52	10.6

Analysis of variance

Source of Variation	DF	Sum of Squares	Mean Square	F-calculated	Sig.
Factor A	3	1.181.71	393.90	2.152.17	A
Factor B	1	1.968.21	1.968.21	10.146.07	B
Interaction A x B	3	147.63	49.209	253.639	A
Error	16	1.936	0.971		
Total	23	1.317.3a			

Precipitating factor 1 showed more sensitivity of nitrate ions mixtures

Table 4.4: Statistical group fingerprint by ICBE

SI No	Bacteria	Accession Number	Table of two substrates
1.	Pseudomonas fluorescens (ITCC)	OL655428	Bacterial isolates of nickel nitrate from different sources such as soil and groundwater
2.	Agrobacterium fabrum (ITCC)	OL655429	
3.	Bacillus cereus group (ITCC)	OL655430	
4.	Arthrobacter nicotianae (ITCC)	OL655431	
5.	Rhizobium sp. (ITCC)	OL655432	
6.	Acinetobacter sp. (ITCC)	OL655433	
7.	Rhizobium sp. (ITCC)	OL655434	
8.	Pseudomonas aeruginosa (ITCC)	OL655435	
9.	Pseudomonas sp. (ITCC)	OL655436	
10.	Pseudomonas fluorescens (ITCC)	OL655437	
11.	Pseudomonas aeruginosa (ITCC)	OL655438	
12.	Bacillus subtilis (ITCC)	OL655439	
13.	Pseudomonas putida (ITCC)	OL655440	
14.	Agrobacterium tumefaciens (ITCC)	OL655441	

Ongoing Research Projects

AB 01 001 01: Evaluation of new hazardous adsorptive materials by novel ITCC-1, ITCC-2, ITCC-3, ITCC-4, ITCC-5, ITCC-6, ITCC-7, ITCC-8, ITCC-9, ITCC-10, ITCC-11, ITCC-12, ITCC-13, ITCC-14, ITCC-15, ITCC-16, ITCC-17, ITCC-18, ITCC-19, ITCC-20, ITCC-21, ITCC-22, ITCC-23, ITCC-24, ITCC-25, ITCC-26, ITCC-27, ITCC-28, ITCC-29, ITCC-30, ITCC-31, ITCC-32, ITCC-33, ITCC-34, ITCC-35, ITCC-36, ITCC-37, ITCC-38, ITCC-39, ITCC-40, ITCC-41, ITCC-42, ITCC-43, ITCC-44, ITCC-45, ITCC-46, ITCC-47, ITCC-48, ITCC-49, ITCC-50, ITCC-51, ITCC-52, ITCC-53, ITCC-54, ITCC-55, ITCC-56, ITCC-57, ITCC-58, ITCC-59, ITCC-60, ITCC-61, ITCC-62, ITCC-63, ITCC-64, ITCC-65, ITCC-66, ITCC-67, ITCC-68, ITCC-69, ITCC-70, ITCC-71, ITCC-72, ITCC-73, ITCC-74, ITCC-75, ITCC-76, ITCC-77, ITCC-78, ITCC-79, ITCC-80, ITCC-81, ITCC-82, ITCC-83, ITCC-84, ITCC-85, ITCC-86, ITCC-87, ITCC-88, ITCC-89, ITCC-90, ITCC-91, ITCC-92, ITCC-93, ITCC-94, ITCC-95, ITCC-96, ITCC-97, ITCC-98, ITCC-99, ITCC-100, ITCC-101, ITCC-102, ITCC-103, 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[1] Stanislaw Kowalski [pg no [yr. 2111]] [2] N. Madhusudhana [Murty [yr. 2111]] L. Kaviarasu [3] S. Ganesh

[4] N. Jayakumaran, [5] Shailesh Kumar, [6] P. Ramu Kumar, [7] A. Sukkarni, Umamaheswaran, [8] Praveen Kumar, [9] Sathishkumar Ravi, [10] B. Radha, [11] P. Sivakumar, [12] Chandrakanth, [13] P. Singh [14] Singh

[illegible]

- To evaluate the performance of [illegible] hybrid, TTH x TTH in field for productivity and egg quality

a total of 2, 58,000 hybrid silkworm were prepared by [illegible] and 2,10,150 silkworm were supplied to different agro-climatic regions of India and 35,000 silkworm were kept in 5 months time-series schedule. The new hybrid TTH x TTH was released before Govt. for release by [illegible] in all India.

Table 6.1: Details of the silk supplied to different states

State	Silk
Karnataka	18,000
Tamil Nadu	41,000
Andhra Pradesh	21,000
West Bengal	15,000
Uttarakhand	8,000
Jammu & Kashmir	5,000
Maharashtra	9,000
Telangana	6,000
Bengaluru	9,000
Total	1,52,000

AIR 2021 (R): Development of productive, outstanding silkworm breeds/ hybrids of Bombyx mori L. its egg crops and sequencing of multi silkworm populations by optimal sampling method for commercial exploitation [Jan. 2021-Dec. 2024]

I. Sharma, S. Ramdhan Bhardwaj, G. S. Laxmi and S. M. Prakash

Objectives

- Development of multi bivoltine and hybrid cocoon crop

- To develop systematic automation technology to rear multi silkworm eggs by optimal sampling method

- Development of productive race (normal bivoltine hybrid and evaluation of mass population for commercial exploitation.

Parental cocoons materials were procured and colonial cocoon were cut up and over hybrid multiplication were made. Seven pairs were reared with 10 silkworms. Only five females expressed one female cocoon. Number of multi population reared between trends. Five selected male and multiple female were reared with eleven females. Study on the effectiveness of mechanical dissection of progeny and performance is under progress. Further, female having more male preferences based on egg colour were reserved. Rearing of 10 breeds including seven parental races and derived lines, 14 hybrid combinations [illegible] [illegible] [illegible] were maintained.

AIR 2020: Evaluation of new bivoltine double hybrid, BH2 x BH10 at farmers' level for authentication for commercial exploitation [Feb. 2020-Dec. 2020]

B. B. Chandrashekar, S. Ramdhan Bhardwaj, L. Bhavana, B. S. Sandya, Anand Kumar, D. Chandrakanth (CTRTI Berhampore), P. Lakshmanan, T. Sreenivasamurthy, B. Thokala Nalawadi, P. C. Phalaksha (RSRS Bangalore), S. Manjunatha (CSRC Mysuru), Radha (CSRC Jharkhand), K. Prasad (CSRC Kalimpong), T. C. Narendra Reddy and A. Basavaraj.

Objectives

- To evaluate [illegible]

[illegible]

[illegible] Evaluation and Popularization of improved technologies developed in the field of mulberry sericulture for South India

Component 4: Popularization of [illegible] double hybrid in Kolar region of Karnataka (Apr. 2021 to Mar. 2022)

[illegible]

Objectives

- To popularize [illegible] double hybrid [illegible] Kolar region of Karnataka

[illegible]

Component 5: Evaluation of productive double hybrid [illegible] (Apr. 2021 to Mar. 2022)

[illegible]

Objectives

- To evaluate [illegible]

[illegible]

Component 7: Evaluation of robust bivoltine silkworm hybrid suitable for different regions of high temperature and high humidity conditions (Apr. 2021 to Mar. 2022)

[illegible]

[illegible]

Pilot Study

Identification of candidate gene markers for the development of silkworm hybrids with [illegible]

[illegible]

Objectives:

- Assessment of lifespan and screening for stress tolerance in selected silkworm breeds.
- Identification and characterization of candidate genes.
- To develop bivoltine silkworm breeds/hybrids with better longevity associated with stress tolerance and productive traits.

Twelve Bivoltine silkworm breeds viz. CSR2, CSR4, CSR6, CSR16, CSR17, CSR26, CSR27, CSR50, [illegible] and [illegible] maintained at Silkworm Breeding [illegible] Laboratory, [illegible] were utilized for the assessment of lifespan (adult longevity) and stress tolerance [illegible] (Starvation and Paraquat (PQ) Oxidative stress). Lifespan assessment in the above breeds have revealed differences in the average lifespan ranging from [illegible] to [illegible], [illegible] to [illegible], [illegible] to [illegible] and [illegible] to [illegible] hours [illegible] respectively [illegible]. [illegible] CSR17, [illegible] along with CSR2 as check breed was exposed to starvation stress and Paraquat (PQ) Oxidative stress. Significant difference was observed among the selected breeds [illegible] in starvation stress. [illegible] of selected breeds [illegible] concentrations of PQ stress [illegible] relatively higher resistance in [illegible] and [illegible] than CSR17 [illegible]. [illegible] was observed in the selected breeds for PQ Oxidative stress. [illegible] was observed in [illegible] (Table 8.8) with [illegible] (both [illegible] and [illegible]). [illegible] CSR17 [illegible] lifespan [illegible] stress [illegible]. [illegible] in CSR26 and [illegible] with longest lifespan and higher resistance to PQ Oxidative stress. The [illegible] suggested to carry out the functional gene analysis through [illegible] for targeting the [illegible]. [illegible]

Table 8.8: [illegible]

Gene marker	Position	Description
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]: Development and evaluation of [illegible] resistant silkworm hybrids developed from marker assisted breeding [illegible] Phase II: Collaborative Research Project (Mar 2019-Feb 2022)

[illegible]

Objectives:

- Identification of [illegible] carrying [illegible] resistance.
- Development of new breeds and bivoltine hybrids resistant to [illegible] with productive traits.

The larval samples of silkworm bivoltine breeds viz. [illegible], [illegible] and [illegible] were collected for [illegible]. PCR amplification of [illegible] markers for [illegible] was initiated. Genome assessment and [illegible] of silkworm bivoltine breeds viz. [illegible], [illegible] and [illegible] were completed. [illegible] in [illegible] of [illegible] male and female moths and [illegible]

reinforced again for the final CT reconstruction. Contrast times for the CT examinations in ABC, ..., CDEF, FGHIJK, LMNOP, and QRSTU were challenged with views during the meeting.

Statistical analysis

Development of Brazilian Portuguese Questionnaire

E. F. Oliveira-Santos, T. Ramírez Gonzalez, [Type Here: 2023], S. Oliveira, M. S. Vasconcelos, R. C. Araújo, and L. Ferreira

Pediatric bacterial meningitis, adult bacterial meningitis, data analysis bacterial meningitis, acute bacterial meningitis, bacterial infection, CSF, infectious meningitis, and encephalopathy variables were examined for concentration and evaluation. The values obtained for the main cases are consistently with the original bacterial meningitis values.

Table 4.1: Sample characteristics of Brazilian geriatric measures.

Patient Category	Variable		Sample size (N=)	Percentage (%)	Concentration (g)	Depth (m)	Tissue Length (m)	Specimen Size (m²)	Duration
Participants	CT01 CT04 CT07 CT09	CT02-03 CT05-06 CT08 CT10-11	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
Patients	CT01-03 CT04-06 CT07-09 CT10-12 CT13-15 CT16-18	CT01-03 CT04-06 CT07-09 CT10-12 CT13-15 CT16-18	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
Participants	CT01-03 CT04-06		n=106	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
Participants	CT01 CT04 CT07 CT10 CT13 CT16	CT02-03 CT05-06 CT08-09 CT11-12 CT14-15 CT17-18	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
Participants Patients enrolled subjects	CT01 CT02 CT03 CT04 CT05 CT06 CT07 CT08 CT09	CT01 CT02 CT03 CT04 CT05 CT06 CT07 CT08 CT09	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
CT01 Participants	CT01 CT04	CT02 CT05	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4
Weighted spinal measures	CT01-03 CT04-06	CT01-03 CT04-06 CT07 CT08	n=53	>20%	1.2–1.5 × 10⁻³	0.5–1.0	2.0–3.5	0.8–1.2	2.1–3.4

5. MULTIDISCIPLINARY RESEARCH LABORATORY

Externally funded Research Projects

NAIP Project 1A: Evaluation of improved Technologies of Pulsewise Agriculture in Jharkhand

Component 1: Evaluation of Improved Pure Strains (PS-1) (Sept. 2022-Mar. 2023)

C. K. Chandrakumar

Objectives

- To evaluate the improved Pure Dynamic Strain - PS-1 at 21 farms (All Bhubaneswar, Rangpur and its considered as farmers Field).

In accordance with the Jharkhand, 3 trainings at PS-1 were conducted with 60 days of improved Pure Dynamic (PS-1) on 21 CSP Bhubaneswar Rangpur and 1000 mentioned (Rs (PS-1 + CSP)) were prepared. All the were distributed to all farmers. The performance of improved PS-1 at farms and were found to farmers level was evaluated for both dry and wet season assessment. The improved Pure Dynamic was found to be superior to the control.

Table 5.1: Performance of Improved Pure Dynamic at 21 Bhubaneswar Rangpur

Brood Source	Pure (Rate)	PDS		ADT (g)	ADT (g)	Yield (t)
		Dose	SPR (%)			
PS-1	4.2 (4.0)	15.2 (5.0)	11.2	2.2	3.2	2.4 (2.0)
	(2.0-4.5)	[200-250]	[5-15]	[1-3]	[3-4]	[1-3]
PS-	4.0 (3.5)	15.0 (5.0)	11.0	2.2	3.3	2.5 (2.0)
	(2-4.5)	[200-250]	[5-15]	[1-3]	[3-4]	[1-3]
% Imp.	5%	1%	5%	0%	11%	4%
t-test (p-value)	0.000	0.457	0.000	0.000	0.431	0.000

Note: Values in parentheses indicate SD; p<0.05 indicates significance at 5%

Table 5.2: Scouting performance of PS-1 v CSP1 on farmer's level

Brood Source	Pur (Rate)	Rate %	PDS		STP (g)	STP (g)	Yield %	Yield (t/ha-1 [SE])	Recovery (%)
			Dose	SPR (%)					
PS-1 & CSP1	3.8 (3.0)	12.5 (5.0)	12.5 (5.0)	10.5 (5.0)	2.2 (1.5)	2.2 (1.5)	10.0 (5.0)	7.1 (5.0)	12.2 (5.0)
	[2.5-4.5]	[5-17.5]	[2.5-17.5]	[5-17.5]	[1.5-3.0]	[1.5-3.0]	[5-15]	[3-12]	[5-17.5]
PS-1 & CSP1	4.0 (3.5)	12.5 (5.0)	10.0 (5.0)	5.0 (5.0)	1.7 (1.5)	1.7 (1.5)	12.5 (5.0)	8.7 (5.0)	10.0 (5.0)
	[3.5-4.5]	[5-17.5]	[2.5-17.5]	[2.5-7.5]	[1.5-3.0]	[1.5-3.0]	[5-20]	[3-15]	[2.5-15]
% Imp.	5%	0%	0%	0%	0%	0%	0%	0%	0%
t-test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Values in parentheses indicate SD; p<0.05 indicates significance at 5%

Table 1.1: Grain quality parameters of improved Durum Wheat genotypes in comparison with the recommended checks

Parameters	DDW-16	Kharchia 65 (check)	% Improvement over check	t-value (2 tailed)
Grain Protein Content (%)	12.8 (12.8)	12.1 (12.1)	6%	0.49
Grain Yield (kg/ha)	5.42 (5.42)	5.42 (5.42)	0%	0.00
Yield %	44.26 (44.26)	45.20 (45.20)	-2%	0.38
Test Weight (g)	43.5 (43.5)	46.67 (46.67)	-7%	1.15
SDS (ml)	40.0 (40.0)	38.0 (38.0)	5%	0.46
NDSS (ml)	42.0 (42.0)	40.0 (40.0)	5%	0.46
Grain Protein Deviation Factor	2.08 (2.08)	2.04 (2.04)	1%	0.49
Sedimentation (ml)	40.0 (40.0)	37.33 (37.33)	7%	0.58
Gluten (Dry Gluten Content %)	7.18 (7.18)	7.03 (7.03)	2%	0.22
Water Absorption (ml)	24.00 (24.00)	24.00 (24.00)	0%	0.00
Water Uptake (ml/100 gram wheat)	79.17 (79.17)	80.83 (80.83)	-2%	0.24
Hardness (Single Kernel Characterization System)	62.00 (62.00)	70.75 (70.75)	-14%	0.82
Average Grain Diameter (mm)	2.42 (2.42)	2.43 (2.43)	-0%	0.00

Note: Values in parentheses indicate the mean values of two replications

Ongoing Research Projects

NIWR 2022-1: On Evaluation of Improved Technologies of Rainfed Agriculture in South India

Completed: Performance of Coarse Cereal (MP1 + MP2) on improved management for increased productivity and milk quality (Apr 2020-Mar 2023)

P. S. Chandrashekar, B. Bhagya, S. M. Mahesh, Raju Kandu, J. B. Narasimhaswamy, J. B. Mahesh, Vinod Kumar Kurmi and N. S. Hadda

Objectives

1. To evaluate the field performance of newly evolved improved recommended Coarse Cereal for productivity and milk quality

Year wise summary (experimental details, results and discussion)

A total of 50,000 dibbles were distributed in the farmers 15,000 dibbles in Kolar zone of Bangalore through KVK Narasapura and 5,000 dibbles in Tiptur (Hardy Seed) through KVK Jagalahalli. The experiment was performed well in Kolar zone, farmers highly appreciated (Dr. MP1) at Kolar Government station.

Table 1.2: Performance of Coarse Cereal in comparison with FCC in 2023

Treatments	Yield / 100 dibbles (kg)	CCP (g)	CPY (g)	Yield (%)
MP1 + FP	76.5 (8.7)	1.09 (0.24)	0.26 (0.03)	20.00 (5.62)
FCC + CCMS (Control)	64.7 (8.0)	1.03 (0.24)	0.22 (0.03)	13.67 (3.70)
% Imp	18	6x	18	8
t-test (p-value)	0.000	0.000	0.000	0.000

Note: Values in parentheses indicate SE, n=100 dibbles sampled per farmer (20)

Table 1.1. Seeding pneumonia (SP) in AI and PI in 2024

Parameter	BTS – AI	PB – CaBA	% imp.
Single cocoon weight (g)	1.65	1.747	5.85
Single shell weight (g)	0.40	0.44	10.00
Shell %	24.24	17.54	18.68
Filament length (m)	800	900	12.50
Denier	2.5	2.0	20.00
Raw silk recovery (%)	18.5	19.5	5.41
Reelability (%)	65.7	85.0	29.34
Breakages (no. per 1000 metres run)	4.0	3.0	25.00
Raw silk superiority (%)	72.5	72.5	0.00
Raw silk grade (Japanese standard)	4A+	5A	20.00
Cocoon to raw silk ratio	6.5	5.5	15.38
Average cocoon crop/ha (kg)	24,000	23,760	1.00
Overall grade	AA	A	—

Table 11.2.1 (Ch): Development of new multivoltine breeds with improved silk quality, reeling performance and cocoon transmission characters (Reg. 2018-Reg. 2022)

S. R. Chandrashekar, K. M. Deshmukh, T. G. Nadkarni and S. Ramaiah, C.S.K. Kharadey (Agust Nov 2024)

Objectives

- To develop multivoltine breed with improved silk quality (Double Cocoon grade) with bivoltine breeds through modern essential technology
- To develop multivoltine hybrids with commercial silk quality and cocoon traits

Four parents and their diallel (nine hybrid combinations) were analysed through RT-PCR for all 24 genes which are responsible for the diapause and non-diapause character. These genes include Diapause-specific Pantothen transporter, Sorbitol dehydrogenase, Hypothetical 60 dehydroxyalkane, Beta2 [Ngal] homolog 1, Prolactin peptide binding protein, Bar 12, Juvenile hormone receptor, Serpentine receptor for diapause and Pseudocholine receptor, Chitinase 2 precursor, Polyubiquitin A [Bg], Ion transporter 2 dehydrogenase, Peptide growth 40K ribosomal protein 12, Nucleoside assembly protein, Prepupal Bm gene1, Bm viable for liver diapause, among 24 genes 3 genes were associated with essential breeds viz., Diapause gene, Prepupal transferase, Serotonin receptor 1 and transporter 2 dehydrogenase and Nucleosome assembly protein. Parthenogenetic eggs were analysed through RT-PCR for selective gene responsible using three standard primer against control (essential breeds). Combined ally with 3 bivoltine breeds - CSR2, CB, BMCS were utilized as progeny (9 different combinations of hybrids).

Based on the RT-PCR results six stabilized lines were maintained viz., HA11, HA22, HA33, HA44, HA55 and HA66. Among the 6 lines, three performing lines were taken and bivoltine breeds. From the six stabilized lines, hybrids were prepared using the bivoltine parents BMC (Exotic), CB (Indigenous) and CSR2. Based on the phenotypic characters of cocoons, breeding, fabrication characters and yield related characters, three hybrids of the lines were selected viz. and RTT were taken as HA11, HA22 and HA33 performed better among the combinations and yielded superior silk quality with 3A to 5A grade.

