

सं./No. 52

के रे उ अ प्र सं-मैसूरु
CSRTI-MYSURU

वार्षिक प्रतिवेदन
ANNUAL REPORT
2015-16



केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
(आई एस ओ 9001 : 2008 प्रामाणित)

CENTRAL SERICULTURAL RESEARCH AND TRAINING INSTITUTE

(ISO 9001 : 2008 Certified)

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

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



सं./No. 52

वार्षिक प्रतिवेदन ANNUAL REPORT 2015 - 16



केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
(आई एस ओ 9001 : 2008 प्रामाणित)

CENTRAL SERICULTURAL RESEARCH AND TRAINING INSTITUTE
(ISO 9001 : 2008 Certified)

केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय, भारत सरकार, मैसूरु-570 008
Central Silk Board, Ministry of Textiles, Government of India, Mysuru-570 008

प्रकाशक

डॉ वी शिवप्रसाद
निदेशक
कें रे अ प्र सं, मैसूरु

Published by

Dr. V. Sivaprasad
Director
CSRTI, Mysuru

संपादकीय समिति

डॉ. वी. शिवप्रसाद
डॉ. विनीत कुमार
श्री जे. जस्टिन कुमार

Editorial Committee

Dr. V. Sivaprasad
Dr. Vineet Kumar
Mr. J. Justin Kumar

सहायता

श्री एच.एम. मुनिकृष्णप्पा
श्रीमती एम. रेखा
श्री एन. के. मंजुनाथ

Assistance

Mr. H. M. Munikrishnappa
Smt. M. Rekha
Mr. N. K. Manjunath

हिंदी अनुवाद/सहायता

श्रीमती वी. जयश्री
श्रीमती के. शचि
श्रीमती वसंता कुमारी वी.सी.

Hindi Translation/Assistance

Smt. V. Jayashree
Smt. K. Sachi
Smt. V. C. Vasantha Kumari

मुख पृष्ठ सज्जा

श्री वी गणेशन
श्री जे जस्टिन कुमार

Cover Design

Mr. V. Ganesan
Mr. J. Justin Kumar

मुद्रण

सर्वश्री गुप्ता ऑफसेट प्रिंटेर्स
विद्यारण्यपुरम, मैसूरु 570 008

Printed at

M/s. Guptha Offset Printers
Vidyaranyapuram, Mysuru-570 008

प्रतियाँ : 100

© कें रे अ प्र सं, मैसूरु अगस्त 2016

No. of Copies: 100

© CSRTI-Mysuru
August 2016

CONTENT

PARTICULARS	PAGE NO.
Foreword	v
About CSRTI-Mysuru	viii
Highlights of Research, Training & Extension Activities	xv
Official Language Implementation	xxi
Progress of Research Projects & Programmes	
Mulberry Breeding and Genetics Laboratory	1
Mulberry Molecular Biology Laboratory	5
Soil Science & Chemistry	11
Agronomy	12
Mulberry Physiology	12
Mulberry Pathology	13
Bivoltine Silkworm Breeding Laboratory	14
Multivoltine Breeding Laboratory	23
Silkworm Genetics Laboratory	25
Satellite Silkworm Breeding Station-Coonor	27
P4 BSF-Hassan	28
Silkworm Molecular Biology Laboratory	29
Silkworm Physiology Laboratory	30
Rearing Technology & Innovation	31
Grainage	32
Pest Management Laboratory	33
Silkworm Pathology	36
Post Cocoon Evaluation Unit	40
Sericultural Engineering Division	41
Sericultural Extension, Economics and Management	43
Capacity Building & Training	56
Bioinformatics Center (Sub-DIC Under BTISNET)	59
RSRS-Kodathi	60
RSRS-Chamarajanagar	63
RSRS-Salem	67
RSRS-Anantapur	75
Administrative Report	79
Research Advisory Committee	81
Meteorological Data	83
Publications	83
Highlights of Research Framework Document (RFD)	89
Patenting and Commercialisation	90

प्रस्तावना

कें रे अ प्र सं, मैसूरु की वार्षिक रिपोर्ट प्रस्तुत करते हुए मुझे प्रसन्नता हो रही है जो उष्णकटिबंधीय क्षेत्र के शहतूत रेशम उत्पादन के विभिन्न पहलुओं पर किए गए अनुसंधान एवं विकास की मुख्य उपलब्धियों पर प्रकाश डालती है। सभी के सम्मिलित प्रयास से कें रे अ प्र सं, मैसूरु की उत्कृष्टता कायम है और पणधारियों के हित के लिए इसका विशेष योगदान है। समूह संवर्धन कार्यक्रम के माध्यम से नियंत्रित समूहों में 2772 मी.ट द्विप्रज कच्चा रेशम का रिकार्ड उत्पादन करते हुए राष्ट्र के कुल उत्पादन का 98.06% दर्ज किया गया।



मुख्य उपलब्धियाँ हैं -वर्षाश्रित अर्ध शुष्क स्थितियों के लिए अधिक उत्पादक (22.7 मी ट/हे/वर्ष) नई शहतूत उपजाति एम एस जी 2 का विकास; शहतूत के लिए डी यू एस (विशिष्टता, एकरूपता, स्थायित्व) का विकास (पी पी वी एवं एफआरए, नई दिल्ली); मूल विगलन रोग प्रतिरोधी शहतूत आनुवंशिकी संसाधनों की पहचान, मूल गॉठ रोग प्रबंधन के लिए निमाहारी का क्षेत्र मूल्यांकन (80% कमी एवं 15.18% अधिक पत्ती उपज), सी एस आर 16 x सी एस आर 17 को चालू करना, सफल प्राधिकरण उत्तर परीक्षणों के अनुसरण में रा रे बी सं द्वारा द्विप्रज एकल संकर का वाणिज्यिक बीज उत्पादन, जी 11 x जी 19 का सफल प्राधिकरण परीक्षण, उप अनुकूलतम स्थितियों के लिए 67.11 कि.ग्रा/100 की औसतन उपज और 2ए-3ए कोटि के रेशम वाला द्विप्रज संकर, (4.03 लाख रो मु बी चकत्ते) एस 8 x सी एस आर 16 का क्षेत्र मूल्यांकन, उत्पादक द्विप्रज एकल संकर (74.64 कि.ग्रा/100 रो मु बी च) और एस एस बी एस 5 x एस एस बी एस 6 अनुकूलतम स्थितियों के लिए उत्पादक द्विप्रज संकर (70-75 कि.ग्रा/100 रो मु बी चकत्ते), उन्नत संकर का विकास, अधिक उत्पादकता (60-65 कि ग्रा/100 रो मु बी च) वाला कावेरी गोल्ड (एम वी 1 x 58) नोसेमा बोम्बिसिस द्वारा उत्पन्न पेब्रिन रोग पहचान हेतु आशोधित लैंप (लूप व्यवहृत समतापीय प्रबंधन प्रक्रिया) का विकास। अनुसंधान एवं विकास कार्यक्रमों के परिणामस्वरूप हस्त चालित परिपक्व कीट पृथककारक एवं संग्राहक और पेडल चालित मिश्र कोसा संग्राहक के लिए एकस्व प्राप्त हुए; रेशम उत्पादन कृषकों के लाभ के लिए नया सामान्य विसंक्रामक सेरिफिट (परामर्शी परियोजना) और जैव सूत्रकृमिनाशी निमाहारी का वाणिज्यीकरण किया गया।

कें रे अ प्र सं, मैसूरु की दृष्टि और लक्ष्य के परिप्रेक्ष्य में विभिन्न प्रशिक्षण कार्यक्रमों के माध्यम से सभी रेशम उत्पादन कार्यकलापों में कुशल मानवशक्ति विकसित करने के साथ-साथ अनुसंधान एवं विकास कार्यक्रमों को कार्यान्वित करने हेतु सभी एकक मिलकर कार्य कर रहे हैं। सुसमन्वित विस्तारण कार्यक्रमों द्वारा विकसित प्रौद्योगिकियों को हस्तांतरित करने के फलस्वरूप पणधारियों की आर्थिक स्थिति में सुधार हुई और शहतूत रेशम उत्पादन को भी मान्यता मिली। कें रे अ प्र सं, मैसूरु अपने वैज्ञानिकों, तकनीकी एवं प्रशासनिक कर्मचारियों के सच्चे, समर्पित अभिनव एवं सामूहिक प्रयास के कारण ही बुनियादी पणधारियों की अपेक्षाओं को पूरा करने में सफल हुआ है।

वी. शिवप्रसाद

(डॉ. वी शिवप्रसाद)

निदेशक

FOREWORD

It is pleasure to present the Annual Report (2015-16) of CSRTI-Mysuru, unveiling the salient achievements of R&D programmes undertaken on different aspects of mulberry sericulture in the tropical region. The *par excellence* status of CSRTI-Mysuru was maintained due to concerted efforts with significant achievements for the benefit of stakeholders. A record quantity of 2772 MT bivoltine raw silk production was achieved in the Command Clusters through Cluster Promotion Programme accounting for 98.6% in the country.

Development of MSG2, a new mulberry variety for rainfed semi-arid conditions with improved productivity (22.7MT/ha/year); Development of DUS (Distinctiveness, Uniformity, Stability) guidelines for mulberry (PPV&FRA-New Delhi); Identification of mulberry genetic resources resistance to root rot; Field evaluation of Nemahari for the management of root knot (~80% reduction & 15-18% improved leaf yield); Introduction of CSR16 x CSR17, bivoltine single hybrid into commercial seed production by NSSO following successful post-authorization trials; Successful authorization trials of G11 x G19, bivoltine hybrid for sub-optimal conditions with an average yield of 67.11 kg/100 and 2A-3A graded silk (4.03 lakh dfls); Field evaluation of S8 x CSR16, productive bivoltine single hybrid (74.64kg/100 dfls) and SSBS5 x SSBS6, productive double hybrid for favorable conditions (70-75kg/100 dfls); Development of Improved Crossbreed, Cauvery Gold (MV1 X S8) with improved productivity (60-65 kg/100 dfls); Development of modified LAMP (Loop mediated isothermal amplification reaction) technique for the detection of pebrine caused by *Nosema bombycis* are the major achievements. The research outcome of R&D programmes lead to the grant of patents for Hand operated mature worm separator & collector and a Pedal operated composite cocoon harvester; commercialization of Serifit, a new general disinfectant (consultancy project) and Nemahari, bio-nematicide for the benefit of sericulture farmers.

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



Dr. V. SIVAPRASAD
Director

कें रे अ प्र सं - मैसूरु के बारे में

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, मैसूरु केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय, भारत सरकार के तत्वावधान में संस्थापित हुआ। वर्ष 1961 में संस्थान का कार्य चन्नपट्टणा में प्रारंभ हुआ और बाद में 1963 में इसे मैसूरु स्थानांतरित किया गया। प्रशिक्षण घटक को सम्मिलित करने के बाद इस संस्थान का वर्ष 1965 में केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, मैसूरु (केंरेअप्रसं) के रूप में पुनर्नामकरण किया गया। यह संस्थान देश में रेशम उद्योग के विकास के लिए पिछले 60 सालों से अच्छी सेवाएं समर्पित कर रहा है। संस्थान को आई एस ओ 9001:2008 से प्रमाणित (2013) किया गया है जो रेशम उत्पादन उद्योग के विकास हेतु अनुसंधान व विस्तारण में गुणवत्ता प्रबंधन और समर्थन सेवाओं में उत्कृष्टता के लिए हमारी वचनबद्धता का प्रमाण है।

आज यह संस्थान अनुभवी वैज्ञानिकों, समस्त आधुनिक सुविधाओं एवं अवसरचनयुक्त रेशम उत्पादन अनुसंधान के उत्कृष्ट प्रमुख संस्थान के रूप में विख्यात है। इस संस्थान ने देश तथा विदेश में उष्णकटिबंधीय रेशम उत्पादन में अग्रणी अनुसंधान व विकास संस्थान के रूप में यश प्राप्त किया है और इसे उच्च अध्ययन एवं उन्नत प्रशिक्षण केंद्र के रूप में मान्यता प्राप्त है। यह संस्थान कर्नाटक, आंध्रप्रदेश, तमिलनाडु, तेलंगाना, केरल, महाराष्ट्र एवं मध्यप्रदेश में शहतूत रेशम उद्योग के कृषि क्षेत्र में आवश्यकताओं की पूर्ति करने हेतु रेशम उत्पादन अनुसंधान व विकास संबंधी सभी कार्यकलापों को करता है। अभी तक इस संस्थान ने रेशम उत्पादन प्रौद्योगिकी के विभिन्न पहलुओं में 800 विदेशियों सहित करीब 50,000 व्यक्तियों को प्रशिक्षित किया है। यह संस्थान अनुसंधान, प्रशिक्षण एवं विस्तारण कार्य संचालित करने के अलावा राष्ट्रीय एवं अंतर्राष्ट्रीय अभिकरणों को परामर्श एवं सलाहकारी सेवाएँ भी प्रदान करता है।

दृष्टि	
द्विप्रज रेशम उत्पादन में श्रेष्ठ अंतर्राष्ट्रीय रेशम उत्पादन संस्थान बनना।	
लक्ष्य	उद्देश्य
भारतीय रेशम उत्पादन उद्योग को आजीविका स्तर के उत्पादन से प्रतियोगी वाणिज्यिक उत्पादन के आधार में परिणत करने हेतु अनुप्रयोग आधारित अनुसंधान में श्रेष्ठता हासिल करना।	<ul style="list-style-type: none"> ▪ भारतीय रेशम का उत्पादन, उत्पादकता एवं गुणवत्ता बढ़ाने हेतु अनुसंधान। ▪ शहतूत एवं रेशम कीटपालन के लिए पैकेज प्रणाली विकसित करना। ▪ उत्पादों और प्रौद्योगिकियों का वाणिज्यीकरण। ▪ प्रौद्योगिकी स्थानांतरण। ▪ प्रौद्योगिकी स्थानांतरण के माध्यम से आयातित रेशम के बदले रेशम उत्पादन बढ़ाना। ▪ प्रशिक्षण। ▪ अनुसंधान कार्यक्रमों के समर्थन के लिए संस्थान के ढाँचे को मजबूत बनाना। ▪ प्रजनक स्टॉक का अनुरक्षण। ▪ रोग पूर्वानुमान एवं पूर्वसूचना। ▪ अनुसंधान एवं विकास अभिनवों और पैकेज प्रणाली का प्रकाशन। ▪ भारत और विदेश में अन्य अनुसंधान व विकास संगठनों के साथ सहयोगी अनुसंधान।

संगठनात्मक रचना

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, मैसूरु, देश में रेशम उत्पादन अनुसंधान विकास कार्य में लगा हुआ सबसे बड़ा और अधिक वैविध्यपूर्ण संस्थान है जो कृषि इंजीनियरों, समाजशास्त्रियों एवं अर्थशास्त्रियों सहित

करीब 150 वैज्ञानिकों से समर्थित है। ये कार्मिक कर्नाटक, तमिलनाडु, आंध्रप्रदेश, तेलंगाना, केरल, महाराष्ट्र और मध्यप्रदेश राज्यों के मुख्य संस्थानों और संबद्ध एककों के माध्यम से समुचित प्रौद्योगिकियों के विकास और उनके स्थानांतरण हेतु समन्वय से कार्य कर रहे हैं। अनुसंधान व विकास कार्यकलाप और प्रौद्योगिकी विकास कार्य चार प्रमुख प्रभागों यथा पोषी पादप, रेशमकीट, विस्तार एवं प्रशिक्षण के विभिन्न अनुभागों में किए जा रहे हैं। कें रे अ प्र सं, मैसूरू अधिदेशात्मक कार्य निपटाने हेतु कई योग्य तकनीकी एवं प्रशासनिक कर्मचारियों की सेवा का भी उपयोग करता है। योजना, अनुवीक्षण, समन्वयन एवं मूल्यांकन कक्ष की सहायता से निदेशक, संस्थान और इसके संबद्ध एककों के अनुसंधान व विकास कार्यकलापों की प्रगति का अनुवीक्षण करते हैं। राष्ट्रीय एवं अंतर्राष्ट्रीय पत्रिकाओं में प्रकाशित तकनीकी एवं अनुसंधान शोध-पत्रों के अलावा 35 पुस्तकें भी प्रकाशित की गई हैं। संस्थान को अंतर्राष्ट्रीय ख्याति की द्वि वार्षिक पत्रिका इंडियन जर्नल ऑफ सेरिकल्चर और रेशम उत्पादन विज्ञान पर दस्तावेज़ी सहित्य सेरिडॉक प्रकाशित करने की प्रतिष्ठा प्राप्त हुई।

विस्तार कार्य-तंत्र

प्रयोगशाला उपलब्धियों के मान्यकरण में एवं उन्हें क्षेत्र में प्रभावी ढंग से स्थानांतरित करने में सुगम बनाने हेतु इस संस्थान के तीन स्तरीय विस्तारण कार्य-तंत्र हैं - क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्र (क्षे रे अ कें), अनुसंधान विस्तारण केंद्र (अ वि कें) और उपएकक। दक्षिणी राज्यों के मुख्य रेशम उत्पादन अंचलों स्थित क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्र क्षेत्र विशेष के अनुकूल और प्रायोगिक अनुसंधान संचालित करते हैं। कृषकों और विस्तारण कर्मचारियों को प्रशिक्षित करने के अतिरिक्त क्षेत्रीय आवश्यकताओं के लिए उपर्युक्त प्रौद्योगिकियों की सिफारिश करने हेतु प्रौद्योगिकी परीक्षण किया जाता है। लाभार्थियों को प्रौद्योगिकी का स्थानांतरण करना और उनकी सहायता के लिए सभी प्रौद्योगिक निवेश देने का उत्तरदायित्व अनुसंधान विस्तारण केंद्र एवं उप-एककों का है। महाराष्ट्र एवं मध्यप्रदेश के साथ दक्षिण राज्यों में भी द्विप्रज रेशम उत्पादन को बढ़ावा देने हेतु कें रे अ प्र सं, मैसूरू, 106 समूहों (समूह संवर्धन कार्यक्रम) और ग्यारह सं ग्रा सं का केंद्रों का समन्वयन करता है। राज्य रेशम उत्पादन विभागों के तकनीकी कार्मिकों के समन्वयन से प्रौद्योगिकियों का प्रभावी स्थानांतरण किया गया है।

प्रशिक्षण केंद्र

इस संस्थान को उष्णकटिबंधीय रेशम उत्पादन के क्षेत्र में प्रशिक्षित मानव संसाधन विकसित करने हेतु अग्रगामी केंद्र के रूप में मान्यता प्राप्त है। यह राष्ट्रीय एवं अंतर्राष्ट्रीय स्तर पर उष्णकटिबंधीय रेशम उत्पादन में प्रशिक्षण देता है। यह संस्थान रेशम उत्पादन प्रौद्योगिकी एवं जैव सूचना विज्ञान में अनुसंधान एवं रेशम उत्पादन में पीएच डी कार्यक्रम संचालित करने हेतु मैसूरू विश्वविद्यालय से संबद्ध है। यह संस्थान ग्रामीण गरीब लोगों, कमजोर वर्गों और महिला रेशम उत्पादकों के सामाजिक-आर्थिक विकास के लिए और प्रौद्योगिक सशक्तिकरण हेतु जैव प्रौद्योगिकी विभाग एवं विज्ञान व प्रौद्योगिकी विभाग, भारत सरकार द्वारा प्रायोजित विभिन्न प्रशिक्षण कार्यक्रम संचालित करते हैं। यह संस्थान राज्य रेशम उत्पादन विभागों की मानव संसाधन विकास आवश्यकताओं को पूरा करने के अलावा जापान अंतर्राष्ट्रीय रेशम उत्पादन प्रशिक्षण कार्यक्रम भी संचालित कर रहा है। प्रशिक्षण स्कंध में दृश्य-श्रव्य शिक्षण उपस्करों से सुसज्जित कक्षाएँ हैं और योग्य संकाय सदस्यों द्वारा कार्यक्रम संचालित किए जाते हैं। करीब 125 व्यक्तियों को ठहराने हेतु छात्रावास सुविधाएँ उपलब्ध हैं।

अवसंरचना सुविधाएँ

- रेशम उत्पादन विज्ञान में उन्नत अनुसंधान संचालित करने हेतु सुसज्जित प्रयोगशालाएँ, शहत्तूत बाग और कीटपालनगृह।
- प्रौद्योगिकी मान्यकरण एवं किसानों को प्रशिक्षण देने हेतु बड़े पैमाने पर कीटपालन गृह।
- चाँकी कीटपालन केंद्र संकल्पना को बढ़ावा देने हेतु आदर्श चाँकी कीटपालन केंद्र।

- यंत्रों/उपस्करों के अभिकल्प एवं विकास तथा संरचना को समर्थित करने हेतु सभी सुविधाओं से युक्त रेशम उत्पादन अभियांत्रिकी प्रभाग ।
- संबद्ध एककों, रेशम उत्पादन विभागों और अन्य संगठनों के साथ प्रभावी पारस्परिक संपर्क के लिए कें रे अ प्र सं, मैसूरु में संस्थापित विडियो सम्मेलन स्टुडियो, प्रौद्योगिकी का तेजी से संप्रेषण एवं प्रभावी स्थानांतरण सुनिश्चित करता है ।
- कंप्यूटर सेन्टर द्वारा लान के माध्यम से प्रिंट/फाइल शेयर समर्थन सहित सभी को इन्टरनेट कनेक्शन दिया गया है।
- जैव सूचना विज्ञान केंद्र आंकड़े संचय की पुनः प्राप्ति सेवा प्रदान करता है ।
- पुस्तकालय सेवाएँ (10920 पुस्तकें, 7189 वैज्ञानिक पत्रिकाओं का बंध खंड, 80 पत्रिकाएँ, शोध पत्र 292, प्रबंध-33 तकनीकी रिपोर्ट एवं सीडी रॉम डेटा बेस-एग्रिस, बयोसिस बयोटेक्नॉलजी साइटेशन इन्डेक्स, एकस्व) ।

ABOUT CSRTI-MYSURU

The Central Sericultural Research & Training Institute (CSRTI), Mysuru was established under the aegis of Central Silk Board, Ministry of Textiles: Govt. of India. The institute started functioning at Channapattana in the year 1961 after taking over the Sericulture Research Institute of erstwhile Mysore province and later shifted to Mysuru in the year 1963. With the inclusion of training component, the Institute was renamed as 'Central Sericultural Research & Training Institute (CSRTI), Mysore' in the year 1965. The Institute has completed >60 years of dedicated service for the development of sericultural industry in the country. The Institute is accredited with ISO 9001: 2008 certification (2013) as a testimony of excellence in quality management in R&D, training and service support to sericulture Industry.

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

Vision	
To become an International Sericulture Institute <i>par excellence</i> in Bivoltine Sericulture	
Mission	Objectives
To achieve excellence in application oriented research to transform Indian Sericulture industry from the subsistence level of production to a vibrant competitive commercial production base	<ul style="list-style-type: none"> ● Research to enhance production, productivity and quality of Indian silk ● Development of package of practices for mulberry and silkworm rearing ● Commercialization of products and technologies ● Transfer of technology ● Enhance production of import substitute silk through transfer of technology ● Training ● Strengthening institutional framework to support research programmes ● Maintenance of breeders stock ● Disease forecasting and forewarning ● Publication of R&D innovations and package of practices ● Collaborative research with other R&D organizations in India and abroad

Organization Setup

CSRTI-Mysuru is the largest and most diversified institution engaged in sericulture R&D in the country, supported by about 150 scientists of various disciplines including agricultural engineers, sociologists and economists. These personnel working in close coordination for the development of appropriate technologies and their transfer through the main institute and its nested units spread in the states of Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Maharashtra and Madhya Pradesh. R&D activities and technology development are carried out in four major divisions: Host Plant Production & Protection, Silkworm Production & Protection, Extension and Training. CSRTI-Mysuru also utilizes the services of several able technical and administrative staff in undertaking the mandated activities. The Director monitors the progress of R&D activities of Institute and nested units with the support of Planning, Monitoring, Coordination and Evaluation cell. CSRTI-Mysuru regularly publishes books, bulletins, leaflets and technical pamphlets. Over 35 books have been brought out so far in addition to large number of technical and research papers published in leading national and international journals. The institute has the distinction of publishing Indian Journal of Sericulture, a biannual journal of international repute and Seridoc - documenting literature on sericultural sciences.

Extension Network

CSRTI-Mysuru has a three-tier system of extension network: Regional Sericultural Research Stations (RSRS), Research Extension Centres (REC) and Sub-Units (REC-SU) to facilitate validation and translation of laboratory findings effectively to the field. RSRSs are located in major sericultural zones of southern states carryout region-specific adaptive and applied research. Technology trials are also conducted to suit the regional requirements besides providing training to farmers and grassroot level extension staff. RECs and sub-units share the major responsibility of technology transfer to the beneficiaries and also provide technological inputs and support services. CSRTI-Mysuru coordinates 106 clusters (Cluster Promotion Programme) and eleven IVLP centers for the promotion of bivoltine sericulture in Southern States along with Maharashtra and Madhya Pradesh. Effective transfer of technologies is undertaken in close coordination with technical personnel of State Departments of Sericulture.

Training Centre

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

Infrastructure Facilities

- Well-equipped laboratories, mulberry gardens and rearing houses to carry out advanced research
- Large scale rearing houses for technology validation and farmers' training
- Model chawki rearing centre (CRC) to promote the concept of CRC
- Engineering Division with excellent facilities to support designing, development and fabrication of machines/equipments
- Video Conference Studio @ CSRTI, Mysuru ensures faster communication and efficient transfer of technology for effective interactions with nested units, DOSs and other organizations
- Computer center provides internet connectivity to all through LAN with print/file share support
- Bioinformatics Center (NBN Sub-DIC: DBT) provides database retrieval services
- Library Services (10920 books; 7189 bound volumes of scientific journals; 80 journals; dissertations- 292; theses-33; technical reports and CD-ROM database-AGRIS, BIOSIS, BIOTECHNOLOGY CITATION INDEX, EKASWA)

अनुसंधान प्रशिक्षण एवं विस्तार कार्यकलापों के मुख्यांश

आंध्रप्रदेश, कर्नाटक, केरल, तमिलनाडु, तेलंगाना महाराष्ट्र एवं मध्यप्रदेश राज्यों के शहतूत रेशम उत्पादन कृषकों की आवश्यकताओं की पूर्ति करने हेतु प्रौद्योगिकियाँ विकसित करने के लिए शहतूत और रेशमकीट प्रजनन, उत्पादन एवं संरक्षण, प्रौद्योगिकी स्थानान्तरण, विस्तारण एवं प्रशिक्षण कार्यकलापों पर अनुसंधान एवं विकास कार्यक्रम संचालित किए गए हैं। राष्ट्र में द्विप्रज समूह संवर्धन कार्यक्रम के माध्यम से प्रमुख समूहों में 2772 मी ट द्विप्रज कच्चा रेशम उत्पादित करके 98.6% उत्पादन दर्ज किया गया जो रिकार्ड है। मुख्य संस्थान तथा संबद्ध एककों की प्रमुख उपलब्धियाँ निम्नानुसार हैं।

शहतूत फसल विकास उत्पादन एवं संरक्षण

- वर्षाश्रित अर्ध शुष्क, स्थितियों के लिए उपयुक्त नई शहतूत उपजाति एम एस जी-2 को वाणिज्यिक उपयोग हेतु विमोचित किया गया और इस उपजाति की उपज क्षमता 22.7 मी ट/हे/वर्ष है जबकि विद्यमान उपजाति एस 13 की उपज क्षमता 13 मी ट है।
- 43 शहतूत उपजातियों से चयनित 48 प्रामाणिक निरूपों का विश्लेषण करके शहतूत के लिए डीयूएस (विशिष्टता, समानता, स्थिरता) दिशानिर्देश विकसित किए गए और पी पी वी एवं एफ, आर.ए, नई दिल्ली (पादप उपजाति संरक्षण एवं कृषक अधिकार प्राधिकारी) को प्रस्तुत किया गया।
- मूल विगलन रोग प्रतिरोध के लिए अपसारी (20 प्रतिरोधी एवं 49 अधिक सेवेदनशील) शहतूत जननद्रव्य को पहचाना गया। 20 पोलिमोर्फिक एस एस आर चिह्नों का उपयोग करते हुए मूल विगलन रोग प्रतिरोध के लिए छियानवे जीनप्ररूपों का अभिलक्षणन किया गया।
- मूल विगलन एवं मूलगांठ रोगों के लिए 10 प्रतिरोधी एवं 5 अधिक उत्पादक जीनप्ररूपों से नियंत्रित संकरण द्वारा सृजित > 10,000 संकर जीवसंख्याओं से कृत्रिम संरोप द्वारा 1091 आशाजनक संकरों का चयन किया गया।
- जैव-सूत्र कृमिनाशी निमहारी के क्षेत्र मूल्यांकन का परिणाम निकाला कि मूल गांठ रोग 80% तक कम होकर पत्ती उपज में 80% (15-18%) वृद्धि हुई।
- मूल विगलन रोग के विरुद्ध वानस्पतिकों एवं वैकल्पिक कवकनाशियों से युक्त नया सूत्र विकसित किया गया जिसकी 88-94% रोग उन्मूलन क्षमता है।
- जी-2 (चॉकी) एवं जी-4 (उत्तरावस्था) शहतूत उपजातियों को लोकप्रिय बनाने हेतु बीज बागानों की स्थापना की गई। लगभग 900 एकड़ के लिए कृषकों को रोपण सामग्री वितरित की गई। लगभग 900 एकड़ों के लिए रोपण सामग्री कृषकों को वितरित की गई।

रेशमकीट फसल विकास, उत्पादन एवं संरक्षण

- द्विप्रज एकल संकर सी.एस.आर 16 x सी एस आर 17 को प्राधिकरण उत्तर परीक्षणों के बाद राष्ट्रीय रेशमकीट बीज संगठन की वाणिज्यिक बीज उत्पादन प्रणाली के अंतर्गत लाया गया।
- आंध्र प्रदेश, कर्नाटक, तमिलनाडु, तेलंगाना एवं महाराष्ट्र में द्विप्रज द्विसंकर जी 11 x जी 19 के 4.03 लाख रो मु बी चकत्तों का प्राधिकरण परीक्षण करने पर 67.11 कि.ग्रा/100 रो मु बी चकत्तों की औसतन उपज दर्ज की गई जिसकी 2ए - 3ए कोटि का रेशम उत्पादन क्षमता है।
- एस एस आर चिह्नों के सहारे किए गए चयन का उपयोग करते हुए तीन ताप सहनशील संकर यथा द्वि टी टी21 x टी टी67 एवं टी टी23 x टी टी67 एकल टी टी2 x टी टी6 विकसित किए गए। 60-70 कि ग्रा/100 रो मु बी चकत्तों की कोसा उपज, (22-23%) कोसा कवच, (88-90%) धागाकरण क्षमता, (15-17%) कच्चा रेशम आदि इन संकरों की विशेषताएँ हैं।

- उच्च तापमान सहनशील दो उन्नत संकरबीज एल 3 x एस 8 और एच बी 4 x एस 8 विकसित किए गए जिसकी प्यूपीय दर > 90%, कोसा कवच 20-21% और कच्चा रेशम 14-15% है।
- आंध्रप्रदेश, कर्नाटक और तमिलनाडु में उत्पादक द्विप्रज एकल संकर एस 8 x सी एस आर 16 का क्षेत्र मूल्यांकन करने पर 74.64/100 रो मु बी चकत्तों की औसतन उपज दर्ज की गई। बेहतर कच्चा रेशम प्राप्ति (19.5%) एवं रैंडिट्टा सहित (5.0 x 5.5) उच्च कोसा बजन (2.12 ग्रा), कोसा कवच वजन (23.75% की दर से 0.502ग्रा), तंतु लंबाई (1175 मी), धागाकरण क्षमता (>90%) स्वच्छता (5.0 - 5.5) आदि इस संकर की विशेषताएँ हैं।
- तमिलनाडु में अनुकूल स्थितियों के लिए उपयुक्त उत्पादक द्विप्रज संकर एस एस बी एस-5 x एस एस बी एस-6 का क्षेत्र मूल्यांकन करने पर 70-75 कि.ग्रा./100 रो मु बी चकत्तों की औसतन उपज दर्ज की गई।
- नए विकसित उन्नत संकर नस्ल कावेरी गोल्ड (एम वी1 x एस 8) के 35, 300 रोग मुक्त बीज चकत्तों का 153 कृषकों को सम्मिलित करते हुए कोसा उत्पादकता एवं रेशम गुणवत्ता के लिए क्षेत्र मूल्यांकन किए जाने पर 60-65 कि ग्रा/100 रो म बी चकत्तों की औसतन उपज दर्ज की गई।
- द्विप्रज संकरों एफ सी 3 x एफ सी 4, और सी एस आर 50 x सी एस आर 51 को लोकप्रिय बनाने हेतु परीक्षण किया गया जिससे यथाक्रम 68.18 और 67.11 कि.ग्रा./100 रो मु बी चकत्तों की औसतन उपज दर्ज की गई।
- बी एम एन ओ एक्स चिह्नक के सहारे चयन करके विकसित बी एम एन ओ एक्स बी एम एन पी वी सहनशील संकरों (एकल 21 x 35 द्वि 21.118 x 62.87 और 21.27 x 62.26) का केंद्र पर परीक्षण किए जाने पर 65.75 कि.ग्रा./100 रो मु बी चकत्तों की औसतन उपज सहित आशाजनक परिणाम दर्शाया।
- ट्रान्सजेनिक बी.एम एन पी वी प्रतिरोधी रेशमकीटों का बहुस्थानीय क्षेत्र परीक्षण प्रारंभ किया गया और ट्रान्सजेनिक संकर (सी एस आर टी x सी एस आर 4) के दो फसल ऑकड़ोंने मानक की तुलना में बेहतर (6.7%) कोसा उपज (61.64 कि.ग्रा./100 रो मु बी च) दर्शाई।
- हवा टनल अध्ययनों के माध्यम से ऊजी मक्खी (एक्सोरिस्टा बोम्बिसिस) को आकर्षित करने में ट्राइकोसिन, ट्राइकोसेन और पेन्टाकोसेन को आशाजनक पाया गया।
- ऊजी मक्खी और मीली बग नियंत्रण के लिए नेसोलिक्स थाइमस (~703 लाख) और क्रिप्टोलीमस मोट्रोजिरी (~ 1.6 लाख) की आपूर्ति की गई जिसके परिणामस्वरूप ई टी एल के नीचे पीड़क प्रकोप प्रबंधन कर पाया।
- संदूषित रेशमकीट अंडों, कीटपालन ट्रे तथा कीटपालनगृह का विसंक्रमण करने हेतु 0.2% की दर से एक नए सामान्य विसंक्रामक सेरिफिट को प्रभावी पाया गया। परामर्शी परियोजना कार्यक्रम के अंतर्गत सर्वश्री श्री रायलसीम हाई स्ट्रेंथ, हाइपो लिमिटेड, कर्नूल के साथ संयुक्त रूप से इस उत्पाद विकसित किया गया।
- रेशमकीटों में पी सी आर और इलेक्ट्रोफोरेसिस के किए बिना विशेष प्राइमरों का उपयोग करते हुए नोसेमा बोम्बिसिस को पहचानने हेतु लैम्प, (लूप - पोषण पदार्थ समतापीय प्रवर्धन) विधि विकसित की गई।
- दक्षिण भारत में मूल बीज फार्मी, रेशम उत्पादन विभागों एवं कें रे बो में किए रेशमकीट रोग अनुवीक्षण से ग्रैसरी (0.01 - 0.81%), फ्लैचरी (0.14 - 1.14%), मस्कार्डिन (0.04 - 0.18%) और पेब्रिन (तमिलनाडु में 0.06%) प्रकोप साबित हुआ। द्विप्रज समूहों में ग्रैसरी (0.04-3.12%), फ्लैचरी (0.66-2.81%) एवं मस्कार्डिन (0.05-0.11%) का औसतन प्रकोप रहा।

प्रौद्योगिकी स्थानांतरण

- आंध्र प्रदेश, कर्नाटक, केरल, तमिलनाडु, तेलंगाना और महाराष्ट्र में द्विप्रज समूह संवर्धन कार्यक्रम (106 समूह) के माध्यम से 256.73 लाख रो मु बी चकत्तों का कीटपालन करने पर 70.18 कि.ग्रा./ 100 रो मु बी चकत्तों की औसतन कोसा उपज के साथ 2772 मे ट द्विप्रज कच्चा रेशम उत्पादित किया गया।

- कर्नाटक, तमिलनाडु, आंध्रप्रदेश, तेलंगाना एवं महाराष्ट्र में सं गा सं का के अंतर्गत विशिष्ट प्रौद्योगिकियों को 100% अपनाते हुए द्विप्रज संकरों के 8.47 लाख रो मु बी चकत्तों का पालन करने पर कोसा उपज में 13.55% वृद्धि हुई।
- द्विप्रज कीटपालन, शहतूत एवं रेशमकीट प्रबंधन और गुणात्मक कोसा उत्पादन में 1083 विस्तार संचारण कार्यक्रम संचालित करके 36, 562 रेशम उत्पादकों को प्रभावित किया गया।
- चोंकी कीटपालन में उद्यमियों को प्रशिक्षण देने में आदर्श चोंकी कीटपालन केंद्र एकक को सम्मिलित किया गया था । 32 सत्रों में 87,550 रो मु बी चकत्तों का चोंकी पालन करके 68 गांवों में 195 कृषकों को आपूर्ति किया गया, फलस्वरूप कोसा उपज में 9.4% वृद्धि हुई (औसतन कोसा उपज 71.15 कि.ग्रा/100 रो मु बी चकत्ते)।
- राष्ट्रीय अनुसंधान विकास निगम, भारत सरकार द्वारा प्रायोजित उद्यमी विकास कार्यक्रम कार्यान्वित करके 10 लाभार्थियों को कोसा हार्वैस्टर्स की आपूर्ति की गई।
- उत्तरावस्था रेशम कीटपालन के लिए सर्वश्री कन्सेप्ट कंपोनेन्ट्स, मैसूरु के साथ संयुक्त रूप से पी वी सी स्टैंड विकसित किया गया ।
- सार्क क्षेत्र में रेशम उत्पादन उद्योग की संभावनाओं और चुनौतियों की विस्तृत समीक्षा करने हेतु सार्क कृषि केंद्र और अंतर्राष्ट्रीय रेशम उत्पादन आयोग द्वारा "सार्क क्षेत्र में रेशम उत्पादन परिदृश्य सार्क क्षेत्र में गरीबी उन्मूलन के लिए उभरता उद्योग (24.28 अगस्त 2015)" पर क्षेत्रीय परामर्शी बैठक आयोजित की गई।
- आगामी दो वर्षों में शहतूत, एरी, तसर एवं मूगा रेशमकीटों में प्रजनन कार्यक्रमों/कार्यकलापों की कार्य योजना को अंतिम रूप देने हेतु रेशमकीट प्रजनन बैठक (29 सितंबर 2015) आयोजित की गई।
- 22 राज्यों के 59 श्रेष्ठ रेशम उत्पादन निष्पादकों का सम्मान करने तथा उत्तम रेशम उत्पादन प्रयोगों के विनिमय को सुकर बनाने हेतु वस्त्र मंत्रालय द्वारा रेशम उत्पादन में अभिनव प्रौद्योगिकियों और उत्तम प्रयोग पर (17 एवं 18 नवंबर 2015) कार्यशाला आयोजित की गई।
- हावेरी (कर्नाटक), हिन्दुपुर (आंध्र प्रदेश), होसूर (तमिल नाडु) एवं बारामती (महाराष्ट्र) में रेशम उत्पादन कृषक कार्यशाला आयोजित की गई और 3275 कृषकों को उन्नत शहतूत रेशम उत्पादन प्रौद्योगिकियों से अवगत कराया।
- कृषकों तथा पदधारियों के लाभ के लिए वाणिज्यिक चोंकी कीट पालन, शहतूत रेशम उत्पादन के लिए एकीकृत सूखा प्रबंधन, शहतूत रेशम उत्पादन में कीट पीड़कों का जैव नियंत्रण पर तकनीकी पुस्तकें प्रकाशित की गई।

एकस्व और वाणिज्यीकरण

सर्वश्री एस वी रिन्यूबिल ऊर्जा, बेंगलूरु के सहयोग से "रेशम उत्पादन रद्दी जैव द्रव्य की उपयोगिता - बिजली निर्मित करने तथा जैव खाद उत्पादित करने हेतु सक्षम संसाधन" शीर्षक संयुक्त प्रौद्योगिकी पर एकस्व आवेदन को रा अ वि नि (दि 18.01.2016 का एकस्व आवेदन पत्र सं. 20162001688) के माध्यम से प्रस्तुत किया गया।

- हस्त चालित परिपक्व कीट पृथककारक एवं संग्राहक (एकस्व सं. 266685), पाद चालित मिश्र कोसा एकत्र यंत्र (एकस्व सं. 267244) और कोसा उत्पादित करने हेतु उपयोग की जाने वाली चंद्रिका के लिए एकस्व प्राप्त हुए जिन्हें 2007 के दौरान फाइल किया गया था।
- वाणिज्यिक उत्पादन हेतु सर्वश्री श्री रायलसीमा हाइ स्ट्रेंगथ हाइपो लिमिटेड, कर्नूल, आंध्र प्रदेश के साथ संयुक्त रूप से नया विसंक्रामक सेरिफिट विमोचित किया गया।
- निमाहारी - एक जैव सूत्र कृमिनाशी को उत्पादित करने तथा रेशम उत्पादन कृषकों को वितरित करने हेतु रा अ वि नि के माध्यम से निमाहारी को वाणिज्यीकृत करने हेतु सर्वश्री रेडनबो एग्रि लाइफ प्राइवेट लिमिटेड, आंध्र प्रदेश को दिया गया।

क्षमता निर्माण एवं प्रशिक्षण

- मुख्य संस्थान और संबद्ध एककों में क्षमता निर्माण एवं प्रशिक्षण- प्रौद्योगिकी अभिविन्यास कार्यक्रम के अंतर्गत 1622 लाभार्थियों (रेशम उत्पादक एवं पदधारी) को प्रशिक्षित किया गया।
- गहन द्विप्रज प्रौद्योगिकी, चॉकी कीटपालन, जैव नियंत्रण कारक उत्पादन, एकीकृत पीड़क व रोग प्रबंधन के अंतर्गत 371 लाभार्थियों को (कृषक, उद्यमी एवं पदधारी) प्रशिक्षित किया गया।
- रेशमकीट प्रजाति अनुरक्षण कार्यक्रम में 14 कें रे बो/रे उ वि पदधारी प्रशिक्षित हुए (60 दिन)।
कें रे बो में भर्ती किए गए 59 नए युवा वैज्ञानिकों को शहतूत रेशम उत्पादन में बुनियादी प्रशिक्षण (6 दिन) और तीन जापान समुद्रपार सहकारी (जा आ स अ) स्वयं सेवकों (30 दिन) और 21 पी जी डी एस छात्रों (5 दिन)के लिए अभिविन्यास पाठ्यक्रम संचालित किए गए।
- थाइलैन्ड, बंगलादेश, ईजिप्त, फ्लिपीन्स एवं उगांडा के 14 प्रशिक्षणार्थियों के लिए भारतीय तकनीकी एवं आर्थिक सहकारी कार्यक्रम (विदेश मंत्रालय) द्वारा प्रायोजित रेशम एवं रेशम उत्पादन उद्योग में अंतर्राष्ट्रीय प्रशिक्षण कार्यक्रम आयोजित किया गया।
- आई एस सी (अंतर्राष्ट्रीय रेशम उत्पादन आयोग) द्वारा प्रयोजित दो ईजिप्टी अनुसंधायकों को रेशमकीट शरीरक्रिया विज्ञान एवं रेशमकीट रोग विज्ञान में उन्नत प्रौद्योगिकी में प्रशिक्षित किया गया (एक महीना)।

क्षेत्रीय रेशम उत्पादन अनुसंधान केंद्रों की उपलब्धियाँ

क्षे रे अ कें, अनंतपुर, आंध्र प्रदेश

- 1286 कृषकों के साथ 1874.50 एकड़ में नई उपजातियों का शहतूत पौधरोपण किया गया ।
- 436 कृषकों के साथ नए द्विप्रज संकरों (जी 11 x जी 19, एफ सी 1 x एफ सी 2, एफ सी 2 x एफ सी 3 और सी एस आर 16 x सी एस आर 17) के 1.30 लाख रो मु बी च का मूल्यांकन परीक्षण करने पर 68.34 कि.ग्रा/100 रो मु बी चकत्तों की औसतन उपज दर्ज की गई।
- मुख्य पीड़कों का पाक्षिक सर्वेक्षण करने पर 10.0 – 23.6% पत्ती रोलर 5.0 – 13.5% टुकरा एवं 0.5 – 6.5% थिप्स प्रकोप पाया गया ।
- जैव नियंत्रण कारक नेसोलिंक्स थाइमस की आपूर्ति कर ऊजी प्रकोप को 13.5 – 16% से < 5% तक कम किया गया।
- स सं का के अंतर्गत 21,821 कृषकों के साथ द्विप्रज संकरों के 63.66 लाख रो मु बी चकत्तों का पालन करने पर 69.54 कि.ग्रा/100 रो मु बी चकत्तों की औसतन कोसा उपज दर्ज की गई । सं ग्रा सं कार्यक्रम के अंतर्गत 200 कृषकों के साथ द्विप्रज संकरों के 85,500 रो मु बी चकत्तों का पालन किया गया और 69.54 कि ग्रा/100 रो मु बी चकत्तों की औसतन उपज प्राप्त हुई।
- राज्य स्तरीय रेशम उत्पादन कृषक कार्यशाला और 123 विस्तारण संचार कार्यक्रमों के माध्यम से 5214 कृषकों को रेशम उत्पादन प्रौद्योगिकियों से अवगत किया गया।

क्षे रे अ कें, चामराजनगर, कर्नाटक

- 19.75 एकड़ नए बागान में 11 कृषकों के बीच ए आर 12 एवं वी-1 शहतूत उपजातियों को लोकप्रिय बनाया गया ।
- आय वृद्धि के लिए सेरि लैक कृषि प्रणाली को रेशम उत्पादन कृषकों के साथ सफलतापूर्वक प्रदर्शित करके रु. 2.00 लाख / एकड़/वर्ष प्राप्त किया गया।

- चौबीस कृषकों ने शहतूत वृक्ष कृषि के लिए 8' x 8' अंतराल में एस 13 पादपों का रोपण किया 35 कृषकों ने सं ग्र सं कार्यक्रम के अंतर्गत वृक्ष शहतूत बागान के लिए सूक्ष्म सिंचाई प्रौद्योगिकी (ए एम आई टी) अपनाई जिसका खर्च वे वहन कर सकते हैं।
- एन. थाइमस की आपूर्ति कर ऊजी मक्खी प्रकोप को 3.95% से 8.69% तक सीमित रखा गया। आगे एस. कोक्सिवोरा भ्रमरों से मीली बग प्रकोप को 13.5% से 7.6% तक कम किया गया।
- सं ग्र सं कार्यक्रम के अंतर्गत 835 कृषकों के साथ द्विप्रज संकरों के 1.89 लाख रो मु बी चकत्तों का पालन किया गया और 64.5 कि.ग्रा / 100 रो मु बी चकत्तों की औसतन कोसा उपज प्राप्त हुई।

क्षेत्र अ कैं, कोडति, कर्नाटक

- 100 मृदा प्रतिदर्शों का विश्लेषण कर कृषकों को मृदा संशोधन उपायों की सिफारिशें दी गईं।
- समूह संवर्धन कार्यक्रम के अंतर्गत 3016 कृषकों के साथ द्विप्रज संकरों के 90.01% लाख रोग मुक्त बीज चकत्तों का पालन करने पर 66.77 कि.ग्रा./100 रो मु बी चकत्तों की औसतन कोसा उपज दर्ज की गई।
- नए रेशमकीट संकरों (द्विप्रज : एस 8 x सी एस आर 16, जी 11 x जी 19, एफ सी 3 x एफसी 4, सी एस आर 50 x 51 और संकर नस्ल : एम वी 1 x एस 8 एवं एल 14 x सी एस आर 2 को लोकप्रिय बनाने का कार्य (93850 रो मु बी चकत्ते / 586 कृषक) किया गया।

क्षेत्र अ कैं, सेलम, तमिलनाडु

- 327 रेशम उत्पादन कृषकों को सम्मिलित कराकर 393 प्रतिदर्शों का मृदा परीक्षण संचालित किया गया और उचित मृदा सुधार उपाय सुझाए गए।
- प्रभावी नियंत्रण हेतु कृषकों के शहतूत बागान में थ्रिप्स (71400 अंडों) की प्राकृतिक शत्रु (क्राइसोपेरला जेस्ट्रोवि सिल्लेमी) को विमोचित किया गया।
- 240 रेशम उत्पादन कृषकों को सम्मिलित करते हुए परजीव्याओं को विमोचित करके पपाया मीली बग नियंत्रण उपाय जारी रखे गए और पाया गया कि 97% पीड़क कम हुआ।
- जैव नियंत्रण कारक यथा ट्राइकोग्रामा किलोनिस (114 सी सी) एवं ब्रॉकॉन (1,635 पॉकेट) टेक्ट्रास्टिकस हावर्डि (92 पॉकेट), क्रिप्टोलीमस मांटोजीरी (3000) साइमनस कोक्सिवोरा (8500) एवं नेसोलिंक्स थाइमस उत्पादित करके कृषकों को वितरित किया गया।
- नए द्विप्रज रेशमकीट संकरों (एस 8 x सी एस आर 16, जी 11 x जी 19, एफ सी 3 x एफ सी 4, सी एस आर 50 x 51, एस एस बी एस 5 x एस एस बी एस 6) के 1.31 लाख रो मु बी चकत्तों का पालन करके 68.23 कि ग्रा/100 रो मु बी चकत्तों की औसतन उपज प्राप्त हुई।
- समूह संवर्धन कार्यक्रम के अंतर्गत 30 समूहों में 72.38 लाख रो मु बी चकत्तों का पालन किया गया जबकि लक्ष्य 68.46 रहा (105.73% प्राप्ति) और देश में 76.76 कि ग्रा/100 रो मु बी चकत्तों की उच्चतम औसतन कोसा उपज दर्ज की गई।
- सं ग्र सं कार्यक्रम के अंतर्गत 200 कृषकों के साथ द्विप्रज संकरों के 2.76 लाख रो मु बी चकत्तों का पालन किया गया और 74.89 कि ग्रा/100 रो मु बी चकत्तों की औसतन उपज प्राप्त हुई जिससे उत्पादकता में 11.15% की वृद्धि हुई।

HIGHLIGHTS OF RESEARCH, TRAINING AND EXTENSION ACTIVITIES

The R&D programmes undertaken in mulberry and silkworm breeding, production and protection, transfer of technology, extension and training activities to develop technologies catering to the needs of mulberry sericulture farmers in the states of Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana, Maharashtra and Madhya Pradesh. A record quantity of 2772 MT bivoltine raw silk production was achieved in the command clusters accounting for 98.6% production through Bivoltine Cluster Promotion Programme in the country. The salient achievements of main institute and its nested units are as follows:

Mulberry Crop Improvement, Production and Protection

- MSG-2, a new mulberry variety for rainfed semi-arid conditions was released for commercial exploitation and the variety has a yield potential of 22.7 MT/ha/year against 13 MT from the existing variety, S13.
- DUS (Distinctiveness, Uniformity, Stability) guidelines for Mulberry were developed by analyzing 48 identified and validated descriptors with 43 example mulberry varieties and submitted to PPV & FRA (Protection of Plant Varieties & Farmers' Rights Authority), New Delhi.
- Divergent mulberry germplasm for root rot resistance (20 resistant & 49 highly susceptible) were identified. Ninety six genotypes were characterized for root rot resistance utilizing 20 polymorphic SSR markers.
- 1091 promising hybrids were short-listed through artificial inoculation from >10,000 hybrid populations generated from controlled crossing among 10 resistant and 5 high yielding genotypes for root rot and root knot diseases.
- Field evaluation of "Nemahari", a bio-nematicide resulted in the reduction of root knot disease upto 80% with an improved leaf yield (15-18%).
- A new formulation consisting of botanicals and alternative fungicides was developed against root rot disease with an efficacy of 88-94% disease suppression.
- Seed gardens for popularizing G2 (chawki) & G4 (late age) mulberry varieties were established. Planting material for about 900 acres was distributed to the farmers.