Table 3.4: The laboratory-rearing performance of the mutilated locus-role 3 locations-silkworm breeds

#	Name	Pre	BCC		BTW (g)	WW (g)	Yield %	diff
			Pre	Wk				
1	RAGE × GE	81.1 [81.47]	83.13 [84.09]	18.83 [95.84]	1.668 [84.09]	0.956 [95.84]	73.44 [89.84]	11.06
2	RAGE×RAGE	184 [111.0]	1099 [111.0]	12.26 [109.0]	2.045 [102.46]	0.249 [82.84]	23.79 [109.0]	89.00
3	RAGE × CBE1	822 [84.84]	3000 [90.84]	16.48 [98.84]	1.668 [91.68]	0.887 [87.84]	69.84 [90.84]	98.91
4	RAGE × GE	490 [84.84]	7800 [90.84]	14.01 [91.84]	1.72 [84.00]	0.919 [89.11]	69.01 [92.84]	30.04
5	RAGE × RAGE	484 [91.84]	5500 [97.84]	14.01 [91.84]	1.789 [84.84]	0.958 [89.84]	69.97 [89.79]	49.09
6	RAGE × CBE1	489 [91.84]	8700 [89.84]	18.84 [90.84]	1.971 [89.84]	0.921 [89.84]	70.00 [97.84]	33.09
7	RAGE × GE	707 [91.79]	5000 [79.84]	14.11 [91.84]	1.184 [89.84]	0.958 [87.84]	70.01 [84.84]	49.84
8	RAGE × RAGE	688 [81.46]	8800 [82.84]	12.16 [90.84]	1.668 [84.79]	0.958 [89.79]	69.97 [82.84]	49.79
9	RAGE × CBE1	820 [83.46]	8800 [97.84]	14.01 [84.84]	1.181 [84.84]	0.958 [89.84]	70.84 [84.79]	49.46
10	RAGE × GE	887 [83.84]	8800 [89.84]	12.16 [98.84]	1.987 [91.84]	0.888 [87.84]	70.84 [89.84]	49.79
11	RAGE × RAGE	842 [91.84]	7700 [89.84]	13.87 [98.84]	1.976 [98.84]	0.968 [88.84]	70.84 [84.84]	89.79
12	RAGE × CBE1	888 [84.79]	8700 [89.84]	12.88 [97.79]	1.987 [89.84]	0.968 [89.84]	70.84 [84.84]	49.89
13	RAGE × GE	484 [84.84]	7800 [89.84]	13.84 [98.84]	1.979 [84.84]	0.967 [89.84]	70.79 [91.79]	49.84
14	RAGE × RAGE	882 [91.79]	8800 [89.84]	14.87 [97.79]	1.988 [91.84]	0.967 [89.84]	70.84 [84.84]	49.89
15	RAGE × CBE1	887 [84.88]	8700 [97.84]	14.87 [98.84]	1.982 [84.84]	0.968 [89.84]	70.84 [99.84]	98.89
16	RAGE × GE	888 [84.84]	8800 [84.84]	12.18 [99.84]	1.984 [84.84]	0.928 [84.84]	73.84 [84.84]	89.89
17	RAGE × RAGE	779 [97.84]	9784 [89.84]	13.88 [98.84]	1.189 [84.84]	0.968 [89.84]	73.84 [88.84]	84.79
18	RAGE × CBE1	887 [91.79]	8800 [84.84]	12.84 [99.84]	1.988 [84.84]	0.967 [89.84]	73.84 [84.84]	49.84
	Average	729	5904	13.79	1.868	0.928	73.81	
	SD	18.837	898.14	1.418	0.288	0.088	3.882	

Note: Values in parentheses indicate SD; p<0.05 indicates significance level

Based on the results of the ETHOS analysis, 3 markers and variations in agro-qualities were revealed with β-score as an inverse standard. The regressions was performed to explicate and results were standardized to the regression level of the construction β in the gene. A Nonconsolidation control (DFC) sample

[illegible] was also run to detect recombination. A set of homologous genes related to carotenogenesis were identified utilizing Barker clustered Interiors [24,25] and constituted among the developed hybrid lines to categorize [illegible] (Fig 4.1)

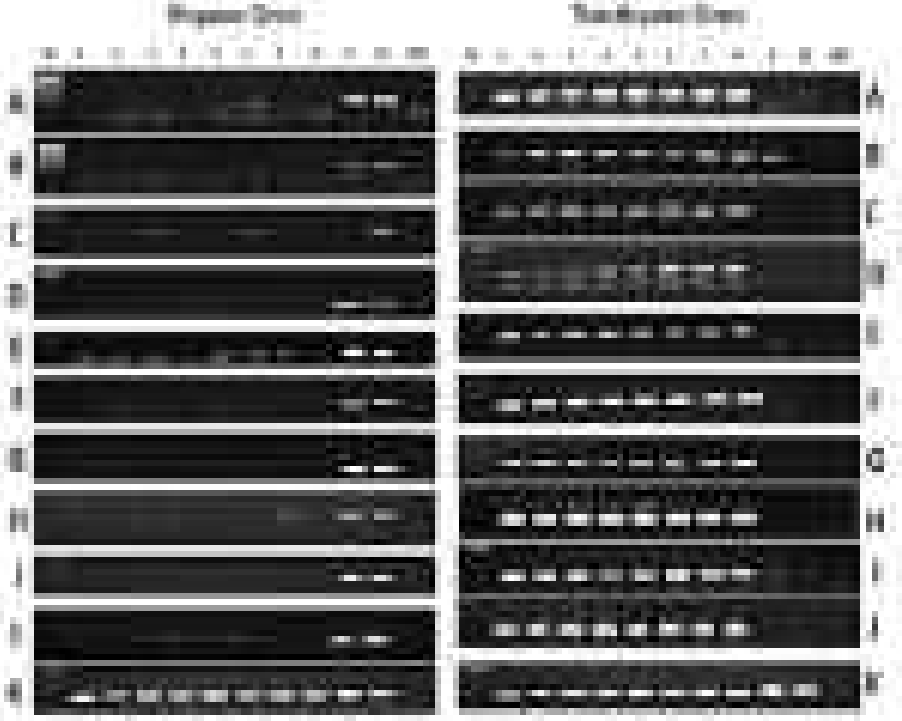

Fig 4.1: Gene expression patterns in established lines and parental breed eggs of Hibiscus Rosa-sinensis, white indicates no disease and non-diseases characters [illegible]

	Abscission factors	Non-abscission factors	
A	[illegible]	[illegible]	A
B	[illegible]	[illegible]	B
C	[illegible]	[illegible]	C
D	[illegible]	[illegible]	D
E	[illegible]	[illegible]	E
F	[illegible]	[illegible]	F
G	[illegible]	[illegible]	G
H	[illegible]	[illegible]	H
I	[illegible]	[illegible]	I
J	[illegible]	[illegible]	J
K	[illegible]	[illegible]	K

The detailed data of pre and post season parameters of the recruited breeds and established lines are presented in Table 4.1

Table 4.1. Growing and breeding performance of the [illegible] experimental hens.

Treatments	Initial weight (g)	Final weight (g)	Feed intake (g)	Egg production (%)	Egg mass (g)	Feed conversion ratio	Survival rate (%)	Fertility (%)	Hatchability (%)	Body weight (g)
Control	1,210	1,320	95.20	78.50	62.80	1.52	96.00	91.20	84.60	1,345
Basal diet + 0.5% [illegible]	1,215	1,335	96.10	80.20	64.10	1.50	97.50	92.40	85.90	1,362
Basal diet + 1.0% [illegible]	1,208	1,342	97.00	82.10	65.70	1.48	98.00	93.10	87.20	1,378
Basal diet + 1.5% [illegible]	1,212	1,328	96.50	79.80	63.90	1.51	96.50	91.80	85.10	1,351
Basal diet + 2.0% [illegible]	1,205	1,315	95.80	77.60	62.10	1.54	95.50	90.60	83.70	1,330
Basal diet + 2.5% [illegible]	1,218	1,340	97.30	81.40	65.20	1.49	97.00	92.90	86.40	1,370
Basal diet + 3.0% [illegible]	1,211	1,325	96.00	79.10	63.40	1.52	96.80	91.50	84.90	1,340
Basal diet + 3.5% [illegible]	1,209	1,318	95.50	78.00	62.50	1.53	95.90	90.90	84.10	1,332
Basal diet + 4.0% [illegible]	1,214	1,332	96.40	80.00	64.00	1.50	97.20	92.00	85.50	1,355
Basal diet + 4.5% [illegible]	1,207	1,310	95.00	76.90	61.60	1.55	94.80	89.80	82.90	1,320

The [illegible] in the two control groups and the [illegible] were statistically analyzed using Tukey's multiple mean comparison test.

Table 4.2. Growing and laying performance of the [illegible] reared in [illegible] housing system.

Replicate	Initial body weight (g)	Final body weight (g)	Feed intake (g/bird/day)	Egg production (%)	Egg mass (g/bird/day)	Feed conversion ratio (kg feed/kg egg)	Survival rate (%)	Fertility (%)	Hatchability of fertile eggs (%)	Body weight at 72 weeks (g)
Replicate 1	1,205	1,378	112.4	78.6	63.1	1.78	96.7	91.2	84.5	1,362
Replicate 2	1,198	1,365	110.9	76.2	61.0	1.82	95.8	90.4	83.1	1,341
Replicate 3	1,212	1,392	113.1	79.4	64.2	1.76	97.1	92.0	85.3	1,378
Replicate 4	1,201	1,371	111.6	77.1	62.0	1.80	96.2	91.0	84.0	1,355
Replicate 5	1,208	1,384	112.0	78.0	62.8	1.79	96.5	91.5	84.8	1,369
Replicate 6	1,195	1,358	110.5	75.8	60.7	1.84	95.4	90.1	82.8	1,334
Replicate 7	1,210	1,375	111.8	77.8	62.5	1.79	96.0	91.0	84.2	1,358
Replicate 8	1,203	1,369	111.2	77.0	62.0	1.80	95.9	90.8	83.9	1,352
Replicate 9	1,215	1,388	112.7	78.9	63.5	1.77	96.9	91.8	85.0	1,374
Replicate 10	1,200	1,362	110.8	76.5	61.4	1.81	95.6	90.5	83.5	1,345
Replicate 11	1,206	1,374	111.5	77.5	62.3	1.79	96.3	91.3	84.4	1,360
Replicate 12	1,209	1,380	112.1	78.2	62.9	1.78	96.6	91.6	84.7	1,366
Replicate 13	1,197	1,355	110.2	75.5	60.5	1.85	95.2	89.9	82.6	1,330
Replicate 14	1,213	1,386	112.5	78.7	63.3	1.77	96.8	91.7	84.9	1,372
Replicate 15	1,204	1,370	111.4	77.3	62.1	1.80	96.1	91.1	84.1	1,356
Replicate 16	1,211	1,383	112.3	78.4	63.0	1.78	96.7	91.4	84.6	1,368
Replicate 17	1,202	1,367	111.0	76.9	61.8	1.82	95.7	90.7	83.4	1,348
Replicate 18	1,207	1,376	111.7	77.7	62.4	1.79	96.2	91.2	84.3	1,359
Replicate 19	1,199	1,360	110.7	76.1	61.2	1.83	95.5	90.3	83.2	1,340
Replicate 20	1,210	1,379	112.2	78.1	62.7	1.79	96.4	91.4	84.5	1,364
Mean	1,205.6	1,373.2	111.8	77.6	62.3	1.80	96.2	91.1	84.1	1,354.8
SEM	1.4	3.1	0.4	0.4	0.3	0.01	0.2	0.2	0.3	3.6

Based on the results of this study, [illegible] was observed from [illegible] Agricultural Research Station to the egg [illegible] during [illegible] and [illegible] of [illegible] performance [illegible] and [illegible] production [illegible].

[illegible]: Development of multivoltine foundation crosses for productivity and high silk percentage [illegible]

[illegible]

Objectives:

- Development of multivoltine foundation crosses [illegible] high silk percentage and improved [illegible]

Based on the rearing performance and the economical parameters, [illegible] combinations of multivoltine foundation crosses (MFCs) have been shortlisted from the initial [illegible] combinations. [illegible]

Table 13: The rearing performance of the short listed multivoltine foundation crosses (MFCs)

MFCs	ERR By No.	ERR By Wt. (kg)	[illegible]	[illegible]	[illegible]	Average Evaluation Index
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
SD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-

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[illegible]

[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
CD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

Based on rearing performance and [illegible] [illegible]

Collaborative Research Project

[illegible]

[illegible]

[illegible]

Objectives

- [illegible]
- [illegible]

[illegible]

[illegible]

Maintenance of polyvoltine silkworm breeds

[illegible]

Objectives

- [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible] SATELLITE SILKWORM BREEDING STATION: COONOOR

[illegible]

[illegible]

[illegible]

Table 10.1: Scoring performance of ODI powerplays

Team	Lowest Batting	Venue	Match	Jan 01 Runs	Jan 02 Balls	Jan 03 4s	Jan 04 6s	Jan 05 Result	Jan 06 Ref
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[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 and supply of Alla to Kirrikkee Brewing Laboratory (2023–Present)

Beyond [illegible] of [illegible] Kirrikkee's [illegible] requirements, supplied [illegible] Alla to [illegible] (2021–Present).

Revenue Concession:

During the reporting period Rs. 1,15,474 revenue was generated.

Table 10.2: Revenue generated under various heads

Particulars/Head	Amount
Rental Fees / Licence Fee / Water Charges	1,15,474
Land Water Charges	20,181
[illegible]	1,000
[illegible]	2,000
Total	1,15,474

11. PO-RAISE SEED FARM, RAYAGADA

Objectives

Breeder oil seed breeds maintenance and multiplication

Objectives

- Maintenance of nucleus seeds for the production and supply of quality seed as per the breed maintenance protocol
- Maintenance of high quality germplasm collection for use in germplasm enhancement programme
- Production, procurement and supply of quality TL seeds for FLD demonstration during kharif

Maintained 0.80 hectare of nucleus seed block plantation in one for environmental isolation of processes and for Basic Seed Farm. Another 2.40 acres of true nucleus has been maintained as per general package of practices. Eight nucleus seed breeds namely including four oil seed breeds (OSB1, OSB2, OSB3 and OSB4) and four dedicated breeds (OSB5, OSB6, OSB7 and OSB8) were maintained twice in the original breed characteristics in four rearing cycles in a year [May-June 2021, Aug-Sep 2021, Nov-Dec 2021 and Feb-Mar 2022]. Continuous rearing of every stage is carried out to keep the stage free from disease or parasite and Pebrine is controlled.

Table 11.1: Performance of breeders breeds (Basis of 1 rearing cycle)

Breed	ERR (No/Dfs)	FER (g + cocoon/Kg)	ECW (g)	SHW (g)	Shell Ratio (%)
OSB1	97.5 (150)	17.15 (+/- 750)	1.55 (+/-0.15)	0.41 (+/-0.07)	21.79 (+/-2.1)
OSB2	96.8 (+/-0.9)	17.05 (+/-0.12)	1.47 (+/-0.10)	0.39 (+/-0.04)	22.1 (+/-1.7)
OSB3	98.1 (+/-0.7)	17.20 (+/-0.22)	1.57 (+/-0.14)	0.42 (+/-0.05)	21.5 (+/-1.9)
OSB4	97.2 (+/-1.1)	17.10 (+/-0.18)	1.51 (+/-0.12)	0.40 (+/-0.04)	21.8 (+/-1.6)
Mean of breeds	97.4 (+/-0.6)	17.12 (+/-0.09)	1.52 (+/-0.06)	0.40 (+/-0.02)	21.8 (+/-0.3)
CSB4	98.1 (+/-0.5)	17.18 (+/-0.10)	1.54 (+/-0.09)	0.41 (+/-0.03)	21.9 (+/-1.2)
CSB5	96.9 (+/-0.8)	16.97 (+/-0.14)	1.49 (+/-0.11)	0.39 (+/-0.04)	21.7 (+/-1.5)
CSB6	97.5 (+/-0.6)	17.08 (+/-0.11)	1.53 (+/-0.08)	0.40 (+/-0.03)	21.8 (+/-1.4)
CSB8	97.8 (+/-0.4)	17.14 (+/-0.09)	1.55 (+/-0.07)	0.41 (+/-0.02)	21.9 (+/-1.0)
Mean of dedicated	97.6 (+/-0.3)	17.09 (+/-0.07)	1.53 (+/-0.04)	0.40 (+/-0.02)	21.8 (+/-0.2)
Overall Mean	97.5 (+/-0.3)	17.11 (+/-0.07)	1.53 (+/-0.04)	0.40 (+/-0.02)	21.8 (+/-0.2)

a total quantity of 1,62,420 kg FL cocoons was procured.

Table 11.2: Production of Seeds and Disposal of Inventory during 2021-22

Item No	Opening stock (kg)	Seeds produced (kg)	Disposal of Seeds (kg)			
		Departmental consumption	Exchange	Sales	Abandoned	Total (kg)
1	84.000	3.720	0.000	0.000*	86.200	89.920.00
2	87.500	3.900	0.000	0.000	89.700	93.600.00
3	84.000	3.600	0.000	0.000*	84.00	87.600.00
4	75.000	4.500	0.000		85.500	90.000.00
Total	330.500	15.720	84.700	0.000	345.500	361.220.00

*DFO, GSP- no improved cocoons for production and also quality seeds are not fully evaluated.

A total of 24,750 kg of meat samples (1 kg/1 hr/ no.) were processed as per the set procedure and produced 9 x 2.75 kg (99) RTC ribs with 97.40% egg recovery. The ribs produced were preserved under 4 and 8 months of storage conditions.

Table 11.1 RTC ribs production in the Banana variety (CV) (2)

Details	Qty. of Dried Coconut collected (kg/nos.)	Qty. of Dried coconut utilized (nos.)	Egg recovery (%)	Moisture content (%)
[illegible] 2014	6,000 (2,143)	1274	40.44	1.68
[illegible] 2011	4,200 (1,714)	1429	39.34	1.21
[illegible] 2012	8,000 (2,963)	1274	40.17	1.27
Pest (1,961)	7,000 (1,111)	1351	40.47	1.19
Total	24,750 (10,000)	6111	97.40	1.27

1000 RTC ribs were supplied to 20 units to RTC multiplication centers of [illegible], Karnataka and 5000 rice farmer beneficiaries. In addition, a total quantity of 1000 (500 x 2) ribs was supplied to CTCRI, Kayamkulam.

Revenue generation:

Table 11.2 Revenue generated

Particulars	Income (Rs.)
Through sale of coconut meat	1,23,111.00
Through sale of RTC ribs	4,000.00
Total	1,27,111.00

12. SILKWORM PHYSIOLOGY LABORATORY

Concluded Research Project:

AICRP(Palm): Identification of probiotic consortium to improve the productivity in mulberry silkworm, Bombyx mori (Nov 2018 to Oct 2021)

Y. Chowdappa, J. Ramakrishnan and K. Bhuvaneswari

Probiotic consortium showing intestinal colonization of *Bacillus* sp. and *Lactobacillus* sp. (Lactobacilli) (T1) formulated with different combinations of both *Bacillus* spp. and *Lactobacillus* spp. viz., *B. licheniformis* (T2), *B. subtilis* (T3), *L. plantarum* (T4), *L. fermentum* (T5), *L. casei* (T6), *L. rhamnosus* (T7), *L. acidophilus* (T8), *L. brevis* (T9), *L. delbrueckii* (T10) and *L. reuteri* (T11) at probiotic supplemented levels and control levels exhibited higher larval weight in probiotic consortium treated levels (T1) followed by probiotic consortium treated levels (T2). Similarly, T1 recorded the highest weight cocoon weight, shell weight and shell ratio followed by T2 and control group. Whereas, PBS groups is lower in T1 than T2 and control. There is not much difference between T1 and T2 with respective to shell (Table 12.1). The rearing parameters viz., survability (%), average filament length (m), NBFR (%), shell ratio (%), pupa wt. (g), cocoon wt. (g), shell weight (g) of probiotic consortium treatments were significantly higher in T1 followed by T2 and control. Similarly the mortality is significantly lower in T1 than in T2 and control.

Table 12.1: Effect of probiotic mushroom supplementation on F1 to F2 hybrid rearing performance

Treatment	Single larval wt. (g)	LCW (g)	ECW (g)	SR (%)	SSR (%)	Time taken for 10% fed (hr)
T1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
T2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Control	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CD @ 5%	[illegible]	[illegible]	-	-	-	-

Table 12.2: Biochemical parameters of probiotic mushroom

Treatment	T1	T2	Control
Protein Content (mg/g)	[illegible]	[illegible]	[illegible]
Phenol (mg/g)	[illegible]	[illegible]	[illegible]
Total Sugar	[illegible]	[illegible]	[illegible]
Antioxidant activity (%)	[illegible]	[illegible]	[illegible]
Antibacterial activity (cm)	[illegible]	[illegible]	[illegible]
DPPH (%)	[illegible]	[illegible]	[illegible]
Flavonoid	[illegible]	[illegible]	[illegible]
Tannin	[illegible]	[illegible]	[illegible]
Saponin (%)	[illegible]	[illegible]	[illegible]
Total Phenolic Content (%)	[illegible]	[illegible]	[illegible]

[illegible] significant at 5% level, [illegible] significant at 1% level

Ongoing Collaborative Project

[illegible]: Optimization and diversification of millet-rice puffed products for business & personal consumption and economy (Oct. [illegible] – Mar. [illegible])

P. Thiruvenkatesh, J. Ramakrishnan, Sarvesha, T. N. Anand Kumar and S. M. Prabhat

[illegible] Physics: D. M. Sadhasivam, K. Sadhasivam Sam, A. Shanka Tiwari, Sandeep A. Gupta and G. Sadhasivam

[illegible] Karnataka: B. K. Das, S. K. Ramanand M. A. Kumar

[illegible] Bangalore: R. G. Negi, Girish B. Pandit and V. M. Sadhasivam

[illegible]: Sanjay K. Jena, Jasmine Sharma and Jitendra Singh

[illegible]: Mahipati D. S. Mahajan and CT. James Babu

[illegible] Physics

Sugars, phenolics, flavonoids and volatile compound profiling were carried out on mulberry silkworm rearing. Sugar profiling revealed the presence of 22 different sugar molecules with an total on the main component sucrose as primary digestion and main health. Total of 22 different phenolic and compounds were found in sugar including [illegible] and [illegible] and all these compounds are known to exert beneficial effects. Moreover, 24 different flavonoids molecules have detected in sugar, of which luteolin, quercetin, myricetin, catechin and epicatechin are having anti-cancer, anti-aging and anti-diabetic properties. The volatile components detected in silkworm pupae were styrene, 2-Ethylhexanol, 4-Tert-butyl-4'-methoxydibenzoylmethane and 3-methylbutanal, have industrial, cosmetic and medical importance. Comprehensive nutritional and bioactive molecule analysis of silkworm pupae revealed the presence of high value nutrients and bioactive compounds and these compounds can be [illegible] used in pharmaceuticals, nutraceuticals, functional foods and food additives.

Microbial analysis by enrichment approach in spent silkworm pupae was carried out and compared the diversity of bacterial communities immediately after rearing and sundried spent pupae. The predominance of genus *Bacillus* as observed by *Staphylococcus* sp. and *Lactobacillus* sp. was observed in fresh spent before drying, whereas *Enterococcus* sp. *Acinetobacter* sp. followed by *Pseudomonas* sp. *Staphylococcus* sp. and *Micrococcus* were commonly present in sundried spent pupae samples. Histogramatic analysis of silkworm pupae indicates that bacterial population was highly diverse in sundried samples. From obtaining the spent pupae immediately after rearing and drying by oven or shading under hygienic conditions could retain all the nutritional characteristics and minimize the spoilage due to microbial growth.

Table (2.3: Profiling of Sugars, Phenolics and Flavonoids compounds in silkworm pupae

Sugars		Phenolics		Flavonoids	
Name Sugars	mg/g	Name of Phenolics	mg/g	Name of Flavonoids	mg/g
Sucrose	0.78	Ferulic acid	0.45	Luteolin	0.21
Galactose	0.59	p-Coumaric acid	0.34	Apigenin	0.01
Trehalose	0.56	o-Coumaric acid	0.24	Diosmetin	0.01
Maltose	0.31	Gallic acid	0.09	Catechin	0.01
Mannose	0.15	Benzoic acid	0.01	Myricetin	0.01
Glucose	0.13	Caffeic acid	0.007	Quercetin	0.009

Table (2.4: Microbial assessment in spent mulberry silkworm pupae

Microbial category	Spent waste [Before drying] (CFU/g)	Spent waste [Sun dried] (CFU/g)
Total bacterial count	[illegible]	[illegible]
Gram negative coliform/enterobacteria	[illegible]	[illegible]
Salmonella		[illegible]
Lactobacillus	[illegible]	[illegible]
Total fungi count	[illegible]	[illegible]
Bacterial colonies	Negative	Positive

[illegible]Process

Preparation of food products from silkworm pupae

For the preparation of food products from fresh mulberry silkworm waste, pupa was taken from boiled pupae and was extracted in frozen drying, drum drying or tray drying to obtain pupae powder. The frozen dried and drum dried powder was homogenized into cookies, namkeen and pasta at 6%, 12%, 18% and 24% level and the samples were analyzed for quality parameters. Sensory evaluation of these food products was conducted at both traditional and non-traditional areas. Roasted adult of silkworm pupae was prepared and sensory evaluation was conducted.

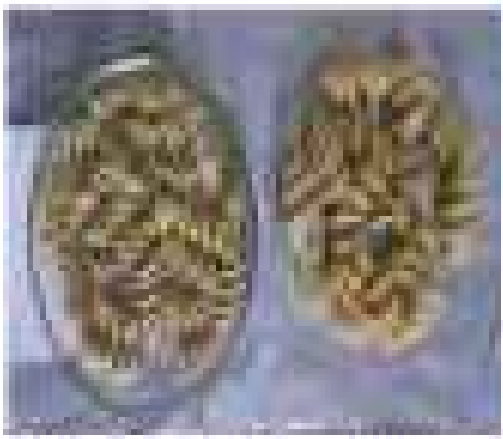

Fig. [illegible]: Treatment with [illegible] pigeon pea meal

Fig. [illegible]: Untreated and pigeon pea meal

Preparation of agbani silkworm pupae (SWP) as an ingredient in practice feed

Formulations for layer feed and broiler feed has been developed and the raw materials (silkworm pupae, defatted silkworm pupae, matured unmatured defatted silkworm pupae and defatted matured silkworm pupae meal) were prepared as per the quantity required to make different feed formulations and conducted broiler and layer feeding experiments.

[illegible] Experiment

Fish feed trials with pupae feed formulations were completed and trials with ordinary pupae meal were compared. The experiment is carried out at [illegible] Bio-sciences, India to study the extent to which fish meal can be replaced by matured silkworm (*Anaphe venata*) pupae meal. As one of the [illegible] Experimentation [illegible] Five experimental diets were formulated using various oil values with sequential replacement of fish meal with pupae meal. Three hundred *Pangasianodon hypophthalmus* fish [illegible] g were arbitrarily divided into five dietary groups viz. [illegible] and [illegible] in duplicate by keeping 10 fish per [illegible] Bio-environmental plastic circular experimental tanks which served the study purpose. Each fish group was fed with respective experimental diets as satiation twice daily at [illegible], [illegible], and [illegible] in the morning. The experimental tanks were cleaned manually after 96 days of feed trial in the growth, fish [illegible] evaluation, fish quality, and survivability of fish, it was observed that [illegible] of fish meal protein can be replaced by *Anaphe venata* pupae meal (ASWP) in the diet of *Pangasianodon hypophthalmus* without any detrimental effect compared to the control diet with 40% Fish meal protein.

The experiment was conducted at [illegible] Bio-sciences to study the extent to which fish meal can be replaced by matured silkworm (*Anaphe venata*) pupae meal in practical fish feed for by all Bio-environmental stations. Five experimental diets were formulated using various oil values with sequential replacement of fish meal with pupae meal. Three hundred *Pangasianodon hypophthalmus* fish [illegible] g were arbitrarily divided into five dietary groups viz [illegible] and [illegible] in duplicates by keeping 10 fish per [illegible] Bio-environmental plastic circular experimental tanks which served the study purpose. Each fish group was fed with respective experimental diets as satiation twice daily at [illegible], [illegible] and [illegible] hrs. After 96 days of trial, based on the growth, nutrient utilization, flesh quality and survivability of fish, it was observed that fish meal protein can be replaced maximally [illegible] by the *Anaphe venata* pupae meal [illegible] in the diet of *Pangasianodon hypophthalmus* without any detrimental effect compared to the control diet with 40% Fish meal protein.

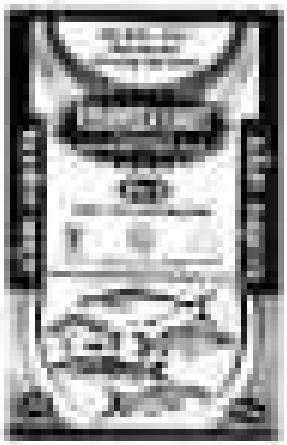

Fig. 11.3. Field level demonstration by using Tawar gripper

[illegible] Bangalore.

Tawar cultivars gripper based weed scrapers (Tawar blade grip) was applied on multiwave field to assess the leaf yield. The same weed is shown in

[illegible], Nashik

Profiling of phenolic acid fermentable in herb kinds and weed tawar waste was carried out. The antimicrobial screen of Bacillus species. Candida albicans to herb kinds and spore gripper were taken at [illegible] g. Double titration and isolation of chitin and chitosan from spore gripper was carried out. [illegible] and hydrolysis generate rearranging processes. [illegible], [illegible], [illegible] and Cellulase enzyme Cellulase and cellulase (tawar cultivar) were made used.

[illegible], Lucknow

Bacterial species were identified from weed scrape cultivars tawar and the nucleotide sequences were submitted to NCBI GenBank and obtained accession numbers. Reverse quantification of rol gene scrape, bacterial strains and scrape strains were carried out and profiling of these genotypes was done using [illegible] gel electrophoresis. The germination determination for herb rol and scrape gripper was also carried out.

Collaborative ongoing project proposed

[illegible]: Development of multiwave variable gripper for commercial applications [Jul. 2020-Jun. 2021]. [illegible] [illegible], [illegible], Bangalore)

[illegible] Mysuru: P. Thirugnanam

[illegible] Bangalore: Abdulaziz and C.V. Ravikumar

[illegible] Mysuru: R. M. Sudhindra and Sukhvir S. Singh

Cultivars scrapers was mechanized using engineer machinery tool and cultivars scraping tool manufacturers. The scrapers shafts were supplied to collaborators in [illegible], Bangalore and [illegible], Mysuru for evaluation and demonstration of multiwave scraper for commercial purposes.

[illegible]: Evaluation and popularization of improved technologies developed in the field of multiwave scraper for [illegible] [April 2021-March 2023]

Evaluation of Chemical Fertilizer and Pesticides in Commercial Scale Cultivation

[illegible], [illegible], [illegible], [illegible], [illegible], [illegible] and [illegible]

Objectives

- To evaluate the seed and seedling performance of clonal [illegible] in the states of **Andhra Pradesh, Karnataka and Tamil Nadu.**

An experiment was conducted for the evaluation of clonal [illegible] on the **commercial clonal seedling nursery of Andhra Pradesh, Karnataka and Tamil Nadu during rainy season** and summer season using RCBD(F) design. The treated batch was supplemented during [illegible] **three days @ 2.5 mL for 100 days and 5 days per day. The CRD was specialized on multiway layout and all the** Mission for elimination indices. Rooting, Germination, seedling root or [illegible] weight (100 nos), percentage of **missing and survival survive and disease incidence were recorded (Table 2.1.4).**

During the rainy season (June to September 2020), the CRD were evaluated the [illegible] of CRD in comparison with clones [illegible] of similar hybrid as control. There was no significant difference in the average [illegible] weight in control and treated batch. Significant difference was observed between the control and treated batches with respect to missing [illegible] percentage (1.70 % and 2.00 %), average [illegible] [illegible] percentage (2.14 % and 1.98%). The [illegible] were supplied in the proportion. Between and **significant difference was noted in the relative root CRD treated group in respect of [illegible] index (0.1417 kg** and 0.1000g) and shoot (0.1 kg) (2.7 kg and 3.1 kg) respectively.

During winter season (October 2020 to January 2021), a total of [illegible] of CRD in comparison with control was evaluated. There was no significant difference in the average [illegible] weight in control and treated batch. Significant difference was observed between the control and treated batches with respect to missing [illegible] percentage (1.97% and 1.17%), average [illegible] [illegible] percentage (1.79% and 1.21%). The treated seedlings were recorded in the progressive increase and significant difference was noted in the control and CRD treated group in [illegible] root (0.1 kg and 0.2 kg) and shoot (0.1 kg [illegible] kg and 0.2 kg) respectively.

During summer season (January to March 2021), [illegible] were evaluated for CRD transformation in Tamil Nadu and there was significant difference in missing [illegible] percentage in control and treated (1.85% and 1.13%), [illegible] shoot [illegible] percentage (1.2% and 1.11%). From the evaluation it is shown that CRD improved the overall [illegible] productivity by 2.7 % with an average yield of 85.12 kg (100 [illegible] in control and 72.1 kg (100 nos) in CRD treated.

Table 2.1.4: Evaluation of CRD in [illegible] Clone at Andhra Pradesh, Karnataka and Tamilnadu

Key [illegible]	Rooting and [illegible]			Leaf and [illegible] parameters						
	Germination (%)	Missing [illegible] (%)	Root and [illegible] (%)	Weight of [illegible] (g)	SCI (g)	SPI (g)	SI (%)	Root [illegible] (cm)	Shoot [illegible] (cm)	Collar [illegible] (mm)
Rainy season										
Control	3.267 (0.0)	3.24 (0.0)	3.76 (0.0)	45.69 (0.1548)	1.001 (0.0)	4.106 (0.0)	10.440 (0.0)	18.457 (0.0)	78.727 (0.0)	44.1.42 (0.0)
CRD treated	8.428 (NS) (0)	3.561 (NS) (0)	1.658 (NS) (0)	48.354 (NS) (0)	1.011 (NS) (0)	4.1014 (NS) (0)	10.2108 (NS) (0)	19.414 (NS) (0)	83.1362 (NS) (0)	44.1.2.1 (NS) (0)
Winter season										
Control	3.264 (0.0)	3.257 (0.0)	3.739 (0.0)	46.598 (0.0)	1.001 (0.0)	4.104 (0.0)	10.2.07 (0.0)	19.256 (0.0)	78.1.65 (0.0)	73.1.2.0 (0.0)
CRD treated	3.466 (0.0) (0)	3.1.9 (0.0) (0)	1.2.1 (0.0) (0)	46.1.7.3 (0.0) (0)	1.2.42 (0.0) (0)	1.1.42 (0.0) (0)	10.2.04 (0.0) (0)	10.2.48 (0.0) (0)	10.1.26 (0.0) (0)	76.1.2.0 (0.0) (0)

Source	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	–	–	[illegible]	[illegible]	[illegible]	[illegible]	–	–	[illegible]

[illegible] value in the source [illegible] not to maximum concentration. **Significant at [illegible] level. [illegible] value [illegible] [illegible] Significant

2.2: TECHNOLOGY VALIDATION AND DEMONSTRATION CENTRE

A. Bhagya

[illegible]: [illegible] Evaluation of improved technologies of [illegible] cocks [illegible] in South India

Component 1: Evaluation of Country Gold (BW) x [illegible] for improved cross breed for carcass productivity and silk quality (Apr. 2022 - Mar. 2023)

Objectives

- **To evaluate the field performance of newly released dual purpose improved Country Gold for productivity and silk quality.**

Under the large scale multiplication programme, a total of [illegible] (BW) and [illegible] of [illegible] brooder cocks reared and procured [illegible] (1:1) crossbreed cocks were evaluated and the data revealed that they are in conformation to the original breed standards.

Table 2.2.1: Rearing performance of different breeds on [illegible] during [illegible]

Breed	No. of [illegible]	Mean [illegible]	Annual yield [illegible]		[illegible] [illegible]		[illegible] [illegible]	[illegible] [illegible]	[illegible]	[illegible] [illegible]	[illegible] [illegible]
			No.	[illegible] [illegible]	No.	[illegible] [illegible]					
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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

Table 2.2.2: Genetic [illegible] during [illegible]

Trait	Mean	Variance		Heritability [illegible] [illegible]
		[illegible] [illegible]	[illegible] [illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	

1.6. PEST MANAGEMENT LABORATORY

Undoubted Research Project:

PRP: 1.6.2.2018: Development of Integrated Pest Management [IPM] module for leaf roller (Diaphania indica (Saunders) & Cnaphalocrocis Pyralidae) in mulberry (May 2018- Feb 2020)

[Manisha Kalsa and S. Mary Lourdes Ebinezer]

Objectives:

- Introduction of egg larval and pupal parasitoids for the management and rolls in mulberry
- Assessing the efficacy of selected botanicals and chemical insecticides against leaf roller and their toxicity to silkworms

Standardized laboratory mass production of leaf roller on mulberry larvae. Continuous leaf roller culture has been maintained in the laboratory. Egg larval parasitoid *Trichogramma* sp. and egg larval parasitoid *Bethylogonidea* sp. of *D. polyzonalis* have been collected from the field. Parasitization efficiency of *Trichogramma* brassicae [IIHR (Trichogramma Telangana)] on leaf roller eggs in different dilution [1:1 ratio] and was studied. The results revealed that *T. brassicae* is able to parasitize *Diaphania* eggs up to 1:7 dilution of soil.

Standardized mass production of leaf roller egg larval parasitoid *Trichogramma* sp. larval parasitoid *Bethylogonidea* sp. and pupal parasitoid *Tetrastichus howardi* (Trichogramma Telangana) on leaf roller egg, larva and pupa. Safety testing of 10 chemical insecticides and five botanicals against different larval instars were completed. The results indicated that Chlorfenapyr 10% SC (Intrepid) Methoxyfenozide 10% SC (Dimilin) Novaluron 10% SC (Rynaxypyr) is safe after 10 days after spray Spinetoram 12% SC (Delegate) safe after 20 days. Indoxacarb 14.5% SC (Avaunt) safe after 30 days and three botanical formulations namely Pongamia oil, Neem oil, Azadirachtin (10000 PPM) Neem extract 5 safe after 5 days after spray. Field evaluation of selected chemicals has been completed in leaf roller infested mulberry plot of CSRTI Hesaraghatta. Data was collected before and after release is completed.

The leaf roller incidence reduced from 11% to 20% in one week after pupal release of parasitoids. In control plot the leaf roller incidence of 11% increased to 45% after one week.

Fig. 1.6.1: Laboratory mass production of *D. polyzonalis* larvae on mulberry Leaves

Fig 14.2: [illegible]

Fig 14.3: [illegible]

Fig. 14.4: [illegible]

Fig. 1 of 3. Release of eggplant, larval and pupal parasitoid against leaf miner in mulberry garden

Table 1 a-c: Comparison of *B. thuringiensis* incidence in mulberry garden before and after release of egg larval, larval and pupal parasitoids

Group	Incidence (%) on eggplant before and after release of parasitoids			Test statistic (F-value) for comparison of before and after release of parasitoids		
	Pre release	One week after post release (Post 1)	Two weeks after post release (Post 2)	Pre vs Post 1	Pre vs Post 2	Post 1 vs Post 2
Exp	7.4 b	6.3	5.6	61.107** (0.000)	83.643** (0.000)	6.000* (0.000)
Control	10.3	10.3	9.9	68.7** (0.000)	84.28* (0.000)	20.24** (0.000)
p-value	0.0.78**	1.182**	10.882**			

** Significant at 0.01 level, * Significant at 0.05 level, ns non-significant

Comparisons of incidence between control and experimental groups was done by using t test for comparison of independent proportions. Comparison was done on the data of pre-release, one week after post release and 14 days after post release was done separately.

- One week after post release and 14 days after post release control groups have more incidence compared to experimental group.
- Incidence was low in the experimental group, and there is a significantly reduction of pest one week after post release from incidence (7.4 %).
- Even though there is a slight increase in incidence percentage (5.6%) 14 days after post release it shows no significant difference with the incidence one week after post release, but is a significantly lower than pre-release incidence.
- In the case of control group, incidence increased significantly from initial day (10.3%) to one week after (10.3%) and then 14 days after initial day (9.9%).

Table 1(2): Comparison of immunity (%) of [illegible] isolates and other isolates of [illegible]

Parent	Mean%		p-value / F-value
	Experimental	Control	
[illegible]	17.75±1.69ᵃ	17.42±1.37ᵃ	1.410ᴺˢ (0.260)
[illegible]	1.13±0.42ᵇ	10.28±1.16ᵇ	5.111* (0.003)
[illegible]	12.5±1.13ᵇ	17.44±1.13ᵇ	4.811* (0.009)
F-value (P-value)	11.75** (0.001)	11.222** (0.001)	

** Significant at 1% level; ᴺˢ Non-significant; Means having different lowercase superscript letter significantly within a row

- Results show that in the experimental group, immunity (%) of [illegible] was 17.75 in the initial day and it significantly decreased to 1.13% in [illegible] and [illegible] and then significantly increased to 12.5% in 15 days after [illegible].
- In the case of control group, immunity was found significantly from initial day (16.42%) to one week after (16%) and then to 15 days after initial day (17%).

Conclusion/Other activities

Maintenance of [illegible] cultures for mass production and supply to [illegible] of economically important species of [illegible] pests in [illegible] ecosystem.

Publications

References

- To maintain [illegible] cultures of [illegible] agents for mass production, storage and supply to [illegible] facilities.