Silkworm Crop Improvement, Production and Protection

- CSR16 x CSR17, bivoltine single hybrid after successful post-authorization trials was introduced into the commercial seed production system of NSSO.
- Authorization trials of 4.03 lakh dfls of G11 x G19, bivoltine double hybrid recorded an average yield of 67.11 kg/100 dfls with 2A-3A graded silk in Andhra Pradesh, Karnataka, Tamil Nadu, Telangana and Maharashtra.
- Three thermo-tolerant bivoltine hybrids, Double: TT21 x TT67 & TT23 x TT67; Single: TT2 x TT6 were developed employing SSR marker assisted selection. The hybrids are characterized by cocoon yield of 60-70 kg/100 dfls, shell (22-23%), reelability (88-90%), raw silk (15-17%).
- Two improved crossbreeds, L3 x S8 and HB4 x S8 tolerant to high temperature and BmNPV were developed with a pupation rate of >90%, shell (20-21%) and raw silk (14-15%).
- Field evaluation of S8 x CSR16, productive bivoltine single hybrid recorded an average yield of 74.64 kg/100 dfls in Andhra Pradesh, Karnataka and Tamil Nadu. The hybrid is characterized by higher cocoon weight (2.12g), shell (0.502g @ 23.75%), filament length (1175m), reelability (>90%), neatness (95%) with better raw silk recovery (19.5%) and renditta (5.0-5.5).
- Field evaluation of SSBS5 x SSBS6, productive bivoltine double hybrid suitable for favourable conditions (6500 dfls/23 farmers) recorded an average yield of 70-75kg/100 dfls in Tamil Nadu.
- Field evaluation of newly developed Improved Crossbreed, Cauvery Gold (MV1 x S8) for cocoon

productivity and silk quality covering 35,300 dfls with 153 farmers recorded an average cocoon yield of 60-65 kg/100 dfls.

- Bivoltine hybrids, FC3 x FC4 and CSR50 x CSR51 were subjected to popularization trials, which recorded an average yield of 68.18 and 67.11 kg/100 dfls, respectively.
- On-Station-Trials of BmNOX BmNPV tolerant hybrids (single: 21x35; double: 21.118 x 62.87 and 21.27 x 62.26) developed through BmNOX marker assisted selection showed encouraging results with an average yield of 65-75kg/100 dfls.
- Multi-location field trials of transgenic BmNPV resistant silkworms was initiated and two crop data showed relatively better (6.7%) cocoon yield (61.64kg/100 dfls) transgenic hybrid (CSR2-T x CSR4) over control (57.75kg).
- Tricosene, Tricosane and Pentacosane were found promising in attracting the uzi fly (*Exorista bombycis*) through wind tunnel studies.
- Biological control agents, *Nesolynx thymus* (~703 lakh numbers) and *Cryptoleamus montrozeuri* (~1.6 lakh numbers) were supplied for uzi fly and Mealy bug control resulting in the management of pest incidence below ETL.
- SERIFIT, a new general disinfectant @ 0.2% was effective for the disinfection of contaminated silkworm eggs, rearing trays and rearing house. The product was jointly developed with M/s Sree Rayalaseem Hi-Strength Hypo Limited, Kurnool, A.P. on consultancy project programme.
- LAMP (Loop-Mediated Isothermal Amplification) method was developed for the detection of *Nosema bombycis* in silkworms using specific primers without involving PCR and Electrophoresis.
- Silkworm disease monitoring revealed an incidence of grasserie (0.01-0.81%), flacherie (0.14-1.14%), muscardine (0.04-0.18%) and pebrine (0.06% in Tamil Nadu) in the BSFs DoS and CSB in South India. The average incidence in bivoltine clusters was - grasserie (0.04-3.12%), flacherie (0.66-2.81%) and muscardine (0.05- 0.11%).

Transfer of Technology

- A record quantity of 2772 MT bivoltine raw silk was produced through Bivoltine Cluster Promotion Programme (106 clusters) in Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Telangana and Maharashtra from 256.73 lakh dfls rearing with an average cocoon yield of 70.18 kg /100 dfls.
- 8.47 lakh dfls of bivoltine hybrids were reared with an improvement of cocoon yield by 13.55% by 100% adoption of specified technologies under IVLP (Seri Model Village) Programme in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana and Maharashtra.
- 36,562 sericulturists were sensitized with new technologies through 1083 extension communication programmes in bivoltine rearing, mulberry and silkworm disease management and quality cocoon production.
- Model CRC unit was involved in training entrepreneurs in chawki rearing. 87,550 dfls were chawki reared in 32 batches and supplied to 195 farmers covering 68 villages resulting in an improvement of 9.4% cocoon yield (average cocoon yield: 71.15 kg/100 dfls).
- Implemented the entrepreneurial development programme sponsored by the National Research Development Corporation (NRDC), Govt. of India and supplied cocoon harvesters to 10 beneficiaries.
- PVC stands for late age Silkworm Rearing were jointly developed with M/S Concept Components, Mysuru.
- Regional Consultative Meet on “Sericulture Scenario in SAARC Region – A Re-Emerging Industry for Poverty Alleviation in SAARC Region” (24-28th August 2015) sponsored by SAARC Agriculture Centre (SAC) and International Sericulture Commission (ISC) was organized for a comprehensive review on potentials and challenges in sericultural industries in the region.

- Silkworm Breeders Meet (29th Sept 2015) was organized to finalize the action plan for breeding programmes/activities in mulberry, eri, tasar and muga silkworms to be undertaken in the next two years.
- A workshop on Innovative Technologies and Best Practices in Sericulture (17 & 18th November 2015) sponsored by Ministry of Textiles was organized to felicitate 59 Best Seri-Achievers from 22 states and for facilitating exchange of best sericulture practices.
- Sericulture Farmers' Workshops were organized in Haveri (Karnataka), Hindupur (Andhra Pradesh), Hosur (Tamil Nadu) and Baramati (Maharashtra) and 3275 farmers were enlightened with improved mulberry sericulture technologies.
- Technical books on Commercial Chawki Rearing, Integrated Drought Management for Mulberry Sericulture, Bio-Control of Insect Pests in Mulberry Sericulture were published for the benefit of farmers and officials.

Patents and Commercialization

- Patent application on "Utilization of Sericultural waste biomass - a potential resource for generation of electricity and production of bio-manure" – A joint technology in collaboration with M/s. SV Renewable Energy, Bangalore was filed through NRDC (Patent application No.20162001688 dated 18.01.2016).
- Patents were granted for "A hand operated mature worm separator and collector" (Patent No. 266685), "A pedal operated composite cocoon harvester" (Patent No. 267244) and "A moutage used for production of cocoons" (Patent No. 267245), which were filed during 2007.
- SERI FIT- a new disinfectant was released for commercial production jointly with M/s. Sree Rayalaseema Hi-Strength Hypo Ltd., Kurnool, Andhra Pradesh.
- NEMAHARI- a bionematicide formulation was commercialized to M/s. Rainbow Agri Life India Private Limited, Kadapa, Andhra Pradesh through NRDC for production and supply to sericulture farmers.

Capacity Building & Training

- 1622 beneficiaries (sericulturists and officials) were trained under Capacity Building & Training (CBT) - Technology Orientation Programme (TOP) in the main institute and its nested units.
- 371 beneficiaries (farmers, entrepreneurs and officials) were trained under need-based programmes including Intensive bivoltine technology, Chawki Rearing, Bio-Control Agent Production, Integrated Pest & Disease Management.
- 14 CSB/DoS officials were trained in Silkworm Race Maintenance programme (60 days).
- Foundation training (6 days) in mulberry sericulture for the 59 newly recruited CSB young scientists and Orientation courses for three JOCV (JICA) volunteers (30 days) and 21 PGDS students (5 days) were conducted.
- An International Training Programme in Silk and Sericulture Industry (45 days) sponsored by ITEC (Ministry of External Affairs), Govt. of India, New Delhi was organized for 14 trainees from Thailand, Bangladesh, Egypt, Philippines and Uganda.
- Two Egyptian researchers sponsored through ISC (International Sericultural Commission) Scholarships, were trained in advanced technology in Silkworm Physiology and Silkworm Pathology (One month).

Achievements of Regional Sericultural Research Stations

RSRS-Anantapur, Andhra Pradesh

- 1874.50 acres with 1286 farmers have been covered under mulberry plantation with new varieties.
- Evaluation trials of 1.30 lakh dfls of new bivoltine hybrids (G11 X G19, FC1x FC2, FC2 X FC3 and CSR16 X CSR17) with 436 farmers recorded an average cocoon yield of 68.34 kg/100dfls.

- The fortnightly survey of major pests showed 10.0-23.6% leaf roller, 5.0-13.5% tukra and 0.5-6.5% thrips incidence.
- Uzi infestation was reduced to <5% from 13.5-16% through the supply of bio-control agent, *Nesolynx thymus* (675 sachets /350 farmers /35 villages).
- Rearing of 63.66 lakhs dfls of bivoltine hybrids with 21,821 farmers under CPP recorded an average cocoon yield of 69.54 kg/100 dfls. Under IVLP programme 85,500 dfls of bivoltine hybrids were reared with 200 farmers recorded an average yield of 69.64 kg/100 dfls.
- 5214 farmers were sensitized with new sericulture technologies through state level sericulture farmers workshop and 123 extension communication programmes.

RSRS-Chamarajanagar, Karnataka

- AR12 and V1 mulberry varieties were popularized among 11 farmers covering 19.75 acres of new plantation.
- Seri-Lac Agro System for income augmentation with sericulture farmers was successfully demonstrated realizing upto Rs. 2.0 lakhs/acre/year.
- Twenty four farmers planted S13 saplings under 8' x 8' spacing for tree mulberry cultivation. 35 farmers adopted Affordable Micro-Irrigation Technology (AMIT) for tree mulberry plantation under IVLP programme.
- Uzi fly infestation was limited to 3.95% from 8.69% through the supply of *N. thymus*. Further, mealy bug infestation was contained to 7.6% from 13.15% with *S. coccivora* beetles.
- Under CPP programme, 1.89 lakh dfls of bivoltine hybrids were reared with 835 farmers and the average cocoon yield realized was 64.5 kg/100 dfls.

RSRS-Kodathi, Karnataka

- 100 soil samples were analyzed and soil correction measures were recommended to the farmers.
- Rearing of 90.01 lakhs dfls of bivoltine hybrids with 3016 farmers under CPP recorded an average cocoon yield of 66.77 kg/100 dfls.
- Under IVLP programme, 47,600 dfls of bivoltine hybrids were reared with 100 farmers and recorded an average cocoon yield of 63.15 kg/100 dfls.
- Popularization of new silkworm hybrids (Bivoltine: S8 x CSR16, G11 x G19, FC3 x FC4, CSR50 x 51 and Crossbreed: MV1 x S8 & L14 x CSR2) were undertaken (93850 dfls/586 farmers).

RSRS-Salem, Tamil Nadu

- Soil testing of 393 samples was conducted covering 327 sericulture farmers and suitable soil amelioration measures were suggested.
- Natural enemy (*Chrysoperla zastrowi sillemi*) of thrips (71,400 eggs) were released in the farmers mulberry gardens for effective control.
- Biological control measures for papaya mealybug were continued by through the release (63,266 individuals) of parasitoids covering 240 sericulture farmers and 97% pest reduction was observed.
- Mass multiplication of bio-control agents viz., *Trichogramma chilonis* (114 cc) and *Bracon* (1,635 pockets), *Tetrastichus howardi* (92 pockets), *Cryptolaemus montrozieri* (3000 nos), *Scymnus coccivora* (8500 nos) and *Nesolynx thymus* (226 pouches) were produced and supplied to the farmers.
- 1.31 lakh dfls of new bivoltine silkworm hybrids (S8 x CSR16, G11 x G19, FC3 x FC4, CSR50 x 51, SSBS5 x SSBS6) were reared with an average cocoon yield of 68.23 kg/100 dfls.
- 72.38 lakh dfls of bivoltine hybrids were reared in 30 clusters under CPP against the target of 68.46 lakh

(105.73 % achievement) and recorded the highest average cocoon yield @ 76.76 kg / 100 dfls in the country.

- 2.76 lakh dfls of bivoltine hybrids were reared under IVLP programme with 200 farmers and obtained an average yield of 74.89 kg / 100 dfls with a productivity improvement of 11-15%.

राजभाषा कार्यान्वयन संबंधी गतिविधियाँ

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान, मैसूरु में वर्ष 2015-16 के दौरान राजभाषा नीति का पूरा अनुपालन किया गया। राजभाषा अधिनियम की धारा 3(3) का शत प्रतिशत अनुपालन सुनिश्चित किया गया है। संस्थान में हर तिमाही में राजभाषा कार्यान्वयन समिति की बैठक का आयोजन कर राजभाषा प्रगति के बारे में समीक्षा की गई।

हिंदी कार्यशालाओं का आयोजन, हिंदी दिवस और पखवाड़े का आयोजन तथा हिंदी टिप्पण-आलेखन प्रोत्साहन योजना का कार्यान्वयन किया गया है।

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

1. **धारा 3(3) का अनुपालन:** राजभाषा अधिनियम 1963 की धारा 3(3) के अधीन आने वाले सभी कागजात द्विभाषी में जारी किए गए।
2. **नियम 11 का अनुपालन:** सभी फार्म, पत्रशीर्ष, रबड़ मोहरें, सूचनापट्ट, नाम पट्ट, लिफाफे, पहचान-पत्र, परिचय-पत्र आदि द्विभाषी हैं इन्हें सुनिश्चित करने हेतु जाँचबिंदु (भंडार अनुभाग, प्रेषण कक्ष और संबंधित अधिकारी के यहाँ) बनाए गए हैं।
3. **हिंदी पत्राचार:** वर्ष के दौरान क, ख तथा ग क्षेत्र स्थित केंद्रीय सरकारी कार्यालयों को क्रमशः 93%, 73 % और 66% तथा क व ख क्षेत्र स्थित राज्य सरकार के कार्यालयों/व्यक्तियों को 100% पत्र हिंदी में भेज कर पत्राचार लक्ष्य से अधिक प्रतिशत प्राप्त किया है।
4. **राजभाषा कार्यान्वयन समिति की बैठकों का आयोजन:** संस्थान में हर तिमाही में राजभाषा कार्यान्वयन समिति की बैठक का आयोजन कर राजभाषा प्रगामी प्रयोग के बारे में समीक्षा की गई। वर्ष 2015-16 के अंतर्गत दिनांक 02.06.2015, 22.08.2015, 19.12.2015 एवं 23.02.2016 को राजभाषा कार्यान्वयन समिति की बैठकें आयोजित की गईं तथा बैठकों में लिए गए निर्णय पर अनुवर्ती कार्रवाई की गई।

संस्थान के अधीनस्थ कार्यालयों के लिए भी दिनांक 28.04.2016 को राजभाषा कार्यान्वयन समिति की बैठक आयोजित की गई और राजभाषा कार्यान्वयन में हुई प्रगति के बारे में समीक्षा की गई।

5. **हिंदी कार्यशालाओं का आयोजन:** संस्थान के पदधारियों को सरकारी काम-काज में हिंदी का प्रयोग करने और साथ-साथ राजभाषा नीति की जानकारी देने के लिए प्रत्येक तिमाही में हिंदी कार्यशाला का आयोजन किया गया। तकनीकी तथा प्रशासनिक पदधारियों के साथ-साथ वैज्ञानिकों के लिए भी इस वर्ष के दौरान दिनांक 25.06.2015, 14.08.2015, 10.12.2015 और 09.02.2016 को अलग-अलग एक दिवसीय हिंदी कार्यशाला का आयोजन कर कुल 23 अधिकारियों व 26 कर्मचारियों को प्रशिक्षित किया गया।

6. **हिंदी टिप्पण-आलेखन प्रोत्साहन योजना का कार्यान्वयन:** संस्थान एवं इसके अधीनस्थ केंद्रों में कार्यरत अधिकारियों तथा कर्मचारियों को हिंदी में मूल रूप से काम करने को प्रोत्साहित करने के लिए केंद्रीय रेशम बोर्ड की उधारिकृत टिप्पण-आलेखन प्रोत्साहन योजना लागू की गई है जिसके अंतर्गत निर्धारित शब्द लिखने पर नकद पुरस्कार दिया जाता है। इस वर्ष के दौरान इस योजना के अंतर्गत संस्थान के 3 पदधारियों को दिनांक 15.09.2015 को आयोजित राजभाषा पखवाड़ा समापन समारोह में नकद पुरस्कार वितरित किए गए, उनके अलावा अधीनस्थ कार्यालयों के 12 पदधारियों को भी इस योजना के अंतर्गत पुरस्कार प्राप्त हुआ है।
7. **वैज्ञानिक क्षेत्र में हिंदी का प्रयोग:** दिनांक 17 नवंबर 2015 को संस्थान में "रेशम उत्पादन में अभिनव प्रौद्योगिकियाँ और उत्तम प्रयोग" पर आयोजित कार्यशाला के दौरान 13 चौपन्नों को द्विभाषी में मुद्रित करके कृषकों को वितरित किया गया।
8. **हिंदी प्रकाशन:** संस्थान की वार्षिक रिपोर्ट अंशतः द्विभाषी में और प्रशिक्षण कैलेंडर द्विभाषी में प्रकाशित किए गए।
9. **राजभाषा नियम 10(4) के अंतर्गत अधीनस्थ कार्यालयों को अधिसूचित किया जाना:** जिन कार्यालयों में हिंदी में कार्यसाधक ज्ञान रखने वालों का प्रतिशत 80 हो जाता है उन कार्यालयों को मंत्रालय द्वारा राजभाषा नियम 10(4) के अधीन अधिसूचित किया जाता है। इस दिशा में इस संस्थान के अलावा 06 अधीनस्थ कार्यालयों को अधिसूचित कराया जा चुका है।
10. **हिंदी प्रतियोगिताओं का आयोजन:** संस्थान में दिनांक 01.09.2015 से 15.09.2015 तक राजभाषा पखवाड़ा मनाया गया जिस दौरान 10 विभिन्न हिंदी प्रतियोगिताओं यथा सहीलेखन, श्रुतलेखन, स्मृति परीक्षण, सामूहिक चर्चा, वाक् प्रतियोगिता, टिप्पण-आलेखन एवं प्रशासनिक शब्दावली, तकनीकी शब्दावली, गीत, तस्वीर क्या बोलती है? और अंत्याक्षरी प्रतियोगिताओं का आयोजन किया गया। प्रत्येक प्रतियोगिता के विजेताओं को प्रथम, द्वितीय, तृतीय एवं सांत्वना पुरस्कार नकद रूप में दिया गया।
11. **कंप्यूटर पर हिंदी में कार्य:** धारा 3(3) का अनुपालन, फार्म/प्रपत्र, मानक मसौदे, तिमाही रिपोर्ट तथा मूल्यांकन रिपोर्ट, बैठकों की कार्यवाही संबंधी कार्य कंप्यूटर पर सुचारु रूप से किया जा रहा है। संस्थान में सभी अभिकलित्रों में यूनिकोड की व्यवस्था है जिससे हिंदी, अंग्रेजी तथा अन्य भारतीय भाषाओं में काम करने में सुविधा हुई है।
12. **प्रशिक्षण:** एक अधिकारी को केंद्रीय हिंदी प्रशिक्षण संस्थान, नई दिल्ली द्वारा प्रबोध पाठ्यक्रम में प्रशिक्षित किया गया है।
13. **निरीक्षण:** अधीनस्थ कार्यालयों में राजभाषा कार्यान्वयन की प्रगति की समीक्षा करने और तदनुसार आवश्यक सुझाव और मार्गदर्शन देने के लिए उनका निरीक्षण किया जाता है। रिपोर्टाधीन वर्ष में कुल 4 कार्यालयों का निरीक्षण किया गया है।

ACTIVITIES REGARDING OFFICIAL LANGUAGE IMPLEMENTATION

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

Organisation of Hindi workshops, Hindi day, Hindi fortnight, Publication of Hindi magazine have been done and Hindi Noting-drafting Incentive Scheme has been implemented.

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

1. **Compliance of Section 3(3):** All the papers coming under section 3(3) of the Official Language Act 1963 have been issued in bilingual.
2. **Compliance of Rule 11:** All types of forms, letter heads, Rubber Stamps, Sign Boards, Name plates, Envelopes, Identity Cards, Visiting cards etc are bilingual. Check points (at Xerox Cell, Stores Section, Despatch Section and the concerned officer) have been devised to ensure the same bilingual.
3. **Hindi Correspondence:** During the year, the prescribed targets for correspondence of Hindi were achieved by sending 93%, 73% and 66% letters in Hindi to Central Govt. Offices of A, B and C regions respectively and 100% letters in Hindi to State Govt. Offices and individuals of A & B regions.
4. **Organisation of meetings of the Official Language Implementation Committee:** The progress of implementation of the Official Language was reviewed from time to time by conducting OLIC meeting in every quarter. During the year 2015-16 Official Language Implementation Committee meetings were organised on 02.06.2015, 22.08.2015, 19.12.2015 and 23.02.2016 and follow up action was taken on the decisions of the meeting.
For the sub-ordinate offices also Official Language Implementation Committee meeting was organized to review implementation of Official Language on 28.4.2016.
5. **Organisation of Hindi Workshops:** Hindi workshop was organised in every quarter for the officials of the Institute to provide information as to use of Hindi in the Official work and extend information about Official Language Policy. During the year, 23 Officers and 26 Staff have been trained in Hindi workshops organised on 25.06.2015, 14.08.2015, 10.12.2015 and 09.02.2016 separately for technical and administrative officials and scientists.
6. **Implementation of noting-drafting incentive scheme:** To encourage the officers and staff of this Institute and its subordinate offices to do their work originally in Hindi. CSB's liberalised noting-drafting incentive scheme was implemented in which cash awards are given for writing prescribed words in Hindi. During the year cash awards were given to 4 officials on the valedictory function of Official Language fortnight held on 15-09-2015. Apart from this, 10 officials of subordinate offices were also awarded prizes under this scheme.
7. **Use of Hindi in Scientific field:** 13 pamphlets were released in bilingual and distributed to the farmers during the workshop on "Innovative Technologies and Best practices in Sericulture" held at the Institute on 17.11.2015.
8. **Publications in Hindi:** Annual report of the Institute was published partly in bilingual and the training calender was published in bilingual.
9. **Notification of the sub-ordinate offices under 10(4) of the Official Languages rules:** The Offices in which 80% of the staff are having working knowledge in Hindi are notified under 10(4) of the official languages rules. In this direction, apart from this office, 6 sub-ordinate offices have also been notified.

10. **Organisation of Hindi Competitions:** Official Language Fortnight was organised from 01.09.2015 to 15.09.2015 during which 10 different Hindi competitions viz. 1. Correct writing 2. Dictation, 3. Memory test, 4. Group discussion, 5. Elocution, 6. Noting-drafting and administrative glossary. 7. Technical glossary, 8. Songs, 9. what does the picture speak ? and 10. Antyakshari competitions were organised. The winners of the competitions were awarded with first, second, third and consolation prizes.
11. **Work on Computers in Hindi:** Compliance of Section 3(3), forms, standard drafts, quarterly progress report and evaluation report, work related to meetings carried out smoothly on computers. Unicode system is activated in all computers which facilitates to do work in Hindi, English and other Indian languages.
12. **Training:** One officer has been trained in Prabodh in Central Hindi Training Institute, New Delhi through correspondence course.
13. **Inspection:** Sub-ordinate offices are inspected for reviewing the progress made regarding implementation of Official Language Policy and extending necessary suggestions & guidance accordingly. During the year under report, 4 offices have been inspected.

Staff position as on 31.03.2016

Category	Sanctioned
Director	01
Scientific	151
Technical	193
Administrative	196
Support	30
Total	571

MULBERRY BREEDING AND GENETICS LABORATORY

Ongoing Research Projects

PIB 3457: Development of disease resistant and productive mulberry genotypes with special reference to root rot and root knot diseases suitable for seri-zones of south India (Jan. 2012 to Dec. 2017)

S. Gandhi Doss, Rajashekar, K., V. Nishita Naik, Tanmoy Sarkar and T. Gayathri

Objective: To identify and select hybrids resistant to root rot and root-knot diseases through hybridization, selection and evaluation in progeny row trial

In an effort to develop disease resistant varieties, 979 promising hybrids were short-listed based on response to artificial inoculation of causal organisms of root rot and root knot diseases from a population of >10,000 hybrids raised from controlled crossing among ten resistant and five high yielding genotypes. The short-listed hybrids were planted in paired rows (60x30 x150cm) spacing for Progeny Row Trial [PRT]. After establishment, the hybrids were pruned and preliminary data on leaf and stem morphology and above ground biomass were recorded. 112 hybrids short-listed based on biomass data and are being multiplied for further evaluation for disease resistance by artificial inoculation.

Cross	Hybrids in PRT	Hybrids short-listed	Above ground biomass (g/plant)
Punjab local x V1	119	14	60-5900
Himachal local x C776	150	11	50-4700
English black x V1	65	9	250-3050
RC2 x V1	4	2	1950-4900
S36 x V1	19	4	100-3250
S30 x Mysore local	14	1	200-2900
Roso x V1	91	11	10-4400
M. multicaulis x Mysore local	81	14	25-4850
K2 (4n) x China white	40	2	50-3400
M. multicaulis x C776	238	28	50-4700
G2 x C776	15	3	700-4250
S36 x Mysore local	12	2	200-3600
S36 (4n) x Almora local	7	2	400-1150
Punjab local x Mysore local	83	5	50-1550
Punjab local x C776	21	4	100-1150
Punjab local x Almora local	20	0	50-775
Total	979	112	

All-India Coordinated Experimental Trial for Mulberry (AICEM) – PHASE-III (Jul. 2011 to Dec. 2015)

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

S. Gandhi Doss, Rajashekar, K., Rekha, M., M. A. Shantahan Babu¹, Ch. Sathynarayana Raju¹,

M. Venkatachalapathi², B. Srinath³, S. Balasaraswathi⁴, S. Masilamani⁴ and Eshwar⁵

¹RSRS-Anantapur, ²REC-Rayachoty, ³REC-Vikarabad, ⁴REC-Krishnagiri, ⁵KSSRDI-Thalaghattapura

The experiment is laid out in RBD with 3 test varieties [C2038, G4, Suvarna-2] along with a regional check [V1] and a National check [Vishala] with six replications. The data for five crop seasons of second year of evaluation of the different test centers (South Zone) is detailed below:

Performance of mulberry varieties - AICEM III Phase

Variety	DSP	TSL (cm)	NLPM	L:S	MC (%)	MRC (%)	Leaf yield (kg/ha/yr)
CSRTI-Mysuru							
C2038	12.5	1272.87	16.43	0.69	77.47	70.78	56503
G4	13.1	1105.15	19.34	0.67	77.38	67.18	53608
Suvarna 2	13.0	1357.99	16.24	0.61	78.12	67.38	49862
Vishala	11.6	1230.85	14.65	0.58	77.48	68.80	53987
V1	13.2	1249.29	17.94	0.64	76.66	71.89	46880
CD at 5%	0.90	NS	1.15	0.01	NS	1.88	4824
CV%	9.52	14.21	11.58	6.58	1.33	3.65	9.36
RSRS-Anantapur							
C2038	12.0	992.31	18.80	0.64	72.35	76.71	48822
G4	14.0	1200.21	20.19	0.64	72.52	77.58	56323
Suvarna 2	12.5	1001.63	19.36	0.62	70.95	76.12	49515
Vishala	13.5	1063.65	19.23	0.62	72.56	72.25	52669
V1	11.3	1227.27	20.39	0.63	72.41	77.31	49539
CD at 5%	0.94	129.22	0.40	0.01	0.89	NS	129
CV%	9.82	12.82	3.58	2.19	1.37	3.04	12.82
REC-Rayachoti							
C2038	12.6	1360.91	21.03	0.52	68.41	86.46	46788
G4	13.5	1338.63	28.24	0.50	68.87	82.44	42342
Suvarna 2	13.1	1233.05	21.72	0.50	70.22	82.17	38131
Vishala	12.4	1136.08	23.14	0.52	69.24	83.82	38372
V1	12.8	1135.35	26.15	0.49	69.60	83.48	36325
CD at 5%	0.98	28.05	0.06	0.01	0.40	0.61	791
CV%	9.78	7.91	4.38	3.18	1.00	1.96	9.41
REC-Vikarabad							
C2038	19.80	898.95	20.83	0.55	71.64	83.26	49854
G4	19.53	1174.30	27.70	0.59	73.36	87.89	58983
Suvarna 2	20.40	826.78	18.16	0.51	67.64	76.44	43121
Vishala	21.60	910.74	18.73	0.53	69.84	80.83	45036
V1	20.23	1165.61	21.02	0.58	74.09	86.35	54534
CD at 5%	1.15	33.57	3.53	0.01	2.52	4.47	2356
CV%	5.57	14.82	20.44	5.76	4.26	4.60	12.22
REC-Krishnagiri							
C2038	13.0	2187.15	18.84	0.61	70.58	52.05	56504
G4	12.5	1998.81	22.38	0.63	72.14	56.71	48293
Suvarna 2	13.5	2043.70	21.47	0.61	70.26	46.42	46350
Vishala	13.4	1888.15	20.06	0.56	70.82	47.75	46891
V1	13.9	2164.11	20.65	0.59	70.89	53.05	44767
CD at 5%	NS	79.76	0.09	0.003	NS	4.00	862
CV%	9.44	6.06	5.85	6.55	1.96	9.41	8.61

Variety	DSP	TSL (cm)	NLPM	L:S	MC (%)	MRC (%)	Leaf yield (kg/ha/yr)
KSSRDI-Thalaghatapura							
C2038	14.2	1255.00	16.99	0.66	73.09	90.08	54557
G4	13.5	1360.00	19.07	0.64	74.22	88.87	58308
Suvarna 2	14.1	1387.00	16.79	0.58	74.22	88.63	52989
Vishala	12.6	1449.00	16.29	0.56	73.68	87.55	55288
V1	14.0	1582.00	17.89	0.59	73.73	90.58	58539
CD at 5%	0.94	74.37	0.53	0.02	0.49	NS	2475
CV%	2.74	12.00	8.49	7.19	0.81	1.61	9.68

DSP - Days to sprout after pruning; TSL - Total shoot length (cm); NLPM - No. of leaves/m length; L:S - Leaf:shoot ratio; MC - Leaf moisture content (%); MRC - Leaf moisture retention capacity (%)

Bioassay performance of mulberry varieties - AICEM III Phase

Variety	Larval duration (h)	No. of cocoons harvested	Wt. of cocoons (g)	SCW (g)	SSW (g)	Shell (%)
CSRTI-Mysuru						
C2038	616	433	572	1.528	0.363	23.72
G4	615	427	558	1.525	0.370	24.30
Suvarna 2	611	433	603	1.607	0.378	23.49
Vishala	614	468	618	1.562	0.365	23.34
V1	610	458	618	1.622	0.397	24.47
CD at 5%	1.02	12.34	32.77	0.05	0.01	0.75
CV%	0.39	5.33	7.64	3.49	4.32	3.03
RSRS-Anantapur						
C2038	565	399	595	1.526	0.300	19.64
G4	559	424	660	1.578	0.320	20.25
Suvarna 2	560	383	538	1.491	0.303	20.34
Vishala	559	394	510	1.603	0.315	19.65
V1	565	409	621	1.664	0.327	19.65
CD at 5%	NS	26.72	53.00	0.064	NS	NS
CV%	0.86	6.02	11.66	5.07	5.97	3.57
REC-Rayachoti						
C2038	558	467	733	1.57	0.35	21.99
G4	552	478	760	1.59	0.35	22.14
Suvarna 2	558	474	752	1.59	0.36	22.34
Vishala	558	472	745	1.58	0.36	22.51
V1	552	473	743	1.57	0.35	22.17
CD at 5%	NS	NS	14.27	0.007	0.005	0.005
CV%	3.45	1.63	1.86	0.63	1.54	1.54

REC-Vikarabad						
C2038	612	480	884	1.776	0.388	21.83
G4	612	477	902	1.895	0.419	22.10
Suvarna 2	618	476	811	1.718	0.361	21.02
Vishala	616	479	860	1.758	0.382	21.71
V1	609	476	887	1.878	0.412	21.95
CD at 5%	3.05	NS	22.00	0.054	0.017	NS
CV%	0.62	1.49	4.11	4.42	6.40	3.94
REC-Krishnagiri						
C2038	588	413	618	1.499	0.255	17.01
G4	566	481	916	1.913	0.399	20.93
Suvarna 2	576	437	784	1.809	0.348	19.26
Vishala	576	440	798	1.821	0.349	19.15
V1	562	472	910	1.937	0.410	21.18
CD at 5%	NS	7.08	15.00	0.014	0.008	0.45
CV%	6.58	5.63	13.50	8.74	15.69	7.88
KSSRDI-Thalaghatapura						
C2038	602	471	882	1.837	0.429	23.32
G4	603	459	831	1.722	0.382	22.21
Suvarna 2	602	473	905	1.789	0.385	21.52
Vishala	601	476	905	1.782	0.414	23.23
V1	602	469	925	1.799	0.419	23.29
CD at 5%	0.78	NS	59.00	0.058	0.03	1.31
CV%	12.68	13.68	14.68	15.68	16.68	17.68

The data on leaf yield and growth parameters for five crop seasons at CSRTI-Mysuru were analyzed. Bioassay of test varieties was also conducted (2 crop seasons) with CSR2xCSR4. Days to sprout after pruning was significantly lower in Vishala (11.6), while it was on par with V1 in all the test varieties. Significantly higher values for No. of leaves/meter length was recorded in G4 (19.34) over both the check varieties, while C2038 (16.43) and Suvarna-2 (16.24) showed significantly higher values over V1. C2038 (0.69) and G4 (0.67) recorded significantly higher values for leaf:shoot ratio over both the check varieties, while suvarna-2 (0.61) showed significantly higher values over V1. Moisture retention capacity (6h after excision) in all the test varieties was on par with the check Vishala. C2038 and G4 recorded significantly higher leaf yield over the check V1. None of the test varieties yielded significantly higher over the check, Vishala. Significant difference was recorded for cocoon shell percentage, where all test varieties showed significantly higher shell % over the check, Vishala.

Continuous/Other activities

Maintenance of mulberry germplasm, mother culture and demonstration plot

Rajashekar, K., S. Gandhi Doss and Tanmoy Sarkar

A working germplasm with 62 accessions was maintained for carrying out hybridization programmes. Sixteen elite varieties were also maintained in the demonstration plot for the benefit of sericulturists, students and other stakeholders. Breeders seed plots of four newly evolved varieties *i.e.*, G4 (late age silkworm rearing), G2 (young age silkworm rearing), MSG2 (soil moisture stress environments) and AGB8 (sub-optimal irrigated conditions) were planted and maintained for seed supply. Eleven transgenic lines of K2 OPH (open-pollinated hybrid) with HVA1 gene and a transgenic line of V1 with DREB2A and SHN1 genes were maintained under containment facility.

MULBERRY MOLECULAR BIOLOGY LABORATORY

Concluded Research Project

PIG 3502 (DBT): Sustaining mulberry yields: Identification of QTLs conferring resistance to root rot disease by Linkage Disequilibrium mapping and trait introgression (Jun. 2013 to Mar. 2016)

V. Girish Naik (PI), V. Nishitha Naik, Marian Vincent Pinto, SRF (CSIR-NET), Sowmya Pesaramilli, SRF (UGC-RGNF), M. S. Rukmangada (JRF), R. Triveni (JRF) and H. S. Poornima (JRF)

Objectives

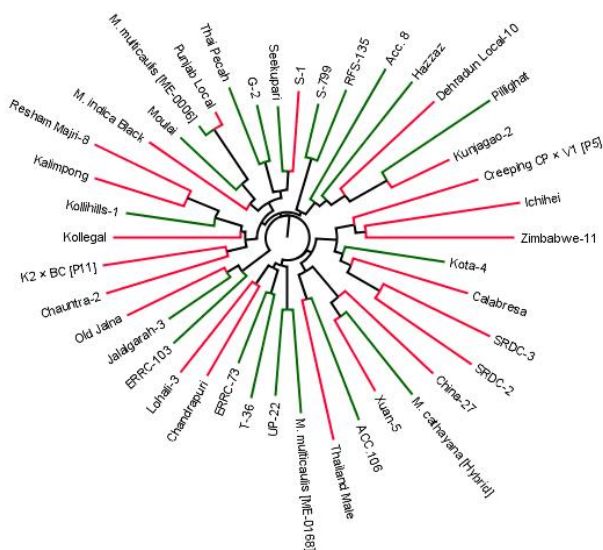
- Resistance response of mulberry germplasm to major causal fungus of root rot disease
- Molecular characterization of germplasm accessions and finally identify the contrasts
- Develop mapping populations

Ninety five fungal isolates associated with the root rot disease in mulberry were collected through field survey in Karnataka, Tamil Nadu, Andhra Pradesh and Telangana (*Macrophomina phaseolina* 35 isolates; *Fusarium* spp. 50 isolates; *Botrydiploidia theobromae* 10 isolates). All the fungal isolates were characterized by cultural and morphological markers. Seventy three isolates were pathogenic to susceptible mulberry variety (V1) in pot grown plants. The major pathogen of mulberry root rot, *M. phaseolina* was characterized using 44 RAPD and 12 microsatellite markers. The minimum Dice dissimilarity index value (0.132) was recorded between MP-6 and MP-9 isolates and the maximum (0.772) was recorded between MP-6 and MP-29 isolates, while the mean dissimilarity value was 0.487. Hierarchical clustering (UPGMA) using dissimilarity coefficient matrix resolved the isolates into nine clusters. The *Fusarium* spp. and *B. theobromae* isolates were also characterized using 27 and 44 random primers, respectively.

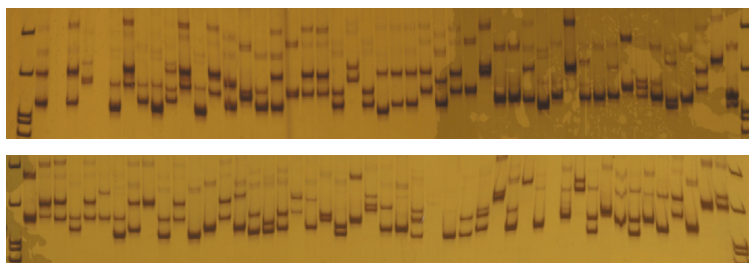
A total of 211 germplasm accessions were established in an experimental plot and evaluated for root rot disease resistance. Twenty accessions were resistant (with <25% root rot) and fifty one accessions were classified as moderately resistant (26-50% root rot) and forty one accessions were susceptible (51-75% root rot). The remaining 99 accessions were with >75% root rot and considered as highly susceptible. The least root rot (9.85%) was observed in *M. cathayana* (Hybrid), whereas 71 accessions developed 100% root rot infection. Genetic distances were measured among resistant and susceptible germplasm based on Dice dissimilarity indices on SSR marker data and clustering based on Neighbor-joining (NJ) method to establish divergence and inter-relationships. Trait specific mapping population employing resistant and susceptible parental genetic resources is under progress.

Mulberry specific microsatellite markers (130 nos.) were screened for marker amplification and 25 were found to be polymorphic. Further, 60 mulberry specific SSR primers were designed based on sequences archived (MulSatDB; <http://btismysore.in/mulsatdb/>) and another twenty five polymorphic markers were also synthesized. So far, 96 diverse germplasm accessions were genotyped using 20 SSR markers.

Acc. No.	Genotype	Sex	Average Root Rot (%)
ME-0254	<i>M. cathayana</i> (Hybrid)	M	9.85
ME-0168	<i>M. multicaulis</i>	M F	12.03
MI-0421	Pillighat	F	13.20
MI-0347	Moulai	F	15.65
ME-0006	<i>M. multicaulis</i>	F	16.57
ME-0056	Thai Pecah	M	18.63
MI-0037	S-799	M F B	18.81
MI-0082	ACC.106	M B	19.68
MI-0551	Kollihills-1	M	19.71
MI-0226	T-36	M F	20.99
MI-0275	ERRC-103	F	21.02
MI-0682	Kota-4	F	21.23
MI-0048	RFS-135	M B	21.35
ME-0100	Hazzaz	M	21.58
MI-0313	Seekupari	M B	22.59
	G-2	F	22.81
MI-0254	UP-22	M F B	23.85
MI-0298	Acc. 8	F	24.07
MI-0276	ERRC-73	F	24.76
MI-0827	Jalalgarah-3	F	25.36



NJ clustering of resistant (green) and highly susceptible (red) mulberry germplasm



Microsatellite marker polymorphism among 96 diverse mulberry germplasm (MulSatG92497)

PIB 3507 (PPV & FRA): Development of Distinctness, Uniformity and Stability (DUS) descriptors for Mulberry (*Morus* spp.) and their Validation (Apr. 2013 to Mar. 2016)

V. Girish Naik (PI), S. Gandhi Doss, Rajashekar, K., T. Thippeswamy, P. Sowbhagya (SRF) and V. Sivaprasad (Coordinator)

Objectives

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

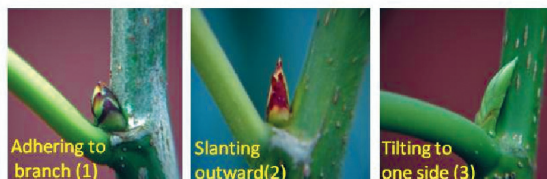
Natural variability in morphological characteristics in the germplasm was assessed for identifying the Distinctiveness, Uniformity and Stability (DUS) descriptors for mulberry and states of expression of each characteristic were determined. Initially, 57 characters were selected for examining the distinctiveness among a set of 16 cultivated varieties. Based on the data analysis for three growth cycles, 35 descriptors were finalized for DUS testing and guidelines were formulated. Besides, 34 example varieties were also identified to represent each state of expression of a characteristic. DUS testing shall apply to all vegetatively propagated varieties, hybrids, mutants, polyploids and transgenics of mulberry (*Morus* spp.). DUS test should be conducted at two places or one on-site testing. The minimum quantity of planting material required for DUS testing per centre shall be 50 stem cuttings/saplings/grafts. The duration of DUS tests in mulberry shall be normally two independent growing cycles of 90 days each per year. The test plot design shall be pit system with 150 cm x 150 cm spacing between the plants and rows. Morphological observations shall be made based on the growth stage of the plants from 8th to 90th day of pruning. Reproductive characteristics shall be observed in the natural flowering season. All observations on shoot, leaf, bud

Examples of Explanation - DUS Testing

Characteristic 10 – Leaf Angle



Characteristic 26 – Bud Attachment



characteristics shall be made on upper (e.g. stipule nature), middle (e.g. phyllotaxy), lower (e.g. mature shoot color and shoot thickness in cm) 1/3rd portion of the longest shoot. Reference varieties for growing trials of candidate variety shall be selected based on 5 grouping characteristics such as inter-nodal distance, phyllotaxy, leaf base, sex and mature inflorescence length. Among the 35 identified descriptors for testing, 14 are essential and 21 are non-essential. Essential characteristics are useful for the international harmonization of the variety descriptions and should always be examined for DUS.