[illegible] cultures of five [illegible] parasitoids viz. [illegible], [illegible] and [illegible] larval and pupal parasitoids of [illegible] and [illegible] [illegible] were established throughout the year.

Mass production [illegible] for the production of egg parasitoid, [illegible] and larval parasitoid, [illegible] for the management of [illegible] and [illegible], [illegible] of [illegible] and [illegible] of [illegible] (pre-release [illegible]) in farmers of [illegible], Tamil Nadu and [illegible].

Mass [illegible]. [illegible] [illegible] for the management of [illegible] in [illegible]. [illegible] and [illegible] [illegible] of [illegible] in [illegible] and Tamil Nadu farmers. Following the [illegible] of the [illegible] the [illegible] reduced from 40 per cent to below 5 per cent. The release of [illegible] along with other components of IPM was effective in [illegible] the major [illegible] pests and [illegible] [illegible] below ETL in the field.

Table 15.1: Details of production of bioagents/ agents at CBCT (Forest), [illegible]

Biological control agents	Quantity produced	Quantity sold	Total Revenue (Rs.)
Beauveria bassiana (No. of products: 2 products) no.s 12,000 (estimated)	2000	[illegible]	[illegible]
Trichoderma viride 5 g/pkt (100 pkts)	[illegible]	[illegible]	[illegible]
Fungal bioagents (5 g/pkt) [illegible]	[illegible]	[illegible]	[illegible]
Metarhizium anisopliae 2 pkts (100 gm/pkt, solid)	[illegible]	[illegible]	[illegible]
Total			[illegible]

15. SILVICULTURE ENTOMOLOGY LABORATORY

Concluded research project:

AICRP (FOR): 15: Development of a knowledge base on the silvicultural diseases and pests and their management (Plan: 2020-9th; 2021)

A.P. Roy (Associate Director), G. Halder (Scientist), Amit Kadali (Scientist), 2021, Consultancy Business Centre, Jorhat, 785 014, Assam, [illegible] (Joint Director)

Objectives:

- To develop silvicultural knowledge base on silvicultural diseases and pests;
- A web based silvicultural diseases and pest diagnostic system and extension for the silvicultural diseases and pest awareness to small holder will be developed;
- To develop a trained silvicultural personnel for the consultancy and awareness on the silvicultural diseases and pests and management of silvicultural diseases and pests.

Completed the Web page for the diseases and pest management. Collected publication from different publishers such as Wiley, Springer, Taylor and Francis and Elsevier related to diseases of silkworms and its management and silkworm pests and their management. The links of the papers collected were collected. **The PDFs of the papers from Indian Journal of Sericulture and Entomology were uploaded with the permission of the competent authority.** The summary of the concluded research projects on silkworm diseases and pest management conducted at CSRTI Mysuru, other CSB institutes (CSGRC, ARSSRS) and universities were collected and uploaded. The uploaded on the silkworm diseases and pests were prepared and uploaded. Web publication consisting of introduction and symptoms of the diseases.

Conclusion:

Developed a data base related to silkworm diseases and prevalence, silkworm pests and their mode of attack, morphology, management, and the works published on the topics.

PDF 31011 (B: Evaluation and implementation of improved methodologies developed in this field to ancillary survey for South India

Component Validation of the DIAGNET technology on Mallaway and Tower snakes (Apr. 2020-Mar 2021)

S. Mallaiyan and A. T. Mary Sangita (Chief)

400 live ophiomedy samples were tested on DIAGNET. Among 200 Mallaway ophiomedy samples, 94 (47.0%) Positive and 106 Mallaway ophiomedy samples, 87 (82.1%) Positive and 106 Mallaway samples confirmed from CMFRI, Positive were tested by both IP LAMP as well as microscopic method. 200 Naga ophiomedy samples were screened at CMFRI, Vizhinjam.

Table 31.1. Testing results of ophiomedy samples by IP LAMP assay and microscopical methods

Observation Location	Sample	No. of Positive samples			Positive samples in both methods
			IP LAMP assay	Microscopy	
DIAGNET, Mallaway	200	200	94 (47.0%)	-	-
DIAGNET, Mallaway	106	106	-	-	-
CMFRI, Vizhinjam	200	200			
DIAGNET, Mallaway	200	200			
CMFRI, Vizhinjam	400	400	94 (47.0%)	306 (76.5%)	94 (47.0%)
Total	1406	1406	94 (6.7%)	306 (21.8%)	94 (6.7%)

Conclusion

The technology DIAGNET assay can be used for testing the microparasitical infection in both ancillary and conservation areas. The validation of the technology has been done in Mallaway, Naga, Tower and Eel and the sensitivity of the assay is 94.0% in ancillary, 87.42% in Tower and 100% in Naga and Eel ophiomedy.

Ongoing Research Project

MT 31010 (B: Screening of drugs/inhibitors in which the PCR-dot ophiomedy in Bonfish over the controlling Bacteria Polymyxin Transcriptional (Dec. 2020-Dec. 2021)

S. Mallaiyan and P.T. Chellaperumal

Objectives

- To screen different commercial drugs and their analogues against BacDIT infection targeting PCR-dot ophiomedy.
- To study the impact of commercial drugs on differential expression of genes involved in PCR-dot pathway for resistance of fish.
- To identify the mutations in vivo as well as drug resistant samples. To evaluate the effect of PCR inhibitors on BacDIT infection during an effective drug for controlling the ophiomedy.

The bioassay was conducted using the drugs identified in the in silico work. Berberine, Curcumin, Indomethacin, PCR 194, CAS 120411, PCR inhibitors and Tyrosine drugs are the selected drugs for the study. The bioassays of the identified drugs were done on Mallaway. Escherichia coli was having any mutation on chromosome. BacDIT associated chromosome (23000 polymorphic markers) were treated with different concentrations of Escherichia (2.5 mg, 5 mg, 7.5 mg and 10 mg) and both healthy and BacDIT associated chromosome from both as control. Genomic DNA was isolated from the work on BacDIT associated, drug treated and drug treated BacDIT associated chromosome. Identification of genes which are involving in the

cross multiplication process to create progenies. Each cross hybrid progeny exhibited a good level of resistance to FOC+ (Moniliophthora roreri) disease.

Title: 2020-21: 1.1: Evaluation and popularization of improved technologies developed in the field of medicinal plants for South India

Component 1: Evaluation of newly developed multi-trait disease tolerant hybrids hybrid [ABBB: (Mal. [MD] Mar. [MD])

L. Lavish, L. Kumar, K. N. Radhakrishnan, B. K. Bommireddy, & P. Mary Angela (Guru)

Objective:

- To evaluate the newly developed multi-trait disease tolerant [ACTT, ATT, & CTT] hybrid [CCCC] at farmer's level

CCCC1 developed through marker-assisted selection showed <72% survival compared to 92.1 ± 0.2 under inoculated conditions. The crosses of ABBB hybrid CBR02 and BAR07 were inoculated and tested on the marker associated resistant genes viz. Mal1 and Mal2. These crosses showed resistance reaction to the Pseudoidium pseudo [BMA] & [MAR] both in leaf and fruit stage. PC were conducted and selected using ISR, markers and CCCC1 + CCC7 progenies PC were consolidated and diversionally selected. The field evaluation of CCCC1 was performed for resting CCC-AR in different location and seasons. The progenies of CCCC1 was 0.4% and PC1 ± PC2 was 0.1%. Other parameters such as season, yield, pepper weight, seed weight, shell percentage, reliability, flavour, length, seed, oil %, flavour, and moisture had no significant differences in CCCC1 and PC1 ± PC2. CCCC1 had significantly better resistance compared to PC1 ± PC2 in all the seasons. The CCCC1 is approved as release variety by Central Varieties and Seeds Committee (CVSC) for the benefit of cocoa farmers.

MC 01/21 (I). Development of Spectroscopic Tools for Insecticide residues Measurement in Different Biological Matrices (Jan.2021-Dec. 2021)

I. Jacob, & Shobha Rekha

Objectives

- To develop and evaluation of a rapid, non-destructive method for the detection of insecticide residues in different biological matrices
- To develop a chemometric model for the quantitative analysis of insecticide residues in different biological matrices

A rapid visual screening assay was developed for the detection of insecticide contamination in agricultural fruits was standardized. The visual screening is based on blue colour appearance during the hydrolysis of indoxyl acetate catalyzed by acetylcholinesterase and retention reduction when acetylcholinesterase is inhibited by pesticides. Different papaya strains (Thailand, Blue papaya 1, Hybrid2, Hybrid3, multipoint) were tested at which Thailand, Blue papaya 1 was found to be more reliable and economically affordable. The optimal analysis was developed as mentioned and diluted in 20 mM Tris buffer solution (pH 7.4), which is a relatively selective and different concentrations of pesticides were dissolved in Tris buffer. The optimal colour development time was found to be 30 minutes which during acetylcholinesterase and indoxyl acetate reactions was maximized.

BP/07/20 (I). Responsiveness of silk filaments from silk waste material (Mar.2021-Feb. 2022) (in collaboration with CSTRI, Bangalore)

K. Ramadevi, G.N.L. Sankar, L. Lavish, & K. N. Ravindranath

Objectives:

- To [illegible] silk waste [illegible] and regeneration of silk
- Characterization of the silk filament
- To [illegible] of the [illegible] from regenerated silk

[illegible] MT of silk was produced in the year 2020-21 from which around 10 % ([illegible] MT) of silk wastes was generated. Silk waste is basically used for spun silk production only. In view of this an attempt was made to regenerate silk filaments from the silk waste materials which could be of relevance in biomedical and biomaterial applications. [illegible] different [illegible] were produced. These cocoon shells were degummed with 0.5% Sodium carbonate, 0.5% Sodium Carbonate, 0.5% Sodium Bicarbonate, [illegible] individually and in combination of 0.5% Sodium Bicarbonate with 0.5% SDS. [illegible] of 0.5% [illegible] Sodium bicarbonate and SDS was found to be more effective in degumming the cocoons with 75% fibre recovery. Different dissolving chemicals namely Lithium bromide (LiBr), Calcium nitrate [illegible], Calcium nitrate [illegible], Calcium chloride [illegible], Magnesium chloride [illegible], Zinc Chloride [illegible], Urea [illegible], Formic acid, mixture of [illegible] with Calcium chloride [illegible] were used for the dissolution of silk filaments. Among these chemicals [illegible] Calcium nitrate was found to be effective in complete dissolution of [illegible] at 60°C. [illegible] was dialyzed against water for 72 hrs and regenerated the dissolved fibroin using [illegible] Ethanol, Methanol and mixture of Ethanol and Methanol [illegible].

CONTINUOUS / OTHER ACTIVITIES

[illegible] Disease Monitoring in South Indian States

Objectives

- To [illegible] the prevalence of [illegible] diseases in [illegible] from [illegible] Farms and Commercial crop [illegible] Clusters in the South Indian States
- To suggest remedial measures on the spot to the farms/farmers to manage the [illegible] diseases and prevent disease outbreak

Results

In the [illegible] of Karnataka the average [illegible] incidence was [illegible], [illegible] incidence was [illegible] and [illegible] incidence was [illegible]. In Madhya Pradesh from [illegible] [illegible] was reported and from Aurangabad, Maharashtra [illegible] was reported. In Tamil Nadu [illegible] collected from [illegible] and [illegible] [illegible] and [illegible] [illegible] and [illegible] respectively.

Maintenance of the [illegible] Pathogens

Maintained the [illegible], [illegible] and [illegible] [illegible] pathogenic bacteria viz., *Staphylococcus aureus*, [illegible], *Bacillus* [illegible] and *Serratia marcescens* and fungal pathogens [illegible] and different [illegible] strains. Sub-culturing of all bacterial and fungal pathogens and [illegible] of the [illegible] pathogens and [illegible] were done periodically. Virulence of all the pathogens tested periodically as per the standard procedure.

Field problems resolved

Resolved [illegible] field problems related to [illegible] diseases and gave guidance to the farmers for proper disease management. Follow up action also done by contacting the farmers.

Implementation of recommendations:

Robotic monitoring

- The committee considered Polymer monitoring at Bandaram and recommended breeding laboratories. Dr. [illegible] Mahanta, Dr. [illegible] Nigam and Dr. [illegible] Sandeep (DoS).

Quality analysis

Tamil Nadu quality analysis experts for different zones and local distribution are planned by the allocation pathology section.

Accreditation and certification

- Dr. [illegible] Mahanta is working as Joint Director of Entomology, Kanpur, UP.
- Dr. [illegible] Sandeep (Deputy) is working at the Local Academy of Agriculture, R.D. Delta, Bangalore and Tamil Nadu Agricultural University.

16. POST COCOON EVALUATION

Dr. [illegible] M. Rakhi Lal and Dr. [illegible] Chandrasekhar

As per the guidelines of Ministry of Textiles "National Handloom Week" was conducted to show different hand loom weaving machines viz. Silk Looms, Pharmaceutical and Chemical machines from 07.08.2023 to 13.08.2023.

Considerable awareness among all the weavers have received from different weavers and workers of this institute and more success was reading of 50 weavers from Agricultural Colleges of this institute.

17. SERICULTURE ENGINEERING DIVISION

Sericultural research Project:

NFSM-CSS: Development of artificial intelligence assessment and taxonomy framework for grading classification and separation of silkworm cocoons (Dec. 2022-Nov. 2025)

Investigators: Dr. [illegible], Dr. [illegible] Sandeep, Dr. [illegible] Nigam, Dr. [illegible] (ICAR College of Sericulture)

Objectives:

- To develop an appropriate machine grading classification system
- To develop an appropriate machine cocoon separation grading classification system

Work done:

- Developed a working prototype of the identified sorted machine for real classification of silkworm cocoons.
- The validation is also of the machine done on ICAR College of Sericulture.

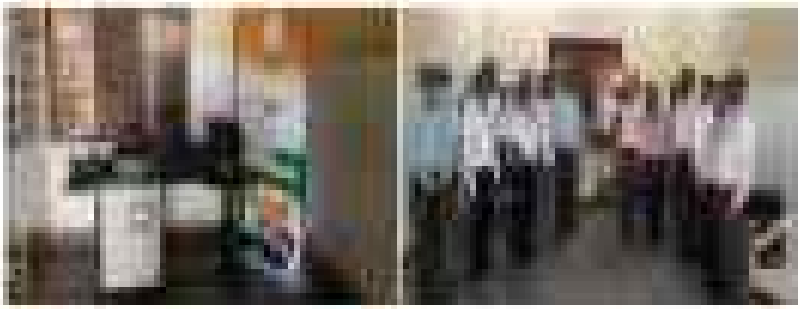

Fig: 17 : Demonstration of the user friendly graphical interface developed in CSIC Mysuru on 28.02.2022

Other works:

Addressed issues pertaining to instructions and developed equipments like:

- Optimizing Temperature & Humidity inside the Brooding Room
- Developed hand operated Reeling equipments
- Developed a prototype for thermocoling, handling & transporting of the reeling house
- Hand and handy feed cutting machine for chawki rearing
- Commercial trays for rearing machines
- An easy mechanism consisting of a motor for mounting tool
- Antiparasitic rearing racks

Pilot Studies:

Design & Development of Fabric based mountages suitable for silk worm rearing (Nov 2021 to Jan 2022) [CSIC/CSRTI/2020/Pilot studies/10-11 dated: 16.11.21]

Development & Validation of Fabric based mountages for silk worm rearing

Objectives

- To develop fabric based mountages for production of cocoons with minimal defective ratio.
- To analyze the impact of such fabric based mountages on different rearing seasons, quality and ease of maintenance during and post harvesting activities.

Expected outcomes:

- Eco friendly mountages developed and made available.
- The developed mountages are easy to keep by spreading and keeping over the rearing bed and the cocoons are easily reeled from the pockets and even sifting.
- Pilot material can offer more comfort and breathability to the worms. The penetrating effect of the worm and web will give a good hold to worms during spinning.
- The more worms at the highly evolved stage and web are going to ensure good cocoon crop with fewer efforts to flat trays and by hands.

- Improving a room size for controlling the mosquito after spraying, removing and cleaning from all flies remains still make the mosquito in the house.

Fig 4.1.2: Entomologist collecting mosquitoes in the study area

Other activities

1. Developed awareness creation (Posters, radio Trotro Tracts, drama, radio talk shows and Theatre drama). Each district had to have distinctive activities, which was documented

2. Distributed over two and hundred (200) insecticide treated mosquito nets and signed obligations.

18. CAPACITY BUILDING AND TRAINING

[illegible]

A total of [illegible] personnel were trained under various training programmes including CBT and BCC for the year 2021-Q2 against the target of 2022 (No of beneficiaries 200). The trainees were from various backgrounds such as [illegible] from MOH, [illegible] attending [illegible] from different districts, young entrepreneurs from [illegible] attending [illegible] as well as [illegible] counselors, [illegible] employment centers as [illegible] present and students pursuing [illegible] (long term, short term) and [illegible] as [illegible] degree.

Table 3.1.1: Vocational Capacity Building and Training (VCT) programmes conducted at CSTRI Mysuru and its centres

Sl.	Particulars	Target		Achievement	
		Programmes (Nos.)	Beneficiaries (Nos.)	Programmes (Nos.)	Beneficiaries (Nos.)
1	Vocational Training Centres*				
1.1	Extension Orientation Programme	1	40	1	24
1.2	Farmers Field Programme	14	1400	14	1421
1.3	MSME workers (TTTP)	1	30	1	31
1.4	Agriculture Extension Services (AESA)	14	840	14	840
1.5	Other Food Based Training	-	-	1	14
2	Rural SSC's	-	240	19	521
2.1	Training on food use	-	-	14	81
	Total	31	2050	124	2932

* Training programmes conducted for agencies other than SSC

During the year, the CSTRI, Mysuru had trained 2932 officers/officials under VCT in its institute and TSS centres, entrepreneurs, students, artisans, farmers and women. A training of SSC persons through webinars on 23 handloom and Eco Based Training (EBT) programmes. Similarly 14 private entrepreneurs were trained for the establishment of Commercial Hands Washing Centre (CHC) and 40 CHC entrepreneurs under Refresher Training programme for the renewal of CHC license (Table 3.1.2). The trained were ~ 2932 by CSTRI of the CSTRI, Mysuru trained 1421 farmers under Farmers Training Programme (FTP). The four Extension Resource Centres (ERC) operating in the states of Tamil Nadu and Karnataka trained 300 carpenters farmers on different post-harvest technologies.

Table 3.1.2: Details of training programmes conducted at CSTRI Centres

Sl.	Name of centre	Area of training	No. of days	Total batches	Date		Total no. of trainees
					From	To	
1	CSTRI	Fishermen Training + SSC Orientation	2	4	03.09.2021	17.09.2021	110
2		ITEP	2		03.09.2021	17.09.2021	
3		TTTP	7		08.11.2021	17.11.2021	
4		SSC-CSC	10		27.09.2021	08.10.2021	
5		Fish extension	2		03.09.2021	05.09.2021	
6		Orientation training	20		07.09.2021	08.10.2021	
7	CMFRI	Awareness programme for Fishermen	10	12	08.09.2021	10.11.2021	180
8			2		03.09.2021	17.11.2021	
9			10		24.09.2021	04.10.2021	
10			7		27.09.2021	30.11.2021	
11			2		2.09.2021	08.10.2021	
12			10		08.09.2021	19.11.2021	
13			7		08.09.2021	17.11.2021	
14			10		08.09.2021	08.10.2021	
15			2		08.09.2021	10.09.2021	
16			7		08.09.2021	16.11.2021	
17			2		03.09.2021	08.09.2021	
18			2		08.09.2021	09.09.2021	

34			9		[illegible]	[illegible]		
35			10		[illegible]	[illegible]		
36			11		[illegible]	[illegible]		
37	[illegible]	[illegible]	12	1	[illegible]	[illegible]		4
38					[illegible]	[illegible]		
39	[illegible]	[illegible]	13	1	[illegible]	[illegible]		8
40					[illegible]	[illegible]		
41	Online	Performance evaluation implementation			August 2021	July 2022		333
42			1		[illegible]	[illegible]		
43			2		[illegible]	[illegible]		
44			3		[illegible]	[illegible]		
45			4		[illegible]	[illegible]		
46			5		[illegible]	[illegible]		
47			6		[illegible]	[illegible]		
48	[illegible]	Embroidery	7	11	[illegible]	[illegible]		11
49			8		[illegible]	[illegible]		
50			9		[illegible]	[illegible]		
51			10		[illegible]	[illegible]		
52			11		[illegible]	[illegible]		
53			12		[illegible]	[illegible]		
54			13		[illegible]	[illegible]		
55			14		[illegible]	[illegible]		
56			15		[illegible]	[illegible]		
57			16		[illegible]	[illegible]		
58			17		[illegible]	[illegible]		
59			18		[illegible]	[illegible]		
60			19		[illegible]	[illegible]		
61	[illegible]	[illegible]	20	3	[illegible]	[illegible]		11
62			21		[illegible]	[illegible]		
			Total					373

Table 1.1.1: Overview Analysis of Farmers Skill Training (FST) and ELC Training

#	Name of work	Annual Target				Achievement			
		FST		ELC		FST		ELC	
		Physical (man)	Result (man)	Physical (man)	Result (man)	Physical (man)	Result (man)	Physical (man)	Result (man)
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
4	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
5	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
6	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
7	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
8	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
9	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
10	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
11	[illegible]	[illegible]	[illegible]	–	–	[illegible]	[illegible]	–	–
	Grand Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table (3.1): Under-one sample of CRC and CRC Trainings

#	Name	CRC (Days)	Non-CRC (Days)
1	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]
7	[illegible]	–	[illegible]
8	[illegible]	–	[illegible]
9	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]

Trainers Training programme on convergence in Horticulture Extension for ATMA Scientists and Subject Matter Specialists

As per the MoU entered between BAIF with CDB, the CDB, Mysuru had organized five days training on 'Convergence in Horticulture Extension Training with KAMCATin'. The extension and subject matter specialists (14 nos) selected working from Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Maharashtra. The training was focused mainly on Soil Management and Nutrient Survey, Nursery Management, Plantation, Orchardism and Organic Nutrient Sharing tools, shared and sole owners, Wadiyani and cBenefits, Farmers and their management, Integrated Farming, Organic Orchardism, Water Management and Farm-processing, Opportunities in Horticulture.