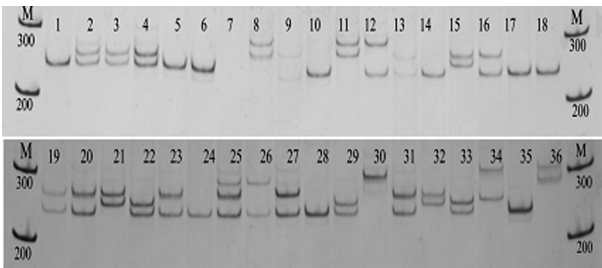
Characteristics identified for DUS testing in Mulberry

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Day)	Type of assessment
1	2	3	4	5	6	7
1 QN (*)	Plant: vigor	Low Medium High	3 5 7	Kajli, Surat, Harmutty Kanva-2 <i>M. laevigata</i> (Hybrid)	45	VG
2 PQ (* (+))	Plant: growth habit	Erect Semi-erect Spreading Drooping	3 5 7 9	Philippines, Kanva-2, Mysore Local <i>M. multicaulis</i> , Kosen Kajli, Bilidevalaya, Doomar Nali, Mizusawa Creeping mulberry	60	VS
3 QN	Sprouting (days)	Early (<10) Medium (10-15) Late (>15)	3 5 7	Kanva-2, Harmuty Birds Foot, Philippines Urgam-1, French	8	MG
4 QN	Survival % of cuttings (rooting)	Low (<40) Medium (40 – 80) High (>80)	3 5 7	Doomar Nali Kosen, Philippines Kajli	90	MG
5 PQ (+)	Shoot: type	Straight Slightly curved Curved	3 5 7	Kanva-2 Kosen Doomar Nali	60	VS
6 QN	Shoot: thickness (cm)	Thin (<1.0) Medium (1.0-1.5) Thick (>1.5)	3 5 7	Harmutty <i>M. multicaulis</i> Mizusawa, Lazuraso, Kosen, Gajapathipur-2	60	MS
7 PQ	Mature shoot: color	Yellow-Green Group 147 Greyed-Green Group 195 Grey-Brown Group 199 Brown Group N200 Grey Group 201	1 3 5 7 9	Kokuso China-34 Asiyoake, Lazuraso, Birds Foot K2xBC (P11) Barbat Farm	90	VS
8 QN (*)	Inter-nodal distance (cm)	Short (<3) Medium (3-6) Long (>6)	3 5 7	Surat, Kokuso Railway Quarter, Kosen Phillipines, Doomar Nali, Moreti (Syringe), Birds Foot	90	MS
9 PQ (* (+))	Phyllotaxy	Distichous (1/2) Tristichous (1/3) Pentastichous (2/5) Mixed type {(1/2 & 1/3), (1/2 & 2/5), (1/3 & 2/5), (1/2, 1/3 & 2/5)}	3 5 7 9	Birds Foot, Doomar Nali, <i>M. laevigata</i> (Hybrid) Bilidevalaya Lazuraso, Kosen, Harmutty, Mizusawa French, Mysore Local, Kanva-2, Asiyoake	60	VS

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Day)	Type of assessment
10 QN (+)	Leaf: angle	Acute Horizontal Obtuse	3 5 7	Kanva-2, Mysore Local Moreti (Seringe) Philippines	45	VG
11 QN (+)	Petiole: length (cm)	Short (<3) Medium (3-5) Long (>5)	3 5 7	Malakai Local, Surat Kanva-2, Punjab Local, Badodhi Railway Quarter, Doomar Nali, Creeping CP x V-1 (P5)	60	MS
12 QN	Petiole: thickness (cm)	Thin (<0.2) Medium (0.2-0.4) Thick (>0.4)	3 5 7	Surat, Kajli, Acc.106, Harmutty Kanva-2, Barbat Farm <i>M. multicaulis</i> , Phillipines, Doomar Nali, China-34	60	MS
13 QL	Stipule: nature	Bud scale Free lateral Foliaceous	1 2 3	Surat, Acc.106 Mysore Local, Railway Quarter Barbat Farm	45	VS
14 QN (*)	Leaf lamina: length (cm)	Short (<10) Medium(10-20) Long (>20)	3 5 7	Surat Kanva-2, Mysore Local <i>M. multicaulis</i> , Doomar Nali, Phillipines, <i>M. laevigata</i> (Hybrid)	60	MS
15 QN (*)	Leaf lamina: width (cm)	Narrow (<10) Medium (10-15) Broad (>15)	3 5 7	Surat, French, Harmutty Kanva-2, Mysore Local, Railway Quarter Doomar Nali	60	MS
16 QN (*) (+)	Leaf: size (sq. cm)	Small (< 200) Medium (200-400) Large (> 400)	3 5 7	Surat Kosen, Kanva-2, Punjab Local Doomar Nali, <i>M. laevigata</i> (Hybrid)	90	MG
17 PQ (+)	Leaf: shape	Cordate (L/W ratio=<1:1) Wide ovate (L/W ratio= 1.2:1) Ovate (L/W ratio=1.5:1) Narrow ovate (L/W ratio=2:1) Lanceolate (L/W ratio =3:1)	1 3 5 7 9	Kanranjotli-1 <i>M. multicaulis</i> Doomar Nali, Kanva-2, Mysore Local Harmutty French	60	MS
18 PQ (+)	Leaf: color	Light Green -141 D Green-137C Dark Green-137A	3 5 7	Kanva-2 Philippines Railway Quarter, Kajli, <i>M. multicaulis</i>	Kanva-2	Philip pines
19 PQ	Leaf: hairiness	Glabrous Sparsely Hairy Hairy (pubescent)	3 5 7	Kosen Birds Foot, Badodhi, Malakai Local, Ranchi-5 Urgam-1	90	VS
20 PQ	Leaf: texture	Membranaceous Charataceous Coriaceous	3 5 7	Philippines Kajli, Surat, Mysore Local French, Barbat Farm	90	VS
21 PQ (*) (+)	Leaf: base	Acute Truncate Cordate Lobate	3 5 7 9	French Kanva-2, <i>M. laevigata</i> (Hybrid) Mizusawa, <i>M. multicaulis</i> , Punjab Local Kosen, Malakai Local	60	VS
22 PQ (*) (+)	Leaf: apex	Acute Acuminate Caudate Obtuse	3 5 7 9	Philippines, French, China-34 Punjab Local, Mysore Local Barbat Farm, Harmutty, Badodhi, Ranchi-5	60	VS

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Day)	Type of assessment
23 PQ (* (+)	Leaf: margin	Crenate Dentate Serrate Repand	3 5 7 9	Philippines, Kosen Surat, Acc.106, Malakai Local <i>M. laevigata</i> (Hybrid) Lamia Bay	60	VS
24 PQ (* (+)	Leaf: type	Unlobed (entire) Lobed Mixed type	1 2 3	<i>M. multicaulis</i> Kajli, Bilidevalaya Mysore Local, Badodhi, Ranchi-5	60	VG
25 QN (+)	Mature bud: size	Small Medium Large	3 5 7	Philippines, Surat, Punjab Local Kosen, <i>M. multicaulis</i> , Kajli Doomar Nali	90	VG
26 QL (+)	Bud: attachment	Adhering to branch Slanting out ward Tilting to one side	1 2 3	Philippines, Surat, Mysore Local <i>M. multicaulis</i> , Kajli, Barbat Farm	60	VS
27 PQ (* (+)	Mature bud: shape	Round Acute triangle Long triangle Spindle	3 5 7 9	Acc.106, Gajapathipur-2 Philippines, Mysore Local, Punjab Local Mizusawa, <i>M. multicaulis</i> , Birds Foot, Badodhi Doomar Nali	90	VG
28 QL (+)	Accessory bud	Absent Present	1 9	French <i>M. multicaulis</i> , Mysore Local	60	VS
29 QL (* (+)	Sex	Gynoecious Androecious Bisexual Andromonoecious Gynomonocious Androgynomonocious	1 2 3 4 5 6	Kajli, , Doomar Nali, <i>M. multicaulis</i> Lamia Bay Gajapathipur-2	20	VG
30 QN (* (+)	Mature inflorescence: length (cm)	Short (<2) Medium (2-4) Long (>4)	3 5 7	Surat, Mysore Local, Bilidevalaya, Harmutty Mizusawa, <i>M. multicaulis</i> , Punjab Local Birds Foot, Doomar Nali, <i>M. laevigata</i> (Hybrid)	20	MS
31 QL	Stigma: nature	Pubescent Papillate	3 7	Mysore Local, Railway Quarter Philippines, Doomar Nali, Lazuraso	20	VS
32 QL	Stigma: type	Erect Spreading Divaricate Twisted	3 5 7 9	Lasuraso, <i>M. multicaulis</i> , Kajli, Birds Foot Punjab Local, Kanva-2, Bilidevalaya Mysore Local, Surat, Harmutty, Karanjotli-1 Doomar Nali, Ranchi-5	20	VS
33 QN (+)	Mature fruit: length (cm)	Short(<2) Medium (2-4) Long (4-8) Very long (>8)	3 5 7 9	Surat, Mysore Local <i>M. multicaulis</i> , China-34, Kanva-2, Karanjotli-1, Moreti (Seringe) Ranchi-5, <i>M. laevigata</i> (Hybrid) Doomar Nali	40	MS
34 QN	Mature fruit: width (cm)	Narrow (<1) Medium (1-1.5) Broad (>1.5)	3 5 7	Surat, Harmutty, Mysore Local, <i>M. laevigata</i> (Hybrid) Kajli, <i>M. multicaulis</i> , Doomar Nali Railway Quarter	40	MS

Sl. No.	Characteristic	State	Note	Example Varieties	Stage of observation (Day)	Type of assessment
35 PQ (+)	Mature fruit: color	Black Group 203 - Bluish Black C Greyed-Orange Group 172 - Dark Reddish Orange B Purple Group 76 - Very Pale Purple C Yellow-Green Group 145 - Light Yellow Green D White Green	1 2 3 4 5 6	<i>M. multicaulis</i> , Kajli, Bilidevalaya, Surat, Kanva-2, Mysore Local <i>M. laevigata</i> (Hybrid) Punjab Local, RC-1 Moreti (Seringe) Ranchi-5 Saravathi Tea Estate	40	VG



Microsatellite marker (MESTSSR42) profiles of 36 cultivated mulberry varieties

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

Explanations on the table of characteristics utilized in DUS guidelines are provided in the form of photographs and diagrams (www.csrtimys.res.in). DUS test guidelines on mulberry was prepared and submitted to PPV & FRA-New Delhi. DUS testing of mulberry varieties is imperative to protect the IPR associated with development of plant varieties, to recognize the rights of farmers in conservation of

genetic resources, to stimulate public and private investment in crop breeding and to ensure high quality planting materials to farmers for the development of sericulture industry.

Continuous/Other activities

Maintenance of Mapping Resources

Traits	Progeny	Nos.
Yield and yield contributing	Mysore Local x V1	350
Water use efficiency (WUE)	Himachal Local x MS3	200
	Muki x S34	432
	G4 x MS3	182
Root trait	Dudhia White x UP	560
	Punjab Local x Thaimale	35
Alkaline tolerance	Sujanpur-5 x V1	169
Introgressed lines (WUE and root trait)		20
Germplasm Backup		~260

SOIL SCIENCE & CHEMISTRY

Continuous/Other activities

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

Sibayan Sen (PI), V. Sobhana, P. Sudhakar¹, J. Ravi Kumar² and B. Kasi Reddy³

¹RSRS Kodathi, ²RSRS Salem, ³RSRS Anantapur

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

A total of 792 soil samples from different locations were analysed and based on results, each mulberry garden was provided with fertilizer and manural recommendations to maintain soil health for obtaining quality leaf production.

State	District	No. of Samples	pH	EC (mmhos/cm)	OC (%)	Available P (kg/ha)	Available K (kg/ha)
KAR	Chikballapur	4	7.70-8.10	0.19-0.38	0.17-0.43	29.8-53.7	493-582
	Chitradurga	4	7.62-8.39	0.07-0.15	0.23-0.58	10.9-45.3	179-558
	Hassan	9	6.02-8.16	0.05-0.35	0.35-0.62	2.49-78.6	134-492
	Mandya	9	7.07-8.96	0.09-3.16	0.34-0.91	6.97-154.8	89-806
	Mysore	60	5.94-8.79	0.04-0.81	0.08-0.92	2.0-217.0	89-941
	Tumkur	101	5.84-8.05	0.04-0.68	0.04-0.92	2.99-219.8	89.6-2374
	Yadgir	12	6.35-6.76	0.14-0.37	0.23-0.63	20.9-30.6	45-224
AP	Madaksira	4	8.05-8.66	0.18-0.65	0.12-0.29	11.4-13.9	179-269
	Vijaywada	15	7.33-8.14	0.14-0.91	0.28-0.99	9.5-104.5	224-762
	Warangal	6	6.77-8.06	0.23-0.96	0.29-0.57	8.9-87.6	314-717
TN	Coimbatore	70	6.81-8.89	0.04-1.62	0.20-1.03	0.54-30.7	179-1165
	Dindugul	33	7.29-8.93	0.04-0.44	0.15-1.35	0.43-29.7	134-762
	Erode	31	6.90-8.81	0.08-0.36	0.21-1.29	0.43-15.9	134-762
	Krishnagiri	58	6.90-8.96	0.03-0.56	0.04-0.89	0.50-20.2	134-1210
	Pudukottai	32	6.00-8.57	0.02-0.56	0.19-1.13	0.65-31.3	89-672
	Thiruppur	46	6.10-8.78	0.02-1.60	0.09-1.08	1.90-18.3	89-1120
	Virudhnagar	42	6.51-9.06	0.03-0.81	0.11-1.23	1.74-16.0	179-1165
KER	Palakkad	3	6.30-7.86	0.06-0.13	0.12-0.82	1.60-2.10	314-493
	Waynad	15	4.74-6.71	0.01-0.13	0.34-1.67	1.96-13.2	179-448
MAH	Gandhinglaj	9	5.14-8.14	0.01-0.32	0.20-0.78	1.0-12.9	224-627
	Parbhani	4	7.28-7.83	0.17-0.50	0.48-0.72	9.9-14.9	314-717
	Others	203	7.28-7.83	0.17-0.50	0.48-0.72	9.9-14.9	314-717

Quality Testing of Disinfectants and inputs used in sericulture

Sibayan Sen

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

Product	Samples	Product	Samples
Asthra	21	FYM	1
Amruth	5	Water	347
Ankush	20	Poshan	23
Vetcare Vijetha	6	CPP Soils	51
Vijetha Supplement	3	Mulberry Leaf	94
Sanitech	1	Soils	168
Vermi-compost	2		

AGRONOMY

Ongoing Research Projects

PPA 3552: Development of technology for production of organic silk (Jan. 2016 to Dec. 2018)

Dasappa (PI), V. K. Yadav, Sibayan Sen, P. C. Santha, M. Balavenkatasubbaiah and Kariyappa

Objectives:

- To produce the mulberry leaf and cocoon through organic practices
- To study the reeling parameters in organic silk
- To workout the economics for production of organic silk

Organic farming practices have assumed paramount importance due to several modern era challenges like decline in productivity, degradation of soil fertility and water resources, diminishing biodiversity and increased environmental pollution for improving crop productivity and soil fertility. Studies on organic farming of mulberry are initiated in an experimental plot for further utilization in the organic production of cocoon crop; first crop completed. Soil profiles were obtained through an accredited agency. Inspection and certification of process for the production of organic silk was initiated through IS COP-Coimbatore.

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

V. Gunasekhar (PI), Rajashekar.K, K. Vedavyasa¹ and Sybian Sen

¹REC SU-Tumkur

Objectives

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

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

PPA 3549: Evaluation of modified spacing with special reference to planting geometry for sustainable mulberry leaf production (Jan. 2016 to Dec. 2018)

Vinod Kumar Yadav (PI) and Dasappa

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

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

MULBERRY PHYSIOLOGY

Pilot Study

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

M.G. Sabitha, Sibayan Sen and M. Munirathnam Reddy

Objective: To identify suitable antitranspirants for improving moisture retention capacity and productivity under deficit irrigation

Physiological parameters *viz.*, photosynthetic rate, transpiration rate, relative water content, moisture percentage, growth, and yield parameters were recorded for the first crop with different antitranspirants. Kaolin (reflectance type) recorded higher values followed by silicone oil as compared to other two antitranspirants, PMA (phenylmercuriacetate) stomata closing type, cycocel (growth retardant type). Further studies are under progress.

MULBERRY PATHOLOGY

Ongoing Research Projects

PRP 3535: Popularization of Nemahari – a bionematicide for management of root knot disease in mulberry (Mar. 2015 to Feb. 2017)

V. Nishitha Naik, H. Jayaram¹, S. Raja Kumar² and M. A. Shanthan Babu³

¹REC-SU Kanakapura, ²RSRS Salem, ³RSRS Anantapur

Objectives

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

Nemahari, an eco-friendly formulation was developed for the management of root knot disease (soil borne) of mulberry caused by nematode, *Meloidogyne incognita*. Large scale field trial of *Nemahari* was undertaken in Karnataka and Tamil Nadu. Root knot disease was observed in all types of mulberry gardens irrespective of soil type, farming system and age of the plantation (Karnataka: 51.35% and in Tamil Nadu: 41.81%) and the disease severity ranged between mild to moderate. Field trials on efficacy of *Nemahari* was initiated in Karnataka (51 farmers) and Tamil Nadu (25 farmers). *Nemahari* (in FYM @ 1:10 ratio & 16kg/acre) was applied near the root zone by making trenches. *Nemahari* application reduced disease severity to a considerable extent (76-82%) and improved the leaf yield (15-18%). Technical brochures in English, Kannada, Hindi, Telugu and Tamil were prepared and distributed to create awareness and popularization among sericulturists. *Nemahari* was commercialized by licensing the technical know-how to M/s. Rainbow Agro-Vet Technologies, Kadapa (AP) through NRDC.

PRP 3530: Development of a broad spectrum formulation for management of mulberry root rot disease (Jan. 2015 to Dec. 2016)

P. M. Pratheesh Kumar (PI) and T. Thippeswamy (up to Feb. 2016)

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

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

Five formulations were made with these effective materials in various combinations and tested in potted mulberry plants under simulated conditions of root rot by artificial inoculation. The formulation, F1 was found highly effective and controls 89.21% root rot and 90.20 % wilt in comparison to existing recommendation (71.21% and 62.74%, respectively), *Navinya*.

BIVOLTINE SILKWORM BREEDING LABORATORY

Concluded Research Projects

AIT 3445: Development of robust bivoltine hybrids of silkworm, *Bombyx mori* L. tolerant to high temperature environment of the tropics through DNA marker assisted selection (Jan. 2011 to Dec. 2015)

S. Manthira Moorthy, S. K. Ashwath, Kariyappa and N. Chandrakanth (JRF)

Objectives

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

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

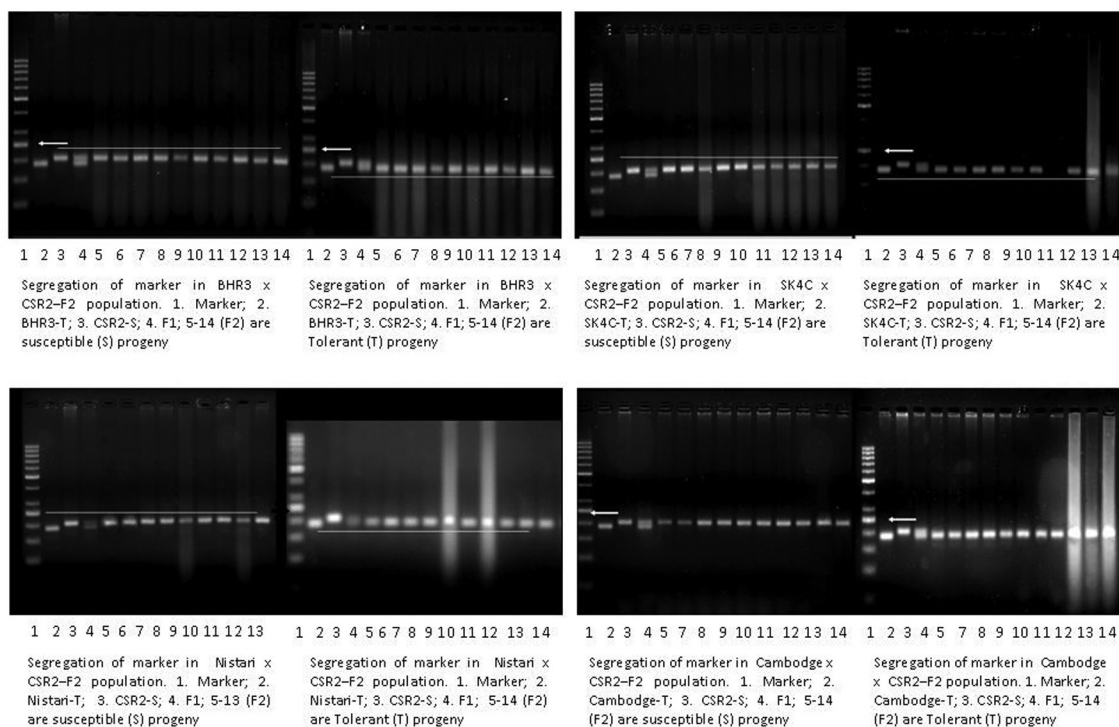
Twenty silkworm breeds collected from different Institutes (CSRTI-Mysore: CSR2, CSR17, S5, D13, 5HT, 8HT; RSRS-Dehradun: ATR16, ATR19; CSGRC-Hosur: B37, S38, NN6D; CSRTI-Berhampore: BHR2, BHR3, D6-P, SK3, SK4, D6-PN, SK4C, Nistari and Cambodge) were exposed to different high temperature regimes (32, 34, 36, 38±1°C and 85±2% humidity) for 6h daily from the 3rd day of V instar to till spinning. Based on pupation rate (%), Nistari, Cambodge (multivoltine), SK4C, BHR3 (Bivoltine) were identified as tolerant to high temperature and CSR2 as susceptible breeds.

Eighty five SSR markers from different linkage groups were screened for the detection of polymorphism in selected breeds. Eleven SSR markers (LFL1123, LFL0329, LFL0407, S0801, S0813, Sat2604, F10648, F10516, F10656, LFL0944, LFL0658) showed distinct polymorphism between the thermo-tolerant and susceptible breeds. Four F2 combinations were raised from selected breeds (BHR3 x CSR2, SK4C x CSR2, Nistari x CSR2 and Cambodge x CSR2) and the F2 progeny was exposed to high temperature (36±1°C) and tolerant & susceptible populations were collected. DNA from tolerant and sensitive bulks was prepared by pooling aliquots containing equivalent amounts of total DNA (50 ng/μl approx). Five SSR markers (LFL1123, LFL0329, LFL0407, S0801, S0813) showed polymorphism between the tolerant and susceptible F2 progeny. However, LFL1123, LFL0329 and S0813, generated polymorphic fragments for the four genetic backgrounds and LFL0407 generated polymorphic fragments in three genetic backgrounds only) indicating the association with thermo-tolerance in silkworm. Further, LFL0329 was identified as the most probable marker associated with thermo-tolerance due to highly significant R² value (33%) in step-wise regression analysis.

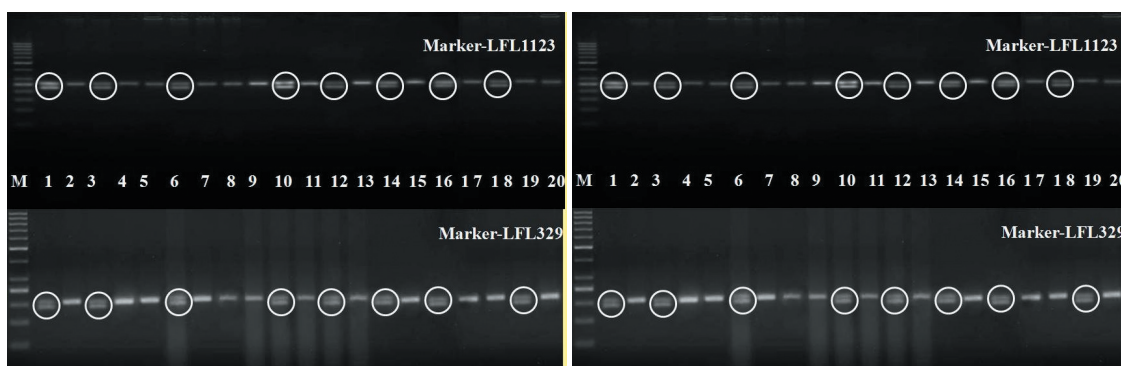
Development of thermo-tolerant silkworm breeds/hybrids through marker assisted selection

In order to select donor parents for breeding programme, thirty seven bivoltine silkworm breeds from different R&D institutes (CSRTI-Mysore, CSRTI-Berhampore, CSRTI-Pampore, CSGRC-Hosur, APSSRDI-Hindupur and KSSRDI-Bangalore) were screened with SSR markers, LFL1123 and LFL329 for thermo-tolerance. A110 (oval) and SK4C (dumbbell) were selected as donor parents based on SSR marker presence, high pupation and shell content at high temperature. CSR27, SK3 (oval), CSR6 and CSR26 (dumbbell) were selected as recurrent parents for high productivity and breeding plans were initiated to develop silkworm breeds with thermo tolerance through SSR marker assisted selection.

The selected parents were crossed and four F1 crosses were prepared (CSR27 x APS110; SK3 x APS110; CSR26 x SK4C; CSR6 x SK4C) and these F1s were crossed with respective recurrent parents and eight back cross (BC) lines were raised. Back crossing was continued for six generations (BC1-BC6) followed by sib-mating for three generations (BC6S1-S3). The marker analysis of progeny (20-30 individuals) in each generation was determined and the polymorphic genotypes linked to thermo-tolerance were utilized for further generations. During back cross generations, the progeny with heterozygous pattern was selected for next generation rearing, while dominant pattern (tolerance) during sib-mating generations. In each generation, the lines were exposed for 6h daily at 36°C (V instar 1st day to spinning) to conform phenotypic expression.



Amplification of SSR marker-LFL329 in tolerant, susceptible parents, F1s and F2 segregating populations of BHR3 x CSR2, SK4C x CSR2, Nistari x CSR2 and Cambodge x CSR2 crosses; Arrows denote 250 bp DNA marker. 190bp corresponds to tolerance and 210bp for susceptibility to high temperature



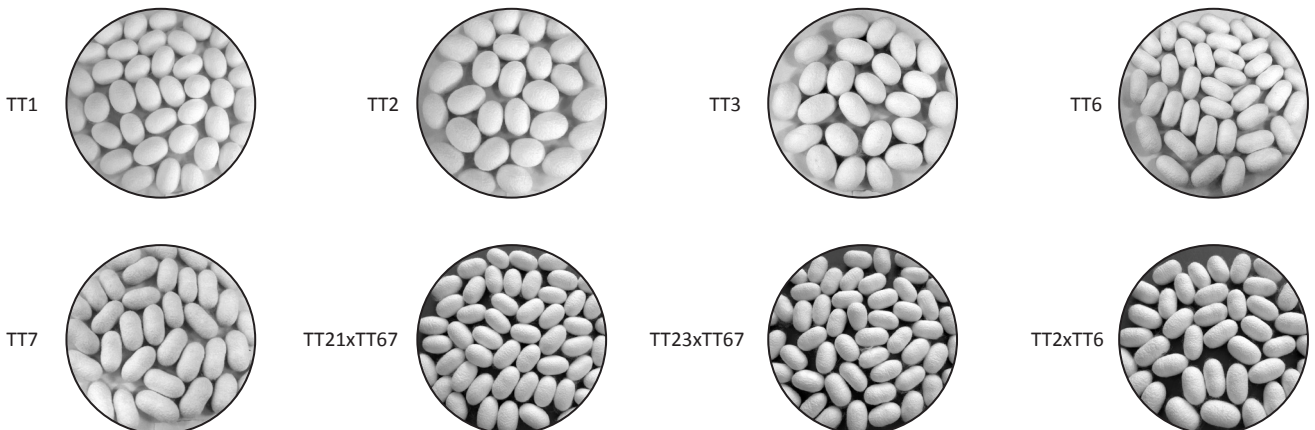
Amplification of SSR markers (LFL1123, LFL0329) in back cross lines (TT2-A, TT6-B) at BC3 generation. PCR product (circled) represents the heterozygous pattern of marker and the same progeny is selected for next generation

Marker-assisted selection resulted in developing eight thermo-tolerant bivoltine silkworm lines (Oval: TT1, TT2, TT3, TT4-; dumbbell: TT5, TT6, TT7, TT8) exhibiting higher survival at high temperature (36°C) and the improvement in survival was 90-120% increase over the recurrent parents indicating introgression of thermo-tolerance trait. Similarly, these lines showed one-fold increase in cocoon yield/10000 larvae at high temperature over the recurrent parent and 6-9% over donor parent. The other economic characters were comparable to their recurrent parents. 21 single hybrid combinations were prepared from developed lines and other productive breeds. Based on mean evaluation index (EI), TT2 x TT6 was found superior with EI value of 58.17 followed by CSR50 x TT6. Similarly, evaluation of 9 double hybrid combinations through foundation crosses (FCs) developed from the thermo-tolerant breeds and others shows that TT21 x TT67 and TT23 x TT67 were superior with an EI value of 55.12 and 54.93, respectively.

Performance of thermo-tolerant bivoltine lines, donor parents and recurrent parents (High temperature (HT): 36±1°C @ 75-95% RH and Optimal temperature (OT): 26±1°C @ 70-85% RH)

Lines/ Parents	Pupation (%)		Yield/ 10000 larvae (wt-kg)		Single cocoon wt (g)		Single Shell wt. (g)		Shell Ratio (%)	
	OT	HT	OT	HT	OT	HT	OT	HT	OT	HT
TT1	90.30 ±1.45	77.00 ±1.25	14.895 ±0.569	10.214 ±0.654	1.618 ± 0.018	1.398 ±0.049	0.360 ±0.019	0.269 ±0.012	22.24 ±0.20	19.24 ±0.098
TT2	92.00 ±1.624	73.00 ±0.785	14.958 ± 0.748	10.015 ±0.581	1.700 ± 0.036	1.420 ±0.062	0.401 ±0.012	0.287 ±0.020	23.59 ±0.150	20.21 ±0.085
TT3	88.50 ±0.569	81.00 ±1.069	15.065 ±0.894	12.069 ±0.995	1.689 ±0.053	1.487 ±0.069	0.398 ±0.011	0.308 ±0.007	23.56 ±0.309	20.71 ±0.120
TT4	91.30 ±0.789	78.00 ±1.36	15.230 ±0.803	11.201 ±1.02	1.654 ±0.048	1.510 ±0.037	0.372 ±0.016	0.306 ±0.014	22.37 ±0.28	20.26 ±0.189
TT5	92.00 ±1.05	83.00 ±0.785	14.654 ±0.564	12.060 ±0.821	1.629 ±0.063	1.429 ±0.066	0.363 ±0.015	0.289 ±0.019	22.28 ±0.39	20.22 ±0.079
TT6	92.00 ±1.25	83.00 ±1.31	14.685 ±0.623	11.741 ±0.745	1.678 ±0.084	1.439 ±0.072	0.385 ±0.014	0.289 ±0.023	22.94 ±0.389	20.08 ±0.136
TT7	91.00 ±0.785	84.00 ±2.05	14.36 ±0.854	11.690 ±0.859	1.659 ±0.052	1.468 ±0.046	0.379 ±0.006	0.286 ±0.018	22.85 ±0.230	19.48 ±0.289
TT8	92.00 ±1.025	85.00 ±1.789	14.305 ±1.025	11.209 ±0.915	1.600 ±0.039	1.360 ±0.033	0.348 ±0.023	0.258 ±0.016	21.75 ±0.37	18.99 ±0.246
CSR27	88.00 ±0.624	32.14 ±0.75	15.715 ±0.754	4.52 ±0.481	1.795 ±0.022	1.409 ±0.016	0.432 ±0.017	0.291 ±0.012	24.07 ±0.110	20.65 ±0.219
SK3	89.00 ±0.685	36.00 ±1.05	15.52 ±0.674	5.124 ±0.514	1.742 ±0.027	1.415 ±0.024	0.416 ±0.016	0.297 ±0.014	23.88 ±0.130	20.99 ±0.227
CSR16	85.00 ±0.678	33.00 ±1.25	14.178 ±0.554	4.325 ±0.471	1.668 ±0.062	1.318 ±0.031	0.378 ±0.013	0.258 ±0.012	22.66 ±0.142	19.58 ±0.248
CSR26	89.00 ±0.285	38.00 ±1.70	15.014 ±0.254	5.1376 ±0.501	1.687 ±0.047	1.352 ±0.039	0.382 ±0.016	0.262 ±0.015	22.64 ±0.152	19.38 ±0.232
A110	92.00 ±0.475	74.15 ±0.875	14.72 ±0.554	10.58 ±0.381	1.598 ±0.038	1.41 ±0.036	0.364 ±0.014	0.294 ±0.013	22.78 ±0.180	20.85 ±0.219
SK4C	93.00 ±0.375	76.56 ±0.574	14.23 ±0.947	10.98 ±0.245	1.529 ±0.029	1.456 ±0.042	0.329 ±0.012	0.289 ±0.010	21.52 ±0.187	19.85 ±0.228

CSR27 is recurrent parent of TT2 & TT4; SK3 is recurrent parent of TT1 & TT3; CSR16 is recurrent parent of TT5 & TT7 and CSR26 is recurrent parent of TT6 & TT8; A110 is donor for TT1, TT2, TT3 & TT4; SK4C is the donor for TT5, TT6, TT7 & TT8



Evaluation of thermo-tolerant single hybrids

Hybrid	Yield/10000 larvae		SCW (g)	Shell (%)	Reela-bility (%)	FL (m)	NBF L(m)	Raw silk (%)	Neat-ness (p)	EI
	No.	Wt (kg)								
TT2 x TT6	9200	15.76	1.714	23.45	87	1050	879	18.31	96	58.17
CSR50 x TT6	9150	15.84	1.715	23.26	85	1020	910	18.35	96	57.25
TT2 x TT5	9000	15.60	1.734	22.80	87	978	902	18.80	96	55.76
TT3 x TT6	9100	15.69	1.725	23.54	87	963	836	18.13	96	55.58
TT4 x TT6	8900	15.29	1.719	23.15	83	993	825	18.40	94	54.48
TT2 x TT7	9200	15.73	1.685	22.78	85	952	880	17.20	96	53.81
SK3 x TT5	8950	14.49	1.619	22.48	89	1054	933	19.26	96	53.80
TT3 x TT5	8800	14.67	1.668	23.08	87	1052	967	18.91	96	53.63
TT1 x TT5	9200	16.32	1.874	22.85	83	925	789	17.56	94	53.33
TT4 x TT7	8950	15.83	1.769	22.84	81	1071	869	19.05	94	52.93
TT3 x TT8	9200	15.35	1.669	23.55	86	965	827	18.13	94	52.45
A110 x TT5	9050	15.07	1.760	22.58	80	1024	880	19.75	94	52.04
A110 x TT6	9240	15.60	1.689	21.85	86	902	854	16.33	94	50.42
CSR2 x CSR4 (Control)	9000	15.89	1.712	23.38	86	1015	910	18.03	96	55.98

Evaluation of thermo-tolerant double hybrids

Hybrid	Yield / 10000 larvae		SCW (g)	Shell (%)	Reela-bility (%)	FL (m)	NBF L(m)	Raw silk (%)	Neat-ness (p)	EI
	No.	Wt (kg)								
TT21 x TT67	9150	15.21	1.662	23.33	84.28	1019	981	19.14	94	55.12
TT23 x TT67	9100	15.83	1.740	23.41	82.00	1021	985	18.25	94	54.93
TT23 x TT78	9160	16.04	1.752	22.48	89.77	969	870	18.05	94	52.91
TT23 x TT58	9200	15.34	1.667	22.71	82.56	978	842	18.39	96	52.39
(SK3 x A110) x (TT67)	9150	15.20	1.662	22.49	82.22	943	775	18.80	95	50.10
TT21 x TT78	9000	14.62	1.625	23.26	83.35	943	785	18.83	94	47.56
TT21 x TT58	9050	14.93	1.650	23.32	82.83	968	802	17.52	96	46.11
(SK3 x A110) x (TT58)	9000	14.13	1.570	23.06	79.00	941	743	19.06	96	45.88
(SK3 x A110) x (TT78)	9200	13.98	1.520	21.70	88.54	863	740	17.48	94	40.58
FC1 x FC2 (Control)	9000	15.07	1.675	23.47	82.00	1025	958	18.85	96	54.41

Conclusion

Two SSR markers (LFL1123, LFL329) linked with the thermo tolerance in silkworm were identified and validated through marker assisted selection. MAS was successful in introgressing the thermo-tolerant trait into popular breeds of different genetic backgrounds. Newly developed single and double hybrid combinations showed better tolerance against thermal stress and suitable for summer seasons of tropics. The identified single hybrids (TT2 x TT6 & TT2 x TT5) and double hybrids (TT21 x TT67 & TT23 x TT67) would be subjected to on -station trial (OST) followed by evaluation at farmer's level.

AIB 3506 (DST-SERB): Studies on Thermo Tolerance, Heat Shock Protein Synthesis during Thermal Shock and Inbreeding in Silkworm, *Bombyx mori* L. (Jan. 2014 to Dec. 2015)

S. Manthira Moorthy and N. Chandrakanth (JRF)

Objectives:

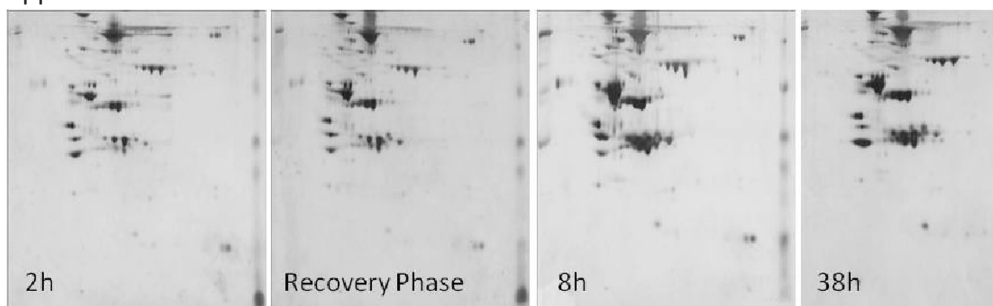
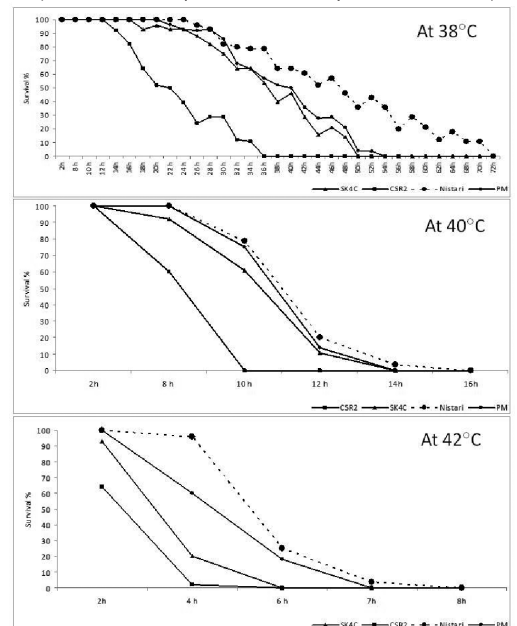
- Identification of critical thermal maximum in silkworm
- Analysis of *hsp* profiles in silkworm under thermal stress

Two indigenous multivoltine breeds (Nistari & Pure Mysore) and two bivoltine (CSR2 & SK4C) were selected for determining the thermo-tolerance mechanism in silkworm. Two sets of conditions were maintained to discern critical thermal maximum in silkworm (I: 1st day IV & V instar larvae exposed to 30, 32, 34, 36 & 38°C for 3, 6, 9 & 12h every day; II: 3rd day V instar larvae continuously exposed at 36, 38, 40 & 42°C till death). High reduction in pupation rate was observed in all the breeds exposed to longer duration (9 & 12h) irrespective of temperature treatment. The larvae exposed from IV instar onwards suffered heavily than V instar larvae, as duration of treatment was longer. The pupation rate (%) varied between 89 & 69, 82 & 51.5, 79 & 45, 72 & 41 in the V instar larvae exposed to 30°C for 3, 6, 9, 12h, respectively. Whereas, the same varied between 71.5 & 8, 67 & 3, 46 & 0, 32 & 0 in the V instar larvae exposed to 38°C for 3, 6, 9, 12h, respectively. No pupation was observed in CSR2 after 9 and 12h of exposure. Nistari was able to survive (11%) till 70h, PM (4%) till 52h, CSR2 (11%) till 32h and SK4C (14%) till 48h in case of V instar larvae exposed continuously to 38°C. It was also observed that Nistari was able to survive (3.6%) till 14h, PM (14%) till 12h, CSR2 (60%) till 8h and SK4C (11%) till 12hr in case of V instar larvae exposed to 40°C continuously from 3rd day. Similarly at 42°C, Nistari was able to survive (3.5%) till 7h, PM (18%) till 6h, CSR2 (2%) till 4h and SK4C (20%) till 4h.

Analysis of *hsp* profiles

The *hsp* profiles of haemolymph of silkworm larvae exposed to heat shock were analysed through one-dimensional (1DE) and two-dimensional electrophoresis (2DE). 1DE analysis revealed eleven polypeptides and significant changes were observed in expression of 23kDa, 30kDa, 35kDa, 70kDa and 90kDa in all the treatments/breeds. 2-DE profiles of CSR2 larvae exposed to 38°C revealed 286-390 protein spots (1-5 days/6h) due to thermal stress. The proteins expressed ranged between ~6kDa to >100kDa and several unique expression patterns were also observed (either up- or down-regulated). In general, up-regulation of 90-100kDa and *shsp* (40-35kDa) family and down regulation of 20kDa family was observed during thermal stress. The lowered intensity of proteins of ~110kDa (pI 8.5) and ~30kDa (pI 3) in control gradually indicates expression over a period of time and to nil expression. Similarly, gradual disappearance of ~35kDa (pI 9.5) spot was noticed. New protein spots (~72kDa/pI5 & ~48kDa (pI8.5) appeared after 1st and 4th day exposure, respectively; while ~64kDa (pI4) spot disappeared.

Survival of Silkworm breeds
(Continuous exposure of 3rd day V instar larvae)



Two-dimensional (2DE) *hsp* profiles of CSR2 exposed to high temperature (38°C)

2-DE hsp profile of CSR2 larvae exposed to 38°C continuously revealed 280 protein spots after 2h of exposure due to thermal stress and 288, 268, 298, 268 and 282 in samples of recovery phase (2h), 14h, 20h, 32h and 38h exposure, respectively. Significant observations include up-regulation of 31.33, 34.41, 96, 98, 165 kDa proteins and down-regulation of 46, 50, 54, 61, 66 and 195 kDa proteins. Mass spectrometry of seven unique protein spots revealed that 70kDa & 20kDa (spot 2, 4) corresponded to stress proteins; 34.24kDa & 59.96kDa (spot 1, 3) with protein metabolism of *B. mori*. Two other spots were predicted as immune-related protein CDIL (spot 5: 58.85kDa) and tRNA ligase (spot 6: 32.65kDa) of *Drosophila sechellia* and *Drosophila yakuba*, respectively. Another protein (spot 7: 6.46kDa) was classified as an uncharacterized protein from *Drosophila ananassae*.

Characterization of Unique 2DE silkworm haemolymph hsp proteins in response to prolonged heat stress

Classification	Spot No.	Protein Description	Accession no.	MW (kDa)/PI	Coverage (%)
Protein metabolism	1	Ribosomal protein P0 [<i>Bombyx mori</i>]	NP001037123	34.24/5.61	41.8
Response to stress	2	Heat shock protein 70 [<i>Bombyx mori</i>]	NP001036837	73.21/4.98	26.0
Protein metabolism	3	DnaJ-like protein [<i>Bombyx mori</i>]	NP001040185	59.96/7.32	29.9
Response to stress	4	Heat shock protein HSP20.8 [<i>Bombyx mori</i>]	GI11120618	20.79/5.98	46.1
Immunity protein cdi1 (Prediction)	5	<i>Drosophila sechellia</i>	195347982	58.85/3.5	28.5
tRNA ligase (Prediction)	6	<i>Drosophila yakuba</i>	195477573	32.65/5.8	28.5
Uncharacterized	7	<i>Drosophila ananassae</i>	94764324	6.46/8.5	33.3

Conclusion

High reduction in pupation rate was observed in larvae exposed to thermal stress for longer duration (9 & 12h) indicating the immense impact of duration on survival of silkworms irrespective of breeds and temperature. Silkworm can also survive continuous exposure to high temperature (38°C) even up to 70h; however, significant reduction in fertility and fecundity was noticed. Persistent expression of families of hsp100, 90 and 30 during prolonged stress period and varied expression of several proteins during stress (especially sHSPs). The relentless expression of hsps throughout stress helps silkworm to survive at sub-lethal temperatures. MALDI analysis reveals expression of stress proteins (70kDa & 20kDa) and protein related metabolism (34.24kDa & 59.96kDa) during stress period might have helped the larvae to survive and also facilitate the larval development. High induction of hsps might improve the short-term survival of silkworm during the first exposure to high temperature, but further demands of heat-shock protein production might lead to issues of survival due to chronic exposure.

Ongoing Research Projects

AIB 3509: Development of productive bivoltine silkworm breeds/hybrids of *Bombyx mori* L. tolerant to nuclear polyhydrosis virus (Jul. 2014 to De. 2018)

N. Mal Reddy, M. Balavenkatasubbaiah and S. Manthira Moorthy

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

Silkworm breeding lines viz., Oval x Oval: CSR2N, CSR17N, CSR27N, CSR50N, CSR52N, S8N; Dumbbell x Dumbbell: CSR4N, CSR6N, CSR16N, CSR26N, CSR51N and CSRR53 were raised by crossing recurrent bivoltine parental breeds with donor parents MASN6 (Oval type) and 5N (Dumbbell type). The second moult larvae of were exposed to BmNPV inoculation (2x10⁶PIBs/larvae).

Line	Survival (%)	SCW (g)	SSW (g)	Shell (%)
Oval lines				
CSR2N	52	1.599	0.347	21.7
CSR17N	60	1.538	0.338	22.0
CSR27N	58	1.580	0.357	22.6
CSR50N	48	1.498	0.327	21.8
CSR52N	69	1.707	0.358	21.0
S8N	74	1.573	0.367	23.3
Dumbbell lines				
CSR4N	45	1.619	0.337	20.8
CSR6N	52	1.463	0.293	20.0
CSR16N	64	1.459	0.299	20.5
CSR26N	56	1.412	0.277	19.6
CSR51N	48	1.549	0.310	20.0
CSR53N	52	1.415	0.292	20.6

The survival rate was calculated based on live pupae and cocoons were selected from beds with high survival and continued for further generations. The NPV incultation was continued from BC1 to BC6. The data indicates that among oval lines, highest pupation was observed in S8N (74%) and lowest in CSR50N (48%), where as highest pupation was observed in CSR16N (64%) and lowest in CSR4N (45%) among dumbbell lines. The breeding lines are presently at BC6 generation.

AIB 3536: Development of bivoltine silkworm hybrids for commercial exploitation (Mar. 2015 - Feb. 2017)

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

Objective: To develop improved bivoltine hybrids for sustainable productivity

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

Hybrids	ERR		SCW (g)	SSW (g)	SR (%)	EI
	By No.	By wt. (kg)				
Productive Single Hybrids						
CSR2 x CSR26	9100	17.76	1.952	0.469	24.0	57.8
CSR17 x CSR26	9200	17.41	1.893	0.450	23.8	61.3
CSR27 x CSR53	9400	18.00	1.915	0.428	22.4	59.7
CSR50 x CSR53	9400	17.47	1.858	0.428	23.0	59.7
CSR52 x CSR6	9150	17.17	1.877	0.437	23.3	57.7
CSR52 x CSR51	9100	17.12	1.881	0.432	22.9	60.5
CSR52 x 4D	9400	17.02	1.811	0.420	23.2	56.6
S8 x CSR6	9300	17.36	1.867	0.424	22.7	58.4
NB1 x CSR53	9100	17.86	1.963	0.437	22.3	55.7
D2 x CSR53	9300	16.63	1.789	0.412	23.0	52.3
Robust Single Hybrids						
D2 x SK6	9350	18.10	1.936	0.400	20.6	53.3
CSR2 x SK6	9500	18.79	1.978	0.409	20.7	51.5
CSR50 x SK6	9800	17.64	1.800	0.374	20.8	52.5
CSR52 x SK6	9650	16.33	1.692	0.344	20.3	53.2
S8 x SK6	9700	16.98	1.751	0.356	20.3	51.6
Productive Double Hybrids						
(CSR2xCSR27) x CSR16xCSR51)	9400	17.87	1.901	0.439	23.1	57.8
(CSR2xCSR50) x (CSR6x4D)	9200	18.33	1.993	0.465	23.3	58.5
(CSR2xCSR52) x (CSR26x4D)	9000	17.05	1.894	0.419	22.1	60.9
(CSR17xS8) x (CSR16xCSR51)	9050	17.69	1.955	0.465	23.8	61.6
(CSR17xS8) x (SSBS6xSSBS7)	9100	17.76	1.952	0.443	22.7	57.0
(CSR17x2C) x (CSR16xCSR51)	9167	17.64	1.925	0.473	24.6	60.7
(CSR27xGEN1) x (CSR6x4D)	9450	18.02	1.907	0.454	23.8	61.5
(CSR27x2C) x (CSR6x4S)	9100	18.15	1.995	0.468	23.5	59.8
(CSR52xGEN1) x CSR16xCSR51)	9600	18.98	1.977	0.474	24.0	66.6
(S8xD2) x (CSR16xCSR51)	9100	17.51	1.925	0.473	24.6	62.2

AIT 3556: To conduct multi-locational field trials on transgenic BmNPV resistant silkworm strains to establish their efficacy and generate data for their regulatory approval [DBT-BIRAC; in collaboration with CDFD-Hyderabad; APSSRDI-Hindupur] (Dec. 2015 to Nov. 2017)

V. Sivaprasad and S. Manthira Moorthy

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

Two trials of transgenic silkworm hybrid for BmNPV tolerance, CSR2(T) x CSR4 was completed. Necessary arrangements were made as per Standard Operating Procedure (SOP) and Biosafety measures for rearing transgenic silkworm hybrids (Recognition Committee of Genetic manipulation, RCGM- New Delhi). Non-transgenic batch (CSR2xCSR4) was maintained as control. The average cocoon yield/100 dfls recorded was 64.02kg in transgenic hybrid against 58.2kg in control.

Season	Hybrid	Yield/ 100 dfls (kg)	SCW (g)	SSW (g)	Shell (%)	Reelability (%)	Renditta	Neatness (p)	Silk Grade
Dec. 2015 to Jan. 2016	CSR2 (T) x CSR4	64.03	1.480	0.306	20.67	95.78	6.73	97	2A
	CSR2 x CSR4	58.20	1.530	0.325	21.25	86.64	7.37	97	B
Feb. to Mar. 2016	CSR2 (T) x CSR4	59.25	1.539	0.309	20.09	84.7	6.35	96	2A
	CSR2 x CSR4	57.31	1.596	0.338	21.18	78.07	7.04	96	A

Continuous/Other activities

Maintenance of bivoltine silkworm breeds

N. Mal Reddy, C. M. Kishor Kumar, S. Manthira Moorthy, P. V. Soudaminy, L. Kusuma and Y. C. Radhalakshmi

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

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

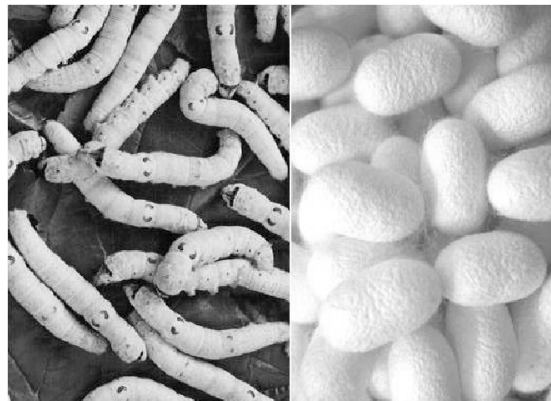
Category	Breeds		Fecundity (Nos)	Pupa - tion Rate (%)	Cocoon wt. (g)	Shell Ratio (%)	Fil. Length (m)	Raw Silk (%)	Denier
Productive	CSR2 CSR3 CSR4 CSR5 CSR6	CSR12 CSR16 CSR17 CSR26 CSR27	>500	>90	>1.70-1.80	>22-24	>900	>17.0	
Robust	CSR18 CSR19 CSR46 CSR47 CSR50 CSR51	CSR52 CSR53 S8 D2 NB1	>500	>90	>1.60-1.80	>22-23	>900	>15.0	
Thin De-nier	CSR48	JPN7	>500	>90	>1.60 -1.70	>22-23	>1200	>15.0	2.2-2.4
Sex-Lim-ited	CSR2 (SL) CSR4 (SL)	CSR 8 (SL) CSR27 (SL) CSR202 (SL)	>400	>90	>1.50-1.70	>20-21	>700	>13.0	

Development of highly productive bivoltine hybrid, S8 x CSR16

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

Objective: Development of productive sustainable bivoltine silkworm hybrid

The breeding programme was undertaken to develop highly productive bivoltine silkworm hybrid with sustainable cocoon yield production among the farmers. Accordingly, the cocoon and silk quality traits of bivoltine breeding line, S8 was improved by out crossing with the productive breed, CSR27 followed by systematic selection for high productive traits. Hybrid evaluation studies with the improved breed (S8) were conducted with bivoltine dumbbell breeds. The hybrid, S8 x CSR16 was identified based on overall performance for cocoon uniformity, higher evaluation indices for productive traits and hybrid vigour. The hybrid is characterized by higher cocoon weight (2.12 g) and shell (0.502 g @ 23.75%), better fibre characteristics (filament length: 1175 m; reelability: 90 %; neatness: 95 p) with better raw silk recovery (19.5%) and renditta (5.0-5.5).



Performance of S8 x CSR16 in the laboratory

Breeds	Pupa-tion(%)	Yield/10000 larvae(kg)	SCW (g)	SSW (g)	Shell (%)	Reelability (%)	Filament length (m)	Raw silk (%)	Filament size (d)	Neat-ness(p)
S8 x CSR16	96.7	21.0	2.12	0.507	23.9	87	1175	19.5	2.86	95
CSR2 x CSR4 [Control]	95.2	19.1	2.01	0.472	23.5	86	1050	17.5	2.89	94
% improvement	1.6	9.9	5.5	7.4	1.7		11.9	11.4		

Transfer of Technology (ToT) Programme

Field testing of new bivoltine silkworm hybrids

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

Several silkworm hybrids developed by CSRTI-Mysuru and some of them have been authorized for different parts of India; however, only few hybrids are commercially exploited. To determine the yield potentiality of these hybrids, systematic evaluation of authorized [Jayachamaraja, (CSR50 x CSR52) x (CSR51 x CSR53) & Chamaraja, CSR50 x CSR51] and pipe-line (S8 x CSR16) bivoltine hybrids at farmer's level is undertaken through ToT programme with the farmers of Karnataka, Tamil Nadu and Andhra Pradesh.

Field Performance of Bivoltine Hybrids – ToT Programme

State	Dfls	No. of farmers	Yield/ 100 dfls	Dfls	No. of farmers	Yield/ 100 dfls	Dfls	No. of farmers	Yield/ 100 dfls
	FC3 x FC4 (Jayachamaraja)			CSR 50 x 51 (Chamaraja)			S8 x CSR16		
Karnataka	44800	257	69.26	22350	130	65.03	68350	374	76.47
Tamil Nadu	61200	311	70.84	10800	72	72.19	22350	110	76.00
Andhra Pradesh	79580	285	65.78	18400	50	65.93	19900	81	67.59
Total	185850	863	68.33	51550	252	67.11	1,10,600	565	74.64

MULTIVOLTINE BREEDING LABORATORY

Ongoing Research Projects

AIB 3546: Development of productive polyvoltine breeds of the silkworm, *Bombyx mori* L. tolerant to high temperature and BmNPV (Oct. 2011 to Sep. 2016)

Dayananda (PI), M. Balavenkatasubbaiah and Kariyappa

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

Four short-listed stress tolerant polyvoltine lines viz., L3, HB1, HB4 & HB6 along with Pure Mysore (PM) and MV1 were evaluated for the overall performance in the laboratory. Two new polyvoltine lines, L3 and HB4 excelled in economic traits over PM and at par with MV1 and these lines are currently at F17. Further, two promising crossbreeds viz., L3 x S8 and HB4 x S8 were identified through hybrid evaluation studies.

Laboratory performance of stress-tolerant polyvoltine lines (Average of 5 trials)

Breeds	Fec. (no.)	Pupation (%)	SCW (g)	SSW (g)	Shell %	Reel (%)	FL (m)	RS (%)	Neat (p)	AEI
MV1	550	86.14	1.485	0.276	18.50	63.31	539	11.12	90	56.64
L3	535	89.06	1.398	0.249	17.82	63.52	595	11.00	90	56.16
HB4	562	93.91	1.384	0.263	18.97	61.09	518	11.04	88	55.57
HB1	563	88.43	1.452	0.269	18.49	57.35	578	10.50	86	53.04
HB6	481	83.94	1.383	0.260	18.77	58.00	5.6	9.93	86	46.67
PM	462	88.03	1.067	0.170	15.91	54.27	479	8.50	86	36.15

Laboratory performance of crossbreeds (Average of 5 trials)

Crossbreeds	Fec. (no.)	Pupation (%)	SCW (g)	SSW (g)	Shell %	Reel (%)	FL (m)	RS (%)	Neat (p)	AEI
L3 x S8	553	86.08	1.728	0.358	20.70	84.83	755	14.75	90	59.41
MV1 x S8	532	86.23	1.699	0.343	20.18	84.10	783	15.03	90	56.87
HB4 x S8	498	87.27	1.559	0.317	20.31	84.95	750	14.77	90	51.73
HB1 x S8	478	84.37	1.580	0.324	20.49	83.66	698	14.46	87	46.38
HB6 x S8	483	77.54	1.544	0.314	20.33	81.37	782	15.27	86	45.07
PM x S8	439	86.67	1.592	0.309	19.43	84.23	690	13.86	87	40.89

AIB 3524: Improvement of Pure Mysore race for productivity and silk quality (Jan. 2015 to Jun. 2018)

Dayananda (PI), S. B. Kulkarni and Kariyappa

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

Pure Mysore lines maintained at CSRTI-Mysuru, P3BSF-Nagenahalli (NSSO) and P4BSF-Bilidevalaya (DoS-Karnataka) were evaluated for various morphological, growth and economic traits. Two sources of PM lines were selected and the base population of selected sources w.r.o cocoon shape (rounded ends), pupation (>90%), cocoon weight (>1.10 g) and shell content (0.170 g) through application of directional selection pressure continuously for three generations. The selection procedure followed is: cellular brushing; selection of beds based on cocoon shape and survival and selection of female cocoons of high cocoon weight and males of high shell weight.

Improvement of PM lines of selected sources (3rd generation)		
Parameter	Source-1	Source-2
Fecundity (no.)	430 – 521	459 – 506
Survival (%)	74.72 – 89.71	70.78 – 90.67
Single cocoon weight (g)	0.845 – 1.167	0.947 – 1.125
Single shell weight (g)	0.125 – 0.180	0.151 – 0.175
Shell ratio (%)	14.79 – 15.42	15.49 – 15.56

AIB 3534: Development of improved cross breeds of silkworm, *Bombyx mori* L. suitable for south India (Mar. 2015 to Mar. 2019)

Dayananda (PI), C. M. Kishor Kumar, M. Balavenkatasubbaiah and Y.C. Radhalakshmi

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

Thirty six F1 crosses were prepared utilizing eleven polyvoltine parental breeds including six greenish yellow (GY: L14, ND7, NDV6, NP1, ND5 & AGL), two dark yellow (DY: APDR15 & FVB1) and three white colored (W: MH1, Sarupat & PV1) cocoons in five breeding plans (GY x GY: 14 crosses; DY x DY: 1 cross; DY x GY: 2 crosses; DY x W: 6 crosses and GY x W: 13 crosses). These were evaluated from F1 to F4 generations and at present 21 crosses (F5 generation) are being maintained for further study.

Continuous/Other activities

Maintenance of polyvoltine silkworm breeds of *Bombyx mori* L.

Dayananda and Kariyappa

Objective: Maintain the polyvoltine breeds conforming to their original characters

Thirty-five polyvoltine breeds were maintained conforming to their original breed characteristics for five generations and the average performance for important evolved breeds is presented below:

Rearing and reeling performance of important evolved polyvoltine breeds									
Race / Breed	Fec. (no.)	Pupation (%)	SCW (g)	SSW (g)	SR (%)	Reel. (%)	FL (m)	Raw silk (%)	Neatness (p)
ND7	543±46	82.71±4.77	1.482±0.11	0.264±0.02	17.83±1.43	54.62	598	10.60	88
NDV6	473±57	88.91±7.05	1.465±0.10	0.271±0.02	18.51±0.95	59.11	586	11.91	90
ND5	562±56	83.68±3.59	1.451±0.10	0.268±0.01	18.45±0.46	66.63	464	10.64	86
NP1	548±17	93.57±3.10	1.379±0.10	0.237±0.01	17.22±1.26	63.63	406	09.12	88
AGL3	478±36	91.80±5.88	1.281±0.10	0.229±0.02	17.86±0.68	60.10	453	11.73	90
AGL5	451±88	88.15±5.94	1.281±0.10	0.236±0.02	18.40±0.88	82.79	559	10.41	86
L15	540±41	89.05±6.83	1.440±0.11	0.261±0.02	18.13±0.82	55.27	576	11.72	86
L14	543±32	83.69±4.82	1.436±0.10	0.257±0.02	17.92±0.94	54.62	574	10.88	86
MV1	550±25	89.56±6.41	1.485±0.11	0.276±0.02	18.59±0.68	63.31	540	10.11	90

Multiplication of silkworm breeds

S.B. Kulkarni

Objective: Generation of seed cocoons for F1 production under ToT

47 dfls of MV1 and 104 dfls of bivoltine breeds were reared and seed cocoons produced were supplied for the production of cross-breed (MV1 x S8) and bivoltine hybrid (CSR50 x CSR51) dfls for ToT.

The new improved cross breed (ICB) Cauvery Gold, MV1xS8 is superior in economic traits of

Performance of Seed Crops								
Breed	Dfls (Nos.)	Fec. (Nos.)	Actual Yield (kg)	Yield/ 100 dfls (kg)	Coc. /kg (Nos.)	SCW (g)	SSW (g)	SR (%)
MV1	47	507	21.56	45.90	686	1.518	0.281	18.15
S8	25	510	13.45	53.80	674	1.752	0.351	20.08
CSR16	20	478	8.94	44.68	714	1.454	0.294	20.24
CSR51	22	515	9.38	42.62	644	1.621	0.432	20.70
CSR50	23	480	9.31	40.48	638	1.614	0.420	21.30
FC4	5	495	2.73	54.56	698	1.758	0.391	22.28
CSR17	3	480	1.54	51.33	602	1.903	0.420	22.07
D7	3	495	1.18	39.27	638	1.715	0.361	21.11
G11	3	480	1.64	54.13	632	1.743	0.376	21.38

survival, silk content, renditta, neatness, size deviation, tenacity, cohesion and elongation. MV1 x S8 was reeled through MRM and ARM produced international grade quality silk (2A~3A) and is suitable for power looms and mechanized hand looms as both warp and weft. 26750 dfls of MV1 x S8 were reared by 129 farmers yielded at an average of 60-65 kg/100 Dfls.

State	Dfls Reared (Nos)	Farmers (Nos)	Avg.Yield/ 100 dfls (kg.)
Karnataka	22300	100	59.80
Andhra Pradesh	3100	21	61.80
Tamil Nadu	1350	8	61.10
Total/Avg.	26750	129	60.10

SILKWORM GENETICS LABORATORY

Ongoing Research Projects

AIB 3528: Evaluation of G11 x G19 - A new bivoltine double hybrid for sub-optimal conditions (Jan. 2015 to Dec. 2016)

K. K. Sharmila (PI), C. M. Kishor Kumar, Y. C. Radha Lakshmi, B. Parthasarathi¹ and Ramesh Babu²

¹SSPC, Bengaluru, ²NSSO, Bengaluru

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

A total quantity of 2450 dfls of foundation crosses (G11 & G19) were distributed to adopted seed rearers for generating seed cocoons for the production of double hybrid, G11 xG19. The yield/100 dfls of G11 ranged from 82-90 kg with higher pupation rate (93%) and G19 yielded an average cocoon of 76 kg with 91%

Place	Farmers (No.)	Dfls (No.)	Yield /100 dfls(kg)	SCW (g)	SSW (g)	SR (%)
Karnataka	701	104250	68	1.709	0.357	20.89
Tamil Nadu	815	84850	77	1.834	0.373	20.33
Andhra Pradesh	684	161650	66	1.851	0.370	20.00
Maharashtra	300	52500	63	1.620	0.368	22.71
Total/Avg.	2500	403250	68.5	1.753	0.367	20.93

pupation rate. The egg yield for the double hybrid ranged from 62 to 73g/kg seed cocoon. A total quantity of 333200 dfls were produced at SSPCs of NSSO (April-July 2015) and kept for 4, 6 and 10 months hibernation schedule.

A total quantity of 403250 dfls was distributed to 2500 farmers of Southern India against the target of 2 lakh dfls. The average cocoon yield recorded was 68.5kg/100dfls and the consistency in cocon yield was observed throughout the season in Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra.

Continuous/Other activities

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

K. K. Sharmila (PI)

Objective: Maintenance of silkworm races conforming to their original characters

Nine oval and seven dumbbell breeds developed through amylase marker assisted selection; four BmNPV tolerant breeds; and mutant stocks (26) were maintained conforming to their original characteristics for two generations. The performances of these genetic stocks were documented.

Performance of breeds developed through amylase marker assisted selection							
Breed	Fecundity (Nos)	ERR /10000 larvae		SCW (g)	SSW (g)	SR (%)	
		No.	Wt. (kg)				
Oval	GEN1	576±04.32	9002±180	14.73±0.69	1.689±0.07	0.360±0.02	21.60±0.62
	GEN3	594±06.97	9140±177	15.01±0.74	1.720±0.03	0.392±0.02	22.79±0.25
	2C	513±08.92	9180±315	15.69±0.58	1.710±0.03	0.398±0.02	23.27±0.37
	2S	530±09.90	8940±223	14.02±0.92	1.569±0.04	0.338±0.03	21.54±0.38
	2M	499±17.50	8540±254	14.00±0.14	1.567±0.09	0.348±0.08	22.20±0.39
	3P	494±13.40	9080±168	14.89±0.74	1.662±0.30	0.364±0.60	21.90±0.45
	3C	542±09.60	8680±240	13.88±0.94	1.560±0.69	0.338±0.90	21.66±0.14
	3D	494±17.60	8880±289	14.20±0.82	1.624±0.78	0.344±0.40	21.18±0.18
	3N	514±11.30	9380±198	15.42±0.25	1.610±0.60	0.366±0.10	22.15±0.21
		508±08.95	9160±174	14.22±0.32	1.560±0.03	0.338±0.01	21.66±0.64
Dumbbells	4D	524±18.60	9200±308	14.75±0.29	1.680±0.04	0.372±0.01	22.14±0.68
	4S	517±04.57	8900±150	14.68±0.63	1.690±0.07	0.379±0.02	22.42±0.14
	4C	524±15.00	8980±220	14.80±0.19	1.660±0.80	0.376±0.30	22.65±0.10
	4P	468±22.00	8780±280	13.96±0.45	1.590±0.90	0.339±0.40	21.32±0.30
	6P	510±09.00	8900±290	14.24±0.54	1.620±0.30	0.354±0.60	21.85±0.41
	6C	498±16.00	9230±226	14.76±2.18	1.640±0.20	0.364±0.30	22.19±0.40

Performance of NPV tolerant breeds						
Breed	Fecundity (Nos)	ERR /10000 larvae		SCW (g)	SSW (g)	SR (%)
		No.	Wt. (kg)			
2N	524±19.5	9040±222	13.56±5.89	1.481±0.35	0.292±0.22	19.75±3.37
5N	464±18.0	8820±352	12.78±2.10	1.436±0.28	0.278±0.08	19.39±0.68
61N	487±12.0	8140±205	12.56±1.72	1.458±0.38	0.286±0.11	19.65±4.51
63N	510±32.0	8240±382	10.15±1.84	1.523±0.52	0.322±0.08	21.14±2.43

Linkage	Description	Linkage	Description
w-2 (10)	White egg 2, yellowish white eggs	K (11)	Knobbed dermal protuberances
Re (5)	Red egg, serosa cells red.	Rb (21)	Red blood
pe; re (5)	Pink eyed white egg	U (14)	Ursa, dark brown pigment on dorsal & lateral sides
elp (18)	Ellipsoid egg	st (8)	Stony, larval body hard & compact
Ge (1)	Giant egg	tub (23)	Tubby larva with short thorax & stout abdomen
b-2 (6)	Brown egg	E (6)	Extra abdominal legs
sp (23)	Spindle shaped egg	nb (19)	Narrow breast, short thorax & stout abdomen
ch (13)	Chocolate newly hatched larvae	e (1)	Elongated II abdominal segment
pS (2)	Striped, black intersegmental bands	la (9)	Dominant chocolate newly hatched larva
pM (2)	Moricaud larval markings	lu (16)	Lustrous eye in moths
Ze (3)	Zebra larval markings	Ws (17)	Wild wing spot in moths
lem (3)	Lemon coloured larval skin	Pk (2)	Pink coloured cocoon
L (4)	Multilunar spots on dorsal side	Y (2)	Yellow blood

SATELLITE SILKWORM BREEDING STATION-COONOOR

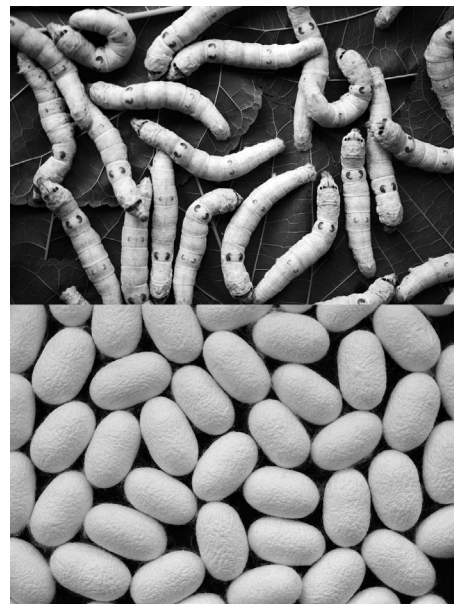
Continuous/Other activities

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

E. Rajalakshmi (PI), S. Nirmal Kumar, R. Gururaj and V. Sivaprasad

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

Seven productive bivoltine breeds have been evolved through systematic breeding programme. The oval breeds are characterized by >90% pupation rate, >1.8g cocoon weight, 40-44 cg shell weight and 21-25% shell ratio; while the dumbbell breeds are characterized by >1.7g cocoon weight, 36-40 cg shell weight and 21-23% shell ratio. Utilizing these productive breeds, a productive bivoltine double hybrid, SSBS5 x SSBS6 was evolved for further use through systematic evaluation of hybrids (May-Jun., Jul.-Aug. and Sep.-Oct. 2015). P1 dfls of SSBS5 x 6 parental breeds were supplied to SSPC-Palakkad (NSSO) for seed cocoon generation and hybrid dfls were prepared for the field trials. 8500 dfls were tested at farmers' field and an average yield of 75kg/100 dfls was recorded.



Double Hybrid	Fec. (Nos)	ERR No.	SCW (g)	SSW (g)	SR (%)
SSBS (3 x 5) x (6 x 7)	591	93.94	2.237	0.522	23.34
SSBS (3 x 5) x (7 x 6)	595	97.00	2.187	0.484	22.06
SSBS (5 x 3) x (6 x 7)	630	97.98	2.240	0.505	22.54
SSBS (5 x 3) x (7 x 6)	625	96.83	2.232	0.518	23.21


Maintenance of Bivoltine breeder's stock of germplasm

E. Rajalakshmi and R. Gururaj

Objective: To maintain evolved breeders stock of bivoltine silkworm germplasm to its original characters

Maintenance rearing of 43 bivoltine germplasm breeds including 29 evolved breeds from SSBS- Coonoor and 14 breeds from CSRTI-Mysuru.



Performance of Breeder's Stocks : SSBS-Coonoor						Performance of Breeder's Stocks: CSRTI-Mysuru					
Breed	Fec.	ERR (No.)	SCW (g)	SSW (g)	SR (%)	Breed	Fec.	ERR (No.)	SCW (g)	SSW (g)	SR (%)
CNR3	518	97.20	1.546	0.310	20.05	CSR2	562	90.00	1.674	0.374	22.32
CNR4	510	95.50	1.650	0.379	22.97	CSR4	499	96.40	1.818	0.381	20.96
CNR5	537	90.02	1.626	0.364	22.53	CSR6	524	94.96	1.710	0.364	21.27
CNR14	493	89.47	1.424	0.334	23.62	CSR16	524	94.96	1.710	0.364	21.27
CNR15	519	94.80	1.586	0.353	22.28	CSR17	506	96.10	1.607	0.350	21.76
SLD1	454	93.50	1.837	0.396	21.55	CSR26	517	96.00	1.674	0.336	20.09
SLD2	526	92.27	1.713	0.375	21.87	CSR27	529	95.81	1.714	0.403	23.50
SLD4	477	95.90	1.604	0.346	21.54	CSR46	568	92.10	1.761	0.392	22.28
SLD6	461	92.67	1.610	0.365	22.65	CSR47	528	96.00	1.614	0.345	21.37
SLD8	484	94.70	1.572	0.338	21.50	CSR50	522	92.30	1.788	0.417	23.34
SLD9	457	92.40	1.451	0.323	22.26	CSR52	499	89.10	1.760	0.400	22.72
D1	508	95.36	1.540	0.349	22.66	CSR53	552	96.32	1.728	0.392	22.70
D2	524	93.87	1.613	0.374	23.17	D20	466	90.08	1.704	0.377	22.15
D7	489	91.30	1.718	0.405	23.58	Gen3	549	95.92	1.799	0.448	24.90
CSR202	456	90.32	1.564	0.363	23.19						
CSR204	444	90.70	1.490	0.340	22.79						
D11	452	96.10	1.514	0.339	22.38						
D13	512	96.40	1.643	0.353	21.46						
D15	480	93.50	1.474	0.338	22.93						
D17	487	89.70	1.599	0.364	22.74						
SSBS 9	573	90.80	1.687	0.379	22.47						
SSBS10	598	91.60	1.684	0.380	22.54						
SSBS11	627	95.80	1.737	0.377	21.70						
SSBS12	599	95.60	1.730	0.392	22.66						
SSBS13	552	94.20	1.731	0.355	20.49						
SSBS14	521	95.40	1.716	0.361	21.03						
SSBS15	503	95.60	1.462	0.300	20.11						
SSBS16	570	95.40	1.600	0.336	20.97						
SSBS17	548	95.60	1.609	0.358	22.24						

P4 BSF - HASSAN

Bivoltine Silkworm Race Maintenance and Multiplication

G.V. Kalpana and K. B. Chandra Shekar

Objective: Systematic mulberry garden maintenance, silkworm race maintenance and supply of quality bivoltine eggs to downstream multiplication centers

Seven bivoltine breeds were reared in four crops (May-Jun., Aug.-Sep., Nov.-Dec. and Feb.-Mar. 2016) following systematic silkworm race maintenance procedure.

Breed	Pupation Rate (%)	Coc. yield/ 10000 Larvae (kg)	SCW (g)	SSW (g)	Shell Ratio (%)
CSR2	97.1±0.6	18.6±1.67	1.841±0.12	0.429±0.03	23.3±0.4
CSR4	97.1±0.6	17.1±2.3	1.703±0.16	0.370±0.03	21.7±0.3
CSR6	97.3±0.7	17.8±2.2	1.770±0.16	0.382±0.03	21.6±0.3
CSR26	97.0±1.1	16.6±1.9	1.694±0.20	0.367±0.03	21.7±0.4
CSR27	97.2±0.6	18.3±1.5	1.835±0.10	0.439±0.02	23.9±0.5
CSR16	97.2±0.4	17.6±1.9	1.754±0.15	0.378±0.03	21.6±0.2
CSR17	97.3±0.8	18.7±1.4	1.859±0.10	0.407±0.02	21.9±0.3

Silkworm breeds were maintained in conformity with the breed characteristics and hybrid vigour was also recorded for the authorized combinations. The crops were meticulously monitored for pebrine incidence. A total of 7813 dfls of pure stock dfls were prepared for supply to P3 and P2 multiplication centres. The percentage of recovery of dfls ranged from 29.9% (CSR6) to 38.4% (CSR27).



CSR4



CSR6



CSR16



CSR17



CSR26



CSR27

SILKWORM MOLECULAR BIOLOGY LABORATORY

Continuous/Other activities

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

Virendra Kumar, Ch. Satyanarayana Raju, C. A. Mary Flora and R. Meenal

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

BmNPV tolerant bivoltine double and single hybrids developed through BmNOX marker system were evaluated at RSRS-Anantapur, RSRS- Salem and RSRS-Chamarajanagar. Ten dfls of each hybrid were reared and the data on rearing and reeling performance was recorded.

Performance of BmNPV tolerant BV hybrids (BmNOX) - OST										
RSRS	Race	Fec. (Nos)	SCW (g)	SSW (g)	SR (%)	Yield/ 100 dfls(kg)	Reelability (%)	AFL (m)	Raw Silk (%)	Neatness (p)
Anantapur	CSR2 x 118 x CSR6 x 87	484	1.996	0.435	21.80	88.86	83.09	946.96	14.69	95.00
	(21 x 118) x (62 x 87)	485	1.898	0.405	21.34	87.12	81.54	910.35	15.23	95.33
	(21 x 118) x 62 x 26)	451	1.857	0.388	20.89	84.54	85.27	990.03	16.19	96.00
	21 x 35 (SH)	410	1.829	0.398	21.76	82.38	82.14	853.65	14.83	95.33
	FC2 x FC1 (Control)	506	1.878	0.408	21.73	90.78	79.40	979.39	15.96	94.67
Salem	CSR2 x 118 x CSR6 x 87	611	1.750	0.371	21.20	81.60	83.28	919.53	16.94	96.00
	(21 x 118) x (62 x 87)	610	1.747	0.368	21.07	80.70	83.28	898.36	16.32	95.00
	(21 x 118) x 62 x 26)	605	1.807	0.362	20.03	94.02	84.06	967.46	15.15	96.00
	21 x 35 (SH)	519	1.414	0.322	22.77	73.09	83.83	908.73	18.76	96.00
	FC2 x FC1 (Control)	672	1.890	0.401	21.22	90.72	82.37	970.21	14.60	95.00
Chamarajanagar	CSR2 x 118 x CSR6 x 87	543	1.616	0.338	20.96	87.60	82.90	834.49	16.71	94.33
	(21 x 118) x (62 x 87)	549	1.568	0.332	21.87	92.28	82.84	875.49	18.29	95.33
	21 x 35 (SH)	532	1.667	0.330	19.82	98.88	82.92	809.38	15.30	95.00
	FC2 x FC1 (Control)	612	1.770	0.384	21.75	105.33	84.26	925.05	16.37	95.00

SILKWORM PHYSIOLOGY LABORATORY

Continuous/Other Activities

Maintenance of silkworm diet-silkworm breeds for original breed characteristics

M. Munirathnam Reddy and E. Bhuvaneshwari

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

Two rearings of diet bivoltine breeds were conducted with semi-synthetic diet for overall performance conforming to the breed characteristics. Feed response ranged between 90.86-95.20 and pupation rate was 86.84-91.57. Similarly, six rearings of diet-multivoltine breeds were also conducted and the feed response ranged 91.36-95.42 with the pupation rate of 88.00-92.58.

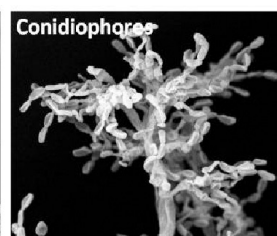
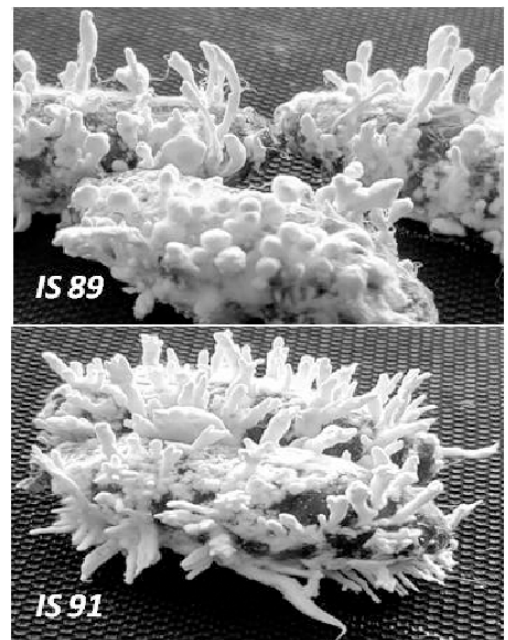
Breeds		Feed Response (%)	Pupation Rate (%)	Cocoon wt. (g)	Shell wt. (g)	SR (%)
Bivoltine	CSR2(A)	90.86±0.74	90.25±0.08	1.665±0.06	0.374±0.01	22.5±0.12
	CSR4(A)	93.82±0.68	86.84±0.44	1.652±0.05	0.364±0.01	22.0±1.12
	CSR18(A)	95.20±0.78	91.57±1.23	1.378±0.02	0.278±0.02	20.2±0.86
	CSR19(A)	94.24±0.27	92.25±0.24	1.450±0.02	0.310±0.01	21.4±0.48
	CSR6(A)	89.25±0.57	89.26±1.02	1.617±0.04	0.338±0.012	20.9±0.42
	CSR26(A)	91.22±0.03	88.87±1.23	1.628±0.24	0.350±0.03	21.5±0.24
	CSR27(A)	94.38±0.23	90.64±0.14	1.556±0.01	0.361±0.02	23.2±0.29
	CSR50(A)	92.26±1.53	90.25±1.24	1.610±0.02	0.359±0.02	22.3±0.43
CSR51(A)	93.42±0.62	90.64±1.14	1.578±0.01	0.328±0.02	20.8±0.44	
Polyvoltine	PM(A)	91.42±1.42	90.25±1.42	1.042±0.12	0.140±0.02	13.4±0.42
	PMSL(A)	91.36±0.38	88.00±2.10	1.094±0.13	0.162±0.01	14.8±0.42
	BL67(A)	91.44±1.28	92.24±1.14	1.136±0.08	0.188±0.01	16.5±0.22
	96C(A)	95.42±1.26	91.42±2.24	1.140±0.12	0.186±0.01	16.3±0.69
	ND7(A)	93.78±0.48	88.82±1.24	1.178±0.12	0.198±0.02	16.8±0.22
	C.Nichi(A)	91.84±1.48	92.58±2.36	0.789±0.07	0.098±0.01	11.7±0.57
	Nistari(A)	93.02±1.12	95.25±1.34	0.910±0.02	0.122±0.03	13.4±0.20

Maintenance of mother cultures of *Cordyceps* Spp.

M. Munirathnam Reddy, Vineet Kumar and Y. Thirupathaiah

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

Mother cultures of 13 isolates of eight *Cordyceps* spp. from different sources were maintained and multiplied on potato dextrose agar (PDA) and sabouraud dextrose agar yeast (SDAY) media periodically by incubating at 15-25°C. The *Cordyceps* stock cultures were in vitro and in vivo sub-cultured for its viability. For *Cordyceps* fruiting body formation, inoculum in potatodextrose broth was injected into live 6/8 days-old silkworm pupae and incubated at 20°C for 20 days. Among thirteen isolates of *Cordyceps* spp., *Cordyceps takaomontana* anamorph (*Isaria tenuipies*) 91 (IS 91) and 89 were found to produce fruiting body on silkworm pupae as well as in vitro culture. Better fruiting body formation was observed on live silkworm pupae and fruiting body of IS 91 was club shaped with whitish cream colour (2-5cm long & 0.5-1.0cm wide). The mycelial and fruiting body morphology and growth was analyzed by SEM.



REARING TECHNOLOGY & INNOVATION

Ongoing Research Projects

AIB 3561: Identification of robust bivoltine silkworm hybrids suitable for different regions of high temperature and high humidity conditions (Mar. 2016 to Mar. 2018)

S. Purushotham, D. S. Somaprakash, N. Mal Reddy, Vineet Kumar, Kariyappa and T.V.S.Rao¹

¹REC- Chebrole

Objectives

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

The bivoltine parental breeds were screened for their tolerance to high temperature (32°C) and high humidity (80±5%) for 8 hours daily till harvesting in IV & V instar. Till third moult, the larvae were reared as per standard rearing technology. 200 larvae per batch were maintained in each treatment. The cocoons were harvested on 6th day and assessed for rearing and post-cocoon parameters.

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

Continuous/Other activities

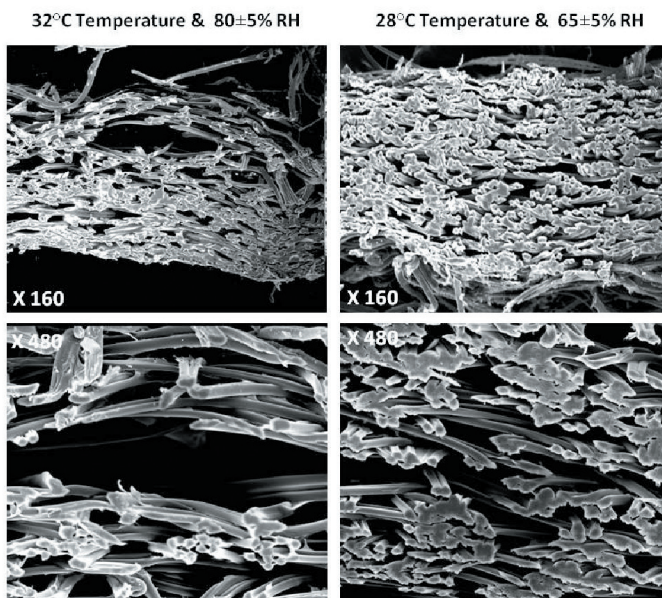
Large scale in-house evaluation of newly developed ICBs and multiplication of parental silkworm breeds

P. C. Santha

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

Under the large scale in-house evaluation and multiplication, four silkworm rearings (835 dfls) were conducted with MV1 breed and improved crossbreeds (ICBs). A total quantity of 3.05 lakh cocoons was generated and the seed cocoons were utilized for ICB dfls production through SSPC-Dhramapuri (NSSO).

Race	32°C Temperature & 80±5% RH					28°C Temperature & 65±5% RH				
	Cocoons harvested (No.)	SCW (g)	SSW (g)	Shell Ratio (%)	Pupa-tion Rate (%)	Cocoons harvested (No.)	SCW (g)	SSW (g)	Shell Ratio (%)	Pupa-tion Rate (%)
CSR2	116	1.06	0.23	21.09	92	93	1.01	0.23	22.27	89
CSR27	80	1.02	0.21	20.58	88	92	1.00	0.22	21.78	74
CSR6	128	1.18	0.25	21.18	90	110	1.13	0.25	22.12	90
CSR4	190	1.04	0.21	20.19	94	64	1.03	0.23	22.23	82
CSR53	193	1.26	0.27	21.42	92	162	1.28	0.28	21.87	86
CSR16	194	1.27	0.27	21.25	92	120	1.21	0.27	22.31	86
S8	179	1.08	0.22	20.37	94	143	1.13	0.23	20.35	82
CSR50	87	1.09	0.23	21.1	90	69	1.01	0.23	22.77	76
CSR51	132	1.1	0.21	14.09	90	40	1.09	0.21	19.26	61
CSR52	186	1.12	0.25	22.32	94	114	1.09	0.21	19.26	84
CSR26	69	1.21	0.25	20.66	84	101	1.22	0.27	22.13	64
CSR17	151	1.05	0.22	20.95	90	140	1.05	0.23	22.77	83



Breed/Hybrid	Crop Period	Dfls (Nos)	Fec. (Nos)	Actual Yield (Nos.)	ERR/10000 L		SCW (g)	SSW (g)	SR (%)	Coc/ Kg (Nos)	Yield/ 100 dfls (kg)
					No.	Wt. (kg)					
S8	May-Jun 15	75	405	22400	8175	12.80	1.886	0.443	23.5	660	46.6
MV1		150	417	50100	8759	13.29	1.730	0.326	18.8	640	50.7
MV1	Jul-Aug 15	210	430	78690	9481	14.70	1.785	0.311	17.4	645	58.1
MV1 x FC4	Oct-Nov 15	50	504	19584	8369	13.68	2.078	0.443	21.3	612	64.0
MV1 x CSR51		50	501	18088	8004	12.40	2.049	0.423	20.6	646	56.0
MV1 x S8		50	503	22074	9556	16.88	2.114	0.456	21.6	566	78.0
MV1XCSR16		50	505	19488	8510	12.66	2.018	0.425	21.1	672	58.0
MV1	Dec-Jan 16	200	436	74800	9235	13.58	1.711	0.308	18.0	680	55.0

Multiplication of parental stocks of newly developed bivoltine hybrids

S. Purushotham and D. S. Somaprakash

Objective: To multiply breeds of newly evolved silkworm hybrids

Four rearings (600 dfls) of bivoltine pure breeds/FCs viz., S8, CSR16, FC3 & FC4 were conducted and the seed cocoons (1.95 lakhs) were supplied to SSPC-Dharmapuri (NSSO) for the preparation of F1 hybrids and supply to farmers in southern states under ToT programme.

Race	Crop Period	Dfls (Nos)	Actual Yield (Nos.)	Pupa-tion Rate (%)	SCW (g)	SSW (g)	SR (%)
S8	May-Jun	80	27090	94.70	1.673	0.392	23.43
CSR16		70	19680	85.50	1.693	0.387	22.85
FC3	Jul-Aug	75	13244	82.55	1.682	0.367	21.82
FC4		75	28050	83.24	1.782	0.386	21.66
CSR16	Sep-Oct	75	20378	87.46	1.412	0.315	22.31
S8		75	18674	85.38	1.134	0.313	21.82
CSR16	Nov-Dec	75	32291	96.05	1.527	0.342	22.39
S8		75	35598	94.55	1.432	0.312	21.78

GRAINAGE

Continuous/Other activities

Evaluation of reproductive performance of newly developed silkworm breeds/hybrids

R. Bhagya and ¹E. Rajalakshmi

¹SSBS, Coonoor

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

A quantity of 22000 seed cocoons (SSBS 5 & SSBS 6) were utilized for the production of 4605 dfls SSBS 5 x 6 and SSBS 6 x 5 with a pairing percentage of 41.78-42.57 and egg yield of 68.6-67.5g/kg cocoons. A quantity of 858 P1 dfls and 217 FC dfls were prepared with a pairing percentage of 45.64-43.92 and dfls recovery of 35.48-39.92%. The P1 & F1 dfls produced were utilized by SSBS-Coonoor for the field trial with farmers in southern states.

Hybrid Combination	Cocoons Utilized (Nos)	Pupation Rate (%)	Egg/g (Nos)	Dfls Production (Nos)	Egg Yield g/kg cocoon
SSBS5 x 6	9000	89.43	1797	2555	68.60
SSBS6 x 5	8970	85.36	1816	2050	67.55

Breed/FC	Cocoons Utilized (Nos)	Pupation Rate (%)	Dfls Production (Nos)	Pairing (%)	Dfls Recovery (%)
FC3 x 5	335	83.90	113	45.64	39.92
FC6 x 7	300	86.86	104	43.92	35.48
SSBS3	525	89.73	156	46.70	30.23
SSBS5	550	88.66	134	45.86	25.18
SSBS6	620	93.53	183	41.61	30.09
SSBS7	440	80.20	144	45.38	35.91
CSR51	700	92.41	241	44.77	35.97

PEST MANAGEMENT LABORATORY

Ongoing Research Projects

PRE 3527: Survey and surveillance of major pests and their natural enemies in mulberry eco-system (Jan. 2015 to Dec. 2016)

J.B. Narendra Kumar (PI), Vinod Kumar, M. Noble Morrison¹, H. Jairam², S. N. Pallavi³, N. Sakthivel⁴, S. Mahiba Helen⁴ and B. Kasi Reddy⁵

¹REC, Madivala, ²REC SU, Kanakapura, ³RSRS, Chamarajanagar, ⁴RSRS, Salem, ⁵RSRS, Anantapur

Objectives

- To monitor the incidence of insect pests and their natural enemies in mulberry eco-system
- To construct life tables and study tri-trophic interaction of new pests, if any and their natural enemies
- To establish cultures of new potential natural enemies for mulberry pests

Ten selected mulberry gardens each were surveyed in the seven selected places covering three southern states of Karnataka, Tamil Nadu and Andhra Pradesh for major pest incidence. Average mealybug incidence was highest in Salem (12.9%) followed by Srivilliputtur (6.34%) and in other places it was <5%. Similarly, thrips incidence was also highest in Salem (10.95/leaf) followed by Srivilliputtur (8.78/leaf) and Kanakapura (6.69/Leaf). Whitefly incidence was quite serious only at Mysuru (9.62/leaf). The seasonal pest, leaf roller was also highest in Mysuru (6.99%) followed by Anantapur (5.51%) and Salem (5.21%). However, no new pests were reported from any of the states. Important natural enemies were also recorded in the mulberry gardens.