Refresher Training on Technological Advancement for CDB Extension Field Functionaries

To enrich and empower the knowledge of CDB extension and field functionaries, the institute conducted training on "Refresher training on Technological advancement in Horticulture and Extension Approaches" for three days from 24th to 26th March 2022 a total of 24 Field Assistant/Technical Assistants/Senior Technical Assistants attended the training and enriched their knowledge in new methodologies on Nutrition Sharing and Extension Management.

Hands on training on Applications of Statistical Tools for CBEES Extension

Three days "Hands-on-Training on applications of Statistical Tools in Horticulture Extension" was organized on 7-9th March 2022 to 21 executives working in different Horticulture Technology Centres (Mini Kendras) located in Karnataka. The participants trained on both conventional statistical tools and advanced statistical techniques and programmes viz., big data analytics, machine learning, python, R programming, etc.

Skill Upgradation Refresher

In addition to the regular training programmes the Institute had also facilitated 04 scientists from different agricultural colleges to do their projects as a part of their Masters Degree under the guidance of CRDT/Professional Scientists at different disciplines.

Table 1.0: List of Dissertations submitted during 2019/20

#	Name of the student	Title	University/Institute where the work is submitted	Name of the guide/ co-guide
1.	[illegible]	Molecular characterization of mugging population genotypes from endemic areas of resistant and susceptible cassava	Pwani Jo's College for Women, Mombasa	[illegible]
2.	E. [illegible]	Isolation, identification and [illegible] of bacterial isolates from soil and [illegible]	Maseno's School College for Women, Kisumu	
3.	L. [illegible]	Characterization of [illegible] against [illegible]	[illegible] University of Higher Education & Research, Kisumu	
4.	B. [illegible]	[illegible]		
5.	B. [illegible]	A [illegible] study on [illegible]		
6.	B. [illegible]	[illegible]	National College, [illegible]	[illegible]
7.	I. [illegible]	[illegible]	[illegible]	
8.	[illegible]	[illegible]	[illegible] College, Kisumu	
9.	[illegible]			
10.	[illegible]			
11.	[illegible]			
12.	[illegible]	[illegible]		
13.	[illegible]	[illegible]		
14.	[illegible]	[illegible]		
15.	[illegible]	[illegible]	[illegible] School College for Women, Maseno	[illegible]
16.	[illegible]	[illegible]		
17.	[illegible]	[illegible]		
18.	[illegible]	[illegible]		

11	K. A. Yeshaka	Molecular characterization of wilt gene in eGlycine, Endosperm by microsatellite markers.		
12	K. Rakesh	Identification and Biochemical characterization of Bacillus species causing bacterial wilt in chickpea (Cicer arietinum L.)		
13	Kidanu ya	Identification and Biochemical characterization of Rhizobia (Glycine species) isolated from soils of selected districts of Jimma zone		
14	K. Sowmya	Molecular characterization of eGlycine max(Color pathogenic microorganisms	Secretary of Women Undergraduate Degree	
15	K. L. Ramesh	Changes in the activity of digestive enzymes in relation to feed refill intervals in the adult Tenebrio molitor L. (Coleoptera: Tenebrionidae)	Mahatma college, Mysuru	
16	Lokesh			
17	M. B. Nandeesh	Extraction and characterization of Citrus pectin and its emulsifier properties from the		
18	M. C. Dhanikar	environment of eGlycine, Bamboo mart		
19	M. G. Bhanuprakash	Studies on the effect of Glycine pesticides		
20	M. K. Pandiyan	Identification and Comparative analysis of the antimicrobial secretion of eGlycine, Bamboo mart		
21	M. Chandrakala	Extraction and characterization of pectin from pericarp of jackfruit	21. UGC Women	Bhuvaneswari B
22	M. N. Pooja	Studies on the effect of microbial fortification on the digestive enzymes and carbohydrates of eGlycine, Bamboo mart		
23	M. Ranjitha	Comparative analysis of few secondary metabolites in eGlycine, Bamboo mart's digestive enzymes with respect to feeding (T1 and T2 medium) Glycine		
24	M. R. Premkumar	Comparative study of few fundamental and commercial traits of eGlycine, Bamboo mart reared with specialties		
25	M. Yashaswini	Anti-Oxidant activity of Amaranthus and Moringa Plant Constituents on the Digestive Enzymes of eGlycine, Bamboo mart		
26	M. C. Lakshmi	Evaluation and Characterization of Cellulase Producing Probiotic Bacteria in Glycine, Bamboo mart	Mahatma Gandhi College, Mysuru	
27	M. Jyothi	Microbial fermentation of eGlycine, Bamboo mart spent pupae	Mahatma Gandhi Women's College, Mysuru	L. Thirumalesh
28	M. P. Chandrashekhar	Environmental characterization of Cordyceps militaris	Mahatma Gandhi Women's College, Mysuru	

37	H. Author/Abc	Enrichment production from multiple strains and molecular screening	Laboratory Sciences College, Division	
38	A. B. Contributor	Novel production characterization of bacteria isolated from rhizosphere. Biology and applied	Laboratory Sciences College, Division	
39	P. Biotechnics	Production of an extracellular hydrolase using Rhizobium. Biology and applied scientific	Laboratory Sciences College, Division	
40	D. F. Biology	Physico-biochemical evaluation of the multiform proteinase like cysteine, metalloidase and glycosidase activities	Dept. Biological Laboratory Education Centre, Division	Department T.
41	Laboratory Analyst	Comparative studies of the multiform proteinase like enzyme activity, properties and physiological parameters	Dept. Biological Laboratory Education Centre, Division	
42	Student Researcher	Antagonistic activity of rhizobium and fungal from healthy multiform plant	GS College of Arts, Commerce and Science, Division	Scientific L.
43	S. C. Experimenter	Production of Biological secondary from the multiform enzymes of Chemical Laboratory	GS College of Arts, Commerce and General, Division	
44	R. Professional	Isolation and Characterization of Multiform multiphylum bacteria and fungi	Laboratory Sciences College, Division	
45	P. Test Faculty	Isolation and Identification of polyethylene from multiform with antagonistic activity	Laboratory Sciences College, Division	
46	M. S. Environmentalist	Isolation and Identification of multiphylum rhizosphere and antagonistic study against similar diseases	Dept. Biological General, Laboratory PC Center, Division,	Research L.
47	J. Practitioner Technician	Isolation and identification of multiphylum rhizosphere and antagonistic activity	Dept. Biological General, Laboratory PC Center, Division,	
48	Student Scientific	Biochemical studies in selected chemical and isolated multiform proteinase	Laboratory Sciences College, For Women, Division	Technician Center
49	S. P. Scientist	Biochemical studies in selected chemical and original multiform proteinase	Laboratory Sciences College, For Women, Division	

10	L.L.Gowda	Isolation of cyanobacteria producing bioactive compounds and characterization of the isolates	Maharani's Science College for Women, Mysuru	Bio-science
12	V.H. Kadkol	Isolation of marine actinobacteria from sponges and their antibiotic and biocatalytic potential	Maharani's Science College for Women, Mysuru	
13	P. Sarita	Assessment of the genotoxic potential of endosulfan, cypermethrin and malathion using human lymphocytes as a model system	DM College of Arts & Science, Mysuru	
14	H.L. Lokanatha	Genetic variability of Drosophila populations in relation to pesticide and insecticide stress using molecular and cytogenetic markers	DM College of Arts & Science, Mysuru	
15	B. Lakshmi	Studies on removal of heavy metals from industrial using mushrooms and microbial consortium	Maharani's Science College for Women, Mysuru	
16	L.T. Kalyanshetti	Studies on removal of heavy metals from industries using mushrooms and microbial consortium	Maharani's Science College for Women, Mysuru	
17	H.S.Nandini	Studies on removal of heavy metals from industries using mushrooms and microbial consortium	Maharani's Science College for Women, Mysuru	
18	K.S. Shivraj	Studies on removal of heavy metals from industries using mushrooms and microbial consortium	Maharani's Science College for Women, Mysuru	
19	K.V. Marulasiddappa	Soil conservation, microbial biomass carbon and related enzymatic activities in Arecanut palm plantations	DM College for Women, Mysuru	Biotechnology Paddhati
20	C. Srinivasa	Soil conservation, microbial biomass carbon and related enzymatic activities in Arecanut palm plantations	DM College for Women, Mysuru	
21	Ajeet Singh	Theory on the fundamental properties of multiferroic bulk ($Y_1-xR_xMnO_3$) under external multivariable operations	PES IISTC Centre, Mysuru	
22	S.Arunkumar	Theory on the fundamental properties of multiferroic bulk (ABMO & RMnO) under external multivariable operations	PES IISTC Centre, Mysuru	
23	K.N. Thejaswini	Phytotoxicity of carbon nanotubes of different aspect ratios on plant species	DM Science & Technology University, Mysuru	
24	T. Shivakumara	Phytotoxicity of carbon nanotubes of different aspect ratios on plant species		
25	T. Sreenivas	Evaluation of genotoxicity of carbon nanotubes of different aspect ratios on plant species		
26	N. Raghavendra	Evaluation of genotoxicity of carbon nanotubes of different aspect ratios on plant species		
27	L.L. Kapoor Kumar	Evaluation of genotoxicity of carbon nanotubes of different aspect ratios on plant species		

47	[illegible]	Study on Allogamy and Resistance Breeding in the Varieties of Jasmine Species	Dept. Botany, Govt. Arts College, Salem	Submitted
48	[illegible]	Comparative study on induced resistance to two fungicides of Jasmine species	Dept. Botany, Govt. Arts College, Salem	Submitted
49	[illegible]	Synthesis and phenotypic analysis of silver nanoparticles from different plant extracts and their antifungal activity	[illegible]	
50	[illegible]	Isolation and characterization of antimicrobial compounds from	[illegible]	
51	[illegible]	Isolation and characterization of proteases from Lactobacillus species and its evaluation for its Chemotherapeutic activity	[illegible]	
52	[illegible]	Chemical and biological analysis of volatile oil of [illegible] and its antifungal activity	[illegible]	[illegible]
53	[illegible]	Phytochemical analysis of [illegible]	[illegible]	
54	[illegible]	Synthesis and characterization of silver nanoparticles from different [illegible] and its antimicrobial activity	[illegible]	
55	[illegible]	[illegible]	[illegible]	
56	[illegible]	[illegible]	[illegible]	
57	[illegible]	[illegible]	[illegible]	

Endowment Fund Research Grant

During the year 21-22, 4 Research Projects were sanctioned to 4 Research Scholars and the total amount sanctioned was Rs. 4,70,000/- as the Research Grant. A total amount of Rs. 3,40,000/- was released for the Research Scholars.

Table 12.6: Research Grants of CAS

Month	Rs. (Rs.)	No. of Scholars	Amount released (Rs.)
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[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]

Feedback evaluation:

Feedback evaluation was conducted for the Training programmes at the end through a questionnaire. The consolidated feedback of the users is given below:

Table 6.7: Feedback analysis 2021-22

Courses	Training Objectives Index	Training Effectiveness Index	Training Facilities Index	Course Coverage Index	Training Study Index	Trainees
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The overall training Management Index for the training programs (TMI) ranged from 77.6% to 83.56% against 80% required indicating 12.4% to 26.44% above the QC standard. The Institute appreciated the knowledge level of faculty, study tour, arrangements & correspondence and others of faculty and staff of Training Division.

Table 6.8: Revenue generated during the year 2021-22

Particulars	Amount (Rs.)
Sale of [illegible]	[illegible]
Income from [illegible]	[illegible]
[illegible]	[illegible]
Sale of [illegible]	[illegible]
[illegible]	[illegible]
Total	[illegible]

IV. AGRICULTURAL EXTENSION, ECONOMICS AND MANAGEMENT

[illegible] Sriramappa, B. Shanthakumar, Ravindra M. Hanjagi and Amit Jain

Ongoing Research Projects

EXTENT: Assessment of Resilience Interventions in Semi-Arid India (Dec. 2020-Dec. 2022)

Amit Jain (Dec 2020-2022), Sriramappa, B. Shanthakumar and M. Ravindra Hanjagi

Objectives:

- Systematic evaluation of experiences from all resilience interventions and measure contributions to different resilience capacities and role of combination of capacities
- Development and validation of a framework and theoretically based indicators for resilience interventions
- To study the economics and efficiency of interventions

Data collected from 1500 households and area interventions clusters from Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu.

Table-II.1: Progress achieved

Item	Target	Achievement		Total
		Tamilnadu	Non Tamilnadu	
Karnataka	140	140	140	280
Tamilnadu	140	7	7	14
Andhrapradesh	420	90	90	180
Telangana	140	23	23	46
Madhya Pradesh	42	42	42	84
Maharashtra	140	47	47	94
Total	1162	349	349	698

Table-II.2: Progress Achieved in Districts

State	Districts	Achievement	
		Tamilnadu	Non tamilnadu
Karnataka	Chikkamagaluru, Kodagu, Hassan, Dakshina Kannada, Udupi, Uttara Kannada, Shivamogga	140	140
Andhra Pradesh	Srikakulam, Visakhapatnam, Vizianagaram, Alluri Sitharama Raju	42	42
Telangana	Adilabad	42	42
Madhya Pradesh	Chhindwara	28	28
Maharashtra	Nandurbar, Dhule, Nashik	42	42
Total		294	294

Ukadey Promotion Programme (UPP)

Central Silk Board in collaboration with the Departments of Sericulture (DoS) implemented the Ukadey Promotion Programme under (SCP) XII plan (2017-2021) in northern states which was extended and continued in 2021-22. The UPP clusters in the northern zone were monitored by CSB's Officers. The northern zone includes 20 Agricultural Districts - 11 Andhra Pradesh, 5 Telangana, 1 Tamil Nadu, 1 and 1 Maharashtra. Out of the districts under coverage one

The Scheme (2021-22) aims to the work more Coordinators, the heads of DSKs and DCSOs are the Nodal Officers for effective implementation of UPP. Each Cluster is closely monitored by one Cluster Development Facilitators (CDFs), who nominated by Central Silk Board and State Departments of Sericulture. Targets of the districts for 2021-22 were fixed based on the farmers profile and potentialities. The name and designation of the CDFs are provided below:

Table-II.3: CDFs of Cluster Promotion Programme in the Implementing for 2021-22

Clusters	CDF	DoS
	ANDHRA PRADESH	
1. Anantapuru (BV)		
2. Kurnool	S. Gadhadar, Sri R, SDO Hindupur	P. Rao, AD, DoS, Kurnool
3. Kadapa		M. Reddy, Asst D, DoS, Kadapa
4. Chittoor	A. Venugopal, Sri R, SDO Kuppam	J. Rama Subramanyam, M, DoS, Chittoor
5. Chittoor (BV)		
6. Srikakulam	S. V. S. Aswini Kumar, Sri R, SDO Palasa	P. Ramya Devi, JD, DSO, Srikakulam
7. Vizianagaram		P. Jagan Rao, SI, DSO, Vizianagaram
8. Visakhapatnam		J. S. V. S. Prasada Rao, JD, Visakhapatnam

1. Hindupur [KA]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. Kolhapur [MH]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
4. Mahendergarh [HR]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
5. Palakkad [KL]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
6. Pathanamthitta [KL]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
7. Ramanagara [KA]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
4. [illegible]		4. [illegible] [illegible]
8. Sangareddy [TG]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
4. [illegible]		4. [illegible] [illegible]
9. Sirsi [KA]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
10. Sivaganga [TN]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
11. Tiruppur [TN]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
12. Vellore [TN]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]
13. Yadgir [KA]		
1. [illegible]	1. [illegible] [illegible]	1. [illegible] [illegible]
2. [illegible]		2. [illegible] [illegible]
3. [illegible]		3. [illegible] [illegible]

1. Commune I		Habitants (RGPH 2009) : 36	Superficie : 1
2. Commune II			
3. Commune III			
4. Commune IV			
5. Commune V			
6. Commune VI			
7. Commune VII			
8. Commune VIII			
9. Commune IX			
10. Commune X			
11. Commune XI			
12. Commune XII			
13. Commune XIII			
14. Commune XIV			
15. Commune XV			
16. Commune XVI			
17. Commune XVII			
18. Commune XVIII			
19. Commune XIX			
20. Commune XX			
21. Commune XXI			
22. Commune XXII			
23. Commune XXIII			
24. Commune XXIV			
25. Commune XXV			
26. Commune XXVI			
27. Commune XXVII			
28. Commune XXVIII			
29. Commune XXIX			
30. Commune XXX			
31. Commune XXXI			
32. Commune XXXII			
33. Commune XXXIII			
34. Commune XXXIV			
35. Commune XXXV			
36. Commune XXXVI			
37. Commune XXXVII			
38. Commune XXXVIII			
39. Commune XXXIX			
40. Commune XL			
41. Commune XLI			
42. Commune XLII			
43. Commune XLIII			
44. Commune XLIV			
45. Commune XLV			
46. Commune XLVI			
47. Commune XLVII			
48. Commune XLVIII			
49. Commune XLIX			
50. Commune L			
51. Commune LI			
52. Commune LII			
53. Commune LIII			
54. Commune LIV			
55. Commune LV			
56. Commune LVI			
57. Commune LVII			
58. Commune LVIII			
59. Commune LIX			
60. Commune LX			
61. Commune LXI			
62. Commune LXII			
63. Commune LXIII			
64. Commune LXIV			
65. Commune LXV			
66. Commune LXVI			
67. Commune LXVII			
68. Commune LXVIII			
69. Commune LXIX			
70. Commune LXX			
71. Commune LXXI			
72. Commune LXXII			
73. Commune LXXIII			
74. Commune LXXIV			
75. Commune LXXV			
76. Commune LXXVI			
77. Commune LXXVII			
78. Commune LXXVIII			
79. Commune LXXIX			
80. Commune LXXX			
81. Commune LXXXI			
82. Commune LXXXII			
83. Commune LXXXIII			
84. Commune LXXXIV			
85. Commune LXXXV			
86. Commune LXXXVI			
87. Commune LXXXVII			
88. Commune LXXXVIII			
89. Commune LXXXIX			
90. Commune XC			
91. Commune XCI			
92. Commune XCII			
93. Commune XCIII			
94. Commune XCIV			
95. Commune XCV			
96. Commune XCVI			
97. Commune XCVII			
98. Commune XCVIII			
99. Commune XCIX			
100. Commune C			

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

[illegible]

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

Performance of Quarters

[illegible]

[illegible]

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

Table 2.1: State-wise foodgrains kharif production for 2022-23

State	Kharif		
	Target (MT)	Achievement (MT)	Achievement (%)
1. Andhra Pradesh	1527.00	1350.34	88.43
2. Karnataka	1848.20	1761.69	95.32
3. Maharashtra	1220.50	1090.51	89.35
4. Tamil Nadu	1407.15	1424.23	101.21
5. Telangana	1102.18	1161.85	105.41
6. Uttar Pradesh	1250.00	1412.01	112.96
Total/Avg	9355.04	8810.63	94.18

Crop Performance

A total of 8810.63 lakh MT was distributed in the Kharif against the target of 9355.04 lakh MT as achievement of 94.18%. A total of 1724.56 MT fertilizer nutrients were distributed with an average nutrient yield of 77.26kg/100 lbs.