Important natural enemies recorded in the mulberry gardens (- : not found; + : found; ++ : moderate; +++ : abundant)				
Natural Enemies	Host	KAR	TN	AP
<i>Cryptolaemus montrouzieri</i>	Mealybugs	+	++	+
<i>Scymnus coccivora</i>	Mealybugs	++	++	+
<i>Menochilus sexmaculatus</i>	Thrips	++	+	+++
<i>Spalgis epius</i>	Mealybugs/ Papaya mealybug	+	++	-
<i>Acerophagus papayae</i>	Papaya mealybug	-	++	-
<i>Pseudoleptomastix mexicana</i>	Papaya mealybug	-	+	-
<i>Phanerotoma noyesi</i>	Leaf roller	++	++	-

Centres	Mealybug (%)	Thrips (Nos./leaf)	White Fly (Nos./leaf)	Leaf Roller (%)	Papaya Mealybug (%)
CSRTI- Mysuru	2.58±1.80	1.16±1.48	9.62±11.83	6.99±12.46	-
REC-Madivala	4.93±2.83	3.52±2.51	-	3.53±5.61	-
REC SU- Kanakapura	1.41±2.57	6.69±5.19	4.15±4.75	0.81±1.23	-
RSRS-Chamarajanagar	2.98±1.88	-	-	-	-
RSRS-Salem	12.9±10.14	10.95±7.96	0.76±1.84	5.21±6.99	0.83±2.3
REC-Srivilliputtur	6.34±5.52	8.78±6.85	-	1.83±3.72	4.7±5.57
RSRS-Anantapur	4.37±3.35	2.24±1.73	-	5.51±7.1	-

ARE 3526: Investigation on semio-chemicals of the silkworm uzi fly, *Exorista bombycis* [In collaboration with NBAIR, Bangalore; Jan. 2015 to Dec. 2016]

Vinod Kumar (PI), J.B. Narendra Kumar, M. Noble Morrison¹, N. Bakthavatsalam (PI)² and Subhaharan²

¹REC, Madivala, ²NBAIR, Bengaluru

Objectives

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

A total of 35 compounds were isolated from the abdominal extract of virgin female uzi fly and three compounds namely Tricosene (major), Tricosane & Pentacosan (minor) were short-listed for attracting uziflies. Tricosene was found effective in attracting uzi flies as revealed through wind tunnel studies. Similarly, two kairomone compounds namely 3-chloropropionic acid & 1,2-benzenedicarboxylic acid (BZCA) were identified from first instar silkworm larvae and the former only was identified in II instar larvae. From third instar silkworm larvae, three 3 compounds viz., hexadecanoic acid, BZCA & isobutyl pentyl carbonate were identified. BZCA and 3-chloropropionic acid were identified from IV & V instar silkworm larvae, respectively. The characterization of these molecules is under progress.

PRE 3546: Identification, characterization, synthesis and field evaluation of sex pheromone of the mulberry leaf roller, *Diaphania pulverulentalis* (Lepidoptera: Pyralidae) [In collaboration with NBAIR, Bengaluru] (Jan. 2016 to Dec. 2017)

Vinod Kumar (PI), J.B. Narendra Kumar, M. Noble Morrison¹, N. Bakthavatsalam² (PI) and Subhaharan²

¹REC, Madivala, ²NBAIR, Bengaluru

Objectives

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

Z-9-hexadecenal was isolated from the abdominal extract of virgin female of mulberry leaf roller, *Diaphania pulverulentalis*.

Continuous/Other activities

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

Vinod Kumar (PI) and J.B. Narendra Kumar

Nucleus cultures of five ecto-pupal parasitoids of uzi fly viz., *Nesolynx thymus*, *Exoristobia philippinensis*, *Trichomalopsis uziae*, *Trichopria* spp. and *Dirhinus anthracia* and two predators of mealy bug (*Cryptolemus montrouzieri* and *Scymnus coccivora*) besides host culture of housefly and pink mealy bug were maintained throughout the year. The bio-control agents were produced and supplied to sericulturists, RSRs, RECs, SU-RECs and DoSs on commercial basis (Rs. 4.853 lakhs). The release of bio-control agents in the field was effective and kept the uzi fly & tukra incidence below ETL.

Production of *Nesolynx thymus*: A total of 7062 pouches (706.2 lakh numbers) of *Nesolynx thymus* were produced and 1439 pouches were supplied to sericulturists of southern states (Karnataka: 905; Tamil Nadu: 184; AP & Telangana: 345; Maharashtra: 5; CSRTI-Mysuru: 1434) covering 71,950 DFLs (@2 pouches/100 DFLs). Further, 4189 pouches worth Rs. 2.09 lakhs were supplied on commercial basis to poultry farms of Davanagere, Shimoga and Mysore for the reduction (50 to 60%) of housefly and other filth fly populations and effectively maintain the *N. thymus* populations in the semi-ecosystems.

Production of Ladybird beetles: A total of 645 boxes of ladybird beetles (1.61 lakhs numbers) were produced and supplied to sericulturists covering 300 acres of mulberry gardens (@2boxes/acre) including CSRTI-Mysuru gardens.

Forewarning and forecasting of mulberry pests

J.B. Narendra Kumar (PI); M.T. Himanjaraj¹, Ch. Satyanarayana Raju², S. Rajakumar³, K. Srikanta Swamy⁴, M. Noble Morrison⁵ H. Jayaram⁶ and B. Mohan⁷

¹RSRS, Kodathi, ²RSRS, Anantapur, ³RSRS Salem, ⁴RSRS Chamrajanagar, ⁵REC, Madivala, ⁶REC-SU Kanakapura, ⁷REC-SU Srivilliputtur

Fort-nightly survey on prevalence of pests in mulberry gardens at CSRTI-Mysuru campus and by six nested units (RSRS- Chamrajanagar, REC- Madivala, REC SU- Kanakapura, RSRS-Salem, REC SU-Srivilliputtur & RSRS-Anantapur) was conducted. Further, conducted survey and data is presented below:

SILKWORM PATHOLOGY

Ongoing Research Projects

ARP 3519: Silkworm Disease Monitoring of Seed and Commercial Crop Rearing of South Indian States (Oct. 2014 to Mar. 2018)

M. Balavenkatasubbaiah (PI), A.V. Mary Josepha and M. Ramesh Babu¹

¹NSSO, Bengaluru

Objectives

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

Silkworm disease monitoring was conducted in every crop of selected basic seed farms (BSFs) of Karnataka, Tamil Nadu and Andhra Pradesh and also in the selected clusters (10 crops/month) of Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala and Maharashtra. The data was uploaded on website specially designed, <http://seridmcsrtimys.res.in>. The monitoring teams also uploaded information on disease monitoring, remedial measures suggested and follow-up actions undertaken. The incidence of grasserie was 0.00-10.0%, flacherie (0.00-7.50%), and muscardine (0.00- 0.38%) in the BSFs of Karnataka, Tamil Nadu and Andhra Pradesh. Pebrine incidence was not recorded in any of the BSFs crops, except in P2BSF-Yelagiri Hills (NSSO) at 0.12%. In the bivoltine clusters, grasserie incidence was 0.03-2.95%, flacherie (0.17-2.66%) and muscardine (0.00-0.17%). Timely advisories were given for the concerned crops for the management of diseases.

Silkworm Disease Monitoring - BSFs					
State	BSF	Disease Incidence (%)			
		Grasserie	Flacherie	Muscardine	Pebrine
Karnataka	P4 BSF-Hassan	-	0.02	-	-
	P4 BSF- Kunigal (DoS)	-	-	-	-
	P3 BSF-Mysore	-	0.12	-	-
	P3 BSF-Kumbarahalli (DoS)	-	-	-	-
	P2 BSF-Nagamangala (DoS)	-	-	-	-
	P2 BSF-Gavimata	0.06	0.57	0.16	-
	P2 BSF-Sira (DoS)	-	0.55	-	-
	P2 BSF-Rudrapatna (DoS)	-	-	-	-
	P2 BSF-K P Doddi (DoS)	-	-	-	-
	P2 BSF-Ambuga (DoS)	-	0.34	0.33	-
Tamil Nadu	P3 BSF-Avalapalli (DoS)	0.71	0.57	-	-
	P3 BSF-Berigai (DoS)	3.50	-	-	-
	P2 BSF-Yelagiri Hills	-	-	0.38	0.12
Andhra Pradesh	P3 BSF-Horsiley Hills (DoS)	5.11	0.14	0.22	-
	P3 BSF-Tadakalapalli (DoS)	0.03	0.66	0.14	-
	P2 BSF-Horsiley Hills	3.15	3.65	0.18	-

Average Disease Incidence in CPP Clusters - South Zone											
State	Hybrid	Dfls Covered (Nos)	Yield/100 dfls (kg)	Disease incidence (%) during V instar(Inspection Time)				Disease incidence (%) upto completion of crop (Farmer Assessment)			
				Gra	Fla	Mus	Peb	Gra	Fla	Mus	Peb
KAR	BV	234065	65.12	1.23	2.66	0.17	-	1.47	2.57	0.24	-
TN	BV	327958	74.02	0.28	2.14	0.08	-	0.49	2.09	0.06	-
	CB	4450	75.27	0.04	0.17	-	-	0.16	0.16	0.10	-
AP	BV	259194	66.93	1.02	1.34	0.09	-	1.19	1.56	0.10	-
	CB	32073	59.30	1.68	1.06	0.01	-	2.15	1.27	0.02	-
TEL	BV	114025	79.41	2.95	2.58	0.05	-	4.10	3.20	0.05	-
	CB	800	69.97	0.53	0.39	-	-	1.46	1.84	-	-
MAH	BV	60900	62.94	0.61	0.82	0.05	-	1.52	1.32	0.12	-
	CB	400	58.65	0.99	0.57	-	-	1.00	0.25	-	-
KER	BV	12053	79.34	0.03	1.51	0.09	-	0.05	3.17	0.13	-

APR 3550: Validation trials of automated disinfection of silkworm rearing house (Jan. 2016 to Mar. 2017)

A.R. Narasimha Nayaka (PI), G. Mallikarjuna, P. C. Santha, C. A. Mary Flora¹, P. Sudhakar Rao and V. Laxmanan²

¹RSRS, Salem, ²REC, Bidaraguppe

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

Automated disinfection units were installed at Technology Validation and Demonstration Centre (TVDC) of CSRTI-Mysuru, RSRS-Salem, RSRS-Kodathi and REC-Bidaraguppe. First trial data (TVDC, CSRTI- Mysuru) shows that disinfection of rearing house with automated disinfection unit is effective in comparison to the existing method (control). A cocoon yiled of 74kg/100 dfls was recorded in automated disinfection method as compared to control (72kg/100 dfls).

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

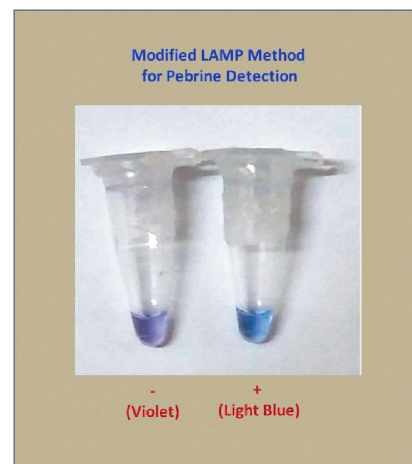
V. Sivaprasad, L. Sathish, N. Chandrakanth¹, G. Mallikarjuna, S. Manthiramoorthy and A. V. Mary Josepha

¹JRF, CSRTI-Mysuru

Objective: To develop molecular diagnostic method for pebrine detection

A direct PCR (dPCR) method employing SSU rRNA primers of *Nosema bombycis* was standardized by CSRTI-Mysuru for the detection of pebrine by amplifying target DNA from crude samples. During 13th pebrine monitoring meet, CSRTI-Mysuru was entrusted to develop field-oriented molecular diagnostic method for the detection of pebrine as SBRL-Bangalore expressed practical difficulties at field level to utilize PCR based multiplex method.

Accordingly in pusuit of beter molecular diagnostic method for the pebrine detection, a simple, cost-effective, less-time consuming and efficient detection method employing LAMP (Loop-Mediated Isothermal Amplification Reaction) primers was developed by CSRTI-Mysuru. The original method was modified to suit field conditions in seed production centres and basic seed farms. The principle involves amplification of DNA in an isothermal reaction using crude samples (without DNA isolation and purification) and amplification visualized employing specific dyes. The samples were prepared by grinding tissues with specially designed lysis buffer and the supernatant is taken for the LAMP reaction. It has high amplification efficiency (target DNA can be amplified 109-1010 times in 60 minutes). The LAMP reaction tubes appear violet and if primers get amplified, the colour of reaction mixture changes to light blue colour indicating the presence of DNA of *N. bombycis*.



The modified LAMP method was found effective with *N. bombycis* DNA; pebrine infected larval samples and egg shells (transovarial transmission); samples infected with pebrine (<4DAI; no spore formation) and the method is also effective in the early detection of *N. bombycis* infection in silkworm. It is superior to immuno-assay methods and PCR methods, which are time consuming, costly and require high concentration of spores. The Modified LAMP method developed is very convenient and field-oriented as it does not involve DNA isolation, Polymerase Chain Reaction and electrophoresis of PCR products and hence requires no costly equipments.

Consultancy Project

SB/63/41-002/23/INC: Mysore/2014-15/PFAE: Validation and refinement of Serifit, an inorganic compound for effective sanitation (Apr. 2015 to Nov. 2015)

M. Balavenkatasubbaiah, A. V. Mary Josepha, A. R. Narasimha Nayaka and V. Sivaprasad

Objective: To Validate and refine the Serifit as disinfectant for disinfection of silkworm rearing house and rearing appliances for use in sericulture

A consultancy project was undertaken for validation and refinement of Serifit, an inorganic chlorine compound for effective sanitation of silkworm rearing house for M/s Sree Rayalaseema Hi-Strength Hypo Ltd., Kurnool, Andhra Pradesh.

Germicidal activity of Serifit - <i>in vitro</i> tests							
Pathogen	Serifit Conc. (%)						
	0.50	0.40	0.30	0.20	0.15	0.10	0.05
<i>B. thuringiensis</i>	+	+	+	+	+	-	-
<i>B. bassiana</i>	+	+	+	+	+	-	-
Control *	-	-	-	-	-	-	-

Efficacy of Serifit as General Disinfectant				
Exposure Time	% mortality/infection			
	BmNPV	<i>Nosema bombycis</i>	<i>Bacillus thuringiensis</i>	<i>Beauveria bassiana</i>
30 min	-	-	-	-
24 h	-	-	-	-
Inoculated Control	+	+	+	+

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

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

Serifit (0.20%) was tested both at laboratory and at farmer's level (Karnataka, Tamil Nadu and Andhra Pradesh) for disinfection of rearing house and appliances. A total of 108 crops were tested with Serifit as general disinfectant and crops of 108 farmers with existing popular disinfectants were maintained as control. The results indicated an improvement of 6.73 kg /100 dfls in cocoon yield with Serifit over the existing disinfectants besides improved cocoon characteristics.

Efficacy of Serifit - <i>in vivo</i> tests (- : no mortality/infection; +: mortality/infection)				
Conc. of Serifit	10 min exposure			
	% mortality/infection due to			
	NPV	N. b	B. t	B. b
0.50%	-	-	-	-
0.40%	-	-	-	-
0.30%	-	-	-	-
0.20%	-	-	-	-
0.15%	-	-	-	-
0.10%	+	+	+	+
0.05%	+	+	+	+
Inoc.Ctrl	+	+	+	+
Control	-	-	-	-

Serifit Disinfection - Rearing Performance (No. of larvae kept after III moult/treatment = 200; Values are an average of 3 replications)								
Treatment	Pupation Rate (%)	SCW (g)	SSW (g)	SR (%)	Disease Percentage			
					Grasserie	Flacherie	Muscardine	Total
0.20% Serifit	95.00	1.820	0.400	21.97	1.50	3.50	0.00	5.00
Control	94.00	1.800	0.390	21.67	3.00	3.00	0.00	6.00

Field Performance of Serifit as General Disinfectant												
Disinfectant	Area	Farmers (Nos)	Dfls (Nos)	Yield/ 100 dfls (kg)	SCW (g)	SSW (g)	SR (%)	Disease Incidence (%)				
								NPV	Fla.	Musc.	Peb.	Total
Serifit	KAR	35	8,300	86.13 ±6.48	1.87 ±0.09	0.38 ±0.03	20.48 ±0.69	0.03	0.02	0.03	0.00	0.08
	TN	35	5,675	78.27 ±1.06	1.90 ±0.04	0.40 ±0.02	20.98 ±0.55	0.02	0.18	0.00	0.00	0.20
	AP	38	11,175	73.41 ±7.40	2.02 ±0.13	0.42 ±0.03	20.96 ±1.46	0.00	1.52	0.41	0.00	1.93
	Total/ Avg.	108	25,150	78.71 ±7.93	1.94 ±0.12	0.40 ±0.03	20.80 ±1.05	0.02	0.60	0.15	0.00	0.77
Control	KAR	35	6,590	69.43 ±10.62	1.74 ±0.05	0.32 ±0.06	18.27 ±3.26	0.12	0.10	0.14	0.00	0.36
	TN	35	5,975	78.11 ±1.31	1.89 ±0.04	0.39 ±0.01	20.65 ±0.41	0.06	0.22	0.00	0.00	0.28
	AP	35	10,075	70.02 ±4.29	2.02 ±0.08	0.41 ±0.02	20.24 ±0.77	0.03	1.81	0.83	0.00	2.67
	Total/ Avg.	108	22,640	71.98 ±7.75	1.89 ±0.13	0.37 ±0.05	19.78 ±2.17	0.07	0.74	0.34	0.00	1.15

Recommendation

Based on test results in the laboratory and at farmers' level, "Serifit" is recommended as a general disinfectant for effective sanitation and hygiene in Sericulture. The product was handed-over to the manufacturer, M/s Sree Rayalaseema Hi-Strength Hypo Ltd., Kurnool, Andhra Pradesh and licensed for large scale production and commercial supply to the farmers. Serifit was released for the benefit of sericulturists during the Sericulture Farmers Workshop held on 11-03-2016 at Haveri, Karnataka by Sri. A. Manju, Hon'ble Minister for Sericulture & Animal Husbandry, Govt. of Karnataka.



Continuous/Other activities

Pebrine monitoring in breeder's stocks and seed multiplication units

M. Balavenkatasubbaiah (PI), A.V. Mary Josepha and A. R. Narasimha Nayaka

Objective: To monitor pebrine disease in breeder's stocks and seed multiplication units

Each crop of Breeder's stocks of CSRTI-Mysuru and Seed multiplication units of CSB at Silkworm Breeding Laboratories (Bivoltine & Polyvoltine), P4 BSF-Hassan, P3 BSF-Mysuru and other rearings of CSRTI-Mysuru is monitored regularly for Pebrine incidence. The pebrine monitoring team involves scientific personnel from CSRTI-Mysuru and NSSO-Bengaluru, SSTL-Bengaluru and SBRL-Bengaluru and the activities are reviewed once-in-six months. Thirteen batches were monitored systematically following prescribed schedules and the infected lots were rejected accordingly.

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

POST COCOON EVALUATION UNIT

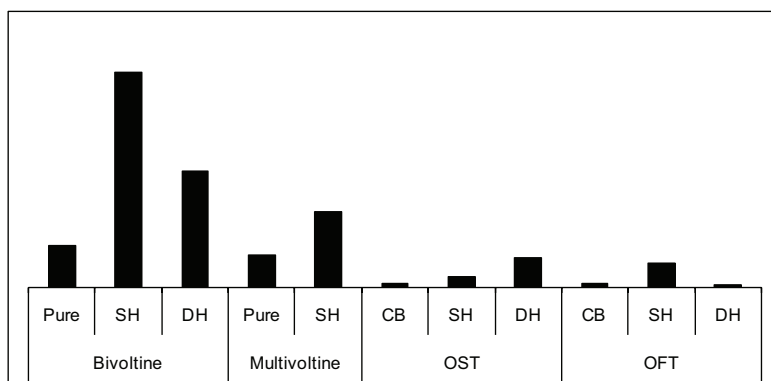
Continuous/Other activities

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

Y .C. Radhalakshmi and Kariyappa

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

Seven hundred and fifty seven cocoon lots of bivoltine and polyvoltine pure races, hybrids and crossbreeds have from different laboratories were assessed for post cocoon parameters. The reeling performance of cocoon lots was analysed and the data were communicated to the concerned scientific personnel.



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

Kariyappa and Y. C. Radhalakshmi

Sixty two FC1 x FC2 cocoon lots from 62 clusters were processed and the reeling performance was documented. The data reveals that reelability ranged 79-86%, average filament length (853-912m), denier (2.41-2.91), raw silk recovery (68-75%), raw silk (14-17%) and neatness (94-97 points)

State	Lots	SCW (g)	SSW (g)	Shell (%)	Reela-bility (%)	AFL (m)	NBFL (m)	Ren-ditta	RS (%)	RSR (%)	Neat-ness (P)
KAR	19	1.642	0.368	22.40	80.27	854	684	6.36	15.82	70.95	97
	CV%	11.58	14.34	6.15	4.26	9.89	11.85	7.97	7.97	11.09	1.05
AP	12	1.778	0.387	21.81	79.43	912	722	6.62	15.27	70.24	96
	CV%	8.16	9.32	6.99	5.83	14.8	13.55	11.32	10.27	11.41	1.40
TN	26	1.683	0.360	21.27	81.26	867	704	6.59	15.40	72.67	97
	CV%	10.55	17.53	10.02	5.72	14.19	15.98	12.10	12.08	10.64	1.18
MP	3	1.919	0.413	21.40	77.20	880	677	6.84	14.67	68.64	94
MAH	1	1.379	0.322	23.35	85.64	887	760	5.68	17.61	75.44	96
	Total/Avg.	11.08	14.86	8.28	5.28	12.67	13.67	10.74	10.25	10.56	1.29

Parameters	SCW (g)	SSW (g)	Shell (%)	Reelability (%)	AFL (m)	NBFL (m)	Renditta	RS (%)	RSR (%)	Neatness (P)
SCW	1.000	0.864**	0.233NS	-0.017NS	0.598**	0.543**	0.037NS	-0.073NS	-0.272*	-0.318*
SSW	0.864**	1.000	0.688**	0.046NS	0.575**	0.541**	-0.152NS	0.114NS	-0.445**	-0.275*
Shell	0.233NS	0.688**	1.000	0.117NS	0.271*	0.284*	-0.365**	0.341**	-0.463**	-0.104NS
Reel	-0.017NS	0.046NS	0.117NS	1.000	-0.029NS	0.370**	0.011NS	-0.010NS	-0.110NS	0.213NS
AFL	0.598**	0.575**	0.271*	-0.029NS	1.000	0.916**	-0.603**	0.572**	0.306*	-0.348**
NBFL	0.543**	0.541**	0.284*	0.370**	0.916**	1.000	-0.560**	0.534**	0.257*	-0.243NS
Denier	0.436**	0.522**	0.368**	-0.012NS	0.046NS	0.033NS	-0.293*	0.293*	-0.008NS	-0.290*
Rendita	0.037NS	-0.152NS	-0.365**	0.011NS	-0.603**	-0.560**	1.000	-0.991**	-0.643**	0.302*
Raw silk	-0.073NS	0.114NS	0.341**	-0.010NS	0.572**	0.534**	-0.991**	1.000	0.672**	-0.283*
Slk Rec	-0.272*	-0.445**	-0.463**	-0.110NS	0.306*	0.257*	-0.643**	0.672**	1.000	-0.156NS
Neat	-0.318*	-0.275*	-0.104NS	0.213NS	-0.348**	-0.243NS	0.302*	-0.283*	-0.156NS	1.000

SERICULTURAL ENGINEERING DIVISION

APR 3529: Design and development of silkworm rearing house models for hot and dry and hot & humid areas of peninsular India (Jan. 2015 to Dec. 2016)

Satish Verma, M.T. Himantharaj¹, Ch. Satyanarayana Raju², D.S. Somprakash and V. Sivaprasad

¹RSRS, Kodathi, ²RSRS, Anantapur

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

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

For management of optimum environmental conditions inside a silkworm rearing house, the overall heat (enthalpy) of the air comprising of sensible heat of air, sensible heat and latent heat of moisture present in the air have been determined. The overall enthalpy of moist air of 63.2 kJ/kg at 25°C temperature and 75% RH are considered as ideal and optimum environmental conditions for late-age silkworms for the production of good quality

Combinations of Temp. and RH for Optimal Environmental Conditions in Silkworm Rearing House (Enthalpy ~ 63 kJ/kg of moist air)				
Temp. (°C)	RH to be maintained in rearing house	Sensible Heat of Air (A)	Sensible + Latent heat of moisture in air (B)	Enthalpy (total heat; A+B)
20	100	20.12	37.29	57.41
21	100	21.12	39.75	60.88
22	95	22.13	40.18	62.31
23	85	23.18	38.18	61.32
24	80	24.14	38.20	62.34
25	75	25.15	38.04	63.19
26	70	26.15	37.70	63.85
27	65	27.16	37.14	64.30
28	60	28.16	36.36	64.53
29	55	29.17	35.32	64.50
30	50	30.18	34.01	64.19
31	45	31.13	32.40	63.59
32	40	32.19	30.47	62.66
33	35	33.20	30.65	63.85
34	30	34.20	29.86	64.06
35	25	35.21	27.02	62.23

cocoons. Based on these calculations, enthalpy of air at different temperatures and relative humidity are classified into five bands (dark blue, light blue, yellow, pink and red). For the comfort of silkworms and personnel working in the rearing house, the enthalpy in the rearing houses should be maintained around 63 kJ/kg of moist air, which is represented by the yellow band with enthalpy around optimal enthalpy. It could be observed that with an increase in the air temperature, the sensible heat of air increases; whereas the latent heat of air decreases due to lower moisture available in the air. It can be inferred that at low temperatures, high RH; at high temperature, low RH should be maintained in the rearing house to maintain optimal enthalpy (heat) levels. The sericulturists in hot & dry areas should have arrangements for converting sensible heat of air into latent heat of moisture through forced or natural humidification to reduce ambient temperature and enhance RH. Similarly, the enthalpy of moist air at high temperature and high RH (red band) is very high in coastal areas of Andhra Pradesh, which might be deterrent to the silkworm rearing. The sericulturists in hot & humid areas should have adequate ventilation, natural or forced, and appropriate arrangements for evacuation of moisture from the silkworm rearing house.

Total Enthalpy of moist air (kJ/kg of air)																
Temp. °C	RH %															
	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
20	27.4	29.3	31.1	33.0	34.8	36.7	38.5	40.4	42.3	44.2	46.0	47.9	49.9	51.7	53.6	55.5
21	28.9	30.9	32.9	34.8	36.8	38.8	40.8	42.7	44.7	46.7	48.7	50.8	52.8	54.8	56.8	58.8
22	30.4	32.5	34.6	36.7	38.8	40.9	43.0	45.1	47.3	49.4	51.5	53.7	55.8	58.0	60.2	62.3
23	32.0	34.2	36.4	38.6	40.9	43.1	45.4	47.6	49.9	52.2	54.5	56.7	59.0	61.3	63.6	65.9
24	33.5	35.9	38.3	40.6	43.0	44.4	46.8	50.2	52.6	55.0	57.5	59.9	62.3	64.8	67.3	69.7
25	35.1	37.6	40.2	42.7	45.2	47.8	50.3	52.9	55.4	58.0	60.6	63.2	65.8	68.4	70.0	73.7
26	36.8	39.4	42.1	44.8	47.5	50.2	52.9	55.6	58.4	61.1	63.9	66.6	69.4	72.2	75.0	77.8
27	38.4	41.3	44.1	47.0	49.8	52.7	55.6	58.5	61.4	64.3	67.2	70.2	73.1	76.1	79.1	82.0
28	40.1	43.1	46.1	49.2	52.2	55.3	58.4	61.4	64.5	67.6	70.8	73.9	77.0	80.2	83.3	86.5
29	41.8	45.0	48.3	51.5	54.7	58.0	60.2	64.5	67.8	71.1	74.4	77.7	81.1	84.4	87.8	91.2
30	43.6	47.0	50.4	53.8	57.3	60.7	64.2	67.7	71.2	74.7	78.2	81.8	85.3	88.9	92.5	96.1
31	45.4	49.0	52.6	56.3	59.9	63.6	67.3	71.0	74.7	78.4	82.2	85.9	89.7	92.5	97.3	101.2
32	47.3	51.1	54.9	58.8	62.7	66.6	70.5	74.4	78.3	82.3	86.3	90.3	94.3	98.4	102.4	106.5
33	49.2	53.2	57.3	63.4	65.5	69.6	73.8	77.9	82.1	86.4	90.6	94.9	99.1	103.4	107.8	112.1
34	51.1	55.4	59.7	64.1	68.4	72.8	77.2	81.6	86.1	90.6	95.1	99.6	104.1	108.7	113.3	117.9
35	53.1	57.7	62.2	66.8	71.5	76.1	80.8	85.5	90.2	95.0	99.7	104.5	109.4	114.2	119.1	124.1

30% less heat
10-20% less heat

Comfortable zone
20% excess heat

30% excess heat

NRDC-New Delhi: Developing Entrepreneurship for Silk Cocoon Harvesting

Satish Verma and V. Sivaprasad

Objectives

- Demonstration and popularisation of cocoon harvester for silk cocoons
- Development of custom hiring system/agency for cocoon harvester

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



custom hiring basis, the present study was taken up with financial support from NRDC-New Delhi. Ten cocoon harvestors were procured from licensed manufacturer and installed at sericulturists farms (2 each in Andhra Pradesh & Tamil Nadu; 6 in Karnataka). Demonstrations and on-hand training imparted to over 100 farmers at CSRTI-Mysore and villages. There was lot of enthusiasm among farmers about the virtues of the machine.

Development of New Technologies

PVC stands for late-age silkworm rearing

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



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

The scales discharged by silkworm moths in egg production units and bed disinfectants released into ambient air in silkworm rearing houses are health hazardous. To mitigate this problem, design and development of a device for trapping the silkworm moth scales and dusts in rearing houses was undertaken. A prototype device has been developed and fabricated. The initial trials gave encouraging results with trapping >95% air-borne particles and the improvements are under progress.



Continuous/Other activities

Fabrication and supply of machines for mechanisation in sericulture

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

SERICULTURAL EXTENSION, ECONOMICS & MANAGEMENT DIVISION

T. Thippeswamy, S. B Nagaraju, B. Gangadhar, Mahima Santhi, G. S. Geetha, D. Joycy Rani

Ongoing Research Projects

MOE 3523: Study on Drought Management practices in Mulberry Sericulture (Jan. 2015 to Dec. 2016)

A. Mahima Santhi, K. Vedavyasa¹, M. P. Reddy², S. Vidyunmala³, A. G. K.Daniel⁴, B.Mohan⁵, M. N. Morrison⁶

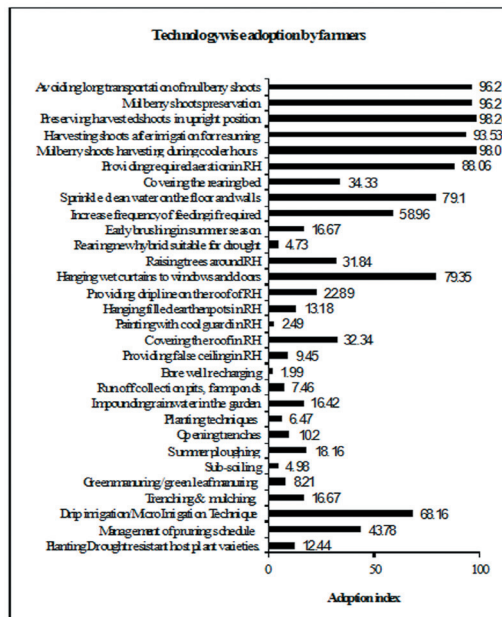
¹REC-SU Tumkur, ²CPC Hindupur, ³REC-SU Penukonda, ⁴REC Samayanallur, ⁵REC-SU Srivilliputhur, ⁶REC Madivala

Objectives

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

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

Three hundred farmers (50 farmers/cluster) from different villages (Ithandahally, Tumkur, Hindupur, Penugonda, Oddanchatrum & Adaikalapattinam) were selected for determining the adoption levels of drought management practices. The data was collected through interview schedule followed by pretesting and finalisation schedule. Awareness programmes (8) were conducted for the selected farmers to motivate and reduce the adoption gaps and adopt drought management technologies. ‘Handbook on Integrated Drought Management for Mulberry Sericulture’ was published for farmers and extension officers in English and translated to Kannada, Telugu and Tamil languages.



MOE 3525: A Study on the impact of pest and disease management practices in sericulture among the farmers under cluster promotion programme in South India (Jan. 2015 to Dec. 2016)

B. Gangadhar, H. Jayaram¹, T. Mogili², G. Punithavathi³ and Ram Prakash⁴

¹REC-SU, Kanakapura, ²REC, V. Kota, ³REC, Udumalpet, ⁴REC, Baramati

Objectives

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

The study was conducted in Andhra Pradesh, Karnataka and Tamil Nadu with a designed schedule for eliciting field data from 550 sericulturists spread over 11 selected clusters. The incidence of pests and diseases of mulberry

Adoption Category	Adoption Index	Farmers (No.)	%
Very Low	<30	36	12.00
Low	30 - 40	104	34.67
Medium	40-50	112	37.33
High	50-60	46	15.33
Very High	> 60	2	0.67

and silkworm were recorded and the levels of adoption of control measures were recorded. The major pests of mulberry recorded were mealy bugs, leaf roller, thrips, white fly, bihar hairy caterpillar, while the important diseases were leaf spot, leaf rust, powdery mildew, root rot and root knot. Uzi fly was the major pest of silkworm, while the important diseases affecting silkworm includes grasserie, flacherie and muscardine.

Silkworm Disease/Pest	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
Flacherie	3.60	2.30	8.13	3.13	3.60	1.70
Grasserie	4.60	3.13	7.15	4.13	1.70	0.40
Muscardine	8.13	2.15	6.10	1.30		
Uzi fly	13.12	2.05	8.50	3.13	7.40	1.90

Control Measures	Andhra Pradesh				Karnataka				Tamil Nadu			
	FA		NA		FA		NA		FA		NA	
	Dis.	Pest	Dis.	Pest	Dis.	Pest	Dis.	Pest	Dis.	Pest	Dis.	Pest
Mechanical	85	80	15	20	61	88	19	12	83	75	17	25
Chemical	88	87	12	13	90	85	10	15	76	86	24	14
Biological	79	75	21	25	70	71	30	29	76	88	24	12

Impact of IDM Packages on Incidence of Mulberry Diseases (BA: Befoe adoption; AA: After adoption)						
Mulberry Diseases	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
<i>C. moricola</i>	0.50		6.13	3.20		
<i>C. fici</i>	1.20		3.60	2.10		
<i>P. corylea</i>	2.97	1.55	10.15	2.00	3.40	1.20
<i>M. incognita</i>			11.00	5.00		
<i>F. solani</i>	10.37	2.90	14.15	5.10	7.80	4.60

Impact of IPM packages on Incidence of Mulberry Pests						
Mulberry Pests	Andhra Pradesh		Karnataka		Tamil Nadu	
	BA	AA	BA	AA	BA	AA
<i>M. hirsutus</i>	11.36	2.31	12.13	3.13	7.60	1.90
<i>P. marginatus</i>					3.70	1.40
<i>D. pulverulentalis</i>	6.92	3.12	8.13	5.00	10.40	2.40
<i>P. mori</i>	6.50		13.25	5.13	14.30	5.00
<i>S. obliqua</i>	5.12	1.20	3.80	1.30		
<i>A. dispersus</i>	12.50		2.00	0.50		

Cluster Promotion Programme (CPP)

V. Sivaprasad, A. Mahima Santhi and Joycy R Dasari

Cluster Promotion Programme is being implemented by Central Silk Board in collaboration with the Department of Sericulture (DoS) of the respective states in the Southern Zone viz., Karnataka, Andhra Pradesh, Telangana, Tamil Nadu, Kerala, Maharashtra and Madhya Pradesh states since 1st April, 2013 in 106 clusters (55 mother & 51 satellite clusters). The main objective of establishing the clusters is to promote bivoltine silk production and produce 5000 MT of gradable raw silk by the end of XII plan. Clusters are organized in the respective states based on farmers profile and potentiality. Each cluster is directly monitored by two Cluster Development Facilitators (CDFs) nominated by Central Silk Board and Department of Sericulture.

State	Clusters		
	Mother	Satellite	Total
Karnataka	27	19	46
Tamil Nadu	11	17	28
Andhra Pradesh	11	2	13
Telangana		4	4
Maharashtra	4	5	9
Kerala	2		2
Madhya Pradesh		4	4
Total	55	51	106

Cluster Development Facilitators (CDFs)

Andhra Pradesh		
Clusters	CSB	DoS
Atmakur	Dr. P Venkataramana, Sci.-D, RECSU-Atmakur	Mr. D Anjaneyulu, SO, Atmakur
Bhimadole	Mr. TVS Srinivasarao, Sci.-D, REC-Eluru	Mr. N Satynarayana, SO, Bhimdole
Chebrole	Mr. TVS Srinivasa Rao, Sci.-D, REC-Eluru	Mr. I Koneti Apparao, SO, Chebrole
Chittoor	Dr. P Deepa, Sci.-D, SSPC-Chittoor	Mr. Vasantharayulu, SO, Chittoor
Giddalur	Dr. NB Chowdhary, Sci.-D, RECSU-Giddalur	Mr. G Sudharkarsharma, ADS (FAC), Giddalur
Hindupur	Dr. MP Reddy, Sci.-D, CPC-Hindupur	Mr. Krishna Reddy, SO, Hindupur
Kalyanadurga	Mr. B Vijaya Naidu, Sci.-D, REC-Kalyanadurga	Mr. K Ramakrishna Reddy, ASO, Kalyanadurga
Madakasira	Dr. B Narasimha Murthy, Sci.-D, REC-Madakasira	Mr. Hanumantharaya, ASO, Madakasira
Palamaner	Dr. GV Prasad, Sci.-D, CDC-Palamaner	Mr. S Noor Basha, ASO, Palamaner
Pattikonda	Dr. P Venkataramana, Sci.-D, RECSU-Atmakur	Mr. Suresh Kumar, SO, Adoni
Penukonda	Dr. Vidyunmala, Sci.-D, RECSU-Penukonda	Mr. K Noor Mahammed, ASO, Penukonda
V.Kota	Dr. T Mogili, Sci.-D, REC-V. Kota	Mr. K Ramachandar Rao, SO, V.Kota
Vijayawada	Dr. RN Prasad, Sci.-D, SSC-Vijayawada	Mr. SVN Malleswar Rao, SO, Vijayawada

Karnataka		
Clusters	CSB	DoS
Andaralahalli	Smt KL Philomena, Sci.-C, RSRS-Kodathi	Mr. S Sundar Raj, ADS, Andaralahalli
Aurad	Mr. Ishwar, Sci.-C, REC-Bidar	Mr. Bheemesha, SEO, Bidar
B.R.Koppalu	Mr. SB Nagaraja, Sci.-D, CSRTI-Mysuru	Mr. V Mahesh Kumar, ADS, S.R.Patna
Bannikuppe	Dr. AR Narasimha Nayaka, Sci.-D, CSRTI-Mysuru	Mr. G Subramanya, ADS, Ramanagar
Belgaum	Dr. CR Hegde, Sci.-C, SSC-Belgaum	Mr. DM Naika, ADS, Belgaum
Bevuru	Dr. B Gangadhar, Sci.-D, CSRTI-Mysuru	Mr. Aluregowda, ADS, Channapatna
Bidarakote	Mr. Shivakumar, TA, RECSU-Maddur	Mr. M Ramakrishna Reddy, ADS, Malavalli
Bijapur	Mr. Shreeshail B Arjune, TA, RECSU-Bijapur	Mr. MJ Maniyar, ADS, Bijapur
Challakere	Mr. GN Niranjanamurthy, TA, REC-Chitradurga	Mr. BGK Shastry, ADS, Challekere
Channarayapatna	Dr. M Maheswari, Sci.-D, RSRS-Kodathi	Mr. S Bojanna, ADS, Channarayapatna
D.Halasaahalli	Dr. S Purushotham, Sci.-D, CSRTI-Mysuru	Mr. M Mallikarjunaswami, ADS, Malavalli
Davangere	Mr. A Umeha, Sci.-C, REC-Chitradurga	Mr. MG Jagadish, ADS, Davanagere
Doddalahalli	Dr. Dasappa, Sci.-D, CSRTI-Mysuru	Mr. GM Mahendra Kumar, ADS, Kanakapura
Gajanur	Dr. VK Harlapur, Sci.-D, SSPC-Malavalli	Mr. M Mallikarjunaswami, ADS, Malavalli
Gouribidnur	Mr. Dayananda Reddy, Sci.-D, SSPC-Hindupur	Smt D Ayishakhanam, ADS, G'bidanur
Gulbarga	Mr. Ishwar, Sci.-C, REC-Bidar	Mr. S Prakash Babu, ADS, Gulbarga
H.B. Halli	Dr. Raveendra Mattigatti, Sci.-D, RECSU-Kudligi	Mr. V Sudheer, ADS, Kudligi
H.D.Kote	Dr. BT Srinivasa, Sci.-D, CSRTI-Mysuru	Mr. B Keshavamurthy, ADS, HD Kote
Harohalli	Dr. P Sudhakara Rao, Sci.-C, RSRS-Kodathi	Mr. PL Chandrappa, ADS, Hosakote
Harohalli	Dr. YV Ramanjaneyulu, Sci.-D, SSPC-R'nagaram	Mr. GM Mahendra Kumar, ADS, Kanakapura
Haveri	Mr. KN Nandi, STA, SSC-Haveri	Mr. Maltesh S Patil, ADS, Haveri
Hiriyur	Mr. KB Shivanna, TA, REC-Chitradurga	Mr. G Nagarajappa, ADS, Chitradurga
Humnabad	Mr. Ishwar, Sci.-C, REC-Bidar	Mr. S Mallikarjuna, SEO, Humnabad
Ithandahalli	Dr. M Noble Morrison, Sci.-D, REC-Madivala	Mr. SN Srinivasan, ADS, Bangarpet
Jamakhandi	Mr. GM Ravi Kumar, TA, RECSU-Jamakhandi	Mr. CG Kollura, ADS, Jamakhandi
K.R.Nagar	Dr. DS Somaprakash, Sci.-D, CSRTI-Mysuru	Mr. KT Rajendra, ADS, K.R. Nagar
Kanakapura	Dr. H Jayaram, Sci.-D, RECSU-Kanakapura	Mr. GM Mahendra Kumar, ADS, Kanakapura
Kudligi	Dr. Raveendra Mattigatti, Sci.-D, RECSU-Kudligi	Mr. V Sudheer, ADS, Kudligi
Kurudamalai	Dr. M Noble Morrison, Sci.-D, REC-Madivala	Mr. M Venkatesh, ADS, Mulbagal
Lingasugur	Mr. M Mritinjaya, TA, RECSU-Koppal	Mr. Jamnoji Rao, ADS, Lingasugur
Ranebennur	Dr. MK Raghunath, Sci.-D, RECSU-Ranebennur	Mr. Maltesh S Patil, ADS, Haveri
Raugodlu	Dr. B Parthasarathy, Sci.-D, SSPC-Bangalore	Mr. D Satish, SEO, Raugodlu, Kengeri
Shahapur	Mr. BM Krishnappa, TA, RECSU-Shahpur	Mr. Nagappa Biradar, ADS, Shahapur
Shapur (Kolar)	Dr. P Sudhakar, Sci.-C, RSRS-Kodathi	Mr. BL Krishnappa, ADS, Kolar
Shirahatti	Mr. Anis Ahamed Shariff, TA, RECSU-Shirahatti	Mr. FG Veeranagoudar, ADS, Shirahatti
Siddlaghatta	Mr. HS Phaniraj, Sci.-D, SSPC-Vijayapura	Mr. MC Chandrappa, ADS, Shidlaghatta
Sira	Mr. K Vedavyasa, Sci.-D, CSRTI-Mysuru	Mr. GM Vishwanath, ADS, Sira
Soraba	Mr. A Umeha, Sci.-C, REC-Chitradurga	Mr. KJ Thammannagowda, ADS, Shivamogga
T.Narasipura	Dr. K Srikanta Swamy, K, Sci.-D, RSRS-Ch.Nagar	Mr. Javaregowda, ADS, T. Narasipura
Tekal	Mr. HM Shanbhogue, Sci.-C, SSPC-Chintamani	Mr. BV Venkataramu, ADS, Malur
Thoreshettihalli	Dr. DS Somaprakash, Sci.-D, CSRTI-Mysuru	Mr. M Ramakrishnareddy, ADS, Malavalli

Clusters	CSB	DoS
Tubagere	Dr. PK Ambika, Sci.-D, RSRS-Kodathi	Mr. Anjanamurthy, ADS, Doddaballapura
Tumkur	Mr. K Vedavyasa, Sci.-D, CSRTI-Mysuru	Dr. YK Balakrishnappa, ADS, Tumkur
Y.N.Hoskote	Dr. P Sudhakara Rao, Sci.-C, RSRS-Kodathi	Mr. J. Munshi Basaiah, ADS, Pavagada
Yelburga	Mr. YN Sanath Kumar, Sci.-C, RECSU-Koppal	Mr. BV Karurmath, ADS, Yelburga
Yeldur	Mr. HM Shanbhogue, Sci.-C, SSPC-Chintamani	Mr. M Nagaraja, ADS, Srinivasapura
KERALA		
Kozhicode	Dr. PM Pratheesh Kumar, Sci.-D, CSRTI-Mysore	Mr. Salim Kumar, ASO-Wayanad
Palakkad	Smt K Sarala, Sci.-D, REC-Palakkad	Anil Kumar, ASO-Palakkad
MADHYA PRADESH		
Betul	Mr. RK Khare, Sci.-D, REC-Hoshangabad	Mr. Laxman Lillore, FO, Betul
Burhanpur	Dr. Pradip Shukla, Sci.-C, RECSU-Burhanpur	Mr. Harishankar Sony, FO, Burhanpur
Hoshangabad	Mr. RK Khare, Sci.-D, REC-Hoshangabad	Mr. Ravindra Singh, FO, Hoshangabad
Khandwa	Dr. Pradip Shukla, Sci.-C, RECSU-Burhanpur	Mr. Kastur Chandra Choudhary, FO, Khandwa
MAHARASHTRA		
Akola	Mr. RV Kushwaha, Sci.-D, REC-Amaravathi	Mr. SS Shinda, DSO, Akola
Beed	Mr. Rahul Singh, Sci.-C, RECSU- Aurangabad	Mr. PM Chougule, SDO Gr.II, Beed
Buldhana	Mr. RV Kushwaha, Sci.-D, REC-Amaravathi	Mr. HS Chavan, DSO, Buldhana
Jalna	Mr. Rahul Singh, Sci.-C, RECSU- Aurangabad	Mr. Ramesh B Hande, SDO Gr.II, Jalna
Nanded	Mr. AJ Karande Sci.-D, REC-Parbhani	Mr. PJ Patil, SDO Gr.II, Nanded
Osmanabad	Mr. AP Bagde, Sci.-C, RECSU-Osmanabad	Mr. MR Digule SDO Gr.I, Osmanbad
Sangli	Dr. CR Hegde, Sci.-C, SSC-Belgaum	Mr. DY Salunke, SDO Sangli
Satara	Mr. Ramprakash, Sci.-D, REC-Baramathi	Mr. Vinit Pawar, SDO, Wai, Satara
Wardha	Mr. RV Kushwaha, Sci.-D, REC-Amaravathi	Mr. VM Paunikar, DSO, Wardha
TAMIL NADU		
Adaikalapattinam	Mr. B Mohan, Sci-D, RECSU-Srivilliputhur	Ms. KS Selvi, AI(S), Nanmagaram
Alankayam	Dr. P Kumaresan, Sci-C, SSPC-Thirupattur	Mr. S Vijayakumar, AI(S), Vaniyambadi
Alangudi	Mr. NG Selvaraj, Sci.-D, RECSU-Trichy	Mr. B Govindarajulu, AI(S), TSC Pudakottai
Annur	Dr. A Mohamed Babu, Sci-D, RECSU-Avinashi	Mr. A Mani, AI(S), Avinashi
Anthiyur	Mr. T. Thirunavukkarasu, Sci-D, REC-Gobi	Mr. M Thangaraj, AI(S), TSC Bhavani
Bagalur	Dr. Jagadishprabhu, Sci.-D, SSPC-Hosur	Mr. S Saktivel, AI(S), TSC Bagalur
Berigai	Mr. Y Humayun Sharief, Sci-C, RECSU-Berigai	Mr. K Sreenivasulu, AI(S), Berigai
Bhavani	Mr. T. Thirunavukkarasu, Sci-D, REC-Gobi	Mr. M Thangaraj, AI(S), TSC Bhavani
Dharapuram	Dr. P Samuthiravelu, Sci.-D, REC-Udumalpet	Mr. M Muthaiah, AI(S), Dharapuram
Dharmapuri	Dr. V Chinnadurai, Sci.-C, SSPC-Dharmapuri	Mr. S Lakshmanan, AI(S), TSC Dharmapuri
Gobi South	Dr. N Dhahira Beevi, Sci-D, REC-Gobi	Mr. V Shivakumar, JI(S), TSC Gobi
Gudimangalam	Mr. R Anbazhagan, Sci.-C, REC-Udumalpet	Mr. M Marappan, AI(S), Gudimangalam
Keeranur	Ms. G Punithavathi, Sci.-D, REC-Udumalpet	Mr. C Thangavelu, AI(S), Dindigul
Kodiyalam	Dr. Jagadishprabhu, Sci.-D, SSPC-Hosur	Mr. S Saktivel, AI(S), TSC Bagalur
Kottur	Mr. S Ramesh, TA, SSC-Udumalpet	Mr. A Alaguramalingam, AI(S), Pollachi

Clusters	CSB	DoS
Kumaralingam	Dr. CM Babu, Sci.-D, REC-Udumalpet	Mr. AV Murthy, AI(S), Udumalpet
Madathukulam	Dr. CM Babu, Sci.-D, REC-Udumalpet	Mr. AV Murthy, AI(S), Udumalpet
Manurpalayam	Mr. Issac Joseph, Sci.-D, RECSU-Avinashi	Mr. TD Karthik Ganesh, AI(S), TSC, Avinasi
Oddanchatram	Mr. AGK Daniel, Sci.-D, REC-Samayanallur	Mr. M Doraisami, AI(S), TSC Dindigal
Palani	Ms. G Punithavathi, Sci.-D, REC-Udumalpet	Mr. C Thangavelu, AI(S), Palani
Pitchandampalayam	Dr. N Dhahira Beevi, Sci.-D, REC-Gobi	Mr. V Shivakumar, JI(S), TSC Gobi
Pollachi	Dr. K Chandrashekar, Sci.-D, REC-Udumalpet	Mr. A Alaguramalingam, AI(S), Pollachi
Pongalur	Mr. Issac Joseph, Sci.-D, RECSU-Avinashi	Mr. P Kannusami, AI(S), Udumalpet
Poolavadi	Dr. P Samuthiravelu, Sci.-D, REC-Udumalpet	M. Marappan, AI(S), Poolavadi
Sannarpatti	Mr. T Sivasubramanian, Sci.-C, REC-Samayanallur	Ms. Mekala, AI(S), Dindigal
Srivilliputhur	Dr. S Rajaram, Sci.-D, RECSU-Srivilliputhur	Mr. S Venkatachalam, AI(S), Srivilliputtur
Udumalpet	Dr. P Samuthiravelu, Sci.-D, REC-Udumalpet	Mr. AV Murthy, AI(S), Udumalpet
Uttangarai	Dr. S Masilamani, Sci.-D, REC-Krishnagiri	Mr. D Alexander, I(S), Vepanapalli
TELANGANA		
Bhongir	Dr. PS Reddy, Sci.-D, RECSU- Suryapet	
Metapalli	Mr BV Sanjeeva Rao, Sci.-D, RECSU-Metpalli	Mr. Venkateswara Rao, ASO, Metapalli
Suryapet	Dr. PS Reddy, Sci.-D, RECSU- Suryapet	
Zaheerabad	Dr. B Srinath, Sci.-D, REC-Vikarabad	Mr. S Sudharkar, SO, Zaheerabad

Bivoltine Raw Silk Production - South Zone Clusters (2015-16)			
Cluste	Raw Silk Production (MT)		Achievement (%)
	Target	Achmnt.	
Karnataka	1072.50	1067.98	99.58
Andhra Pradesh	510.00	615.92	120.77
Telangana	62.50	66.48	106.36
Tamil Nadu	653.50	855.71	130.94
Kerala	22.50	14.03	62.36
Maharashtra	138.00	128.84	93.36
Madhya Pradesh	32.50	23.12	71.15
Total	2491.50	2772.09	111.26

South Zone clusters achieved record bivoltine raw silk production of 2772.09MT (111.26% achievement) the target of 2491.50MT and the annual increase (23.69%) in bivoltine raw silk production 530.93MT over the previous year.

Raw Silk Production in South Zone Clusters			
Year	Target (MT)	Prdn. (MT)	Achmnt (%)
2013-14	1413.00	1420.90	101.49
2014 -15	1944.00	2241.15	115.30
2015-16	2491.50	2772.09	111.26

Performance of Clusters

The performance of each cluster was documented monthly as per targets/achievements on all the activities; wherein IO represents increase over the previous year; a figures in parenthesis indicate number of farmers under taken new plantation; b figures in parenthesis indicate number of events conducted.

Performance of Clusters										
Cluster	Dfls Distribution			Yield/ 100 dfls (kg)	Raw Silk Production (MT)				New Planta- tion (acres)	ECP (farm- ers)b
	Target (lakhs)	Crops (Nos)	Ach.		Target	Ach.	Ach. (%)	IO 2014-15 (%)		
Andhra Pradesh										
Atmakur	1.50	441	150000	69.76	15.00	15.00	100.00	20.25	250 (105)	237 (8)
Bhimadole	2.00	681	165700	68.15	20.00	16.57	82.85	-1.37	75 (30)	221 (7)
Chebrolu	2.80	863	316,300	71.67	28.00	31.63	112.96	29.62	164 (87)	44 (2)
Chittoor	1.20	607	151900	68.33	12.00	15.19	126.58	35.18		410(11)
Giddalur	2.50	673	275000	64.98	25.00	27.50	110.00	23.68	59 (20)	375 (8)
Hindupur	3.00	1599	420300	64.34	30.00	42.03	140.10	59.44	28 (28)	374 (9)
Kalyanadurgam	3.00	1232	327895	71.68	30.00	32.79	109.30	28.21	272 (255)	26 (1)
Madakasira	5.20	2521	692400	70.14	52.00	69.24	133.15	37.21	170 (150)	436 (10)
Palamaner	10.50	4324	1052000	69.54	105.00	105.20	100.19	6.37	54 (50)	415 (9)
Pattikonda	2.20	952	299550	71.93	22.00	29.96	136.16	42.65	145 (49)	137 (5)
Penukonda	2.00	1106	280,975	71.38	20.00	28.10	140.49	95.08	90 (90)	410 (8)
V. Kota	12.60	4632	1326050	71.83	126.00	132.61	105.24	9.67	143 (109)	692 (10)
Vijayawada	2.50	1113	267000	69.71	25.00	26.70	106.80	22.03		630 (8)
Total/Avg.	51.00	20744	5725070	69.50	510.00	572.51	1503.83	22.70	1450.00 (973)	4407 (96)
Karnataka										
Andaralahalli	1.60	640	144425	65.61	16.00	14.44	90.27	15.02	64.45 (44)	188 (8)
Aurad	1.00	198	65950	68.15	10.00	6.60	65.95	11.67	47.50 (17)	297 (7)
B.R.Koppalu	4.30	1690	362975	62.82	43.00	36.30	84.41	-3.89	183.40 (148)	443 (13)
Bannikuppe	1.50	747	120625	69.16	15.00	12.06	80.42	22.24	62.00 (70)	271 (7)
Belagam	4.20	3245	393300	63.68	42.00	39.33	93.64	1.25	100.00 (47)	325 (26)
Bevuru	1.20	911	94713	72.10	12.00	9.47	78.93	9.25	106.17 (112)	1866 (18)
Bidarakote	1.00	638	88748	66.23	10.00	8.87	88.75	68.46	87.60 (86)	434 (18)
Bijapur	1.50	740	124505	65.42	15.00	12.45	83.00	4.26	205.75 (127)	397 (10)
Challakere	4.30	1727	346970	68.28	43.00	34.70	80.69	-11.89	127.15 (67)	432 (7)
Channarayapatna	1.30	657	100580	61.47	13.00	10.06	77.37	5.64	69.76 (60)	263 (8)
D. Halasahally	1.20	587	98070	67.43	12.00	9.81	81.73	25.05	29.50 (18)	505 (18)
Davangere	2.00	1444	219855	71.79	20.00	21.99	109.93	37.65	116.55 (82)	201 (6)
Doddalahalli	1.20	1214	129637	70.48	12.00	12.96	108.03	38.39	129.80 (32)	549 (9)
Gajanur	1.50	1021	134585	63.31	15.00	13.46	89.72	50.05		
Gouribidanur	3.00	1033	267595	62.95	30.00	26.76	89.20	9.46	251.00 (144)	346 (8)
Gulbarga	3.50	1057	191405	64.17	35.00	19.14	54.69	-38.23	249.75 (132)	1016 (15)
H.D. Kote	2.00	1313	175245	68.64	20.00	17.52	87.62	26.67	77.25 (72)	534 (13)
Hag'bmanahalli	3.00	1588	332020	66.74	30.00	33.20	110.67	20.93	83.24 (47)	178 (4)
Harohalli (B)	3.00	1271	226215	68.17	30.00	22.62	75.41	-10.81	174.65 (98)	237 (6)
Harohalli (KKP)	2.00	1854	178260	69.66	20.00	17.83	89.13	35.06	43.31 (125)	373 (10)
Haveri	2.60	1564	279290	68.75	26.00	27.93	107.42	23.20	58.62 (45)	296 (10)
Hiriyur	2.30	1342	206465	63.00	23.00	20.65	89.77	9.77	300.74 (168)	95 (5)

Cluster	Dfls Distribution			Yield/ 100 dfls (kg)	Raw Silk Production (MT)				New Planta- tion (acres)	ECP (farm- ers) ^b
	Target (lakhs)	Crops (Nos)	Ach.		Target	Ach.	Ach. (%)	IO 2014-15 (%)		
Humnabad	1.00	335	68950	63.49	10.00	6.90	68.95	-9.44	46.00 (19)	625 (11)
lthandahally	4.00	3015	531848	66.77	40.00	53.18	132.96	45.28	514.93 (269)	1088 (22)
Jamkhandi	4.00	2222	324930	60.45	40.00	32.49	81.23	-9.17	137.00 (104)	273 (5)
K.R. Nagar	1.00	610	67930	67.33	10.00	6.79	67.93	59.04	48.37 (40)	308 (7)
Kanakapura	1.50	1089	106725	74.25	15.00	10.67	71.15	26.96	266.04 (334)	329 (7)
Kudligi	2.75	2566	426890	66.25	27.50	42.69	155.23	80.55	208.10 (127)	472 (8)
Kurudumalai	2.10	556	142350	67.51	21.00	14.24	67.79	-23.52	102.20 (117)	776 (21)
Lingasgur	2.80	1180	244215	60.05	28.00	24.42	87.22	3.29	16.00 (14)	130 (1)
Ranebennur	5.20	3047	581189	66.03	52.00	58.12	111.77	30.28	29.50 (19)	698 (17)
Raugodlu	0.80	394	74130	74.99	8.00	7.41	92.66	9.16		78 (5)
Shahapur	0.60	267	71650	61.11	6.00	7.17	119.42	233.19	99.10 (35)	71 (5)
Shapur Kolar	3.00	1428	342935	61.26	30.00	34.29	114.31	38.21	861.86 (485)	383 (10)
Shirahatti	2.30	1504	243050	68.98	23.00	24.31	105.67	23.54	129.45 (87)	193 (3)
Siddlaghatta	2.30	800	188625	63.69	23.00	18.86	82.01	4.41	28.70 (36)	1408 (17)
Sira	3.60	2155	334500	70.55	36.00	33.45	92.92	-9.73	40.00 (32)	158 (5)
Soraba	1.00	721	90440	68.14	10.00	9.04	90.44	1.33	66.50 (57)	165 (3)
T. Narasipura	2.00	835	189000	64.30	20.00	18.90	94.50	16.15	70.87 (95)	431 (8)
Tekal	2.60	1782	339000	73.89	26.00	33.90	130.38	31.52		
Thoresettyhally	1.00	568	72502	64.39	10.00	7.25	72.50	134.32	93.35 (103)	199 (5)
Tubagere	1.30	616	93100	76.13	13.00	9.31	71.62	-21.38	18.90 (17)	215 (9)
Tumkur	3.60	2181	338620	70.36	36.00	33.86	94.06	-4.71	30.00 (27)	108 (4)
Y.N. Hosakote	6.50	4247	977500	68.18	65.00	97.75	150.38	63.49	134.75 (97)	122 (5)
Yelburga	1.80	982	164660	63.71	18.00	16.47	91.48	19.78	144.20 (81)	115 (2)
Yeldur	1.30	479	104630	73.36	13.00	10.46	80.48	-8.32		
Total/Avg.	107.25	60060	10400802	67.03	1072.50	1040.08	96.98	15.92	5653.98 (4224)	17591 (406)
Kerala										
Kozhikode	1.00	103	9400	0.34	10.00	0.94	9.40	3.17	4 (4)	21 (2)
Palkkad	1.25	897	114790	75.33	12.50	11.48	91.83	22.63	20 (20)	252 (14)
Totla /Avg.	2.25	1000	124190	75.69	22.50	12.42	55.20	21.06	24 (24)	273 (16)
Madhya Pradesh										
Betul	1.25	1718	164600	45.21	12.50	16.46	131.68	106.15	100 (100)	
Burhanpur	0.55	366	51000	44.55	5.50	5.10	92.73	52.69	25 (25)	63 (2)
Hoshangabad	0.8	529	82000	55.15	8.00	8.20	102.50	73.82	50 (50)	1403 (21)
Khandwa	0.65	199	27500	46.17	6.50	2.75	42.31	10.44	25 (25)	315 (7)
Total/Avg	3.25	2812	325100	47.66	32.50	32.51	100.03	75.43	200 (200)	1781 (30)
Maharashtra										
Akola	0.75	321	41850	61.59	7.50	4.19	55.80	8.90	103 (78)	125 (8)
Beed	3.00	1529	300600	63.62	30.00	30.06	100.20	15.48	251.5 (161)	464 (10)
Buldana	0.75	401	61550	57.75	7.50	6.16	82.07	10.70	171.5 (154)	410 (15)

Cluster	Dfls Distribution			Yield/ 100 dfls (kg)	Raw Silk Production (MT)				New Planta- tion (acres)	ECP (farm- ers) ^b
	Target (lakhs)	Crops (Nos)	Ach.		Target	Ach.	Ach. (%)	IO 2014-15 (%)		
Jalna	2.80	2024	351250	61.97	28.00	35.13	125.45	43.14	586.5 (538)	334 (8)
Nanded	1.70	654	133350	55.37	17.00	13.34	78.44	0.78	141 (95)	538 (16)
Osmanabad	1.40	843	118300	69.41	14.00	11.83	84.50	2.47	133 (110)	437 (17)
Sangli	1.00	656	104400	65.49	10.00	10.44	104.40	28.72	126.5 (92)	411 (29)
Satara	1.40	1035	141125	68.28	14.00	14.11	100.80	14.23	101 (104)	369 (9)
Wardha	1.00	605	128600	55.13	10.00	12.86	128.60	60.60	164.75 (80)	384 (7)
Total/Avg.	13.80	8068	1381025	62.07	138.00	138.10	100.07	22.05	1778.75 (1412)	3472 (119)
Tamil Nadu										
Adaikalapattinam	1.80	1559	193900	72.59	18.00	21.65	120.29	39.93	64.5 (39)	501 (12)
Alankayam	3.00	2267	452485	77.99	30.00	54.29	180.98	71.51	70 (76)	
Alangudi	1.20	726	121625	74.41	12.00	13.92	116.03	21.86	62 (39)	376 (14)
Annur	3.40	2997	441790	77.57	34.00	52.72	155.06	48.86	164 (78)	71 (5)
Anthiyur	2.25	1695	231500	80.70	22.50	28.74	127.74	20.14	84 (36)	181 (8)
Bagalur	0.80	523	112300	79.49	8.00	13.73	171.67	47.83		
Berigai	3.00	1475	327150	77.63	30.00	39.07	130.24	21.19	226.25 (103)	305 (13)
Bhavani	2.25	1696	225550	80.34	22.50	27.88	123.90	16.84	86 (34)	184 (9)
Dharapuram	2.50	1754	285200	79.60	25.00	34.93	139.70	29.96	18 (10)	26 (1)
Dharmapuri	1.50	1258	137105	69.07	15.00	14.57	97.13	-0.59	94.75 (69)	84 (3)
Gobi South	2.20	1716	287550	79.36	22.00	35.11	159.57	50.42	112 (37)	206 (12)
Gudimangalam	2.30	1142	245725	77.87	23.00	29.44	127.99	19.52		123 (3)
Keeranur	2.90	1295	290300	75.92	29.00	33.91	116.92	10.51	5 (2)	76 (4)
Kodiyalam	1.25	527	142100	80.58	12.50	17.62	140.93	32.79		
Komaralingam	1.00	507	100100	78.75	10.00	12.13	121.28	8.71	10 (5)	72 (4)
Kottur	1.00	585	113725	77.74	10.00	13.60	136.01	36.61		
Madathukulam	2.25	1138	227075	79.18	22.50	27.66	122.94	8.97	11.5 (6)	207 (6)
Manurpalayam	1.75	1149	214950	81.13	17.50	26.83	153.31	50.44	43.5 (30)	106 (5)
Ottanchatram	3.00	1271	300281	76.20	30.00	35.20	117.34	7.21	35 (18)	233 (9)
Palani	3.75	1382	376550	77.50	37.50	44.89	119.72	11.63	24.5 (12)	243 (8)
Pitch'palayam	2.80	1629	286741	78.04	28.00	34.43	122.96	19.87	79 (36)	276 (9)
Pollachi	2.50	1515	261303	78.49	25.00	31.55	126.22	15.27	17.5 (9)	283 (9)
Pongalur	1.40	913	162000	79.63	14.00	19.85	141.75	43.53	50 (28)	137 (3)
Poolavadi	3.20	1403	338100	77.41	32.00	40.26	125.83	18.36	13 (7)	119 (6)
Sannarpatti	2.50	1382	251220	78.55	25.00	30.36	121.43	15.44	40 (23)	231 (9)
Srivilliputhur	2.60	1558	281600	75.88	26.00	32.88	126.44	19.77	117 (62)	430 (14)
Udumalpet	4.25	2327	425100	78.76	42.50	51.51	121.19	7.45	18 (10)	217 (7)
Uthangerai	3.00	2293	310652	77.34	30.00	36.97	123.22	12.88	393 (190)	365 (13)
Total/ Avg.	65.35	39682	7143677	77.86	653.50	855.70	130.94	23.65	1838.5 (959)	5052 (186)

Cluster	Dfls Distribution			Yield/ 100 dfls (kg)	Raw Silk Production (MT)				New Planta- tion (acres)	ECP (farm- ers) ^b
	Target (lakhs)	Crops (Nos)	Ach.		Target	Ach.	Ach. (%)	IO 2014-15 (%)		
Telangana										
Bhongir	1.30	446	143400	65.75	13.00	14.34	110	86.19		
Metpalli	1.00	668	122900	63.69	10.00	12.29	123	69.68	119 (64)	410 (8)
Suryapet	2.00	693	223950	70.53	20.00	22.40	112	33.10	160 (64)	379 (9)
Zaheerabad	2.00	539	173400	62.49	20.00	17.34	87	22.32	90 (45)	161 (7)
Tot/Avg.	6.30	2346	663650	65.61	63.00	66.37	105	46.93	369 (173)	950 (24)

In order to increase the silk production in the clusters, more emphasis was given on horizontal expansion and 7965 farmers were motivated to plant improved mulberry varieties to the extent of 11314 acres in the 106 clusters. During the year, various 877 ECPs (group discussion; awareness, enlightenment, & training programmes; exposure visits; exhibitions) were conducted and 33526 farmers were sensitized on new technologies in the clusters. These programmes helped in changing the attitude of farmers and improved the technology adoption levels for improved productivity in bivoltine silk production.

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

A total of 257.63 lakh dfls were distributed to the farmers against the target of 249.20 lakh (103.38% achievement) and the brushing capacity of farmers increased by 20.85% due to continuous and effective monitoring. A total of 17159012MT bivoltine cocoons were produced by harvesting 244.55 lakhs dfls with an average cocoon yield of 70.16 kg/100 dfls and the average cocoon yield/100 dfls increased remarkably.

Cluster	New Plantation		ECPs	
	Farmers (Nos)	Area (acres)	Events (Nos)	Farmers Sensitized (Nos)
Karnataka	4224	5653.98	406	17591
Andhra Pradesh	973	1450.00	96	4407
Telangana	173	369.00	24	950
Tamil Nadu	959	1838.50	186	5052
Kerala	24	24.00	16	273
Maharashtra	1412	1778.80	119	3472
Madhya Pradesh	200	200.00	30	1781
Total	7965	11314.28	877	33526

Performance of South Zone Clusters - Bivoltine Raw Silk Production (2015-16)									
Cluster	Target (Lakhs)	Harvest- ed Crops (Nos)	Dfls (Lakh Nos)	Achmnt. (%)	Increase (%) over 2014-15	Average Cocoon Yield/100 dfls (kg)			
						XI Plan	2013-14	2014-15	2015-16
Karnataka	107.25	60060	104.00	96.98	16.34	62.73	65.83	65.23	66.74
Andhra Pradesh	51.00	20744	57.25	112.26	25.87	61.56	66.69	66.68	69.93
Telangana	6.30	2346	66.36	105.34	47.12			65.08	66.11
Tamil Nadu	65.35	39682	71.44	109.31	19.97	71.13	74.46	75.54	77.86
Kerala	2.25	1000	1.24	55.20	41.33		76.45	75.88	75.69
Maharashtra	13.80	8068	13.81	100.07	19.21	60.73	63.26	63.49	62.51
Madhya Pradesh	3.25	2812	3.25	100.03	44.71		52.93	53.93	47.66
Total	249.20	134712	257.63	103.38	20.85	64.98	68.45	68.27	70.16

Institute-Village Linkage Programme (Seri Model Village)

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

IVLP was re-initiated in eleven clusters through CSRTI-Mysore and its nested units (RSRSs/ RECs/REC-SUs) in the states of Karnataka (4), Andhra Pradesh(2), Tamil Nadu(2), Maharashtra(2) and Madhya Pradesh(1) with 1089 identified farmers covering nearly 1000 acres of mulberry plantation. Based on bench mark survey of identified farmers before implementation, existing status of technology adoption and technology need in mulberry cultivation and silkworm rearing were identified for implementation.

Further, awareness programmes on various technologies were conducted through demonstrations and ECPs. A total 7.07 lakh dfls of bivoltine hybrids were reared with an average yield of 65.46kg/100 dfls and improvement recorded in cocoon yield against the bench mark was 13.55%. Through the programme, the crossbreed rearing farmers were encouraged to rear bivoltine hybrids and a quantity of 34.45MT of bivoltine raw silk production was achieved through IVLP.

State	Cluster	Scientist
Karnataka	Kadakola	S. B. Nagaraja, Sci-D, CSRTI-Mysuru.
	K.M. Doddi	V. Gunashekar, Sci-D, CSRTI-Mysuru.
	Hosakote	V. Lakshmanan, Sci-D, REC- Bidarguppe
	Chamarajanagara	K. Srikantaswamy, Sci-D, RSRS-Ch.nagara
Tamil Nadu	Sathyamangalam	Thirunavukkarasu, Sci-D, REC- Gobi
	Thondamathur	Smt. K. Sarala, Sci-C, REC-Palakka
Andhra Pradesh	Rayachoty	M. Venkatachalapathi, Sci-D, REC- Rayachoty
	Vizanagaram	T.V.S. Rao, Sci-D, REC- Chebrole
Maharastra	Ahmadnagar	Ramprakash, Sci-D, REC- Baramathi
	Baramathi,	Ramprakash, Sci-D, REC- Baramathi
Madhya Pradesh	Hoshangabad	R.K. Khare, Sci-D, REC- Hoshangabad

Technologies Implemented under IVLP	
Mulberry Cultivation	Silkworm Rearing
Soil tests for maintaining soil health	Disinfection and hygiene maintenance in silk-worm rearing house
Soil fertility management	Supply of chawki reared worms from CRCs
Popularization of new mulberry varieties	Application of bed disinfectants for control of silkworm disease
Management of mulberry pests	Mounting and spinning care for production of quality cocoons
Application of Poshan – for leaf quality production & to correct nutrient deficiencies	Control of uzi fly through Integrated approach

Achievements of IVLP (2015-16)						
State	Dfls bushings(No.)		Cocoon Yield/100 dfls(kg)			Raw Silk Production (MT)
	Target	Achievement	Benchmark	Avg. Yield/ 100 dfls (kg)	Improve- ment (%)	
Karnataka	284700	282715	57.67	62.81	7.66	26.08
Tamil Nadu	130000	276047	63.00	74.63	13.45	31.68
Andhra Pradesh	110500	85500	55.00	68.00	24.90	7.79
Maharastra	112450	137800	60.00	65.26	8.55	13.83
Madhya Pradesh	70200	65910	50.00	47.18		3.96
Total	707850	847972	58.42	65.46	13.55	83.34

Performance of IVLP Centers							
State	Dfls bushings (No.)		Cocoon Yield/100 dfls (kg)			Raw Silk Production (MT)	
	Target	Achvmnt	Bench-mark	Avg. Yield/ 100 dfls (kg)	Improve-ment (%)	Annual Target	Achvmnt
Kadakola	128700	162005	60.00	63.70	6.16	11.88	14.55
K.M. Doddi	94000	76860	58.00	61.50	6.5	8.39	7.27
Hosakote	55000	43850	55.00	63.24	10.32	4.65	4.26
Ch. nagara	7000					0.59	0.00
Sathyamangalam	75000	126112	59.00	74.65	15.6	3.79	14.47
Thondamathur	55000	149935	67.00	74.60	11.3	5.67	17.21
Rayachoty	45250	40100	55.00	68.00	13.0	3.83	4.20
Vizanagaram	65250	45400	50.00	71.27	42.0	5.02	3.59
Ahmadnagar	50000	64250	60.00	64.73	7.8	4.62	6.39
Baramathi	62450	73550	60.00	65.78	9.3	5.76	7.44
Hoshangabad	70200	65910	50.00	47.18		5.40	3.96
Total	707850	847972	58.42	65.46	13.55	63.62	83.34

Continuous/Other activities

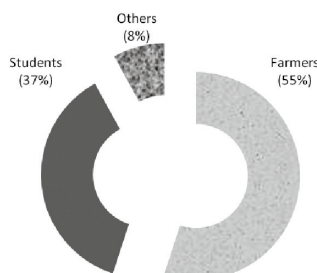
Extension Communication Programmes (ECP)

Extension Communication Programmes (830) were conducted in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Kerala, Maharashtra and Madhya Pradesh. Farmers were sensitised on new bivoltine sericulture technologies through ECPs and major topics covered were: popularisation of new mulberry varieties; soil testing & its importance in mulberry cultivation; popularisation of tree mulberry; INM practices for mulberry; IPM; integrated disease management practices; disinfection & hygiene in silkworm rearing; popularization of new silkworm hybrids; demonstration of rotary mountages; mounting & spinning care etc.

ECP	Events	Farmers Sensitized
Group Discussion	659	18459
Filed day/Awareness Prog.	103	10601
Technology Demonstration	35	853
Exhibition	1	1500
Workshop/Seminar	02	350
Resham Krishi Mela	05	4799
Exposure visits	25	278
Total	830	36840

Visitors' Service

CSRTI-Mysuru being the premier research institute draws the attention of sericulture farmers across the country. Every year sericulture farmers, students from all over the country and foreign nationals (2321 farmers, 1539 students and 355 foreign nationals) visited the institute for an update on the recent innovations in sericulture.



State	Farmers	Students	Others	Total
Karnataka	2024	966	144	3263
Kerala	14	188	15	217
Tamil Nadu	128	347	32	507
Maharashtra	21	28	9	52
Madhya Pradesh	16	2	2	20
Andhra Pradesh	32		19	51
Telangana	24		2	26
West Bengal	41		6	47
Jammu & Kashmir		8	1	9
Uttarakand	21		2	23
Total	2321	1539	232	4215

Sericulture Farmers' Workshops

CSRTI-Mysuru organized a Sericultural Farmers Workshop on “Sericulture for sustainable Income – **Bivoltine for Quality Silk**” on 11th March, 2016 at Shri Kanaka Kala Bhavana, Kaginele, Byadagi Taluk, Haveri District in coordination with Department of Sericulture, Govt. of Karnataka. Around 1,500 farmers across northern and southern districts of Karnataka besides scientists and personnel from CSRTI-Mysuru & nested units and DoS-K attended the programme. The thrust of workshop was to create awareness on new sericulture technologies for bivoltine sericulture and empower farmers. A sericulture exhibition was also organised wherein new technologies/products/machines/equipments/publications developed by the institute were exhibited for the benefit of farmers/officials. Publicity Section (CSB)-Bengaluru, CSTRI-Raipur, KSSRDI-Thalaghattapura, CSRTI-Mysuru license holders and Private Agencies also displayed their exhibits.

Technologies/Booklets Release
<ul style="list-style-type: none"> ● Cauvery Gold - New improved cross breed (MV1 x S8), a productive silkworm hybrid producing international grade silk for sustainability of silk Industry. Suitable for all regions and seasons with 22-23% cocoon shell, rendita (5.5-6) and cocoon yield (65-70 kgs/100 dfls) ● Serifit - A new disinfectant ● Released booklets on Chawki Rearing; Integrated Drought Management; Management of Insects and Pests through Bio-control agents; five other technology pamphlets in Kannada. ● Issued sanction letter for 'Sericulture Resource Centre' at BG Kere, Chitradurga district to train farmers at local/cluster levels in coordination with research institute and DOS

The workshop also witnessed awarding of progressive sericulture farmers (18 women & and 80 men) for their extraordinary success sericulture under different categories sponsored by DoS-Govt. of Karnataka. The workshop also witnessed the release of technical literature, mulberry and silkworm hybrids and equipments for the benefit of sericulturists.

Activities of RECs attached to SEEM Division, CSRTI-Mysuru

The performance of RECs in Karnataka, Maharashtra and Madhya Pradesh and attached to SEEM Division, CSRTI-Mysuru with regard to the supply of seed cuttings/saplings of improved mulberry varieties for expansion of mulberry plantation; performance of CSR hybrids and extension communication programmes conducted for creating awareness on new technologies is summarized below:

Centre	Area (Acres)	Farmers (Nos)	Dfls (Nos)	Avg. Yield/ 100 dfls (kg)	GD	FD/ AP	DOT	EV	Others
REC SU-Maddur	70	894	169100	58.43	20	3	16		
REC SU-Shivamogga	56	143	90440	68.14	3				
REC-Amaravathi	439	516	232100	58.16	14	6	6	10	
REC-Aurangabad	378	707	103900	63.62	7	2		20	
REC-Parbhani	93.50	251	41850	64.75	12	1			
REC SU-Osmanabad	470	263	118300	68.20	17		10		
REC-Baramathi	170	365	114360	64.90	6	1			1
REC SU-Jalna	586	1158	351250	62.00	8				
REC-Hoshangabad	150	538	242066	49.73	7	12	1	13	2
REC SU-Burhanpur	50	220	76925	45.00	2	4			

CAPACITY BUILDING & TRAINING

S. D. Sharma (up to 30-06-2015), R. S. Katiyar, A.S. Suma and C. Parameswara

Several officials of the state departments of sericulture, students, researchers and practitioners including cocoon producers and chawki rearers were trained under different programmes (TOP: Technology Orientation Programme; FST: Farmers' Skill Training; NBT: Need Based Training; CC: Certificate Course; IBT: Intensive Bivoltine Training; RMT: Silkworm Race Maintenance Training). Further, sixteen trainees from Egypt, Thailand, Philippines, Bangladesh and Uganda were also trained under ITEC. Of the 2173 persons trained during the year by CSRTI-Mysuru, 46.90% were trained at main institute and the rest at RSRS and its nested units.



Prog.	Course	Duration (days)
TOP	Chawki Rearing	10
	Bivoltine Sericulture Technology	10
	Late Age Silkworm Rearing	10
	Mechanization in Sericulture	5
	Refresher Course	5
	Integrated Pest Management	5
	Mulberry cultivation & Organic Farming	5
	Orientation Programme	2
FST	Chawki Rearing	10
	Late age silkworm rearing	10
	Mulberry Cultivation & Organic Farming	5
	Integrated Pest & Disease management	5
NBT (Officials)	Training in Sericulture	16
	Orientation Training	10
	Race Maintenance	15
	Mechanization in Sericulture	4
	Orientation for PGDS students	5
	Foundation Training	6
NBT (Farmers)	Chawki Rearing	8
	Production of Bio Control Agents	6
	Intensive Training in Bivoltine Sericulture	90
	Awareness Programme	5
	Commercial Chawki Rearing	90
	Intensive Bivoltine training	34

Prog.	Location	Trainees	State					Total	
			KA	AP	TS	TN	MH		OT
TOP	CSRTI-Mysuru	O	148	35		35	68		286
FST	CSRTI-Mysuru	F	130	1	72	36	74		313
TOP	RSRS & RECs	O	80	40		50			170
FST	RSRS & RECs	F	300	179		300	175	30	984
INTL	CSRTI-Mysuru	O/F						16	16
NBT	CSRTI-Mysuru	O	20	1			2	63	86
		F	67		1	2	91	124	285
CC	CSRTI-Mysuru	O	9						9
IBT		O	5		1	4			10
RMT		O	6	4		2		2	14
Total			765	260	74	429	410	235	2173
Percent			35	12	3	20	19	10	

Persons Trained at Nested Units of CSRTI-Mysuru			
Unit	FST	TOP	Total
RSRS-Kodathi	225	65	290
RSRS-Chamarajanagara	75	15	90
RSRS-Anantapur	179	40	219
RSRS-Salem	300	50	350
REC-Baramati	45		45
REC-Amaravathi	60		60
REC-Parbhani	40		40
REC-Aurangabad	30		30
REC-Hoshangabad	30		30
Total	984	170	1154

F- Farmers; O-Officials; KA- Karnataka; AP-Andhra Pradesh; TS-Telangana, TN-Tamil Nadu; MH-Maharashtra; INTL-International

International Training Programmes: International Technical & Economic Cooperation [ITEC] programme sponsored by the Ministry of External Affairs, Gol with fourteen participants from Egypt, Uganda, Bangladesh, Philippines and Thailand. Another program sponsored by International Sericulture Commission [ISC] was conducted for two researchers from Egypt in the field of Silkworm Physiology & Silkworm Pathology for 30 days.

Need Based Training Programmes: These programmes are tailor made to suit the specific requirements of the State governments, wherein sericulturists, unemployed youth, personnel from NGOs, universities etc. participate at CSRTI-Mysuru.

Trainee	Organization	Country
Md. Mahbubur Rahman	Sericulture Development Board, Rajshahi	Bangladesh
Md. Mahbub-Ul-Haque	District Sericulture Extension Office, Bholahat, Chapainabagong	
(Ms.) Dr. Rehab Hosny Taha	Department of Sericulture, Plant Protection Research Institute, 7 Nadi El Seid Street, Dokky	Egypt
(Ms.) Dr. Marwa Nabil Mostafa		
Ms. Apaporn Khantee, Agriculturist	The Queen Sirikit University, Department of Sericulture (QSDS), Ministry Of Agriculture & Cooperatives, Bangkok	Thailand
Mrs. Pissamai Pokhao		
Mrs. Payao Butwathit		
Ms. Parinyaporn Virodsakul		
Ms. Kanda Chatchaisiri		
Mrs. Maricris E. Ulat	Sericulture Research & Development Institute, Don Mariano Marcos Memorial State University, La Union	Philippines
Dr. Crestilyn N Damasco		
Mr. Roel Supsup		
Mrs. Anne Kifounji Ochieng Asinde	Tororo District Local Government, Tororo	Uganda
Mr. Naboth Ngambe Mugume	Sheema District Local Government, Kabwohe	
Dr. Mahmoud Saad Ibrahim Saad	Researcher, Plant Protection Research Institute, Dokky, Giza, Egypt	Egypt
Dr. Ibrahim Abdelazim Ibrahim Saad	Senior Researcher, Plant Protection Research Institute, Dokky, Giza, Egypt	

	Programme	State					Total
		KA	AP	TN	MH	OT	
Officials	Training in Sericulture		1				1
	Orientation Training	1					1
	Race Maintenance	3					3
	Mechanization in Sericulture				1		1
	Orientation for PGDS students					21	21
	Foundation Training	16			1	42	59
	Total	20	1		2	63	86
Farmers	Chawki Rearing				19	5	24
	Production of Bio Control Agents			1			1
	Intensive Training in Bivoltine Sericulture	6					6
	Awareness Programme				52	115	167
	Commercial Chawki Rearing	57		2		4	63
	Intensive Bivoltine Training	4			1		5
	Integrated Pest & Disease Management				19		19
	Total	67		3	91	124	285

Silkworm Rearing: The Institute also conducts chawki and late age silkworm rearings for skill development as a part of training programmes. A total of 87500 dfls were chawki reared and distributed to 666 rearers and late age silkworm rearings were conducted in seven batches (650 dfls) and an average cocoon yield of 75.57kg/100 dfls was recorded.

Late Age Rearing - Training Batches						
Period	Dfls (Nos)	Hatching (%)	SCW (g)	SSW (g)	SR (%)	Yield/ 100 Dfls (kg)
Apr-May 15	100	92.50	1.731	0.374	21.55	80.00
Jun-Jul 15	100	91.00	1.775	0.379	21.58	74.40
Jul-Aug 15	100	89.30	1.725	0.375	21.74	77.91
Sep-Oct 15	50	85.00	1.807	0.380	21.25	67.80
Oct-Nov 15	100	97.00	1.740	0.381	21.91	87.88
Dec-Jan 16	100	92.83	1.742	0.343	19.81	87.69
Jan-Feb 16	100	75.31	1.495	0.304	20.33	53.28
Total/Avg	650	88.99	1.716	0.362	21.17	75.57

Model CRC - Training Batches			
Month	Dfls Reared (Nos)	Farmers (Nos)	Yield/ 100 Dfls (kg)
Apr-15	6000	47	66.40
May-15	7200	56	71.80
Jun-15	9000	62	67.50
Jul-15	9000	71	60.80
Aug-15	5700	62	66.80
Sep-15	8700	55	71.20
Oct-15	10500	86	76.30
Nov-15	7600	53	74.80
Dec-15	7500	55	69.60
Jan-16	7500	63	74.00
Feb-16	4300	28	78.00
Mar-16	4500	28	77.00
Toal/ Avg.	87500	666	71.18

Feedback & Assessment

Post-training feedback is collected after each of the training programmes and the responses in respect of four important indices are recorded. The details of the responses and variance over the benchmark value (65%) are recorded. The average values of responses ranged from 89.42 (training course coverage) to 75.19 (training facility index) and the variance in training management index (TMI) varied from 13.29 (structured programmes) to 19.82 (International training programmes).

Feedback Analysis						
Course	Training Utility Index (A)	Training Efficiency Index (B)	Training Facilities Index (C)	Course Coverage Index (D)	TMI [(A+B+C+D)/4]	Variance
International Training	85.05	85.88	84.41	83.93	84.82	19.82
Structured	76.51	78.49	75.19	82.98	78.29	13.29
Technology Orientation	82.79	82.17	81.12	89.42	83.88	18.88
Need Based Training	79.66	83.71	82.67	86.29	83.08	18.08

Knowledge Improvement Analysis			
Course	Pre-Test Score (%)	Post-Test Score (%)	Improvement (%)
Structured	57.87	88.22	55.47
Technology Orientation	58.49	88.23	54.49
Need Based Training	52.64	89.45	117.25

The knowledge improvement among the participants is analyzed based on pre- and post-training responses to structured questionnaires and ranged from 117.25% (NBT programmes) to 54.49% (TOP).

BIOINFORMATICS CENTER (Sub-DIC under BTISNET)

V. Sivaprasad (Coordinator), V. Girish Naik (Co-Coordinator) and R. Sumathy

The Bioinformatics Centre at CSRTI-Mysuru was established in November, 1999 as Sub-DIC under BTISNET-DBT, Gol. It provides access to scientists, researchers, teachers and students involved in sericulture, seri-biotechnology and seri-bioinformatics in India; thus contributing significantly for the HRD in the field of Biotechnology and Bioinformatics with complete infrastructure facilities. Two M.Tech (Bharathidasan University, Tiruchirappalli) Dissertation - Ms. K. Lakshmi Pradeepa, (Identification of transcription factors in mulberry, *Morus notabilis*; Ms. S. Ambikavathi (Identification of G-protein coupled receptors and Gprotein signaling pathway in mulberry, *Morus notabilis*) works were carried out. One each of Studentship & Traineeship sponsored by DBT was provided. A workshop on Bioinformatics & its Applications (16-17 March 2015) was organized for scientists from CSRTI-Mysuru & its nested units and 691 persons have been trained in Bioinformatics till date since inception.

Database & Software (http://btismysore.in)	
Database	Utility
SILKPROT	Annotated protein database for silkworm
SilkTF	Silkworm specific transcription factor database (587 protein sequences)
Mulberry Genome Database	Marker data on mulberry genome (DNA fingerprints & molecular IDs, binary scores; similarity & dissimilarity indices; marker based clustering etc.)
Soilinfo	Information on types of soils in South India including physio-chemical properties, micro-nutrient status etc.
SilkPPI	Protein-protein interaction in silkworm, <i>Bombyx mori</i>
MulSatDB	Mulberry microsatellite marker database (<i>M. notabilis</i>); supported with tools for primer design (primer3plus) and map markers on strawberry chromosomes (Cmap); integrated with Blast
STRPLOT	Software for drawing elegant STRUCTURE bar plots
Growth Index	Construction of growth indices in popular breeds/hybrids of silkworm, <i>Bombyx mori</i> in relation to nutritional supplements

Regional Sericultural Research Stations (RSRS)

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



RSRS-KODATHI

REC & Sub-Units	Staff	
RSRS-Kodathi	In-charge Officer:	M.T. Himantharaj
REC-Bidaraguppe	Dr. K. L. Rajanna (upto June 2015)	
REC-Chitradurga	Scientists:	15
REC-Madivala	Technical Staff:	25
RECSU-Bijapur	Administrative Staff:	5
RECSU-Jamkhandi	Farm Based Units	
RECSU-Kanakapura	Unit	Area (Acres)
RECSU-Koppal		Mulberry Acreage
RECSU-Kudlagi	RSRS-Kodathi	66.90
RECSU-Ranebennur	REC-Bidaraguppe	7.00
RECSU-Shahapur	REC-Chitradurga	7.00
RECSU-Shirahatti	REC-Madivala	8.00
RECSU-Tumkur	RECSU-Koppal	8.00
	Total	96.90
		19.63

Research Projects**MOE 3564: Impact of CPP on Sericulture development in North Karnataka (Mar. 2016 to Aug. 2017)**

Raveendra M. Mattigatti¹, (PI), M. K. Raghunath², A. Umesh³, Y. N. Sanathkumar⁴, C.R. Hegde⁵, Ishwar⁶

¹RECSU-Kudlagi, ²RECSU-Ranebennur, ³REC-Chitradurga, ⁴RECSU-Koppal, ⁵RECSU-Bijapur, ⁶RECSU-Bidar

Objectives:

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

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

Collaborative Research Projects/ Programmes

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

- PRE 3512: Studies on pest status and eco-friendly management of thrips (*Pseudodendrothrips mori*) (Thysanoptera: Thripidae) on mulberry in Tamil Nadu and Karnataka
- PRE 3527: Survey and surveillance of major pests and their natural enemies in mulberry eco-system
- MOE 3523: Study on Drought Management practices in Mulberry Sericulture
- ARP 3519: Silkworm Disease Monitoring of Seed and Commercial Crop Rearing of South Indian States
- MOE 3525: A study on the impact of Pest and Disease Management practices in Sericulture among the farmers under Cluster Promotion Programme in South India
- PRE 3535: Popularisation of Nemahari - A bio-nematicide for management of root knot disease in mulberry
- PIB 3172: All India Co-ordinated Experiment for Mulberry (Phase-III)

Cluster Promotion Programme (CPP): Bivoltine sericulture technologies were disseminated in 36 clusters across Karnataka. A total of 90.01 lakh bivoltine hybrid dfls with 100.01% achievement against the target (90.00 lakh dfls) were brushed with an average yield of 66.77 kg/100 dfls and 780.12MT bivoltine raw silk was produced against the target of 780.08MT.