Table 10.1: State-wise fertilizer distribution: target vs achievement

State	Fertilizer (Lakh)	Fertilizer	Fertilizer (Lakh)	Achievement (%)
1. Andhra Pradesh	1527.00	1350.34	1350.34	88.43
2. Karnataka	1848.20	1761.69	1761.69	95.32
3. Maharashtra	1220.50	1090.51	1090.51	89.35
4. Tamil Nadu	1407.15	1424.23	1424.23	101.21
5. Telangana	1102.18	1161.85	1161.85	105.41
6. Uttar Pradesh	1250.00	1412.01	1412.01	112.96
Total/Avg	9355.04	8810.63	8810.63	94.18

Table 10.2: Average nutrient yield, Lakh MT (kg) in respective used Over Capture (OC) districts

#	State	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
1	AP	61.50	66.00	69.00	69.00	70.00	71.47	73.00	73.00	74.00
2	KA	60.75	62.00	63.00	65.74	67.00	67.00	69.00	69.00	71.00
3	ML	-	74.00	75.00	75.00	76.00	76.00	78.00	-	-
4	NA	-	62.00	63.00	64.00	65.00	66.00	68.00	-	-
5	MH	60.75	61.00	62.00	63.00	64.00	65.00	66.00	67.00	68.00
6	TN	71.00	74.00	75.00	77.00	78.00	80.00	82.00	83.00	85.00
7	TG	-	-	65.00	66.00	67.00	68.00	69.00	70.00	71.00
8	UP	-	-	-	-	-	-	-	65.00	66.00
Average		64.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00

Table 10.1: Performance of Yoga clusters in Andhra Pradesh for the year 2021-22

Yoga cluster	Min. target (lakhs)	Min. achievement (lakhs)	Min. achiev. (%)	Income per kg	Yield (100 kg/ha)	Rate/kg (Rs.)	Rice plantations No. of farmers	Area (acres)
1. Jamalpur	14.81	12.87	86.89	1,03,50,000	75.64	1,200	231	1,200.00
2. Dodgaon	11.20	10.08	90.00	72,00,000	80.00	1,000	189	1,000.00
3. Rampur	17.35	15.26	87.97	1,68,00,000	79.84	1,100	312	1,600.00
4. Kanigiri	12.73	10.83	85.08	1,40,00,000	78.11	1,050	198	1,400.00
5. Nallamalai	9.42	7.54	80.04	84,00,000	80.00	1,000	142	1,000.00

Table 10.2: Performance of Yoga clusters in Karnataka for the year 2021-22

Yoga cluster	Min. target (lakhs)	Min. achievement (lakhs)	Min. achiev. (%)	Income per kg	Yield (100 kg/ha)	Rate/kg (Rs.)	Rice plantations No. of farmers	Area (acres)
1. Cluster Kannada	12.50	10.63	85.04	1,06,25,000	75.89	1,400	210	1,250.00
2. Malnad	10.20	8.67	85.00	86,70,000	74.29	1,200	167	1,020.00
3. Chikkaballapura	15.00	12.75	85.00	1,27,50,000	75.00	1,000	255	1,500.00
4. Mysuru	18.75	16.31	87.00	1,63,10,000	76.05	1,300	321	1,875.00
5. Hassan	11.40	9.69	85.00	96,90,000	73.85	1,100	193	1,140.00
6. Kodagu	13.60	11.56	85.00	1,15,60,000	80.00	1,000	226	1,360.00
7. Mangaluru	16.80	14.28	85.00	1,42,80,000	78.95	1,200	280	1,680.00
8. Shivamogga	14.25	12.11	85.00	1,21,10,000	77.56	1,000	237	1,425.00
9. Udupi	12.00	10.20	85.00	1,02,00,000	80.00	1,000	200	1,200.00
10. Belagavi	17.50	14.88	85.03	1,48,80,000	77.08	1,200	292	1,750.00

Table 10.3: Performance of Yoga clusters in Maharashtra for the year 2021-22

Yoga cluster	Min. target (lakhs)	Min. achievement (lakhs)	Min. achiev. (%)	Income per kg	Yield (100 kg/ha)	Rate/kg (Rs.)	Rice plantations No. of farmers	Area (acres)
1. Konkan	13.50	11.48	85.04	1,14,80,000	76.53	1,500	230	1,350.00
2. Vidarbha	16.20	13.77	85.00	1,37,70,000	75.00	1,000	275	1,620.00
3. Marathwada	14.00	11.90	85.00	1,19,00,000	77.92	1,000	238	1,400.00

Table 2.2.1: Performance of Oil Palm clusters in Telangana for the year 2022-23

Oil Palm cluster	Oil palm acreage (Ha)	Oil palm farmers	Oil palm yield (MT)	Economic yield (kg/ha)	Yield (FFB kg/ha)	Productivity (MT/ha)	New plantation	
							No. of Farmers	Area (Ha)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bhadradri Kothagudem	6,000	5,400	47,000	7,833	19,000	4.5	1,200	1,500
Khammam	8,000	6,800	62,000	7,750	18,500	4.4	1,500	1,800
Total	14,000	12,200	109,000	7,786	18,750	4.45	2,700	3,300

Table 2.2.2: Performance of New cluster districts for the year 2022-23

Cluster	Oil palm acreage (in Ha)	Oil palm farmers	Oil palm yield (MT)	Economic yield (kg/ha)	Yield (FFB kg/ha)	Productivity (MT/ha)	New plantation	
							No. of farmers	Area (in Ha)
Mahabubnagar	0.75	240.00	19.00	19,000.00	25.00	2.50	0	0.00
Jogulamba Gadwal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wanaparthy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nagarkurnool	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nalgonda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Suryapet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yadadri Bhuvanagiri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jangaon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Siddipet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Medak	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sangareddy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vikarabad	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.75	240.00	19.00	19,000.00	25.00	2.50	0	0.00

Yadadri, Peddapalli, Kamareddy, Mahabubabad, Jagtial, Rajanna Sircilla, Kumuram Bheem Asifabad, Mulugu, Narayanpet, Jayashankar Bhupalpally, Mahabubnagar, Jogulamba Gadwal, Wanaparthy, Nagarkurnool, Nalgonda, Suryapet, Yadadri Bhuvanagiri, Jangaon, Siddipet, Medak, Sangareddy, Vikarabad

New Plantation in clusters

Most emphasis was given on horizontal expansion and 15,000 farmers were motivated to plant commercial varieties in an extent of 17,000 Acres in the irrigated and non-traditional districts.

Table 2.2.3: New plantation targets in Clusters and non-cluster areas for the year 2022-23

Name	New plantation	
	No. of farmers	Area (Ha)
Andhra Pradesh	4,000	4,000
Karnataka	3,000	2,000
Maharashtra	400	400
Tamil Nadu	1,000	1,000
Telangana	200	1,000
Non-clusters	400	1,000
Total	10,000	10,000

Non-Plantation activities

A total of 11,000 acreage covering 10,000 farmers were addressed under Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, Andhra Pradesh and other states were covered during the year through multi-locations.

Maintenance/Other activities

Extension Communication programmes (ECP):

During 2022-23, a total of 200 Extension Communication Programmes were conducted and sensitized 15,000 farmers. The main topics of ECPs covered are: Water and nutrient management, weed control, pest management, soil health and fertility, and integrated crop management. As part of ECPs, soil testing & its importance in nutrient solutions, IPM practices for nutrient, INM, integrated disease management practices

[illegible] & progress in extension strategy, popularization of new extension methods, demonstration of latest technologies, monitoring & reporting system, etc.

Table 11 (a): Farmers Participatory Programmes conducted

KVK	Number	Farmers participated
[illegible]	4	1151
[illegible]	47	1454
[illegible]	111	4771
[illegible]	141	4371
[illegible]	1	191
[illegible]	4	471
Total	111	14654

[illegible]

[illegible] conducted various farmers' workshops in coordination with Department of [illegible] covering [illegible] farmers were conducted during 2021-22.

Table 11 (c): Details of [illegible] during workshops

Name of the workshop	Venue	Date
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible] organization of technical workshops

A Technical Workshop was organized on 2nd October, 2021 on Water and Nutrient Management under the chairmanship of Dr. N. K. Krishna Kumar, DDG (Hort), Hyderabad. The scientists possessed of various [illegible] Organizations / Universities from [illegible] and representatives from [illegible] participated.

Social Mobilization and Programmes

An Awareness programme on Seed Act Regulations was organized by Regional Seed Control Research Centre, Salem in association with National Silkworm Seed Organization, Bangalore at Salem on [illegible] to enlighten the sericulture seed stakeholders viz., Registered Grainage Owners [RGOs], Registered Seed Growers [RSGs] and Registered Seed Merchants [RSMs] of Tamil Nadu on the importance of Seed Law Regulations. Totally 300 members including 27 RGOs, 11 RSGRs, 3 RSMs besides 20 CSB and [illegible] officers/officials participated in the programme.

Technical workshop for Registered Seed/Planting material growers

A Technical Workshop on New Technologies in Mulberry Germplasm for Registered Seed/Planting Material Growers was organized by RSC, Hyderabad in association with National Silkworm Seed Organization, Bangalore at Pangidipet on [illegible] wherein 65 farmers & RSRs, 12 CSB and [illegible] officials participated.

Publications of Agricultural Economics Scientists

A compilation depicting the publishing activities made "Agricultural Economics scientists" released [illegible] was released during Krishi Vigyan Kendra on [illegible] Major are: (1) [illegible] The book is the collection of [illegible] (2) [illegible] (3) [illegible] and (4) [illegible] is a resource book containing basic steps of cultivation, life and opportunities for making a better use of [illegible] the sustainable livelihood.

Visitors' Service

A total of [illegible] farmers visited government have visited the Institute during 2021-2022. Visitors include Farmers, Students, Extension workers, Research and Field based services were rendered to **farmers/farmers visiting the Institute. Agriculture farmers were mentioned on all the activities of** Horticulture, Products of natural Horticulture etc., Agriculture, Life sciences, Training, Horticulture, Biotechnology etc., were mentioned about the activities of Institute. They were also mentioned with various **Extension marketing opportunities to farmers/farmers. Various farmers were encouraged to take up farmers for** more livelihood for highlighting the importance of [illegible] in Horticulture production.

Category	No. of Persons
Farmers	[illegible]
Students	[illegible]
Others	[illegible]
Total	[illegible]

10. REGIONAL SERICULTURAL RESEARCH STATION (RSRS) - ANANTAPUR

In Charge officer	[illegible]
Scientists	[illegible]
Technical staff	[illegible]
Administrative & Supporting staff	[illegible]

Items	Total area (acres)	Realized acreage
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Collaborative Research Projects/Programmes

RSRS Anantapur and its mandal units are involved in the following collaborative projects with the **main institute.**

Project/Programme	Year
[illegible]	[illegible]
[illegible]	[illegible]

Livestock and allied activities

Cluster Demonstration Programmes (CDP)

Breeding and feeding technologies were demonstrated in 23 clusters in [illegible] (3451 [illegible] and crossbred dairy cows reared) with an achievement of 96.09% against the target of 3590.00 [illegible] and recorded the average yield of 1411 kg/365 days. The cow milk production achievement was 1302.34 MT against the target of 1357.93 MT with an additional income of Rs.[illegible].

Performance of new mulberry plantations at Chintoor

Item	Target	Achievement
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Extension communication programmes (ECM)

Technology Group discussions, Awareness Programmes, Field Days, Farmers Days and Exposure visits were conducted by ZRS, Anantapur and the extent wise performance of technologies developed by each institute and profiles is as

Table 23.1: Extension communication programmes conducted by ZRS, Anantapur and extent wise

Extent	Technology Demonstration		Awareness Programmes		Field Day		Farmers Scientist Week	
	No. of Prog (No)	No. of Farmers (No)	No. of Prog (No)	No. of Participants (No)	No. of Prog (No)	No. of Farmers (No)	No. of Prog (No)	No. of Farmers (No)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[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]	[illegible]

Farmers Scientists Interaction/ workshop

Farmers Scientists was conducted on Saturdays on 15.07.2023. 113 participants including farmers, RSKs staff, Lab officials of Horticulture Faculty, Lab Scientists from S. Anuma Kumari, Assistant Director of Horticulture, Govt. of AP, Dr. S. Ramakrishnan, Scientist-E, Dr. P.C. Sahadeva, Scientist-E, CSSRI, Regional and Smt. C. Subhashini, Joint Director of Horticulture, Anantapur participated in the workshop.

Table 23.2: Training Programmes under Capacity Building and Training (Farmers/ SHG Training) [FCT]

Item	No. of programmes	No. of Participants
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]

AICRP/2019-20: Evaluation of new bivoltine silkworm hybrid TT21 × TT56 in farmers level for authorization and commercial exploitation

KP Kiran Kumar

Table 20.8: DFL details of RSRS, [illegible]

Hybrid	DFLs	Yield/100 dfls	Rate (/kg)
TT21 × TT56	[illegible]	[illegible]	[illegible]

Radio / TV programme

RSRS, [illegible] participated in [illegible] radio programme for the benefit of sericulturists as part of technology dissemination.

Revenue generation

Unit	Amount (Rs.)
RSRS [illegible] CSB Complex	[illegible]

21. REGIONAL SERICULTURAL RESEARCH STATION (RSRS) CHAMARAJANAGARA

In-Charge officer	[illegible]
Scientists	[illegible]
Technical staff	[illegible]
Administrative / Supporting staff	[illegible]

Farm	Total area (acres)	Mulberry acreage
RSRS, Chamarajanagara	[illegible]	[illegible]

Transfer of Technology

Under the ToT programme [illegible]

Table 21.1: Rearing performance of new hybrids

Season	Race	DFLs	Cocoon yield/100 dfls (kg)	Yield By No.	Yield By wt (kg)	SCW (g)	SSW (g)	SR%
Apr '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]
	Total / Avg.	[illegible]	[illegible]					
Nov '20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Feb. 22	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total/Avg	[illegible]	[illegible]					
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total/Avg	[illegible]	[illegible]					

Table [illegible] Rearing performance of [illegible] and [illegible] rearing

Season	Race	Dfls	Yield (kg)	Yield /100 dfls (kg)	ERR		SCW (g)	SSW (g)	SR%
					By No	By 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]

Extension Communication Programmes:

[illegible] Programmes, [illegible] Farmers Field Day and [illegible] Awareness Programmes covering [illegible] farmers were conducted by [illegible].

Farmers Skill training programmes:

[illegible] farmers were trained under Farmers Skill Training Programme [illegible].

Farm rearing:

[illegible]

Revenue generation:

Particulars	Amount (Rs.)
[illegible]	[illegible]
Sale of Cocoons	[illegible]
Total	[illegible]

12. REGIONAL AGRICULTURAL RESEARCH STATION (RARS) – KOTA (RJ)

In-Charge officer	I.B. Kalyani, Scientist-C
Scientific	06
Technical staff	06
Administrative/Supporting staff	03

Name	Total area (acre)	Effective area
RARS, Kota (RJ)	84.00	2.00
RRC, Dholi-Piprai	7.00	1.40
RRC, Kukrola	4.00	1.00
RRC, Sangod	4.00	1.00

Collaborative Research Projects/Programmes

Project/Programme	Duration
NICRA: Evaluation of sorghum germplasm genotypes for grain and stalk quality under varied water deficit conditions (Jan. 2020 to Dec. 2021)	RARS, Kota
PME (2020-21) (AICRP on Forage Crops) - All India Coordinated Research Project on Forage Crops (Project Cycle: 2020-21 to 2024-25)	RARS, Kota RRC, Dholi-Piprai
ARI (2020-21) - Evaluation of selected germplasm lines/ varieties in high temperature and low humidity conditions under protected environment (Jan. 2021 to Dec. 2021)	RRC, Dholi-Piprai

On-Farm Trials (OFTs)

Table 12.1: Popularization of new hybrids

Crop	Hybrid	No. of Villages	No. of Farmers	Yield (Q/ha)	Increase (%) over check	Total seed (Q)
RRC, Dholi-Piprai	7711 vs 7704	07/21	126	68.00	-	126.00
RARS, Kota (RJ)	111 vs 1121	2021	11	76.00	9.00	14.00
	9711 vs 10	20/21	84	72.00	6.00	75.00
	Total/Avg	47/21	144	71.67	4.75	177.00

Variety Demonstration Programmes

Results of cultivar technologies were demonstrated in 14 crops clusters across Rajasthan, a total of 1,167 units were established in crops situations and harvested an average common yield of 72.20 kg / 100 sqm.

Extension communication programmes

A total of 11 technology demonstrations, 08 Field Days and 11 Awareness programmes were conducted in all clusters covering 2020 farmers. Of numerous startups were undertaken.

Capacity Building Farmers' Training Programmes (FTC)

Table 22.1: Capacity Building Farmers Training Programmes (FTC)

Centre	Beneficiaries
[illegible]	70
[illegible]	44
[illegible]	30
[illegible]	360*
Total	504

*in coordination with ATMA & Dist. Admn

Extension Training at KVKs

During the year 2021-22, 2,824 and the ensuing under-serviced, and trainings on rice, horticulture, [illegible] in [illegible] Kheri & [illegible] Sonbhadra). 258 farmers were explored in Kheri lands and under FDT 427 farmers were trained.

Revenue generation:

Table 22.2: Revenue generation earned at KVKs Sonbhadra

Name of the items	KVK Sonbhadra	KVK Chandauli	KVK Pratapgarh	KVK, Deoghat	Total
Sale of Machinery land	12442		17360		29,802
Sale of Crop/crop nursing	2270	-	—	-	2270
Sale of Livestock	6602	33014			39,616
Sale of Seeds revenue	850	-	-	-	850
Class-42 [illegible]	-	-	-	27864	27864
Others	—	-	3600	-	-
Total	22163	33014	21360	27864	104876

Others contributions

In the [illegible] of [illegible] different agencies of Farming society were mobilized.

23. REGIONAL SERICULTURAL RESEARCH STATION (RSRS), MAU/AGE

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

Name	Total area (acres)	Mulberry (acres)
[illegible]	-	-
[illegible]	[illegible]	[illegible]

Collaborative Projects

Project/Programme	Year
ICAR-AICRP (B): Identification, evaluation and isolation of potential entrepreneurs/ members in Integrated Farm Units on Farming Management in Kuttanad	2020-Onwards
ICAR-NAHEP (B): Evaluation of new hybrids/ germplasm lines of ICAR-CTCRI in different locations for their performance and release and notification	2020-Onwards
ICAR-CTCRI-KVK (AICRP Phase-VII): All India Coordinated Experimental Trial in Kuttanad (Kuttanad Phase-VI)	2017-Continued

Capacity building Programmes

Technical Officers participated in 7 training workshops conducted by ICAR-CTCRI, Sreekariyam

Extension Communication Programmes

Programmes	No. of Programmes	No. of Farmers	No. of Programmes	No. of Farmers
	ICAR-Budget		ICAR-Plan Fund	
Farmers Field Day	4	180	-	-
Awareness Programmes	3	142	4	194
Trade Fairs, Exhibitions	2	68	1	140
Farmers Interactions	1	120	-	-
Total	10	510	5	342

Climate Prevention Programmes

Monitored two major disease and one major pest in Thrissur and Kozhikode districts. Information regarding crop diseases in the farmers' field of 14.25 lakh ha were disseminated and monitored on a regular basis to avoid 17.8 kg/ha yield loss.

Revenue generation

Particulars	Amount (Rs.)		
	ICAR-Budget	ICAR-Plan Fund	Total (Rs.)
Machinery rent receipts	15000		15000
Sale of Farm Produce		4870000	4870000
Others	-	2600000	2600000
Total	15000	7470000	7485000

16. REGIONAL AGRICULTURAL RESEARCH STATION (RARS) - KAYAM

In Charge officer	1 (Senior Scale)
Scientists	2
Technical staff	5
Administrative & supporting staff	1

Items	Total area (ha)	Mulberry (ha)
ICRISAT-Patancheru	1400	5.40
RSRS, Hindupur	1.77	1.50
RSRS, Lam (Farm)	1.83	1.80
ICRISAT-Dokur (Irrigated)		
RSRS, Tirupathi		

On-going Research Projects

PN: XXXXX: TE: Effect of Potassium Fertilizing Bacteria Pseudomonas on growth and development of mulberry (Nov 2009-Dec 2012)

S. Sharma Rani and S. Ramesh

Objectives

- to study the influence of potassium solubilizing bacteria with graded levels of potassium on growth and biochemical of mulberry
- reduce the cost of chemical by avoiding the chemical fertilizer application
- Conserving the soil sustainability by applying eco-friendly biological agents

Potassium (K) solubilizing bacteria was isolated from the Soil having P+K and K-K mulberry rhizosphere soils. Completely randomized design with factorial concept was followed. Soil samples were collected before the application of PSB bacteria and microbial inoculum.