On-Station-Trials

Evaluation of NPV tolerant bivoltine hybrids

M. Maheswari, K. L. Philomena and M. T. Himantharaj

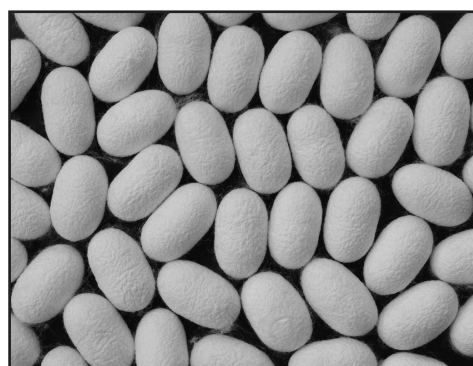
Objective: To evaluate the NPV tolerant bivoltine hybrids

Identified BmNPV tolerant bivoltine hybrids based on BmNOX were reared along with control during Feb-Mar 2016. (CSR2 x 118) x (CSR6 x 87) recorded higher survival (>97%) with lower incidence of NPV (2.5) as compared to control; while (CSR62 x 87) x (CSR21 x 118) recorded higher filament length (770m) as compared to control (732m).

Hybrid	Fec. (No.)	ERR (Nos)	ERR-wt. (kg)	SCW (g)	SSW (g)	SR (%)	NP (%)	Reela-bility (%)	AFL (m)	Raw Silk (%)	Neat-ness (p)
(CSR21 x 27) x (CSR62 x 26)	414	9632	14.38	1.535	0.310	20.19	4.2	91.67	724.2	16.25	96
(CSR21 x 118) x (CSR62 x 87)	473	9432	12.80	1.390	0.285	20.47	3.0	92.39	722.0	17.06	96
(CSR2 x 118) x (CSR6 x 87)	463	9712	13.46	1.411	0.281	19.90	2.5	89.64	724.9	16.60	96
(CSR62 x 87) x (CSR21 x 118)	423	9736	13.86	1.450	0.296	20.43	3.5	91.33	770.9	16.72	96
(CSR62 x 26) x (CSR21 x 27)	402	9664	13.64	1.445	0.299	20.69	3.1	92.77	727.0	15.42	96
(FC2 x FC1) Control	410	9688	13.26	1.402	0.294	20.97	2.9	91.73	732.2	16.96	96

Continuous/Other activities

Field testing of newly developed Bivoltine & ICB hybrids: New bivoltine double & single hybrids; improved cross-breeds were test verified with 565 farmers (1.061 lakh dfls) with an average yield/100 dfls recorded being 69.74 kg (S8 x CSR16), 61.5 kg (G11 x G19), 75.5 kg (G19 x G11), 64.29 kg (FC3 x FC4), 70.2 kg CSR50 x 51) and 58.24 kg for Cauvery Gold (MV1 x S8).



Unit	Hybrid	Dfls (No)	Farmers (No)	Yield/ 100 dfls (kg)	Rate/Kg (Rs)
RSRS-Kodathi	S8XCSR16	15200	55	64.61	262.00
	G11 x G19	5250	20	63.24	278.00
	FC3 x FC4	7500	34	67.00	252.00
	MV1 x S8	4000	23	58.62	221.70
REC-Chitradurga	S8 x CSR16	4400	22	62.00	305.00
	G11 x G19	7600	46	52.00	229.00
	FC3 x FC4	3000	21	63.00	383.00
	MV1 x S8	2000	11	52.00	296.50
REC-Madivala	S8 x CSR16	21200	126	82.60	322.00
	G11 x G19	5500	39	69.50	365.00
	G19 x G11	8900	59	75.50	336.00
	FC3 x FC4	2950	14	73.70	305.00
	CSR50 x 51	4900	27	84.40	377.00
	MV1 x S8	4700	16	64.10	321.00
REC-SU Koppal	S8 x CSR16	1000	5	56.50	262.00
	FC3 x FC4	7000	39	53.44	307.63
	CSR50 x 51	1000	8	56.00	258.00
Total		106100	565		

Extension Communication Programmes: Various kinds of ECPs (5882 farmers benefited with 157 programmes) were conducted for the transfer of technologies developed by the main institute and are fine-tuned.

Extension Communication Programmes (Values represent farmers participated & figures in parentheses indicate number of events)							
Centre	Tech. Demo.	Group Disc.	Aware. Prog.	Field Day	Enlight. Prog.	Exhi- bition	Study Tour
RSRS-Kodathi		880 (34)		443 (5)			75 (5)
REC-Bidaraguppe		30 (1)		147 (1)			
REC-Chitradurga	20 (1)	152 (8)		325 (2)			
REC-Madivala	35 (1)	314 (12)	258 (2)				50 (1)
RECSU-Koppal		23 (1)			227 (2)		
RECSU-Kanakapura		186 (6)	140 (1)				
RECSU-Kudlagi		109 (4)		210 (2)			
RECSU-Ranebennur	62 (3)	515 (20)	101 (1)	61 (2)			
RECSU-Tumkur		243 (8)	83 (2)	25 (1)			
RECSU-Bijapur		368 (10)	50 (1)	94 (1)			
RECSU-Jamkhandi		169 (4)	54 (1)	50 (1)			
RECSU-Shahapur		72 (5)					
RECSU-Sirahatti		193 (6)				118 (2)	
Total	117 (5)	3254 (119)	686 (8)	1355 (15)	227 (2)	118 (2)	125 (6)

Popularization of Improved Mulberry Varieties: A total of 3775.23 acres of new mulberry plantation was taken up by 2474 farmers with V1 variety and new varieties (G4, G2, RC1, RC2 & Vishala) were popularised among 73 farmers (79.44 acres).

Unit	Farmers (Nos)	V1 (Acres)	Farmers (Nos)	New Varieties (Acres)
RSRS-Kodathi	811	1334.33	33	35.44
REC-Bidaraguppe	7	7.5		
REC-Chitradurga	235	427.89	25	23.50
REC-Madivala	386	617.13		
RECSU-Bijapur	127	205.75		
RECSU-Jamkhandi	105	137.00		
RECSU-Kanakapura	334	266.04		
RECSU-Koppal	95	160.20		
RECSU-Kudlagi	174	291.34		
RECSU-Ranebennur	19	29.50	15	20.50
RECSU-Shahapur	35	99.10		
RECSU-Sirahatti	87	129.45		
RECSU-Tumkur	59	70.00		
Total	2474	3775.23	73	79.44

Production of Biological Control Agents: A total of 35000ml of *Nesolynx thymus* were produced and supplied by REC-Madivala and distributed to stakeholders for the management of uzi fly.

Establishment of AMIT: Affordable Micro Irrigation Technology (Drum Kit Technology) and drip irrigation system was installed at RSRS-Kodathi and REC-Chitradurga to mitigate drought situation.

Farm Rearings: A total quantity of 2525 dfles were reared and generated 11.47 lakh cocoons (1593.20kg) with an average yield of 63.09kg/100 dfles at RSRS-Kodathi and farm-based nested units (REC-Madivala, REC-Bidaraguppe & REC SU-Koppal). Further, a total of 38850 bivoltine hybrid dfles were chawki reared and distributed to 234 farmers through REC-Chitradurga & REC SU-Koppal.

Farm maintenance: A total of 19.98 acres of mulberry garden was maintained by RSRS and farm-based nested units and produced 94MTmulberry leaf for farm rearing. Farm waste was recycled and 49MT compost and 44.5MT vermicompost were produced and utilized for mulberry gardens.

Capacity Building Training Programme (CBT): A total of 15 Farmers Skill Training Programmes (FST) were conducted by RSRS and its nested units in respective clusters and a total of 225 farmers were trained on different technologies. A total of 65 officials/students were trained under Technology Orientation Programme (TOP) in three programmes conducted by REC-Chitradurga & REC-Madivala.

Visitors Service: A total of 2459 sericultural farmers, students and officials visited the RSRS-Kodathi, REC-Chitradurga and REC-Madivala.

Unit	FST		TOP	
	Prog.	Trainees	Prog.	Trainees
RSRS-Kodathi	6	90		
REC-Bidaraguppe	1	15		
REC-Chitradurga	2	30	2	30
REC-Madivala	2	30	1	35
REC SU-Kanakapura	1	15		
REC SU-Koppal	1	15		
REC SU-Tumkur	1	15		
REC SU-Rannebennur	1	15		
Total	15	225	3	65

RSRS-CHAMARAJANAGAR

REC & Sub-Unit
SU-Kinakanahally

Staff	
In-charge Officer:	Dr. K. Srikantaswamy
Scientists:	3
Technical Staff:	8
Administrative staff:	4

Farm Based Units		
Unit	Total Area (Acres)	Mulberry Acreage
RSRS-Chamarajanagar	14.02	6.153
SU-Kinakanahally	17.40	2.60

Ongoing Research Projects

PPF 3500: Development of Seri-lac culture model for income augmentation (Inter institutional Project with IINRG-Ranchi; Mar. 2013 to Dec. 2016)

V. Sivaprasad (Project Coordinator), R. Ramani¹, K. Srikantaswamy², Sibayan Sen, Mohanasundram¹

¹IINRG, Ranchi, ²RSRS Chamarajanagar

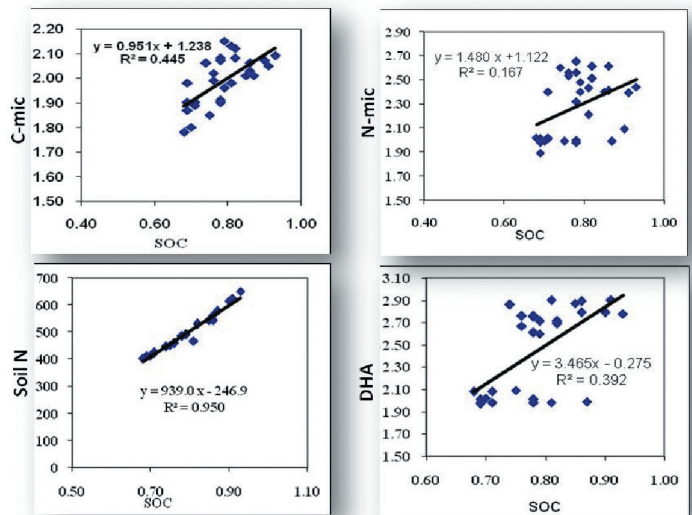
- Objectives**
- To work out the additional income generation out of lac production and its economics in relation to mulberry leaf production
 - To find carbon sequestration rate in improving the soil fertility and for sustenance of crop productivity
 - To generate employment for rural people and improve their livelihood
 - To study the pest & disease incidence, cross infectivity studies in mulberry, lac host plant vice versa

Tree mulberry plantation with widely spaced mulberry trees (S13 variety; 8' x 8' spacing @ 680 plants/acre) facilitate intercropping with lac host plant (*Flemingia semilata*) and is being currently explored in Chamarajanagar of Karnataka during the last two years (2014 -2016). Affordable micro-irrigation technology (AMIT) was utilized for irrigating mulberry and lac host plants and the soil moisture was maintained nearer to field capacity resulting in >95% survival, higher total shoot length, no. of leaves, LA (cm²), LAI (m²) and leaf yield. However, no significant difference was noticed, except in LAI (m²) indicates that lac host plants did not compete with mulberry for nutrients and water. Mineral composition of mulberry leaf with respect to nitrogen (4.2%), phosphorus (0.81%) and potassium (1.21%) have shown higher levels, over single mulberry plantation. Soil organic carbon, nitrogen content, microbial biomass carbon and nitrogen, and dehydrogenase enzyme activity significantly increased over the control, whereas soil pH reduced significantly. Regression analysis of pooled data indicates that the SOC is positively and significantly associated with respect to microbial biomass carbon and nitrogen, and dehydrogenase activity by showing high R² values.

Bioassay showed the improvement in cocoon production (577/kg/acre/year) with higher returns. About 150 kg stic lac was harvested and resulted in an additional income of Rs.46750/acre/year). The land equivalent ratio (LER) recorded was around 1.75 indicating complimentary nature of two crops, while supporting lac production. The cost benefit ratio was high in seri-lac culture (1:2.06) over mulberry (1:1.74). The present study suggests that Seri-Lac culture model could be vital for income augmentation for rural folk.

Soil Characteristics in Seri-Lac Plantation			
Parameters	Mulberry with Lac	Mulberry	t-value
pH	7.52	7.57	**
Organic carbon content (%)	0.82	0.74	**
Available nitrogen (kg/ha)	526	451	**
Microbial biomass carbon (Cmic x 10 ⁻² gm ⁻¹ soil)	2.07	1.90	**
Microbial biomass nitrogen (Nmic x 10 ⁻³ gm ⁻¹ soil)	2.48	2.08	**
Dehydrogenase enzyme activity (mg TPR-1hr ⁻¹)	2.78	2.10	**
Available soil moisture (%)	16.6	10.20	**

Correlation of SOC : Seri-Lac Plantation



Economic Viability of Seri-Lac Culture Farming Model				
Parameters	SERI-LAC CROP		SOLO MULBERRY CROP	
	Mulberry Production	Lac Production	Mulberry Production	Lac Production
A: Expenditure (Rs.)				
FYM 4+2 MT	8000	4000	8000	4000
Ammonium sulphate 20 kg		250	250	250
Single super phosphate 20 Kg	160		160	
MOP 20Kg	250		250	
Labor charges	2000	1000	2000	1000
Protection measures		1500		1500
Miscellaneous charges	2500	2500	2500	2500
Mother brood culture cost		4000		4000

Rearing cost	50000		50000	
Sub-Total	62910	13250	63160	13250
Leaf Produced (Kg/acre/year)	11160		11152	
No of Dfls Brushed	825		825	
B: Returns (Rs.)				
Cocoon produced	577		560	
Amount realized @ Rs.300/kg /annum	173250		173250	
Lac production (Stic lac)		150		200
Amount realized @ Rs.400/ kg /annum		60000		80000
Profit B – A	110340	46750	110090	53500
Net profit	157090		110090	66750
CB Ratio	1:2.06		1:1.74	



PPA 3551: Determination of Yield Potential of Newly developed Bivoltine Hybrids under Tree type Mulberry Plantation with Protective Irrigation (Jan. 2016-Dec.2016)

S. N. Pallavi and R. Meenal

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

New silkworm hybrids (FC3 x FC4 & G11 x G19) were evaluated with two control hybrids (FC2 x FC1 & CSR2 x CSR4) by feeding S13 tree mulberry leaves with AMIT. First trial data indicates test hybrids recorded significant improvement over the control hybrids for commercial characters. Six farmers

Hybrid	Yield/10000 Larvae		Cocoon Wt. (g)	Shell Wt. (g)	Shell Ratio (%)	Yield/ 100 dfls (kg)
	No.	Wt. (kg)				
FC3 x FC4	8511	13.82	1.578	0.348	22.03	76.02
G11 x G19	8244	13.36	1.540	0.332	21.54	73.46
FC2 x FC1 (Control)	8110	11.59	1.505	0.320	21.29	63.74
CSR2 x CSR4 (Control)	8002	10.90	1.444	0.293	20.30	59.95
CD 5%	285.85*	1.09**	0.08*	NS	NS	5.99**

with tree mulberry plantation were identified (Tumbla, Aralikatte, Marallipura villages) for experimental rearings with the test hybrids.

Collaborative Research Projects/Programmes

- ARP 3519: Silkworm disease monitoring of seed & commercial crop rearing of south Indian states
- AIB 3528: Evaluation of G11 x G19 a new bivoltine double hybrid for sub optimal conditions

- PRE 3527: Survey & Surveillance of major pests and their natural enemies in mulberry eco-system

Cluster Promotion Programme (CPP): Bivoltine sericulture technologies were disseminated in T. Narasipura cluster and 1.89 lakh dfls (94.50% achievement) were brushed with an average yield of 64.5kg.

Institute Village Linkage Programme (IVLP): Promotion of mulberry tree plantation using AMIT has been undertaken in 30 acres (30 farmers). Tree plantation with AMIT maintained soil moisture nearer to field capacity resulting significant improvement in biomass production (total no of shoots, shoot length, no. of leaves, LA, LAI and leaf yield). Leaf quality with respect to leaf moisture (70%), nitrogen (3.87%), phosphorus (0.37%) and potassium (1.19%) improved significantly over control. Leaf yield was significantly high in tree mulberry plantation (11160kg/acre/year) over the traditional practice (3097kg/acre/year).

Continuous/Other activities

In situ green manuring through *Gliricidia* and wider planting

K. Srikantaswamy, S. N. Pallavi and Sibayan Sen

Gliricidia bio mass has been harvested at four months schedule and quantified (1.45-2.18kg/plant) and the green biomass was covered as surface mulch (884.5kg in 0.103ha) to build soil organic matter. AMIT has been installed to provide protective irrigation for better establishment of mulberry tree. Three mulberry varieties (RC1, RC2 & S13) were pruned after six months of establishment. Soil samples were collected from treated and control plants and analyzed for SOC content and the *in situ* green manured plot showed higher SOC (0.72%) as against the control (0.47%).

Forecasting and forewarning of mulberry pests

S.N. Pallavi and K. Srikantaswamy

Survey has been conducted at twenty five farmer's field covering five villages. Pest incidence was recorded in relation to weather parameters. No severe pest and disease incidence was noticed in majority of the mulberry fields; however, tukra incidence was recorded in four farmers' fields (6-10%) and thrips incidence was noticed in five farmers' field (5-10%).

On station Trial of new NPV tolerant hybrids

R. Meenal and K. Srikantaswamy

Two trials were conducted with five test hybrids along with the control hybrid (FC2 x FC1). The BmNPV incidence recorded varied from 2-4% and double hybrids were comparatively more tolerant to BmNPV than single hybrids.

Multiplication of Mulberry Varieties (RC1/RC2/G2/G4/Anantha/V1): A quantity of 7500 (RC2) and 17000 (RC1) seed cuttings were supplied to RSRS-Kodathi and a nursery with 25000 seed cuttings (S13/RC1/RC2) was raised.

Multiplication of Parental Breeds: 25 dfls each of FC3 and FC4 were reared and 23.76 kg cocoons were produced for hybrid dfls production.

Technology	Transfer of Technology Programmes-Impact Analysis
IPM-Mulberry	Reduction of tukra infestation (13.15 to 7.6%) by release of <i>Scymnus coccivora</i>
IPM-Silkworm	Reductions of uzi fly infestation (8.69 to 3.95%)

Centre	Extension Communication Programmes (ECP)				Training Programmes	
	Group Discussion	Field Days	Exposure Visits	Exhibition	Farmers Skill Training	Technology Orientation
RSRS-Chamarajanagar	196 (7)	392 (3)	11 (1)	1533 (1)	60 (4)	15 (1)
REC SU-Kinakahalli	27 (1)				15 (1)	

RSRS-SALEM

REC & Sub-Units
Tamil Nadu
Samayanallur
Krishnagiri
Udumalpet
Gobichettipalayam
Sub Unit-Berigai
SU-Srivilliputtur
SU-Vaniyambadi
SU-Tiruchirappalli
SU-Avinashi
Kerala
Palakkad

Command Area	Staff	
	In-charge Officer	Dr. Chikkanna (Upto 29-02-2016) Dr. S. Rajakumar (From 01-03-2016)
Tamil Nadu	Scientists:	29
Kerala	Technical Staff:	24
	Administrative Staff:	20

Farm Based Units		
Unit	Total Area (Acres)	Mulberry Acreage
RSRS-Salem	20.0	3.4
REC-Krishnagiri	2.77	2.5
REC-Samayanallur	2.62	0.6

Concluded Research Project

PRE 3512: Studies on pest status and eco-friendly management of thrips (*Pseudodendrothrips mori*) (Thysanoptera: Thripidae) on mulberry in Tamil Nadu and Karnataka (in collaboration with NBAIR, Bangalore; Apr. 2014 to Mar. 2016)

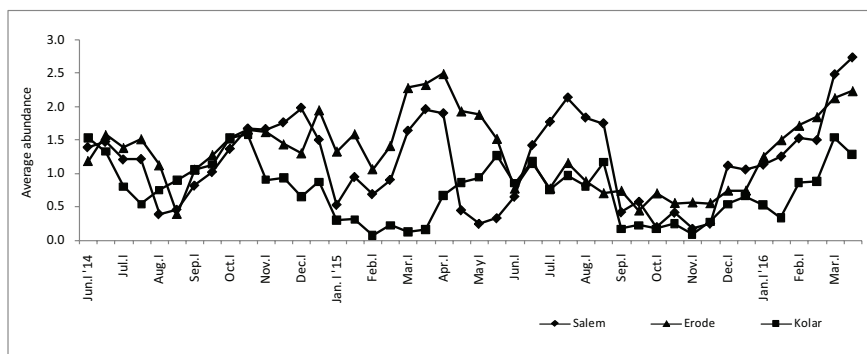
S. Mahiba Helen (PI), Chandish R. Ballal¹, N. Dhahira Beevi², M. Noble Morrison³, Chikkanna

¹NBAIR, Bangalore; ²REC, Gobichettiapalayam; ³REC, Madivala

Objectives

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

Thrip, *Pseudodendrothrips mori* (Thripidae: Thysanoptera) is a serious pest on mulberry in Tamil Nadu. Thrips incidence occurs throughout the year, especially severe in summer and the estimated loss is about 30-40% of total leaf yield. Fortnightly fixed plot survey was carried out in three farmers' field each covering Salem & Erode districts (Tamil Nadu) and Kolar district (Karnataka) with an objective to determine the pest frequency and its distribution. Thrips population (Nymphs/adults) was calculated based on grading of nymphs population as 0, 1, 2, 3 & 4 (Nil: 0; low: 1-10; moderate: 11-30; high: 30-40; very high: >60) on ten individual mulberry plants (top three leaves from different directions: N, S, E and W) at the centre of each plot. During the period from June 2014 to March 2016, highest thrips incidence was reported in Erode and Salem districts of Tamil Nadu and highest incidence (11-30 thrips/leaf) was recorded during March to June. During the same period, very low incidence of thrips population (1-10 thrips/leaf) was recorded in Kolar district of Karnataka.



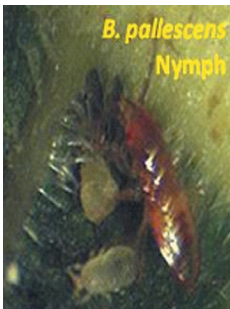
Karl Pearson correlation coefficient was determined for correlating the thrips population with weather parameters. The correlation (three sets of pooled data) between climatic parameters and thrips abundance was found to be significant and negatively correlated with rainfall. Thrips population was not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

Parameters	Salem	Erode	Kolar	Overall
Max. Temp.	-0.054ns	0.319ns	0.102ns	0.246*
Min. Temp.	0.262ns	0.529*	0.011ns	0.385**
Max. Humidity	-0.294ns	0.033ns	-0.173ns	-0.339**
Min. Humidity	0.169ns	0.148ns	-0.135ns	0.077ns
Rainfall	-0.496**	0.100ns	-0.366ns	-0.263*

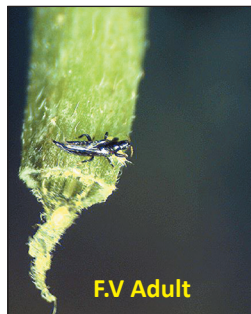
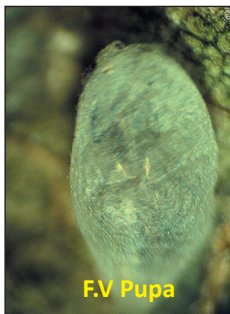
* significant at 0.05 level
 **significant at 0.01 level
 ns- non significant at 0.05 level

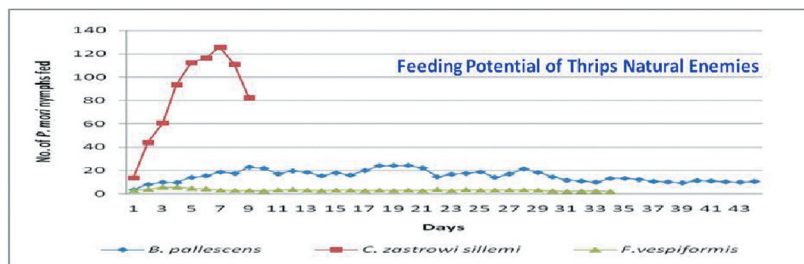


Natural Enemies Against Thrips	
Predatory thrips Identified by ZSI-Kolkata	<i>Franklinothrips vespiformis</i> Crawford (Thysanoptera: Aeolothripidae)
	<i>Mymarothrips garuda</i> Ramakrishna Ayyar & Margabandhu (Thysanoptera: Aeolothripidae)
	<i>Aduncothrips asiaticus</i> Ramakrishna Ayyar & Margabandhu (Thysanoptera: Aeolothripidae)
	<i>Scolothrips asura</i> Ramakrishna Ayyar & Margabandhu (Thysanoptera: Thripidae)
Predatory Anthocorids (Hemiptera: Anthocoridae) Identified by NBAIR-Bangalore	<i>Orius maxidentex</i> Ghauri
	<i>Orius dravidensis</i> Muraleedharan
	<i>Montandoniola indica</i> Yamada
Predatory Mites Identified by NBAIR-Bangalore	<i>Trombidiforme</i> mites



Predatory Potential of Natural Enemies		
Predators	Mulberry Thrips Fed/ larva/nymph (Nos)	Longevity (days)
<i>Chrsoperla zastrowi</i> Sillemi	848	8-10
<i>Blaptostethus pallescens</i>	680	40-44
<i>Franklinothrips vespiformis</i>	64	28-30





Laboratory Evaluation of Predatory Potential of *C. zastrowi*, *B. Pallescens* & *F. Vespiformis* on *P. mori* nymphs

The predatory potential of *C. zastrowi* Sillemi, *B. pallescens* and *F. vespiformis* on mulberry thrips was studied under laboratory conditions at RSRS-Salem and the predators were obtained from National Bureau of Agricultural Insect Resources (NBAIR), Bangalore. The prey density (100 *P. mori* nymphs/predator) was maintained initially and the density was increased gradually based on consumption. The experiment was replicated 10 times/larvae/nymph, separately. A control was also maintained without predators to determine the normal mortality. *C. zastrowi* Sillemi could feed on a total of 848 nymphs of *P. mori* and its predatory potential was higher as compared to *B. pallescens* (680) and *F. vespiformis* (64).

Field Evaluation

- Thrips populations viz., pre-release and post release (I, II & III) of *C. zastrowi* Sillemi and *B. pallescens* were compared using Kruskal Wallis ANOVA followed by Mann Whitney U test for pair wise comparison and Wilcoxon signed rank test. Chi-square statistics computed in this case was found to be significant and the results of the pair wise comparison are presented. Z-value computed in the Wilcoxon signed rank test for the pair wise comparison was also provided. The results show that in Salem, T2 shows significant difference in the thrips populations after 1st and 2nd release; Significant reduction in count was observed under T4 and T5 after 3rd release in Gobi; if 15 Nos. of CZS are released/plant, 3rd release might not be required as significant reduction was observed in thrips population after 2nd release of CZS in Salem and Gobi.

Cultures Supply (NBAIR-Bangalore)		
Insect Cultures	REC-Gobi	RSRS-Salem
<i>C. zastrowi sillemi</i> (eggs)	49200	29800
<i>B. pallescens</i> nymphs	4100	3000

Thrips Population/Leaf in Control and Predator Released Plots (Salem)							
Group	Pre Count (A)	7 days after 1st release (B)	7 days after 2nd release (C)	7 days after 3rd release (D)	Z-value		
					B vs A	C vs B	D vs C
T1-5 nos. of CZS	1.02 ± 0.01a	1.5 ± 0.08a	0.77 ± 0.12b	0.98 ± 0.13b	2.706**	2.675**	1.790NS
T2-10 nos. of CZS	0.99 ± 0.01a	1.10 ± 0.04cd	0.18 ± 0.04d	0.57 ± 0.1cd	2.360*	2.812**	2.448*
T3-15 nos. of CZS	0.82 ± 0.03b	1.04 ± 0.03d	0.15 ± 0.03d	0.15 ± 0.05e	2.623**	2.818**	0.000 NS
Control	0.98 ± 0.02a	1.48 ± 0.04a	2.46 ± 0.14a	2.70 ± 0.11a	2.814**	2.810**	1.173 NS
T4-10 nos of B.p	1.05 ± 0.03a	1.18 ± 0.07b	0.71 ± 0.12bc	0.83 ± 0.1bc	1.761ns	2.499**	0.969 NS
T5-20 nos of B.p	0.98 ± 0.03a	1.28 ± 0.07bc	0.40 ± 0.08cd	0.47 ± 0.08d	2.670**	2.823**	0.511 NS
T6-30 nos of B.p	1 ± 0.02a	1 ± 0d	0.21 ± 0.05d	0.33 ± 0.1de	.000	2.814**	1.632NS
Chi square value	28.101**	38.555**	46.703**	45.691**			
p-value	< 0.001	< 0.001	< 0.001	< 0.001			

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

Thrips Population/Leaf in Control and Predator Released Plots (Gobi)							
Group	Pre Count (A)	7 days after 1st release (B)	7 days after 2nd release (C)	7 days after 3rd release (D)	Z-value		
					B vs A	C vs B	D vs C
T1-5 nos. of CZS	1.02 ± 0.01a	1.5 ± 0.08a	0.77 ± 0.12b	0.98 ± 0.13b	2.706**	2.675**	1.790NS
T2-10 nos. of CZS	0.99 ± 0.01a	1.10 ± 0.04cd	0.18 ± 0.04d	0.57 ± 0.1cd	2.360*	2.812**	2.448*
T3-15 nos. of CZS	0.82 ± 0.03b	1.04 ± 0.03d	0.15 ± 0.03d	0.15 ± 0.05e	2.623**	2.818**	0.000 NS
Control	0.98 ± 0.02a	1.48 ± 0.04a	2.46 ± 0.14a	2.70 ± 0.11a	2.814**	2.810**	1.173 NS
T4-10 nos of B.p	1.05 ± 0.03a	1.18 ± 0.07b	0.71 ± 0.12bc	0.83 ± 0.1bc	1.761ns	2.499**	0.969 NS
T5-20 nos of B.p	0.98 ± 0.03a	1.28 ± 0.07bc	0.40 ± 0.08cd	0.47 ± 0.08d	2.670**	2.823**	0.511 NS
T6-30 nos of B.p	1 ± 0.02a	1 ± 0d	0.21 ± 0.05d	0.33 ± 0.1de	.000	2.814**	1.632NS
Chi square value	28.101**	38.555**	46.703**	45.691**			
p-value	< 0.001	< 0.001	< 0.001	< 0.001			
** significant at 0.01 level; * significant at 0.05 level; NS: Non Significant							

Inference: Two releases of 10 Nos. of *C. zastrowi* sillemi/plant and 20 Nos. of *B. pallescens*/plant at weekly intervals are recommended for the management of thrips in mulberry plantations.

Ongoing Research Projects

MOE 3562: Socio-economic impact of Cluster Promotion Programme on Bivoltine seri farmers in Tamil Nadu (Mar. 2016 to Aug. 2017)

S. Rajakumar (PI), J. Ravikumar, N. Dhahira Beevi, A. G. K. Daniel, N. G. Selvaraju, G. Punithavathy and Y. Humayun Sharief

Objectives

- To analyze the impact of CPP on technology adoption and productivity improvement in sericulture in the study area of Tamil Nadu
- To estimate the socio-economic impact of CPP on marginal and small sericulturists in the study area
- To elucidate the cost and returns from bivoltine sericulture among different farm size holdings
- To elicit the constraints in non-adoption of technologies faced by farmers and suggestions

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

Collaborative Research Projects/Programmes

- ARP 3519: Studies on Disease forecasting and forewarning model (Mulberry pests and Silkworm pests)
- RE 3527: Studies on Disease forecasting and forewarning for Mulberry pests, diseases and Silkworm pests
- MOE 3523: Studies on Drought Management practices in Mulberry Sericulture
- All India Co-ordinated Experiment for Mulberry (Phase-III) at REC-Krishnagiri

Continuous/Other activities

Cluster Promotion Programme: Bivoltine sericulture technologies were disseminated in 28 clusters across Tamil Nadu and 2 clusters in Kerala. A total of 71.54 lakh (DH) and 1.22 lakh (SH) dfls were distributed and harvested an average cocoon yield of 77.39 and 76.12 kg/100 dfls, respectively in Tamil Nadu and Kerala.

Adharshgram (IVLP): A total of 2.76 lakh dfls of bivoltine hybrids were reared with 200 farmers in two clusters (Sathyamangalam & Thondamuthur) and the average yield recorded was 74.63kg/100 dfls, which is 11.63% improvement in productivity against the bench mark.

Monitoring of soil fertility status of mulberry gardens in Tamil Nadu

J. Ravikumar

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

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

A. Gnanakumar Daniel and S. Rajakumar

Objectives

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

Incidence of pest survey conducted fortnightly in 25 selected farmers' field and data collected including weather parameters have been analysed.

Pest incidence of 1.6-21.5 (leaf

webber); 0.8-10.3 (thrips); 0.12-13.0 (Tukra); 0.0-1.0 (papaya mealybug); 0.38-8.5 (grasshopper); 0.0-1.9 (whitefly) & 0.0-2.1 (uzi) was recorded.

On-Station Trials

C.A. Mary Flora

Testing of NPV Tolerant Bivoltine Hybrids: Two trials (Oct-Nov 2015 & Feb-Mar 2016) of four BmNPV tolerant bivoltine hybrids were conducted with FC2xFC1 as control. (CSR62x26) x (CSR21x27) performed better in terms of Fecundity (687), ERR No. (9494), ERR Wt. (16.59kg), yield/50000 eggs (80.49kg), reelability (84.05%), AFLaa (930.47m), NBFL (782.04m), denier (2.66), renditta (6.76), raw silk (14.79%) and raw silk recovery (81.4%) followed by (CSR21x27) x (CSR62x26) in the first trial.

Hybrid	Fec.	Yield/ 50K eggs (kg)	SCW (g)	SSW (g)	SR (%)	Reelability (%)	AFL (m)	Raw Silk (%)
(CSR21x27) x (CSR62x26)	592	72.577	1.906	0.381	19.99	83.90	922.17	14.79
(CSR62x26) x (CSR21x27)	687	80.489	1.849	0.336	18.17	84.05	930.47	14.79
(CSR6x87) x (CSR2x118)	611	74.286	2.010	0.373	18.56	82.19	890.26	13.96
(CSR62x87) x (CSR21x118)	605	66.881	1.993	0.384	19.27	84.50	873.39	13.87
FC2 x FC1 (Control)	673	73.805	2.057	0.418	20.32	79.30	981.47	13.56

On-Farm-Trials: Newly developed silkworm hybrids (improved cross breeds; bivoltine double and single hybrids) were test verified with the farmers by the RSRs-Salem and its nested units.

Fertility Ratings of Soil Samples (figures in parentheses indicate % of samples)			
Parameter	Status		
pH	Acidic	Neutral	Alkaline
	< 6.5 (4.83)	6.5-7.5 (11.71)	> 7.5 (83.46)
EC Ratings (mmhos/cm)	Normal	High	Toxic
	< 1 (98.73)	1-2 (1.27)	> 2 (0)
OC Status (%)	Low	Medium	High
	< 0.65 (66.16)	0.65-1.00 (26.21)	> 1.00 (7.63)
Available P (kg/ha)	Low	Medium	High
	< 10 (88.80)	10-20 (9.67)	> 20 (1.53)
Available K (kg/ha)	Low	Medium	High
	< 120 (2.54)	120-240 (32.83)	> 240 (64.63)

Pests	Leaf webber	Thrips	Tukra	PMB	GH	Others	Uzi
Annual Avg.	12.95	3.16	4.96	0.20	3.66	0.03	0.72
Range	Min	1.60	0.80	0.12	0.00	0.38	0.00
	Max	21.46	10.30	13.02	1.04	8.50	0.36

Centre	Hybrid	Dfls (Nos.)	Farmers (Nos.)	Yield/ 100 Dfls (kg)
RSRS- Salem	G11 x G19	18550	41	69.00
	G19 x G11	20500	76	70.00
	FC3 x FC4	24250	86	71.00
	S8 x CSR16	15700	51	75.00
	SSBS5 x SSBS6	6950	28	71.00
REC SU-Berigai	MV1 x S8	300	1	66.00
	L14x CSR2	500	2	64.30
	G11 x G19	4300	14	67.20
REC-Gobi	MV1 x S8	300	1	53.00
	FC3xFC4	2600	10	60.00
	G19 x G11	3000	11	56.50
	G11 x G19	6000	34	64.00
REC-Udumalpet	SSBS5 x SSBS6	500	5	69.80
REC-Krishnagiri	S8 x CSR16	2100	21	74.90
	FC3 x FC4	1500	13	77.00
	G11 x G19	500	3	77.60
REC-Samayanallur	G11 x G19	9750	32	63.10
	MV1 x S8	750	5	62.40
	FC3xFC4	1000	7	69.10
	G11 x G19	8900	50	68.60
Combination-wise	MV1 x S8	1350	7	61.11
	(Total/Avg.)	500	2	64.30
	G11 x G19	48000	174	63.62
	G19 x G11	23500	87	66.12
	SSBS5 x SSBS6	7450	33	71.46
	S8 x CSR16	17800	72	75.04
	FC3xFC4	26750	116	77.30
Total / Avg.		125350	491	69.07

Production of Bio-control Agents: 54750 *Acerophagus papayae* and 8500 *Pseudleptomastix mexicana* and 16 *Anagrus loeki* were produced and supplied to 240 sericulture farmers through DOS/CSB units and released in the mulberry gardens infested with papaya mealybug various districts in Tamil Nadu and Kerala. About 97% reduction in the papaya mealybug population was achieved after release of these exotic parasitoids.

Establishment of AMIT: Affordable Micro Irrigation Technology (Drum Kit Technology) and drip irrigation system covering 1.2 acre was installed at RSRS-Salem (0.40 acres) & REC-Krishnagiri (0.80 acres) for effective utilization of irrigation water in mulberry garden.

Extension Communication Programmes (figures in parentheses indicates the number of programmes conducted)						
Centre	Tech. Demos	Group Dis.	Aware. Prog.	Field Day	Orient. Prog	Study Tour
RSRS- Salem		15 (1)	229 (3)			77 (1)
REC-Krishnagiri		150 (10)	100 (10)			
REC-Samayanallur		300 (20)	320 (4)			
REC-Udumalpet		856 (45)	462 (4)			
REC-Gobi		495 (33)	240 (4)	100 (2)		
REC- Srivilliputhur	40 (1)	531 (19)	325 (3)			
REC SU-Berigai		128 (8)	110 (1)	25 (1)		
REC SU-Vaniyambadi		128 (6)	132 (1)			
REC SU-Avinashi		135 (9)	107 (1)			
REC SU-Trichy		120 (8)	140 (3)			
REC-Palakkad		134 (8)	86 (4)		30 (2)	30 (1)

Transfer of Technology Programmes (values in parentheses denote number of farmers covered)							
Centre	Nemahari	G2 (acres)	G4 (acres)	RC1 (acres)	RC2 (acres)	AMIT	Serifit
RSRS-Salem	16	11.00 (12)	15.0 (30)	0.25	0.25	1	
REC-Gobi	5	0.5 (1 CRC)	4.5 (7)	250 saplings (2)			
REC SU-Trichy	4	3.5 (7)	3.0 (5)				
REC-Udumalpet		1.00 (1)	1.0 (1)				(35)
REC-Samayanallur		1.5 (2)	3.8 (4)	3.70 (6)			
REC-Krishnagiri		3500 saplings	3000 saplings			1	

Popularization of Improved Mulberry Varieties & Bivoltine hybrids

A total of 1963.25 acres were planted with improved mulberry varieties (1042 farmers). A total of 5.95 lakh dfls of CSR single and double hybrids (534 farmers) were distributed to the farmers in non-captive area and the average yield recorded was 78.00 kg/100 dfls.

Resham Krishimela/Workshops	
Resham Krishi Mela (CSGRC-Hosur; 15-03-2016)	Seed Act Awareness Programme (Salem; 10-02-2016)
250 farmers attended A booklet on "Advanced Technologies in Sericulture" released	300 farmers attended Released Booklets on "Advanced Technology for silkworm seed production"; "Pest management in mulberry & silkworm" & "Integrated Nutrient Management in mulberry cultivation"

Improved Mulberry Varieties		
Unit	Farmers	Acres
RSRS-Salem	120	188.00
REC, Krishnagiri	190	393.00
REC-Samayanallur	32	64.75
REC-Udumalpet	76	140.75
REC-Gobi	143	361.00
RECSU-Berigai	105	228.25
RECSU-Srivilliputhur	105	181.50
RECSU-Avinashi	136	257.00
RECSU-Trichy	39	59.00
RECSU-Vaniyambadi	76	70.00
REC-Palakkad	20	20.00
Total	1042	1963.25

Training Programmes				
Unit	FST		TOP	
	Events	Farmers	Events	Personnel
RSRS-Salem	2	30	1	5
REC-Krishnagiri	2	30	1	5
REC-Samayanallur	2	30	1	5
REC-Udumalpet	2	30	1	5
REC-Gobi	2	30	1	5
REC-Srivilliputhur	2	30	1	5
REC SU-Berigai	2	30	1	5
REC SU-Avinashi	2	30	1	5
REC SU-Trichy	2	30	1	5
REC- Palakkad	2	30		
Total	20	300	9	45

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

Ph.D Students: RSRS-Salem is recognized as Centre for Higher Studies in Botany and Sericulture for doing M.Phil and Ph.D by Periyar University-Salem. One student was awarded Ph.D. Degree by Periyar University- Salem (2015-16) and at present eleven students are pursuing Ph.D (Periyar University-Salem) and one pursuing Ph.D (Manonmaniam Sundaranar University-Tirunelveli).

Student Sarvashri / Smt.	Research Supervisor	Year	Ph.D Title
Dr. S. Rajakumar *	Dr. D. S. Chandrashekar Scientist-D (CSB-Rtd)	2008	A Comparative Study on Knowledge, Adoption and Economic Performance of Sericulturists in Salem District of Tamil Nadu
N. G. Selvaraju			Studies on the incidence, biology, crop loss and management measures against papaya mealybug, <i>Paracoccus marginatus</i> in mulberry
G. Punithavathy			Studies on fertility of Commercial Chawki Rearing Centres and its impact on bivoltine cocoon production
B. Mohan	Dr. N. Dhahira Beevi Scientist-D	2010	Evaluation of silkworm (<i>Bombyx mori</i> L.) and development of core sets using qualitative, quantitative and molecular methods
P. P. Anilkumar	Dr. S. Masilamani Scientist-D	2008	Socio-economic factors contributing to the level of diffusion of improved sericulture technologies among bivoltine and cross breed rearers
B. S. Prabhakar**			Studies on sericultural technologies disseminate on vertical improvement of bivoltine cocoon production in traditional areas (Krishnagiri District) of Tamil Nadu
K. Velayudhan**		2010	Evaluation of different eco-races of Eri silkworm <i>Samia ricini</i> (Donovan) for rearing and Grainage performance in Krishnagiri District of Tamil Nadu, India
E. Rajalakshmi	Dr. N. Sakthivel Scientist-D	2013	Studies on identification of new foundation crosses and double hybrids of bivoltine <i>Bombyx mori</i> L under semi-temperate conditions of Nilgiris
T. Sivasubramonian		2016	Studies on the diversity of natural enemies in relation to the incidence of major pests of mulberry in Tamil Nadu, conservation and feasibility of their utilization in bio-control measures
Y. Humayun Sharief			Evaluation of different eco-races of eri silkworm, <i>Samia cynthia ricini</i> Boisduval on primary and secondary host plants for the development of ericulture in Tamil Nadu
K. Thangaraj			Impact of adoption of bivoltine sericulture technologies and techno economic analysis in southern district of Tamil Nadu

M. Rajasekhar	Dr. S. Balasaraswathi Scientist-D	2016	Impact of training programmes on sericultural technologies in traditional and non-traditional districts of Tamil Nadu
A. GnanakumarDaniel #	Dr. V. Prabhakaran Asst. Professor	2010	Survey and studies on seasonal incidence of bacteria and viral disease with special reference to flacherie in Bombyx mori L. and its impact on economics

* Ph.D. Degree awarded during 2015-16; ** Thesis submitted during 2015-16; # Manonmaniam Sundaranar University-Tirunelveli

RSRS-ANANTAPUR

REC & Sub-Units
Andhra Pradesh
REC-Eluru
REC-Kalyanadurgam
REC-Madakasira
REC-V.Kota
SU-Atmakuri
SU-Bhimadole
SU-Chebrolu
SU-Giddalur
SU-Hindupur
SU-Kalyanadurgam
SU-Palamaner
SU-Penukonda
Telangana
SU-Met Palli
SU-Surya Peta
Karnataka
SU-Bidar

Command Area	Staff	
	In-charge Officer:	Mr. Satyanaryana Raju
Andhra Pradesh Telangana Karnataka	Scientists:	18
	Technical Staff	21
	Administrative Staff:	19

Farm Based Units		
Unit	Total Area (Acres)	Mulberry Acreage
RSRS-Anantapur	40.73	4.00
REC-Rayachoty	5.00	1.00
REC-Vikarabad	5.50	1.80
RECSU-Bidar	11.33	5.50

Ongoing Research Projects

MOE 3565: Studies on yield gaps in silkworm cocoon production in the states of Andhra Pradesh and Telangana (Mar. 2016 to Aug. 2017)

S. Rajakumar (PI), J. Ravikumar, N. Dhahira Beevi, A. G. K. Daniel, N. G. Selvaraju, G. Punithavathy and Y. Humayun Sharief

Objectives

- To identify the yield gaps in silkworm cocoon productivity at farmers' level in Andhra Pradesh and Telangana states
 - To study the impact of new technologies on silkworm cocoon production
- Based on literature survey and discussions with the subject experts as per the milestone, questionnaire for data collection has been finalized.

Collaborative Research Projects/Programmes

- ARP 3519: Studies on Disease forecasting and forewarning model (Mulberry pests and Silkworm pests)
- RE 3527: Studies on Disease forecasting and forewarning for Mulberry pests, diseases and Silkworm pests
- MOE 3523: Studies on Drought Management practices in Mulberry Sericulture

- All India Co-ordinated Experiment for Mulberry (Phase-III) at RSRS-Anantapur, REC-Royachoty and REC-Vikarabad

Continuous/Other activities

Cluster Promotion Programme

Bivoltine sericulture technologies were disseminated in 13 clusters in Andhra Pradesh State and 4 clusters in Telangana State. 63.66 lakhs dfls of bivoltine hybrids were reared (111% achievement) against the target of 57.30 lakhs dfls and recorded the cocoon yield of 68.31 kg/100 dfls. The raw silk production achievement was 635MT against the target of 490MT.