Table 11.1: Effect of Potassium solubilizing bacteria on plant growth parameters in V1 mulberry variety

Treatments	Plant height (cm)	Shoot weight (cm)	Leaf yield/ha (kg)	Internode (cm)	Total shoot weight/plant (kg)
T1	150.33	320.33	7361	1.693	3.16
T2	165.66	351.66	15334	1.316	3.51
T3	160.34	327.66	14,346	1.333	3.33
T4	154.67	317.33	13,443	1.293	3.74
T5	157.33	329.33	13,113	1.45	3.24
T6	162.34	333.66	9,337	1.423	3.38
T7	155.71	331.33	9,757	1.744	3.66
CD at 5%	1.11	1.73	347	0.027	0.118
SE(m)	0.54	0.87	75.26	0.018	0.058
SE(d)	0.76	1.23	106.43	0.025	0.083
CV	0.72	0.53	0.46	1.353	1.921

Table 11.1: Effect of Probiotic supplementation on growth parameters in GIFT broodstock

Treatment	Mean weight (gm)	Mean length (cm)	Condition factor	Survival (%)	Total eggs/gm of female
T1	118.27	13.1	7.81	1.11	1.38
T2	140.00	15.2	10.23	1.09	1.71
T3	130.00	14.2	10.20	1.10	1.52
T4	142.67	15.1	10.07	1.11	1.78
T5	131.33	13.6	9.71	1.11	1.42
T6	143.00	15.0	9.74	1.11	1.64
T7	132.00	13.8	9.68	1.11	1.47
CD (0.05)	4.04	1.0	1.3	0.03	0.08
SEM	1.37	0.3	0.4	0.01	0.03
CD@5	1.464	1.0	10.3	0.1	0.09
C.V	1.167	0.0	0.8	0.01	1.000

Collaborative Research Projects/Programmes

Project parameters	Name of the unit
ICAR-AICRP on Probiotics in Aquaculture Project Title: All India Coordinated Research Project on Probiotics in Aquaculture Project Duration: April 2018 – March 2023	ICAR-CIBA, Chennai

Significant Results

1. Validation of Clinical Feed Supplement Formulation

In-farm trials were conducted for shrimp feed supplement formulations (CIBT) evaluation in the commercial shrimp rearing farmers of Tamil Nadu during the rainy, winter and summer seasons with FCR/PER differences. The CIBT was evaluated for growth parameters such as larval growth (weight of 100 no), survival rate of stocking post-seed larvae and changes occurred during the crucial months. Later, various parameters were compared and the results are given in the Table 11.1.

Rainy season trial was held at January 2021 and subsequently 7 days in October and November 2021 with 100 Kilo for the control and 100 Kilo for the CIBT treatment. Significant difference was noted in stocking larvae to seed under mixed farmer to 20 (±1.00), 0.20 Kilo in control and 0.10(±0), ±0.10 in CIBT treatment respectively in shrimp rearing. Significant difference was noted in shell 10, 20 KGs in control, 25 KGs in CIBT treatment) also.

Winter season trial was held in shrimp SEC Ranipet with @ 100 Kilo of CIBT and control during January and February 2021. Significant difference was noted in stocking larvae to post seed larvae to 25 (±2.5), 1.25 Kilo in control and 1.1 (±0.58) ±0.05 in CIBT treatment respectively in shrimp rearing. Significant difference was noted in single shell weight and yield 2.20 Kilo (2.100 g; 20.1 kg) 2.0 Kilo in control 1.9 (1 g; 19.0 kg) 1.90 Kilo in CIBT treatment) in late age rearing.

Similarly the CIBT was assessed during the summer season (March and 2021) with 100 Kilo treated and control at hatchery (PL) larvae and 2000 Kilo of treated at farmers (PL). Significant difference was noted in stocking larvae to post seed larvae to 20 (±2.00), 2.0 Kilo in control and 0.05(±0.1), ±1.5 in CIBT treatment respectively in shrimp rearing. Also significant difference was noted in survival rate and yield /100 Kilo (Rs 1.8 Kg; 18.00 kg) 1.80 Kilo in control, 2.0 (±0.1), 21.600 kg) 2.16 Kilo in CIBT treatment) in late age rearing.

Table 2.1.1: Evaluation of CRP in commercial CB-duroc boars.

Parameter	Growth performance			Carcass and meat quality parameters						
	Body weight at 180 days (kg)	Daily gain (g)	Feed conversion ratio	Weight at 210 days (kg)	ECM (g)	EMA (cm²)	Lean (%)	Fat (%)	FCM/ FCF (Ratio)	Backfat (mm)
Overall	97.46 ±0.2**	0.42±0.0 0.1	3.47± ±0.07	107.1 ±1.15	2.54 ±0.07	37.54 ±0.21	52.35 ±0.33	12.36 ±0.21	4.15 ±0.03	17.73 ±0.13
CRP crossbred	97.25 ±0.28 3.48%	0.39 ±0.02 (5.00%)	3.56 ±0.05 (2.06%)	106.32 ±0.72 2.75%	2.57 ±0.06 2.73%	36.92 ±0.23 2.73%	52.126 ±0.45 0.13%	13.123 ±0.35 1.08%	3.974 ±1.73 (-3.93)*	18.125 ±1.13 2.26%
Control	3.307 ±0.08 n/a	3.111 ±0.03 *	3.023 ±0.07 *	40.364 ±0.45 n/a	3.207 ±0.08 n/a	3.307 ±0.21 n/a	35.499 ±0.29 n/a	13.342 ±0.23 n/a	35.456 ±0.31 —	3.6 ±0.03 n/a
CRP crossbred	3.275 ±0.09 n/a	3.111 ±0.03* *	3.023 ±0.07 *	39.457 ±0.33 n/a	3.258 ±0.09 n/a	3.326 ±0.21 *	35.893 ±0.33 n/a	13.778 ±0.23 n/a	35.456 ±0.31 —	3.62 ±0.24 *
Control	3.307 (3.00%)	3.206 ±0.03	3.316 ±0.07 *	40.752 ±0.03	3.306 ±0.06	3.307 ±0.24	35.401 ±0.31	13.342 ±0.03	34.35 ±0.31	3.57 ±0.1 *
CRP crossbred	3.308 ±0.08	3.306 ±0.03*	3.319 ±0.03 *	40.333 ±0.03	3.312 ±0.06	3.318 ±0.21	35.664 ±0.33	13.235 ±0.28	33.389 ±0.31	3.68 ±0.03 *

Each value is the mean ±SE of the regression observations; *Significant at 0.05 level; (P value <0.05); NS= Non Significant

Evaluation of Halothane and Rn genes in CB-Duroc

Halothane (Hal) gene screening

The survey was conducted under the continuous programme, 'Molecular Genetic Monitoring of Stress and Commercial Gene Flowing of Exotic Indian Swine Genome' covering 4 key farms. 50 unrelated breeders' screening for each CRP student from scheduled and scheduled in the institute and ICAR.

Polymerase Chain Reaction Programme (PCR):

Table 2.1.2: Polymerase Chain Reaction Programme

Location	Farrowing days	Conventional programme	Technological domain	Research station	Technical publications
ICAR Farms	1 (0.4%)	3 (1.1%)	3 (1.4%)	0	1 (0.5%)
ICAR Kanakapura	—	4 (1.5%)	4 (1.9%)	1	
ICAR Sonnenahalli	4 (2.4%)	11 (7.3%)	4 (1.9%)	1	
KVK Mandagere	—	4 (1.5%)	4 (1.9%)	1	
ADC Kolar		4 (1.5%)	4 (1.9%)		
Total	10 (1.9%)	27 (10.4%)	20 (9.6%)	11	1 (0.5%)

Note: Figures in parentheses indicate percentage of the total farms

Brochure Release Workshop:

Brochure Release Workshop was conducted at Theni on 12/07/2022. Theni DTP Vijaya Kumar, I.A.S., Director, Tribal Welfare, Theni, Tmt.P.Santhi I.A.S., Director of Horticulture, Govt. of Tamil Nadu, Salem, Dr. Balasubramaniam, Director, CSMRTI, Mysuru, Theni D. Sathishkumar, District Development Manager, NABARD, Theni, Theni District Managers, NABARD, Madurai, Theni, All Geographical Area Tribal Assistant Directors / Staff of Central Silk Board and Officers / Officials of Department of Horticulture, Tamil Nadu participated in this Meet.

Seed Act Awareness Programmes:

An Awareness programme on Seed Act and Regulations was organized by CSRTI, Mysuru in association with National Silkworm Seed Organization, Bangalore on 07.12.2021 to enlighten the industry actors/stakeholders viz., Registered Grainage Owners (RGOs), Registered Seed Farmers (RSFs) and Registered Seed Producers (RSPs) of Tamil Nadu on the importance of Seed Act Regulations. 100 members including 27 RGOs, 01 RSPs, 1 RSFs besides 20 CSB and RSO officers/officials participated in the programme.

Technical workshop for Registered Grainage Owners and Farmers:

A Technical Workshop on New Technologies in Bivoltine Sericulture for Registered Grainage Owners RGOs and Farmers was organized by CSRTI, Mysuru in association with National Silkworm Seed Organization, Bangalore at Bangalore on 07.03.2022 in which 61 farmers, 01 RSPs, 01 CSB & RSO officials were involved.

Transfer of Technology Programmes:

Table 20.1: Innovations/ Technologies commercialized under Transfer of Technology Programmes

Crop/ Activity Name of the innovation	No. of ToT Prog. conducted	No. of participants	Area covered (ha)	No. of Sericulturists trained	Total Production (kg)	Benefit cost ratio
Mulberry	-	-	-	-	-	1:3.5 (Net)
Silkworm Rearing	-	-	-	-	-	-
Silkworm Seed Production	-	-	-	-	-	-
Silkworm Rearing	-	-	(CSR&T, Mysuru)	-	-	-

Values in parentheses indicate the number of farmers involved

Climate Demonstration Programmes:

Bivoltine sericulture technologies were demonstrated to 8 nos. farmers and 1 extension officer across Tamil Nadu. A total of 1,29,115 laid BFLs and 3,344 laid SCRs were distributed to nine selected potential clusters and harvested an average cocoon yield of 58.65 and 60.82kg / 100 dfls respectively.

Capacity Building Programme (Skill Training Programmes (STP):

Table 20.2: Capacity Building under Farmers Skill Training Programmes (STP)

Name of the Centre	Duration (Days)	Participants	Male	Female	SC	ST	OBC	Others
CSRTI-Kalimpong	4	50	27	23	4	12	20	42
CSRTI-Mysuru	4	51	40	9	1	5	18	36

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

Extension Resource Centres (ERC)

Extension Resource Centres at Bhawanipur, Rajnandgaon ranges under the [illegible] Division and Mungeli, Gaurella ranges under [illegible] Division are functional. Each ERC is manned by a Forester and 2 Forest Guards. The ERC functions in collaboration with the local farmers and NGOs having a vision to adopt new scientific methodologies in modern agriculture & allied areas of farming.

Table 14.1: Training Programmes conducted by ERCs

Name of the Centre	Name of the ERC Forest Officer	No. of trainees	Rural Resource Mobilized	Male	Female	Expenditure (Rs.)
ERC, [illegible]	[illegible]	[illegible]	[illegible]	[illegible] (2 days)	[illegible] (2 days)	[illegible]
ERC, [illegible]	[illegible]	[illegible]	[illegible]	[illegible] (2 days each)	[illegible] (2 days each)	[illegible]
Total		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Share working days and Distribution of Bio-manure Agency

Name of the Bio-manure Agency	Pellets supplied	No. of Farmers
[illegible]	[illegible]	[illegible]

Centre for Higher Studies in Botany and Conservation, RSM, Saiyan

Principal Conservator, Saiyan has recognized Mohd. Saiyan as a Centre for Higher Studies in Botany and Conservation for pursuing M.Sc. & Ph.D., and the following candidates are pursuing Ph.D. programmes:

Name of the candidate (Supervisor's Name)	Name of the Topic	Year of Joining	Topic of Research
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

M. Saravanan	Dr. M. Shanmuga Kumar, Scientist-D	2021	Effect of micronutrient application on growth and yield of mulberry
A. Abdul Kareem	Dr. T. Balasaraswathi, Scientist-D	2021	Studies on economic impact of cocoon production by sericulturists through marketing

* Dissertation submitted and awaiting result

25. LECTURES, WEBINARS, VIDEO OR RADIO-TALKS DELIVERED

Lectures

Topic	Organized by	Date	Name
Package of practices for mulberry sericulture and disease management	Dr.K.Sannappa gowda	20.01.2021	K.Sannappa
Management of thrips & mites in mulberry	Dr.K.Vidya, Sr.Scientist, CSRTI	28.01.2021	Dr.Narendra Kumar
Assessment of cocoon defects in mulberry	Dr.K.Sannappa gowda	01.02.2021	K.Sannappa
Management of Thrips & Mites in Mulberry	Dr.K.Vidya, Sr.Scientist, CSRTI	11.02.2021	Dr.Narendra Kumar
Management of white & dimpled in mulberry	Dr.S.Nagaraju, Sr.Sc, Farm, Kalgodatti	17.02.2021	Dr.Narendra Kumar
Management of white & dimpled in mulberry	Dr.C.Devi Prasad, Sr. Scientist, Kalgodatti	23.02.2021	Dr.Narendra Kumar
Pest management in mulberry	Dr.K.Vidya, Sr. Scientist, CSRTI	25.02.2021	Dr.Narendra Kumar
Management of mites in silkworm rearing (Online)	Dr.M.C.Gowda, Scientist-E, CSRTI, Hindupur	2.03.2021	Dr.Narendra Kumar
Constraints and farmers participation for silkworm rearing & Package of practices for mulberry sericulture	Dr.K.Sannappa gowda, Scientist-E, CSRTI	2.03.2021	K.Sannappa
Management of mites and non-insect pests of mulberry	Dr.K.Vidya, Sr.Scientist, CSRTI, Hosur	09.03.2021	Dr.Narendra Kumar
Mulberry cultivation practices and silkworm rearing technology	Dr.K.Jagadeesh, Sr.Sc, CSRTI, Kodathi, Hosur	09.03.2021	Dr.Sudhir Kumar
Management of insect and non-insect pests of mulberry	Dr.K.Vidya, Sr.Scientist, CSRTI, Hosur	09.03.2021	Dr.Narendra Kumar
Mulberry cultivation practices, Abiotic & biotic constraints in silkworm rearing	Dr.K.Jagadeesh, Sr.Sc, CSRTI, Kodathi, Hosur	16.03.2021	Dr.Sudhir Kumar
Management of insect and non-insect pests of mulberry	Dr.K.Nagaraju, Sr.Scientist, CSRTI, Kalgodatti	17.03.2021	Dr.Narendra Kumar
Bivoltine silkworm rearing	Dr.K.Vidya, Sr.Scientist, CSRTI, Hosur	18.03.2021	Dr.Narendra Kumar
Management of quality silkworm seed cocoon	Dr.K.Vidya, Sr.Scientist, CSRTI, Hosur	23.03.2021	Dr.Narendra Kumar
Mulberry cultivation practices, disease and insect pests in silkworm rearing	Dr.K.Jagadeesh, Sr.Sc, CSRTI, Kodathi, Hosur	30.03.2021	Dr.Sudhir Kumar
Mulberry cultivation practices, disease and insect pests in silkworm rearing	Dr.K.Jagadeesh, Sr.Sc, CSRTI, Kodathi, Hosur	07.04.2021	Dr.Sudhir Kumar
Bivoltine silkworm rearing	Dr.K.Vidya, Sr.Scientist, CSRTI, Hosur	13.04.2021	Dr.Narendra Kumar

Webinar

Topic	Organized by	Date	Name
Silkworm pests and their management	CSRTI, Hosur	30.04.2021	Dr.Narendra Kumar
Mulberry sericulture	CSRTI, Kodathi, Bengaluru	07.04.2021	Dr.Sudhir Kumar
Mulberry diseases and their management	CSRTI, Kodathi, Bengaluru	14.04.2021	Dr.Sudhir Kumar
Improved silkworm rearing technology for young age worms	CSRTI, Kodathi, Bengaluru	21.04.2021	Dr.Sudhir Kumar

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

Radio Talk:

Topic	Organized by	Date of broadcast	Name
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

IX CONFERENCES, WEBINARS, WORKSHOPS ATTENDED

Conference/Webinar/Workshop	Organized by	Date	Role
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Improved extension methodology for dissemination of seeding technology among farmers	ICAR-IIOR, Coimbatore, DoC, Kolkata & KVK, Hyderabad	16.08.2021	Dr. Ramesh, Dr. Sujatha
IPM in mulberry	ICAR-IIOR, Bangalore	18.08.2021	Dr. Ramesha Kumar, Dr. Sujatha
Laboratory diagnosis and their management	DoC, Hyderabad, ICAR-IIVR, Bidar & Bull, Bidar	23.08.2021	Dr. Sujatha
Agri-entrepreneurship for livelihood enhancement & rural development	Sri Padmavathi Mahila Visva Vidyalayam, Tirupati	26.07.2021 to 30.07.2021	Dr. Sujatha
International seminar on silkworm as a model for drug development	Dept. of Studies in Zoology & Entomology, Delhi, Women	28.07.2021	Dr. Sujatha
Role of genetics and biotechnology in mulberry	Silk Technologists of India, Bangalore	31.08.2021	Dr. Sujatha
Conservation areas and management practices	Silk Technologists of India, Bangalore	14.07.2021	Dr. Sujatha
Policy and farmer management	CSRTI, Mysuru	02.08.2021	140 scientists, Staff of CSRTI, RSs
Management of Locust and Grass Hoppers	Silk Technologists of India, Bangalore	28.07.2021, 23.08.2021	Dr. Sujatha
A peer reviewing assessment of evaluation methodology	Central Silk Board	30.07.2021 to 31.07.2021	Dr. Ashwath, Dr. Vijayakumar, Dr. Mahendra Gaikwad, Dr. Mangaraj
Disease screening resistant cotton germplasm for Cotton mealy bug production	ICAR-IIOR, Tamilnadu	04.11.2021 to 05.11.2021	Dharanidhar Padhan
National webinar on conservation agriculture in India: Status, potential and way forward	Rajasthan College of Agriculture, Rajasthan	27.07.2021	Dharanidhar Padhan
Managing agrochemicals for crop and environmental health	Society for Fertilizers and Environment	31.07.2021 to 31.07.2021	Dr. Ashwath, Dharanidhar Padhan

27. HUMAN RESOURCE DEVELOPMENT

Training programme	Organization	Date	Name of Participants
Extension management approaches for promotion of sericulture industry	ICAR-IIOR, Hyderabad	27.09.2021 to 01.10.2021	Mahendra Padhan
Molecular characterization of Mulberry germplasm using SSR markers	Acharya N.G. Ranga Agricultural University, S.V. Agricultural College, Tirupathi	13.12.2021 to 18.12.2021 (1 Week)	Participant
Advances in agricultural water management under changing climatic conditions	Centre for Water Resources Development and Management, Kozhikode, Kerala	06.12.2021 to 10.12.2021	Dr. Ashwath
Disease management in mulberry	Directorate Silkworm Seed, Mysuru	22.09.2021	03 Students

	Global Agriculture Govt of India, Hyderabad		
Awareness Training on Chemical Fertilizers and Pesticides Control under Schedule Scheme	Central Office, CIB, Government of India, Hyderabad	10.10.2021	Participants 1 Rajesh Kumar 2 Venkateswarlu 3 Srinivas 4 Ramesh 5 Suresh 6 Mahesh 7 Ravi Kumar Yadav 8 Jayachandra 9 Laxman 10 Narayana
Basic and Training on Application of Statistical Tools in Agriculture	ICAR Mysuru	17.10.2021 to 30.10.2021	11 scientists of ICAR-Mysuru
Improved Modular Agriculture Technology (IMAT-1)	CIAT Mysuru	1.11.2021 to 15.11.2021	1 Rajesh 2 Nagaraju 3 Shivakumar
Improved Modular Agriculture Technology (IMAT-2)	CIAT Mysuru	16.11.2021 to 1.12.2021	10 farmers
Technology Demonstration in Agriculture and Allied Sectors (one month)	CIAT Mysuru	01.10.2021 to 30.10.2021	15 Agriculturists

10. PATENTS & COMMERCIALISATION

Patents granted

Process for the utilization of agro wastes for producing value added lignocellulosic fibers **No 456732, granted on 02.04.2021.**

Product	Name of Firm/Party	Date
	Commercialisation	
Pigeon Pea Cultivar Hybrid Seeds	1. M/s. Seed Tech Solutions, No. 112, Kanakamahalli Village, Bandra Road, Kota Taluk, Pin-560 123	12.05.2021
	2. M/s. Farmers Agro Products, Plot No.23, Nallagalla Industrial area, G.K. Road, Mysuru 570 010	15.06.2021
Pandan a multifunctional formulation for increasing soil and deficiencies in millets	1. M/s. Farmers Agro Products, Plot No.23, Nallagalla Industrial area, G.K. Road, Mysuru 570010	15.06.2021
	Licensed Technology	
Pharaoh a plant based formulation for control of mulberry root rot disease	1. M/s Black Agro Pvt. Plot No. 45A, Cauvery Industrial Area, 2nd Stage, BASE, Thattegere, Nelamangala, Bangalore-562 157	12.12.2020

28. KUSAM-K ADVISORY COMMITTEE & MEETINGS

Chairman

Dr. Ashok K. Patel
Vice-Chancellor
University of Agricultural Sciences (UAS)
Krishinagar Campus
Dharwad - 580 005

Members

Dr. A. Lakshmana Rao
Principal Scientist & Division of Vegetable crops
ICAR-Indian Institute of Horticultural Research
Hesaraghatta Lake post
Bengaluru - 560 089

Dr. P. Chandrasekhar Rao
Associate Director of Extension
Agricultural Science Division
University of Agricultural Sciences
GKVK Bengaluru - 560 065

The Commissioner of Horticulture
Horticulture Development & Director of Horticulture
Govt. of Karnataka, 3rd Floor
'D' & Building, Dr. B. R. Ambedkar Veedhi
Bengaluru - 560 001

The Commissioner of Horticulture
Govt. of Horticulture, Govt. of Andhra Pradesh (TSH),
Building, Front Row, Dilsukhnagar, Chaitanyapuri
Chaitanya Bharathi Nagar, Dilsukhnagar - 500 060
Andhra Pradesh

The Director of Horticulture
Dept. of Horticulture
Govt. of Maharashtra, New Administrative
Building, 4th & 5th Floor, Civil Lines, Pune
Maharashtra Region - 411 001

Mr. C. Shankar Reddy
S/o Chennamma Reddy
Chakravarthi Colony
Kalamandiram Post, Thanamma Mandal,
Cuddapah - 517 502, Andhra Pradesh

The Director
National Bamboo Mission(NBM)
Central Silk Board, CSB Complex
BTM Layout, Madiwala
Bengaluru - 560 068

Scientist 'C' (Plant)
National Coconut Research Centre
Central Silk Board, CSB Complex
BTM Layout, Madiwala
Bengaluru - 560 068

Prof. Chandrakant
Professor and Head
Department of Geology
University of Madras
Chennai - 600 025

Dr. R. D. Gunaratna
Joint Director (Dir)
National Bamboo Seed Organization (NBSO)
No.183, Sri Guru Shivaganga Layout
Mysuru - 570 020

The Director of Horticulture
Govt. of Tamil Nadu
Thottagi Complex, Nandanampakkam,
Tamil Nadu, Salem - 636 007

The Commissioner of Horticulture
Govt. of Telangana
Block no. 13, Aruppukottai Bypass
Adjacent to Police Head Quarters Gate
Telangana, Hyderabad - 500 001

The Commissioner of Horticulture
Govt. of Madhya Pradesh,
Lower Basement, Satpuda Bhawan,
Bhopal - 462 004, Madhya Pradesh

Shri Bhaskar Naik
Ahmedabad, Village and post
Chinnamma Thota
Gudimallayyapalli - 517 502

The Director (Tech)
Central Silk Board, CSB Complex
BTM Layout, Madiwala
Bengaluru - 560 068

The Director (Member Secretary)
Central Horticultural Research and Training
Institute, Central Silk Board, Ahmedabad
email@horticulture.kharagpur.in

Details of Seminars / Workshops on CSIR's Mandate

68th Executive Council	: 27th & 28th July 2021
67th Executive Council	: 24th November 2021
68th Executive Advisory Committee	: 27th August 2021
67th Executive Advisory Committee	: 23rd & 24th January 2022

30. PUBLICATIONS

Book/Book Chapter

Abdulkhaleq Mukhtar Ahmedzai, Manvir Kaushal, Amrita Singh, Rajesh Kumar Singh (2021) Agriculture in Classical Carotenogenesis Academic Press, Elsevier Science Publishing Co Inc, San Diego, United States, pp: 11-4.

Bakshi, Ruchi and Ali, Sk Jamaluddin and Kaushalkumar M (2020) Horticulture Science and Technology, Central agricultural research and training institute, Central ICAR Board, Ministry of agriculture, Govt of India, Srikaniyam, Tripura, pp: 1-148.

Chandrashekar M, Mukherjee P, Rathod A, Rekha M, Mangrauthia V (2021) Molecular approaches for detection of pathogen disease in agriculture, Applied & Microbiology Academic Press, pp: 47-72.

Amrita singh, Jaiprakash Kumar Singh, Vijay Kumar Singh, Anupam Ghosh, Ramesh Verma, Ajay Kumar (2021) Plant growth promoting bacteria as bio-control agents against diseases of cereal crops. In: Food security and Plant Disease Management (eds.) Ajay Kumar and Kumar Singh, Woodhead Publishing, Oxford Kingdom, pp: 201-238.

Shanthi S, Radhakrishnan VT, Biswas B Rajak, Bhagyaraj BA, Nisha MS and Babu CN (2021) Advances in silk waste management and recycling. Published by Dr. Jaibhai V Naik, Director, CSTRI, CSB, Bangalore, pp: 81-91.

Thiyagesh S, Somasekhar CS, Ganesh PS, Prashanth A Sangannavar, Ramesha A and Dash SK (2020) Essential Oil-Bearing Grass Resources in Mulberry. In: Essential Oil-bearing Grasses: Medicinal Crops. In: Chikmagalur Rose (eds) Essential Oil-bearing Grasses: Medicinal crops. Springer, Cham. https://doi.org/10.1007/978-3-030-01980-0_10.

Research Papers

International Journals

Somasekhar CS, Dhanraj PS, Ramakrishnan PR, Devi Sandhya S, Singh T, Deepthi P and Rashid Ahmed (2020) Genetic Diversity, Identification and Utilization of Novel Sources Resistance to Aleurodicus dispersus in Mulberry (Morus spp.). Plant Breed. 2021;00:1-9. https://doi.org/10.1094/PDIS-12-20-2618-RE

Mukesh M, Mallikarjuna G, Ramesha C, and Sengupta P (2021) Advanced techniques for improved mulberry leaf efficiency and mulberry productivity. Int.J. Plant & Soil Science.33(20): 243-257. DOI: 10.9734/ijpss/2021/v33i2030647 Short article, 8 pp.

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Nithin, Bharathi M, Sadashiva A, Ramprasath AG and Vinodha A (2021) Knowledge and Adoption Levels of Farmers on Sericulture Technologies in Srirangapatna Taluk of Mandya District of Karnataka. Adv J Agric Sci. 14(2): 109-114.

Narendra Kumar M and Ramaseth A (2021) Comparative performance of trichogrammatids using a pupal parasitoid of the tailorbird, Orthotomus longicauda (Gmelin) (Aves: Cisticolidae). Int J Entomol Res. 6(3): 1-4. ISSN: 2455-4758; DOI: 10.33545/2455-4758.2021.v6.i3a.

Narendra Kumar M and Ramaseth A (2021) Effect of temperature on trichogrammatids using pupal parasitoid of the silkworm egg fly, Exorista bombycis (Loulie). J Entomol Res. 45 (2021) Online published; DOI No.: 10.5958/0974-4576.2021.00004.4.

Rajendra Kumar M and Ramaseth A (2021) Effect of temperature on trichogrammatids using pupal parasitoid of the silkworm egg fly, Exorista bombycis (Loulie). J Entomol Res. 45 (2021) Online published; DOI No.: 10.5958/0974-4576.2021.00004.4.

Rajagukguk W, Anwarhaq HF and Chanselo MH (2021) In vitro evaluation of novel fungicide molecules against Cercospora fijiensis (Morelet) causing black leaf rust of mulberry. Cytologia. 86 (Web): 1-4.

Rishi Gupta, Archana Yadav, Varuna Shringarkhede, Jana Kumar Chandal (2021) Biochemical conversion of CO2 to Fuels and chemicals: Status, recommendations and technical aspects. Science Progress and Bioeconomy. DOI: 10.1007/s42398-021-00191-0

Sahay T, Narbadia VD, Rao TR, Pratheesh Kumar PM, Tewary T (1977) In vitro regeneration of mulberry plants from seedling explants of Morus indica cv. G4 through direct embryogenesis (1977). Plant Cell Tissue and Function (Springer). 94:119-126. doi.org/10.1007/s11240-017-1236-1.

Sandhu AK, Vasudevan AA, Arunkumar KS, Bhanja SK and Ramesh Ali (2011) Assessment of molecular markers to analyze genetic diversity in mulberry germplasm. Sericologia. 51(3&4): 307-313.

Shrivastava V, Sarode A, Hallikeremath G, Chandrakanth A, Mary Josephs AV and Anandhi SH (2021) A Field-Friendly Loop-Mediated Isothermal Amplification (FF-LAMP) method for rapid detection of Enterocytozoon bieneusi, Nosema ceranae, and Nosema apis. Microbiol Spectr. 18(1): e0114-21.

Shringarkhede V, Anandhan N, Mandloi Anuradha K, Chandi Ashalata MK, Chandi Jaikishanlal H, Singh Sunil P and Pandal Tanvary (2021) Nikkomycin (Bombyx mori) pupae protector: The review of high value natural acidic sericulture exclusive. 14-21.

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[illegible], [illegible] and [illegible] (2012) Handwriting of silk cocoons. *Asian Textile Journal*, March-April 2012, pp. 75-77.

[illegible], [illegible], [illegible] and [illegible] (2021) Tree Mulberry: The future of marginal sericulture farming. *Indica Research Today*, 3(3): 267-272.

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[illegible], [illegible], [illegible], [illegible], [illegible], [illegible] and [illegible] (2020) Soil microbial biomass carbon, dehydrogenase and urease activity as an indicator of soil quality in relation to tillage, crop residue and nutrient management in a cotton-wheat system in India. *Soil and Tillage Research*, 200: 104610. https://doi.org/10.1016/j.still.2020.104610

Popular articles

[illegible], [illegible], [illegible] and [illegible] (2021) Tomato wilt in mulberry and their management. *Sericulture Info*. http://sericulturein.com/ [illegible] 2021 (in Kannada) pp. 2-6.

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[illegible], [illegible] and [illegible] (2011) Drought management technologies in mulberry sericulture. *Indian Silk*, 50(5): 6-7.

[illegible] (2011) Mulberry valorpil: ecologically [illegible]. *Pothi Malar*, 2(9): 14-15.

[illegible] and [illegible] (2021) [illegible] in agriculture. *Kisan World* (March-April 2021), pp. 19-20.

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Nishkala T, Rao S, Rudra MM, Nadhaniel P, Nalini Rani N, Vijay Naidu B, Narendra, Babu CH, annapurna r and mahesh (2021) Agronomical and health care and soil fertility management in mulberry gardens. Indian Silk 59-12(7): P.11.

Conferences/Webinars

Mahesh MS, Arunkumar KA, Vasanth A, Rajesh M and Manjunatha BK (2021) Molecular phylogenetic analysis of the fungal complex associated with root rot in mulberry (Morus spp.). ICOMBIOSS; 27th to 29th Dec 2021; DLA-UBDT, Bangalore. P. 19

Ramanaik M and Chakkra Rani N (2021) Impact of micronutrients application on mulberry growth and yield parameters. International Virtual Congress on world sericultural scientific Research, August 13-14, 2021 on line presentation.

Mahesh B, Nalini C, Nagaraja T, Babu CH and Mahesh (2021) Balanced fertilization for improved economic use efficiency and mulberry productivity. In proceedings of 9th Annual Convention and 3 Webinar on "Managing Agro-chemicals for Crop and Environmental Health" organized by Society for fertilizers and environment, Kolkata during February 23 & 24, 2021.

Mary Josphin Mary AF, Manjunatha Kumar BS and Mahesh (2021) Annual Census of the Central Sericultural Research & Training Institute Campus in Mysore presented in National Level Annual Conference on Sericulture and Biodiversity of native birds, organized by National Silkworm Association, Dept. of Zoology, St. Joseph's College, Bangalore on 1st May 2021 pg:14

Radhika R, Nandini C, Nalinkumar T, Narendra Babu CH and Mahesh (2021) Comparison of different chemical extractants for estimation of bioavailable zinc in mulberry garden. National Webinar on "Managing Agro-Chemicals for Crop and Environmental Health, organized by Society for fertilizers and environment, Kolkata during February 23 & 24, 2021. Pg:11.

Ramesha, Urmila S, Sushma KM, Chengalraddi S, Siddaraju, Dhanalakshmi Pallavi, Kulkarnikumar S, Mahesh (2021) Isolation of Protease producing bacteria from soil and characterization of protease in seminal webinar on managing agro-chemicals for crop and environmental health organized by Society for fertilizers and environment Kolkata during 23th and 24th February 2021 pg:46.

Upadhyay S, Nandhakishore G, Jagan KG, Sekhar T and Mahesh (2021) Agro-biochemical evaluation of mulberry genotypes for alkalinity stress tolerance. International conference on Sustainable silkworm Biotechnology at University of Kalyani on 19th to 21st Jan 2021 (Abstract) P.188.

Vinod TT and Shubha Rani N (2021) Effect of poultry manure with bio fertilizers on leaf quality of S-6 mulberry variety (Morus indica L.) assessed through silkworm feeding. Abstract presented in international webinar congress on world sericultural scientific research, Tamilnadu, India, August 13-14, 2021.

Sequences submitted to National Centre for Biotechnology Information (NCBI)

2. Microbial sequence submitted

S	Microbes	Accession Number
1.	[illegible]	[illegible]
2.	[illegible]	[illegible]
3.	[illegible]	[illegible]
4.	[illegible]	[illegible]
5.	[illegible]	[illegible]
6.	[illegible]	[illegible]
7.	[illegible]	[illegible]
8.	[illegible]	[illegible]
9.	[illegible]	[illegible]
10.	[illegible]	[illegible]
11.	[illegible]	[illegible]
12.	[illegible]	[illegible]
13.	[illegible]	[illegible]
14.	[illegible]	[illegible]
15.	[illegible]	[illegible]
16.	[illegible]	[illegible]
17.	[illegible]	[illegible]
18.	[illegible]	[illegible]
19.	[illegible]	[illegible]
20.	[illegible]	[illegible]
21.	[illegible]	[illegible]
22.	[illegible]	[illegible]
23.	[illegible]	[illegible]
24.	[illegible]	[illegible]
25.	[illegible]	[illegible]
26.	[illegible]	[illegible]
27.	[illegible]	[illegible]
28.	[illegible]	[illegible]
29.	[illegible]	[illegible]
30.	[illegible]	[illegible]
31.	[illegible]	[illegible]
32.	[illegible]	[illegible]
33.	[illegible]	[illegible]
34.	[illegible]	[illegible]
35.	[illegible]	[illegible]
36.	[illegible]	[illegible]
37.	[illegible]	[illegible]
38.	[illegible]	[illegible]
39.	[illegible]	[illegible]
40.	[illegible]	[illegible]
41.	[illegible]	[illegible]

The endophytes were isolated from the collected samples sourced from Tamil Nadu, Telangana and Karnataka.

2. Some important provisions of Directorate prevention of unlicensed schools submitted to ADM

Main provision	Provision	Description
Objective	Section 3	Objective of the Act
Definitions	Section 2(1)	Definitions
Prohibition of unlicensed schools	Section 4	Prohibition of unlicensed schools and its consequences

11. ADMINISTRATIVE REPORT

Activities of Directorate of Technical Education

Name	Profile	Work	Activities	Projects	Others
Andhra Pradesh	Administrative	Library Maintenance Recruitment			
Karnataka	Technical Administrative	Administrative Financial Health Care	Library Facilities	Partners	
Madhya Pradesh		Environmental			
Maharashtra		Administrative Accomplishment Recruitment Recruitment			
Tamil Nadu	Partner	Administrative Development Administrative Management			Promotion
Telangana	Manager	Financial			

Audit Note of Activities of Directorate of Technical Education

Technical Education

Technical Work Procedure

Library Library Committee (LC) Chair Jan 10

Chandra Shekhar IAS (DoC) Jan 10

Data Administrator (Dir) Jan 10

Administrative (Dir) Jan 10

Manager (Dir) Jan 10

Registered IAS (Dir) Jan 10

Administrative (Dir) Jan 10

Public (Dir) Jan 10

Procedure Manual (Dir) Jan 10

Accounts Manager Jan 10

Manual (Dir) Jan 10

Recruitment Manager (Dir) Jan 10

Facilities (Dir) Jan 10 (Start 10.01.2022)

Administrative (Dir) Jan 10

Facilities Plan (Dir) Jan 10

Health Practice (Dir) Jan 10

Administrative (Director) Jan 10 (Start)

Chandra Shekhar IAS Jan 10 (Start)

Assistant Engineer Jan 10 (Start) Procedure Administrative

Address (Dir) Recruitment (Start) Plan (Dir) Jan 10 (Start)

Secretary (Dir) Engineering IAS (Dir)

Engineer (Dir) IAS (Engineer)

Civil Professional Engineer Engineering Jan 2022

Facilities (Dir) Recruitment (Start)

Administrative (Dir) Jan 10

Staff IAS (Dir) Jan 10

Management (Dir) Jan 10

Training Plan Planning Jan 10

Technical Facilities (Dir) Jan 10

Administrative (Dir) Jan 10

Evolutionarily K. [97] (Bed. 20.05.2021)

[BC]-Retirement

Petrochemical polymer B [Qty] Lev 0

Legal L. [71] (Bed. 15.08.1931)

Journalist P. [2]

Recycle Refer Drive Cycle [Tx]

Lawsuit file index [CC-Lv-]

[BC] Recycle body

Transplant A [Qty] Lev 0

Economic C. [71] (Bed. 13.08.1974)

Query database A. [2] (Bed. 12.09.2021)

Military flight [ATC Pilot license] [Phone] 54 [K 1931]

Emergency doctor [Ambulance] [Nurse 2019-2023]

Stomach [-197]

[BC]-Stock

Inductance Bank [72] [Qty] Lev 0 (Bed. 11.07.2021)

Cloud Infrastructure Bank [-2] (Bed. 15.01.2022)

Electrochemical Element [72]

[AD]-Lawsuit

Pilot P. [Qty] Lev 0

Counterparty [-2]

Transfer [72 -72]

Lecture [BL] (Vol [Bed. 02.06.2021]

Ophthalmology [-72]

Nanotechnology [-197]

[CBD]-Valve

Electrical Engineer B [Qty] Lev 0

Query Density Lev 0

Contract [-Lv-]

Mathematician [72] Lease Supply [Lawsuit] [Phone: 30 [K 1931]

Retail Lease Agent [Lawsuit] [754 [-111 2021]

Chemical Reactor [-172] (Bed. 19.07.2020)

Mathematician [72] [754 (Bed. 11.02.1977)]

Transplant [-172]

Environment [-172] (Bed. 11.07.1914)

Pharmacokinetics [-2] (Bed. 19.02.2021)

Stock Cardiologist [C [CC-Lv-]

Transplant [-172] [Lv-]

Mathematics [Cyber Talk] (Bed. 15.07.1912)

Microbiology [-197]

[BC]-Skyscraper

Solid Waste Laboratory [Lv-] Lev 0

Mathematics [-97] (Bed. 12.04.1921)

Transplant [-2] [-172]

[BC]-Transportation

Reservoir [-Qty] Lev 0 (Bed. 20.05.1921)

Medicine Stock [-172] [Lv-]

Biochemistry [72] [-2]

Windows Chemistry [-172]

Transplant [-Lv-] [-72]

Psychology [-72]

Engineering [-172]

[BC]-Gastroenterologist

Radiologist [-72] [-2]

Agreement [-Yield Lender [Phone: 54 [K 1921]]

[BC]-Intermediate

Semiconductor B [Qty] Lev 0

Executive [-72] [Lv- 20.08.2020]

Organic Lawsuit [-Yield Lender

Telecommunications Lawsuit [-Lv-]

[BC]-Package

Precision Engineer Valve [Lv-] Lev 0

Patent Business Tanker [Qty] Lev 0

Environment [-Lv- Lawsuit Contract]

Quality Cardiologist [72] [Phone: 14 [K 1992]

Transplant [-72 -72]

Lawsuit, Lender Contractor

[BC]-Ultrasound

Investment [-Qty] Lev 0

Energy Calculate Valve [-72]

Quality Asset [-172] [Phone: 10 [K 2020]

Risk Attorney Realty [-72] [-2] Assist

Wholesale Engagement, Lender Contractor

[BC]-Anatomy

Asset Value Bookkeeping [Lv-]

Chemical [-Environment [-72]

Stock Chemistry [72]

Biomedical Economics [72]

Engineering Lawyer Drug [-97]

[BC]-Bankruptcy

Cardiologist [engineering Electronic Lev 0] [Bed. 21.07.2021]

Sodium Patient Geology [-Lv-]

Refinery Purchasing Right [72]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

BUDGET (Rs. in lakhs)

Budget Head	Grants Received	Grants Sanctioned	Expenditure Incurred
1. [illegible]	[illegible]	-	[illegible]
2. [illegible]	[illegible]	-	[illegible]
3. [illegible]	44.[illegible]	-	44.[illegible]
4. [illegible]	111.00	-	111.00
5. [illegible]	220.00	-	220.00
Total	[illegible]	-	[illegible]

CSIR Institutes & Nestled Units