Adarsha Gram (IVLP)

A total of 85500 dfls of bivoltine hybrids were reared with 190 farmers in two clusters (Rayachoti and Vizianagaram) and average yield recorded was 65kg/100 dfls, which is an improvement of 12.8% against the bench mark.

On station trials

Testing of NPV Tolerant Bivoltine Hybrids: Two trials (Oct-Nov 2015 & Feb-Mar 2016) of three BmNPV tolerant bivoltine hybrids were conducted with FC2xFC1 as control. (CSR62x26) x (CSR21x27) performed better followed by (CSR21x27) x (CSR62x87).

Performance of New BmNPV Tolerant Bivoltine Hybrids											
Hybrids	ERR		SCW (g)	SSW (g)	SR (%)	Reela- bility (%)	AFL (m)	NBFL (m)	Raw Silk (%)	Raw Silk Rec. (%)	Neat- ness (p)
	No.	Wt. (kg)									
(CSR21 x 27) X (62 x 26)	9216	18.00	2.06	0.473	22.96	85.73	1069.57	916.88	16.78	73.10	95
	9052	15.09	1.83	0.386	21.06	82.83	994.33	823.55	16.78	79.64	96
(CSR21 x 118) X (62 x 87)	9348	16.80	1.95	0.439	22.50	80.89	967.73	782.77	16.31	72.50	96
	8692	13.86	1.86	0.379	20.37	80.93	908.93	734.85	15.74	77.23	96
21 x 35	8668	15.04	1.92	0.414	22.50	83.93	962.22	807.72	16.35	75.85	96
	9060	13.25	1.76	0.391	22.53	80.90	880.16	798.11	16.37	72.44	96
FC2 x FC1 (Control)	9408	17.04	1.96	0.445	22.69	79.18	1078.32	853.73	18.30	80.66	96
	8652	14.30	1.83	0.388	21.20	78.42	970.14	760.88	15.62	73.68	94

On-Farm Trials

Unit	Hybrid	Dfls (Nos.)	Farmers (Nos.)	Yield/ 100 dfls (kg)
RSRS-Anantapur	G11 x G19	15400	60	65.30
REC-Madakasira	G11 x G19	500	3 2 2 7	61.40 64.70 60.70 65.80
	FC3 x FC4	4		
	S8 x CSR16	50		
	FC3 x FC4	500		
		2050		
REC-V. Kota	G11 x G19 S8 x CSR16	13100 1500	41 5	78.10 70.20
REC SU-Palamaner	G11 x G19	13500	53	71.90
REC SU-Hindupur	G11 x G19	1500	5	62.50

REC SU-Atmakur	G11 x G19 FC3 x FC4	47750 1200	162 4	68.19 78.30
REC SU-Giddalur	G11 x G19 G 19 x G11 S8 x CSR16	10500 1000 2000	52 3 5	63.50 57.75 60.57
REC SU-Penukonda	G11 x G19 S8 x CSR16	2500 800	7 3	65.45 71.60
REC SU-Chebrolu	G11 x G19 S8 x CSR16	3700 600	9 3	40.00 74.16
REC SU-Metpalli	G11 x G19 FC3 x FC4 S8 x CSR16	3600 2200 350	12 9 2	63.42 48.59 89.33

Production of *N. thymus* for control of Uzi fly infestation

B. Kasi Reddy (PI) and Ch. Satyanarayana Raju

N. thymus (750 pouches; 50 ml=2000 pupae) was produced using house fly pupae and supplied to different areas covering 215 farmers were supplied. There was significant decrease in the uzi infestation (10.52% to 3.60%) through integrated control measures.

Extension Communication Programmes (values represent farmers participated and figures in parenthesis indicate number of events conducted)			
Centre	Group Discussions	Awareness Programs	Exposure Visits
RSRS-Anantapur		305 (2)	
REC-V. Kota	482 (9)	210 (1)	
REC-Madakasira	278 (9)	158 (1)	
REC-Eluru	221 (7)		
REC-Kalyandurgam	221 (7)	189 (1)	
REC-Rayachoti	343 (7)	166 (1)	
REC SU-Chebrolu	44 (2)		
REC SU-Atmakur	236 (10)		
REC SU-Giddalur	225 (7)	150 (1)	5 (1)
REC SU-Penukonda	332 (7)	88 (1)	
REC SU-Hindupur	200 (8)	174 (1)	
REC SU-Palamaner	259 (8)	156 (1)	
REC-Vikarabad	252 (7)		
REC SU-Suryapet	214 (8)	165 (1)	
REC SU-Metpally	224 (7)	186 (1)	
REC SU-Bidar	260 (9)		

Resham Krishimela/Workshops	
Resham Krishi Mela (Hindupur: 29.3.2016)	Seed Act Awareness Programme (Palamner; 17-02-2016)
<ul style="list-style-type: none"> ● 967 farmers attended A booklet on "Malbari thotala sagu nandu samagra karuvu nivarana ● Seri-fit relaesd for commercialization ● Two cocoon harvesters were provided to enterpreneurs 	<ul style="list-style-type: none"> ● 150 farmers attended

Popularisation of Improved Mulberry Varieties		
Unit	Farmers	Acres
Andhra Pradesh		
REC-Madakasira	58	90
REC-V. Kota	58	105
REC-Rayachoty	85	103
REC-Eluru	30	75
REC-Kalyanadurgam	125	135
REC SU-Penukonda	50	50
REC SU-Hindupur	28	28
REC SU-Palamaner	52	48
REC SU-Chebrolu	87	161
REC SU-Atmakur	161	420
REC SU-Giddalur	18	55
Total	752	1270
Telangana		
REC-Vikarabad	45	90
REC SU-Suryapeta	101	205
REC SU-Met palli	62	98
Total	208	393
Karnataka		
REC-Bidar	50	65
Grand Total	1010	1728

Training Programmes				
Unit	FST		TOP	
	Prog. (No.)	Farmers (No.)	Prog. (No.)	Personnel (No.)
Andhra Pradesh				
RSRS-Anantapur	2	24	3	40
REC-V.Kota	1	15		
REC-Kalyanadurgam	1	15		
REC-Eluru	1	15		
REC-Rayachoty	1	15		
REC-Madakasira	1	15		
REC SU-Chebrolu	1	10		
REC SU-Giddalur	1	10		
REC SU-Atmakur	1	10		
REC SU-Penukonda	1	10		
REC SU-Hindupur	1	10		
REC SU-Palamaner	1	10		
Telangana				
REC-Vikarabad	1	15		
REC SU-Met palli	1	10		
REC SU-Suryapeta	2	20		
Karnataka				
REC SU-Bidar	1	10		
Total	18	214	3	40

ADMINISTRATIVE REPORT

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

Regional Sericultural Research Stations (RSRS)

- | | | |
|--------------------------|-------------------|--|
| 1. Kodathi [Kar] | 3. Anantapur [AP] | 5. P4 Basic Seed Farm, Hassan [Kar] |
| 2. Chamarajanagara [Kar] | 4. Salem [TN] | 6. Satellite Silkworm Breeding Station, Coonoor [TN] |

Research Extension Centres (REC)

- | | | |
|---------------------------|-----------------------|----------------------|
| 1. Bidaraguppe [Kar] | 7. Udumalpet [TN] | 13. V. Kota [AP] |
| 2. Chitradurga [Kar] | 8. Palakkad [Ker] | 14. Vikarabad [TS] |
| 3. Madivala [Kar] | 9. Eluru [AP] | 15. Amaravathi [MH] |
| 4. Gobichettipalayam [TN] | 10. Kalyandurgam [AP] | 16. Baramati [MH] |
| 5. Krishnagiri [TN] | 11. Madakasira [AP] | 17. Parbhani [MH] |
| 6. Samayanallur [TN] | 12. Rayachoty [AP] | 18. Hoshangabad [MP] |

Sub-units of Research Extension Centre (REC SU)

- | | | |
|-----------------------|-------------------------|---------------------|
| 1. Atmakur [Kar] | 11. Shahapur [Kar] | 20. Chebrolu [AP] |
| 2. Bidar [Kar] | 12. Shirahatti [Kar] | 21. Giddalur [AP] |
| 3. Bijapur [Kar] | 13. Shivamogga [Kar] | 22. Penukonda [AP] |
| 4. Jamkhandi [Kar] | 14. Tumakuru [Kar] | 23. Metpally [TS] |
| 5. Kanakapura [Kar] | 15. Avinashi [TN] | 24. Suryapet [TS] |
| 6. Kinkanahalli [Kar] | 16. Berigai [TN] | 25. Aurangabad [MH] |
| 7. Koppal [Kar] | 17. Trichy [TN] | 26. Jalna [MH] |
| 8. Kudligi [Kar] | 18. Vaniyambadi [TN] | 27. Osmanabad [MH] |
| 9. Maddur [Kar] | 19. Srivilliputhur [TN] | 28. Burhanpur [MP] |
| 10. Ranebennur [Kar] | | |

Other Units

Cluster Promotion Centre (CPC): Hindupur

Cluster Development Centre (CDC): 1. Palamaneru 2. Y. N. Hoskote 3. Agali

R&D and Administrative Personnel of CSRTI and Nested Units

R & D Personnel

CSRTI Mysore	Mal Reddy N (Dr.)	Srinivasa BT (Dr.)
Director	Manthira Moorthy S (Dr.)	Suma AS
Sivaprasad V (Dr.)	Mary Josepha AV (Dr.)	Thippeswamy T (Dr.) (Rtd. Feb. 16)
Scientist-E	Mukund V Kirsur	Vindhya GS (Dr.), (Rtd. May 15)
Satish Verma (Dr.) (Engineer)	Munirathnam Reddy M (Dr.)	Vineet Kumar (Dr.)
Scientist-D	Nagaraja SB (Dr.)	Vinod Kumar (Dr.)
Ashwath SK (Dr.) (Rtd. Jun. 15)	Narasimha Nayaka AR (Dr.)	Virendra Kumar (Dr.)
Balavenkatasubbaiah M (Dr.)	Narendra Kumar JB	Scientist-C
Bhagya R (Dr.)	Nishitha Naik V (Dr.)	Geetha GS (Dr.)
Dayananda (Dr.)	Parameshwara C	Kulkarni SB
Gandhi Doss S (Dr.)	Pratheesh Kumar PM (Dr.)	Munikrishnappa HM
Gangadhar B (Dr.)	Purushotham S (Dr.)	Renukeshwarappa JP (Rtd. May 15)
Girish Naik V (Dr.)	Radhalakshmi YC (Dr.)	Santha PC (Dr.)
Gunashekara V (Dr.)	Rajashekar K	Sibayan Sen (Dr.)
Kariappa (Dr.)	Sabitha MG	Vinod Kumar Yadav
Katiyar RS (Dr.)	Sharma SD (Dr.), (Rtd. June, 2015)	Scientist-B
Kishor Kumar CM (Dr.)	Sharmila KK (Dr.)	Arunkumar (Dr.)
Mahima Santhi A (Dr.)	Somaprakash DS (Dr.)	Bhuvaneshwari E (Dr.)

Gayathri T (Dr.)
 Joycy Rani D
 Kusuma L (Dr.)
 Mallikarjuna G (Dr.)
 Satish L (Dr.)
 Sobhana M
 Tanmoy Sarkar (Dr.)
 Thirupathaiah Y (Dr.)
 Vaijayanthi PV
 Yashavanth BSB
Assistant Director (Stat)
 Rekha M
Information Officer-DBT SubDIC
 Sumathy R (Dr.)
Nested Units
Karnataka
Scientist-D
 Ambika PK (Dr.)
 Chandrashekar KB (Dr.)
 Himantharaj MT (Dr.)
 Jayaram H (Dr.)
 Kalpana GV (Dr.)
 Lakshmanan V (Dr.)
 Maheswari M (Dr.)
 Mathur VB (Dr.), (Rtd. July, 2015)
 Meenal R (Dr.)
 Noble Morrison M (Dr.)
 Pallavi SN (Dr.)
 Raghunath MK (Dr.)
 Rajanna KL (Dr.), (Rtd. June, 2015)
 Raveendra M Mattigatti (Dr.)
 Srikanta Swamy K (Dr.)
 Sudhakar P (Dr.)
 Vedavyasa K
Scientist-C
 Hanumantharayappa SK
 Ishwar
 Mahalingappa KC

Philomena KL
 Sanath Kumar YN
 Shivashankar N (Rtd. July, 2015)
 Sudhakar Rao P (Dr.)
 Umesha A
Tamil Nadu
 Babu CM (Dr.)
 Balaraswathi S (Dr.)
 Chandrasekaran K (Dr.)
 Chikkanna (Dr.), (Rtd. Feb. 2016)
 Dhahira Beevi N (Dr.)
 Gnanakumar Daniel A
 Gururaj R (Rtd. Jan. 2016)
 Issac Joseph
 Mary Flora CA
 Masilamani S (Dr.)
 Mohamed Babu A (Dr.)
 Mohan B
 Punithavathi G
 Rajakumar S (Dr.)
 Rajalakshmi E
 Ravikumar J (Dr.)
 Sakthivel N (Dr.)
 Samuthiravelu P (Dr.)
 Selvaraju NG
 Thirunavukkarasu T
Scientist-C
 Anbazhagan R
 Gopinath OK, (Rtd. Jun. 2016)
 Humayun Sherief Y
 Mahiba Helen S (Dr.)
 Sivasubramonian T
 Vijayakumar R
Kerala
Scientist-D
 Sarala K
Scientist-C
 Soudaminy PV

Andra Pradesh
Scientist-D
 Ch. Satyanarayana Raju
 Chowdary NB (Dr.)
 Kasi Reddy B (Dr.)
 Mogili T (Dr.)
 Narasimha Murthy B (Dr.)
 Prasad GV (Dr.)
 Raghupathi M (Dr.), (Rtd. Jul. 2015)
 Reddy MP (Dr.)
 Shanthan Babu MA
 Srinivasa Rao TVS
 Venkatachalapathy M (Dr.)
 Venkataramana P (Dr.)
 Venkateswara Rao M (Dr.),
 (Rtd. Sep. 2015)
 Venugopal A (Dr.)
 Vidyumala S (Dr.)
 Vijaya Naidu B
Scientist-C
 Reddy PS (Dr.)
Telangana
Scientist-D
 Sanjeeva Rao BV
 Sreenivasulu Reddy P (Dr.)
 Srinath B (Dr.)
Maharashtra
Scientist-D
 Karande AJ
 Kushwaha RV
 Ram Prakash
Scientist-C
 Bagde AP
 Rahul Singh
Madhya Pradesh
Scientist-D
 Khare RK
Scientist-C
 Pradeep Shukla

ADMINISTRATIVE PERSONNEL

Mohan Rao Jadhav, EE
 Manoharan A, DD (F)
 Jayaramulu B, DD (OL) (Rtd. Jun.2015)

V. Ganesan V, DD (C)
 Talawar BY, LIO

Yoganarasimha S, AD (A&A)

Jayashree V, AD (OL)
 Pappu BS, AD (Pub)
 Girijamma, AD (A&A)
 Mohan, AD (A&A)

Budget (Rs. In lakhs)

Particulars	Grant Released	Expenditure
Non-Plan	4,064.65	4,064.65
Plan-Gen-31	1,208.54	1,208.54
Plan-Cap-35	338.67	338.67
Total	5,611.86	5,611.86

RESEARCH ADVISORY COMMITTEE

Chairman

Prof. K. Narayana Gowda
Former Vice Chancellor, UAS, Bengaluru
3, Jakkur New Extension, Jakkur
Navanagar, Bengaluru - 560 064

Members

Dr. K.S. Anil Kumar
Principal Scientist, Soil Science Discipline
NBSS & LUP, P.B. No. 2487, Hebbal
Agricultural Farm, P.O.
Bangalore - 560 024

Dr. K. Siddeswaran
Professor (Retd.), Dept. of Agronomy
Tamil Nadu Agricultural University
Coimbatore - 641003, Tamil Nadu

Dr. Kantipudi Nirmal Babu
Project Coordinator, AICRPS
Indian Institute of Spices Research
Kozhikode (Calicut) - 673012
Kerala

Dr. S. Shivashankar
Principal Scientist & Head
Division of Plant Physiology & Biochemistry, IIHR
Hassaraghatta Lake Post
Bangalore - 560 089

Prof. K.P. Chinnaswamy
Department of Sericulture
University of Agricultural Sciences
GKVK, Bengaluru - 560 065

Dr. H.K. Basavaraja, Sc-E (Retd.)
Central Silk Board
Door No. 263, 9th Cross, II Stage
Srirampura, Mysore – 570023
Karnataka

Dr. A.N. Shylesha
Pr. Scientist, Division of Insect Systematics,
National Bureau of Agriculturally Important Insects,
P. Bag. No: 2491, H.A. Farm Post
Bellary Road, Bangalore - 560 024

Prof. M. Anathachar
Former Dean (Ag. Engg.) & Professor and Head,
Dept. of Farm Machinery and Power Engineering
College of Agricultural Engineering, UAS
P.O. No. 329, Raichur – 584102

Invitees

Commissioner for Sericulture
5th Floor, M. S. Building
Dr. B. R. Ambedkar Veedhi
Bengaluru - 560 001, Karnataka

Director of Sericulture
Govt. of Tamil Nadu
Department of Sericulture
Nethaji Nagar, Hasthampatty
Salem - 636 007, Tamil Nadu

Commissioner of Sericulture
Govt. of Andhra Pradesh & Telagana
Road No. 72, Prashasan Nagar
Adjacent to Water Tank, Jubilee Hills
Hyderabad – 5000 033, Andhra Pradesh

Director of Sericulture
Govt. of Maharashtra
New Administrative Building
No.2, B-Wing, Civil Lane, VI Floor
Nagpur - 440 010. Maharashtra

The Director
Andhra Pradesh State Sericulture Research & Development
Institute
Kirikera, Hindupur - 515 211
Andhra Pradesh

The Commissioner
Directorate of Sericulture
Govt. of Madhya Pradesh
Lower Basement, Satpura Bhavan
Bhopal - 461 004

The Commissioner
Commissionerate of Rural Development
LMS Compound, Vikas Bhavan, P.O.
Thiruvananthapuram - 695 033, Kerala

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

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

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

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

The Director
Seri-Bio-Tech. Research Laboratory
CSB Campus, Sarjapur Road
Carmelram Post, Kodathi
Bengaluru -560 035

The Director
Karnataka State Sericulture Research & Development Institute
[KSSRDI]
Thalaghattapura, Bengaluru - 560 062

The Deputy Secretary (Insp.)
Regional Office of Central Silk Board
Ministry of Textiles, Govt. of India
No. 16, Mittal Chambers, Nariman Point
Mumbai-400 021, Maharashtra

The Deputy Secretary (Tech.)
Regional Office of Central Silk Board
No.28/22, K.K. Salai, Kaveri
Rangan Nagar, Saligramam
Chennai- 600 093, Tamil Nadu

The Deputy Secretary (Tech.)
Regional Office of Central Silk Board
Prashasan Nagar, Road No.72
Near New Water Tank, Jubilee Hills
Hyderabad-500 096, Andhra Pradesh

Thiru. T.Jeevanatham
S/o. C.Thangavel, Sericulture Farmer
Ramalingam Gounder Thottam
Komaralingam Post
Udumalpet Taluk -642126, TN

Officer Incharge
Regional Sericultural Research Station
Central Silk Board
Ministry of Textiles, Govt. of India
P.B. No.50, Rappthadu,
Ananthapur -515 001 Andhra Pradesh

Officer Incharge
Regional Sericultural Research Station
Carmalram Post
Kodathi, Bengaluru-560 035

Officer Incharge
Regional Sericultural Research Station
Near Railway Station
Nanjangud Road
Chamarajanagara-643 101

Officer Incharge
Regional Sericultural Research Station
Veeranam Road, Allikuttai Post
Vaikkalapattarai, Salem - 636 003
Tamil Nadu

Shri. K. Y. Shivanandaiah
S/o K.V. Rachappa
Sericulture Farmer
Madi Halli, Kallanhalli Post
Turuvekere Taluk, Tumkur District

Shri. Syed Ziyauulla
Silk Reeler
Masid Road
Kumudan Mohalla
Ramanagar District

Sri. Peddi Ravindar
Silk Reeler, M/s. RA Silks, 2-8-P-236
Near Ekasila College, Hyderabad Road
Jangaon - 506 167, Warangal District, AP

Sri. Satyanarayana Reddy
S/o. Sri. P.Ramachandra Reddy
Bivoltine Farmer
Ramakonda Village, Tuggali Mandal- 518 468
Kurnool Dist, Andhra Pradesh

Thiru. C.M.Ramesh
S/o. Muniraj, Silk Reeler, Dhivakar Silk Reeling
Kamrajanagar, Chettigarai
Dharmपुरi, Dharmपुरi Dist.
Tamil Nadu

Member-Convener

Dr. V. Sivaprasad
Director
Central Sericultural Research and Training Institute Srirampura,
Manandavadi Road
Mysore-570 008, Karnataka

Details of Review Meetings

Meeting	Date
Research Advisory Committee (RAC)	21st September 2015
Regional Research Advisory Committee (RRAC)	23rd May 2015 at Chamarajanagar
	16th June 2015 at Coonoor
	23rd June 2015 at Anantapur
	20th January 2016 at Kodathi
	26th February 2016 at Anantapur

METEOROLOGICAL DATA 2015 – CSRTI-MYSURU

Meteorological Observatory

Honorary Superintendent:
Rajashekar, K.

Observers: B. Rama Naika and
Chikkamahadeva Naika

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

Month	Temperature [°C]			Humidity [%]			Rainfall [mm]
	Max.	Min.	Avg.	Max.	Min.	Avg.	
January	30.90	9.60	22.30	77.00	46.00	62.00	0.00
February	33.80	11.90	23.90	91.00	17.00	49.00	1.20
March	35.00	16.00	26.40	86.00	19.00	53.00	41.30
April	36.50	18.90	27.60	96.00	31.00	63.00	82.10
May	34.80	17.00	26.80	96.00	43.00	74.00	238.70
June	32.80	19.50	25.20	95.00	55.00	77.00	164.10
July	31.20	18.00	25.00	90.00	47.00	74.00	14.40
August	32.10	17.90	25.40	90.00	43.00	73.00	55.20
September	32.90	18.40	25.60	96.00	47.00	71.00	130.00
October	31.00	16.00	25.00	95.00	37.00	71.00	99.20
November	30.90	15.90	23.88	86.00	44.00	75.00	122.60
December	31.00	13.90	23.55	94.00	27.00	67.00	1.60
Mean	32.74	16.08	25.05	91.00	38.00	67.42	
Extreme High	36.50	19.50		96.00	55.00		
Extreme Low	30.90	9.60		77.00	17.00		
						Total Rainfall	950.40
						Rainy days	52

PUBLICATIONS

International Journals

- Balavenkatasubbaiah, M.; Sharma, S. D.; Chandrasekharan, K.; Narasimha Nayaka, A. R. and Sivaprasad, V. (2015) Silkworm Disease Management Technology for higher Cocoon Productivity and Crop stability- A Success Story. *Int. J. Res. Zool.*, 5(1): 1- 4.
- Chowdary, N.B.; Ch. Satyanarayana Raju, Govindaiah and Sivaprasad, V. (2015) Discriminant function analysis of factors associated for the outbreak of root rot disease in Mulberry (*Morus Spp.*). *Sericologia*, 5(3): 165-172.
- Daphine, R. and Daniel, A.G.K. (2016) Attitude towards Individualization is behind the success in learning science through computer technology. *Int. J. Multidis. Res. Review (IJMDRR)*, 1(3): 28-30.
- Dayananda; Sivaprasad, V.; Kulkarni, S. B.; Parameswara, C. and Kariyappa (2016) Identification of improved crossbreeds of silkworm, *Bombyx mori* L. suitable for Southern India. *IJAES*, 6(1): 109-113.
- Lakshminarayana reddy, P; Shanthan Babu, M. A.; Ravi, G; Sujatha, B; Satyanarayana, B. and Sankar Naik, S. (2015) Studies on the population density for the fifth instar larvae of the commercial silkworm, *B. mori* L. *Asian J. Sci. and Tech.*, 6(10):1836-1839.

- Lakshminaryana Reddy, P.; Sujatha, B.; Shanthan Babu, M. A. and Sankar Naik, S. (2015) Comparative growth of V instar silkworm (*B. mori* L.) larval and silk gland under certain temperature and humidity conditions. *Int. J. Curr. Res. Life Sci.*, 4(6): 221-224.
- Mahimasanthi, A. and Prassana Kumar, S. (2015) Interactions among three trophic levels: Influence of host plants on Interactions between pink hibiscus mealy bug, *Maconellicoccus hirsutus* (Green) and its predator, *Nephus regularis* Sicard. *Int. J. Curr. Res.*, 7(4): 14850-14854.
- Narendra Kumar, J. B.; Vinod Kumar and Sivaprasad, V. (2015) Parasitization of silkworm uzi fly, *Exorista bombycis* (Louis) by *Trichomalopsis* sp. (Hymenoptera: Pteromalidae) – A New Report. *Sericologia*, 55(4): 276-278.
- Pratheesh Kumar, P. M.; Sushma, R.; Thippeswamy, T. and Sivaprasad, V. (2015) Antagonistic and growth promotion potential of endophytic bacteria of mulberry (*Morus* spp.). *Int. J. Indust. Entomol.*, 31 (2): 107-114.
- Radhalakshmi, Y.C.; Somashekar, T.H. and Subramaniam, V. (2015) Effect of dyeing methods on mechanical properties of silk fabrics. *Sericologia*, 55(3): 181-188.
- Sakthivel, N. (2015) Evaluation of cassava varieties for eri silkworm, *Samia cynthia ricini* Boisduval. *Mun. Ent. and Zool.*, 11(1): 165-168.
- Sakthivel, N. (2015) Quality loss in mosaic virus affected cassava (*Manihot esculenta* Crantz) leaves and its impact on economic traits of eri silkworm (*Samia cynthia ricini*). *Int. J. Appl. Pure Sci. and Agric.*, 1(12):137-140.
- Sakthivel, N.; Humayun Sharief, Y.; Sivasubramonian, T. and Sivaprasad, V. (2015) Impact of spray of dichlorovos and dimethoate on population build-up of papaya mealybug, *Paracoccus marginatus* and its parasitoid, *Acerophagus papayae* in mulberry ecosystem, *Int. J. Sci. Env. and Tech.*, 4 (5): 1296-1300.
- Sivasubramonian, T.; Daniel, A.G.K.; Sakthivel, N. and Chikkanna (2015) Need of weed management in mulberry. *Venture Int. J. Biol. Sci.*, 1(2):145-150.
- Sujatha, B.; Lakshminaryana reddy, P.; Shanthan Babu, M.A.; Anjan Reddy and Sankar Naik, S. (2015) Socio-economic factors influencing the adoption levels of new sericulture technologies by different farming groups in Anantapur district of Andhra Pradesh, *Int. J. Agric. Extn.* 3(2):149-153.
- Sujatha, B.; Lakshminaryana reddy, P.; Shanthan Babu, M.A; and Sankar Naik, S. (2015) High knowledge and low adoption levels on organic farming in mulberry cultivation with farmers of chittoor district of Andhra Pradesh. *J. of Agric. Eco. and Sus. Develp. Photon*, 104:170-174.
- Suvarna, G.; Raghavendra, K.; Shanthan Babu, M.A.; Srinath, B.; Sujatha, B; Lakshminaryana reddy, P. and Sankar Naik, S. (2015) Studies on the pattern of first developmental marker event, hatching in the commercial mulberry silkworm, *Bombyx mori* L., *Int. J. Advanced Biol. Res.*, 5(3):251-256.
- Umesha, A. and Sannappa, B. (2015) Efficacy of organic based nutrients on mulberry in three types of soils during different seasons in relation to rearing performance of double hybrid silkworm (*Bombyx mori* L.). *Int. J. Sci. Res.*, 4(12): 482-488.
- Umesha, A. and Sannappa, B. (2015) Studies on application of organic based nutrients to three types of soils in different seasons on growth and yield attributes of mulberry. *Ind. J. Nat. Sci.*, 6(33): 10395-10404.
- Vinayaka Reddy, B.; Lakshminaryana Reddy ,P.; Shanthan Babu, M. A.; Sujatha and B. Sankar Naik, S. (2015) Egg laying pattern of the uzi fly, *Exorista sorbillans* on the larvae of the silkworm, *Bombyx mori* L., *Global J. of Biosci. and Biotech*, 4(1):175-180.
- Yadav, V.K., Dasappa and Thippeswamy, T. and Sivaprasad V. (2015) Inhibitors for efficient utilization of nitrogenous fertilizer for sustainable leaf yield of mulberry. *Recent Adv. Appl. Biosci.*, (1): 219-222.

National Journals

- Chandrakanth, N.; Moorthy, S.M.; Ponnuvel, K. and Sivaprasad, V. (2015) Identification of micro-satellite markers linked to thermo-tolerance in silkworm by bulk segregants analysis and in silico mapping. *Genetika*, 47(3):1063-1078.

- Chandrakanth, N.; Moorthy, S.M.; Kariyappa, Ponnuvel, K. and Sivaprasad, V. (2015) Reeling performances of F2 and backcross populations under high temperature condition. *J. Ent. Zool. Stud.*, 3(6): 219-222.
- Chandrakanth, N.; Moorthy, S.M.; Ponnuvel, K. and Sivaprasad, V. (2015) Screening and classification of mulberry silkworm, *Bombyx mori* based on thermo-tolerance. *Int. J. Indust. Entomol.*, 31(2): 115-126.
- Chandrakanth, N.; Ponnuvel, K.; Moorthy, S.M.; Sasibhushan, S. and Sivaprasad, V. (2015) Analysis of transcripts of heat shock protein genes in silkworm, *Bombyx mori*. *Eur. J. Entomol.*, 112(4): 676-687. doi: 10.14411/eje.2015.094.
- Himantharaj, M.T. and Lakshmanan, S. (2015) Training needs identification in sericulture; A field level study. *Indian J. of Trg. and Dev.*, 45(2): 15-23.
- Mandal, K. and Moorthy, S. M. (2016) Analysis of phenotypic stability for yield and yield components in bivoltine silkworm hybrids. *J. Ent. Zool. Stud.*, 4(1): 378-385.
- Moorthy, S.M. and Chandrakanth, N. (2015) Analysis of phenotypic diversity and protein polymorphism in some silkworm breeds of *Bombyx mori* L. *Mun. Ent. and Zool.*, 10(2):1-7.
- Moorthy, S.M.; Chandrakanth, N. and Krishnan, N. (2016) Inheritance of heat stable esterase in near isogenic lines and functional classification of esterase in silkworm, *Bombyx mori*. *Invert. J. Surv.*, 13: 1-10.
- Moorthy, S.M. and Sivaprasad, V. (2015) Performances of F2 and backcross populations in silkworm, *Bombyx mori* under high temperature. *Annals. Bio. Res.*, 6 (9): 1-6.
- Naik, V. G.; Dandin, S. B.; Tikader, A. and Pinto, M. V. (2015) Molecular diversity of wild mulberry (*Morus* spp.) of Indian subcontinent. *Indian J. Biotech.*, 14:334-343.
- Sakthivel, N. (2015) Impact of feeding papaya mealy bug affected cassava leaves on economic traits of eri silkworm, *Samia cynthia ricini* Boisduval. *Ind. J. Sci. Res. Tech.*, 3(2): 5-8.
- Sakthivel, N.; Narendra Kumar, J.B.; Sivasubramonian, T.; Chikkanna and Sivaprasad, V. (2015) New record of *Tiracola* sp. (Lepidoptera: Noctuidae) as a pest of mulberry from Tamil Nadu, India. *Current Biotica*, 9(1): 74-77.
- Sivaprasad, V., S. Manthira Moorthy and N. Mal Reddy (2015) Mulberry silkworm breeding - recent breakthroughs in south zone, silkworm breeders' meet held on 22nd September, 2015 at Mysore, p. 1-13.
- Sudhakara Rao, P.; Balavenkatasubbaiah, M.; Selva Kumar, T. and Premalatha V. (2014) Development of productive Bivoltine silkworm (*Bombyx mori* L.) hybrid CSR2DR x CSR4DR against BmDNV through gene transfer. *J. Seri. Tech.*, 4(1&2):5-9.

Popular articles

- Balasaraswathi. S. and Masilamani, S. (2015) Popularisation of Drum kit technology in Krishnagiri district, *Pattu malar*, 4(12):7-8.
- Chowdary, N. B. (2015) Pattupurugullo palu karu rogamu nivarana (Telugu), *Annadata*, 47(10), 6-7.
- Himantharaj, M.T. and Umesha, A. (2015) Reshme Uddimeyalli Moulyavruddhigagi Upa Uthpannagala Balake. *Krishi Munnade*, 28(8): 14-15.
- Mogili, T.; Prasad, G.V.; Sathyanarayana Raju, Ch. and Sivaprasad, V. (2015) Pattupurugula pempakamulo flacherie (natchulu) niyanthrana padhathulu. *Sedyaphalam*, 3(5): 19-24.
- Mogili, T.; Prasad, G.V.; Satyanarayana Raju, Ch. and Sivaprasad, V. (2015) Pattupurugulathopatu pashuvulu, gorrela poshana-1 *Annadata*: 47(8):26-28.
- Mogili, T.; Prasad, G.V.; Satyanarayana Raju, Ch. and Sivaprasad, V. (2015) Pattupurugulathopatu pashuvulu, gorrela poshana-2 *Annadata*: 47(9): 22-23.
- Narasimha Nayaka, A. R.; Balavenkatasubbaiah, M.; Chandrasekharan, K. and Sivaprasad, V. (2015) Automated disinfection of Silkworm Rearing House. *Indian Silk*. 5-6 (53-54 old) No.122:19-21.
- Narendra Kumar, J.B. (2016) Management of thrips in mulberry. *Krishimitra*, 13(4), 32-33 (in Kannada).

Yadav, V.K.; Dasappa; Thippeswamy, T., and Bindroo, B.B. (2015) Seri-waste dara taiyar vermicompost, ke labh. *Kheti* –14-15, July, ICAR, New Delhi.

Technical Reports

Chikkanna, S.; Rajakumar, C.A.; Mary Flora, C.A. and Ravikumar, J. (2015) Seed Act Awareness Programme at Krishnagiri. *Indian Silk*, 5-6(12-2):44.

Daniel, A.G.K. and Sivasubramonian, T. (2015) Sericulture Awareness programme at Sivagangai. *Indian Silk*, 5 (10-11): 41.

Daniel, A.G.K. and Sivasubramonian, T. (2015) Sericulture Awareness programme at Dindigul. *Indian Silk*, 5 (10-11): 41.

Books/Book Chapters

Mary Flora, C.A.; Dhahira Beevi, N.; Chikkanna and Sivaprasad, V. (2015) Pest Management in Mulberry and Silkworm (Tamil). Regional Sericultural Research Station, Salem, Tamil Nadu.

Mary Flora, C.A.; Ravikumar, J.; Sakthivel, N.; Mahiba Helen, S.; Rajakumar, S. and Sivaprasad, V. (2016) Advanced Technologies in Sericulture (Tamil), Regional Sericultural Research Station, Salem, Tamil Nadu.

Narendra Kumar, J.B.; Vinod Kumar and Shekhar, M.A. (2016) Management of mealy bugs in mulberry. In: Mealy bugs and their Management in Agricultural and Horticultural crops (Edt. M. Mani and C. Shivaraju). Springer India, 579-588.

Rajakumar, S.; Chikkanna and Sivaprasad, V. (2016) Sericulture as a tool for empowerment of rural women; In Book of Gendered development and marginalisation of women, Serials Publication Pvt. Ltd. New Delhi. PP.216-225.

Rajakumar, S.; Sakthivel, N.; Chikkanna; Sivaprasad, V. and Jayaprakash, P. (2016) Advanced technology for silkworm seed cocoon production (Tamil), Regional Sericultural Research Station, Salem, Tamil Nadu.

Ravikumar, J.; Mary Flora, C. A., Chikkanna and Sivaprasad, V. (2015) Integrated nutrient management in mulberry cultivation (Tamil), Regional Sericultural Research Station, Salem, Tamil Nadu.

Booklets

Mahimasanthi, A., Vindhya, G. S, Thippeswamy, T. and Sivaprasad, V. (2016) Handbook on integrated drought management technologies, CSRTI, Mysore.24p

Mahimasanthi, A., Vindhya, G. S, Thippeswamy, T. and Sivaprasad, V. (2016) Mulberry pattu valarpil varatchi melanmai.(Tamil) CSRTI, Mysore.24p.

Mahimasanthi, A., Vindhya, G. S, Thippeswamy, T. and Sivaprasad, V. (2016) Reshme Krushiyalli samagra bara nirvahana thathra gnana gala kaipidi.(Kannada) CSRTI, Mysore.24p

Mahimasanthi, A., Vindhya, G. S, Thippeswamy, T. and Sivaprasad, V. (2016) Mulberry sagu nandu samagra karuvu nirvahana yajamanya paddathulu. (Telugu) CSRTI, Mysore.24 p.

Narendra Kumar, J.B.; Vinod Kumar and Sivaprasad, V. (2016) Biological Control of Insect Pests in mulberry sericulture. CSRTI publication, Central Silk Board, Mysore, pp. 20.

Sivaprasad, V.; Himantharaj, M.T.; Satish Verma and Mogili, T. (2015) Commercial chawki rearing. Published by CSRTI, Mysore. November 2015, 50 p.

Sudhakar Sarma G. and Chowdary, N. B. (2015) Pattu rytula sanketika vignana karadeepika (Telugu), Published by the Department of Sericulture, Govt.of A.P., Markapuram.

Technical Bulletin/Pamphlets

Balavenkatasubbaiah, M.; Mary Josepha, A. V.; Narasimha Nayaka, A. R. and Sivaprasad, V. (2016) Serifit – Swachhathaku Samarthavanthamyna disinfectant. Technical Bulletin No.44 (Telugu), Published by CSRTI, Mysuru.

Balavenkatasubbaiah, M.; Mary Josepha, A. V.; Narasimha Nayaka, A. R. and Sivaprasad, V. (2016) Serifit – Suchithvake Parinamakari Sonkunivaraka. Technical Bulletin No.44 (Kannada), Published by CSRTI, Mysuru.

Balavenkatasubbaiah, M.; Mary Josepha, A. V.; Narasimha Nayaka, A. R. and Sivaprasad, V. (2016) Serifit – Disinfectant for Effective Sanitation. Technical Bulletin No.44 (English), Published by CSRTI, Mysuru.

- J.B. Narendra Kumar and Vinod Kumar (2016) Biological control of insect pests in sericulture Technical Bulletin No. 36 (Kannada & English)
- Vinod Kumar and J.B. Narendra Kumar (2016) IPM of Leaf roller of mulberry Technical Bulletin No. 16 (Kannada & English)
- Vinod Kumar and J.B. Narendra Kumar (2016) IPM of tukra mealybug in mulberry Technical Bulletin No. 17 (Kannada & English)
- Vinod Kumar and J.B. Narendra Kumar (2016) IPM of uzi fly, a serious pest of silkworm Technical Bulletin No. 18 (Kannada & English)
- Sivaprasad, V.; Dayananda; Kulkarni, S. B. and Balavenkatasubbaiah, M. (2016) Cauvery Gold (MV1 x S8) – New improved cross breed for cocoon productivity and silk quality, Technical Bulletin No. 43 (English).
- Sivaprasad, V.; Dayananda; Kulkarni, S. B. and Balavenkatasubbaiah, M. (2016) Cauvery Gold (MV1 x S8) – Adika gudina eluvaru hagu guna mattada reshmege nuthana sudharita mishra tali, Technical Bulletin No. 43 (Kannada).

Seminars/Conferences

- Doss, S. G.; Rajashekar, K.; Nishita Naik, V. and Sivaprasad, V. (2015) Development of disease resistant progeny with special reference to root knot disease complex through germplasm screening, hybridization and selection in mulberry (*Morus* spp.). Presented in the International Conference on “Plant Research and Resource Management” held on 11 – 13 February, 2016 at Tuljaram Chaturchand College, Baramati – 413 102, Maharashtra. Abs. No. COPR-1, p. 197.
- Doss, S. G.; Rajashekar, K.; Sarkar, T. and Sivaprasad, V. (2015) Importance of triploid mulberry for increasing leaf productivity for wider adaptability – A mini review. Presented in the International Conference on “Plant Research and Resource Management” held on 11 – 13 February, 2016 at Tuljaram Chaturchand College, Baramati – 413 102. Maharashtra, in the Resource Management Session – Abs. No. RM-4, p. 94.
- Kasi Reddy, B and Satyanarayana Raju, Ch. (2016) Studies on the comparative efficacy of disinfectants on bivoltine crops at farmers level in Madakasira area of Anantapur district, Andhra Pradesh presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 49.
- Kasi Reddy, B; Murthy, B.N. and Satyanarayana Raju, Ch. (2016): Impact of new technologies on mulberry leaf yield and bivoltine cocoon yield at farmers level under cluster promotion programme (CPP) presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 51.
- Krishnan, R. R., Sumathy, R., Naik, V.G. and Sivaprasad, V. (2016). Development of mulberry specific microsatellite markers by in silico mining of *Morus notabilis* genome. In: Conference on Accelerating Biology held at CDAC, Pune, 19-21 January 2016.
- Pratheesh Kumar, P.M. (2015) Mulberry plantation and silkworm rearing. Presented in the workshop for Project Directors, Block Development Officers and Assistant Sericulture Officers 25.05.15 to 26.05.15, Malampuzha, Palghat, Kerala.
- Pratheesh Kumar, P.M.; Sushma, R.; Thippeswamy, T. and Sivaprasad, V. (2015). Antifungal and Growth promotion activity of endophytic bacteria isolated from mulberry (*Morus* spp.), 3rd Lucknow Science Congress & National Conference on Science for Society an Inter Disciplinary Approach, 31 Oct- 2nd Nov, 2015, Baba Saheb Bhimrao Ambedkar University, Lucknow, India.
- Radhalakshmi, Y. C. (2015) Indian science communication congress; Social media : connecting science to society , regional science city , Lucknow , India, on 25th & 26th of December, 2015.
- Radhalakshmi, Y. C. (2016) Studies on interrelation among cocoon and reeling characteristics during 29th national convention of Textile engineers on 26th & 27th February 2016 at institute of Engineers.

- Rajakumar, S.; Chikkanna and Sivaprasad, V. (2015) Studies on mulberry nutritional facts and its benefits for human health management. In abstract of 6th International Conference on Emerging Technologies in Food and Nutrition for Health Management (ICETF-2015), International Institute of Food and Nutritional Sciences (IIFANS), New Delhi & Southern Regional Station (SRS), ICAR-NDRI, Adugodi, Bangalore, India. P. 34.
- Rajakumar, S.; Sakthivel, N.; Ravikumar, J.; Chikkanna and Sivaprasad, V. (2016) Impact of technology intervention for the impressive growth of bivoltine sericulture in Tamil Nadu. "National Seminar on Trends for Advancement of Sericulture, 21 & 22nd January, 2016, Department of Sericulture, Sri Krishnadevaraya University, Anantapuramu, Andhra Pradesh, India. Pp. 40-44.
- Ravikumar, J.; Qadri, S.M.H.; Chikkanna and Sivaprasad, V. (2015) Impact of Integrated Nutrient and Pest Management (INPM) module on soil health in mulberry ecosystem of Tamil Nadu. In abstract of International Symposium on Biodiversity, Agriculture, Environment and Forestry, Association for the Advancement of Biodiversity Science, Ooty on 11/12-12-2015. P. 28.
- Satyanarayana Raju, Ch.; Prasad, G.V.; Mogili, T.; Kasi reddy, B.; Reddy, M.P.; Rao, M.V; Naidu, B. V.; Chowdary, N.B.; Purushottam, S.; Sivarami reddy, N; and Qadri, S.M.H. (2016) Cluster Promotion programme (CPP)- A new approach in extension - its impact on sericulture in AP presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 36.
- Srinivasa Rao, T.V.S.; Venugopal, A.; Lavanya latha, K.; P Laksmkinarayana Reddy; Dandin, S.B.; Sivarami Reddy, N. and Sankar Naik, S. (2016) Studies on soil specific INM package for improving mulberry leaf quality/quantity and silkworm cocoon yield/cocoon economic traits in semiarid zone of Andhra Pradesh presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 5.
- Srinivasa Rao, T.V.S.; Venugopal, A.; Lavanya latha, K.; P Laksmkinarayana Reddy, Dandin, S.B.; Sivarami Reddy, N. and Sankar Naik, S. (2016) Studies on augmenting mulberry leaf quality through INM in Anantapur district presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 6.
- Sumathy, R.; Naik. V.G. and Sivaprasad, V. (2016) MulTF: the database of mulberry transcription factors. In: 103rd Indian science Congress 2016, University of Mysore, Mysuru, January 3-7, pp 152-153.
- Venugopal, A.; Shylesha, N.; Vidyunmala, S.; Satyanarayana Raju, Ch. and Sivaprasad, V. (2016) Acerophagus, a classical biocontrol agent for control of papaya mealy bug for infested mulberry gardens of Kadiri area presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 50.
- Venugopal, A.; Vidyunmala, S.; Satyanarayana Raju Ch. and Sivaprasad V. (2016) Field trial of new productive silkworm bybrids, CSR16 X CSR17 and FC3 X FC4 in Penukonda area of Anantapur district presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 52.
- Venugopal, A.; Vidyunmala, S.; Satyanarayana Raju, Ch. and Sivaprasad, V. (2016) Field performance of silkworm double hybrids, FC2 X FC1 in Penukonda area under Cluster Promotion programme presented in the National Seminar on Trends for advancement of sericulture held at Dept of Sericulture, S.K. University on 21st and 22nd January, 2016, page 51.
- Yadav, V.K.; Dasappa; Thippeswamy, T. and Sivaprasad, V. (2016) Influence of nitrification inhibitors on nitrogen content in leaf and leaf yield in mulberry. Indian Science Congress Association (ISCA). January 3-7, University of Mysore, Mysore. pp- 146.

Highlights of Research Framework Document (RFD)

#	Action	Unit	Target	Achievement
1	Total on- going Projects	No.	23	30
2	Projects Concluded	No.	5	6
3	New Projects taken up (initiated)	No.	12	13
4	New projects taken up at RSRS	No.	5	4
5	No of Technologies/ innovations developed	No.	2	3
6	New Technologies for field testing	No.	9	9
7	High yielding mulberry varieties developed	No.	1	1
8	Improved bivoltine/multivoltine breeds developed	No.	2	3
9	3rd Generation Cross Breeds developed	No.	1	2
10	Technologies / solutions developed	No.	1	1
11	Equipment/machines developed for mechanisation	No.	1	1
12	Machines / equipment absorbed in the field	No.	3	3
13	Technologies commercialised	No.	2	3
14	Technologies patented/ applied for patenting	No.	1	4
15	No. of farmers database created for m-Kissan portal	No.	6000	31285
16	Preparation of technology descriptor	Date	01.05.15	In time
17	No of seri-model Villages identified	No.	15	13
18	No. of farmers adopted	No.	1400	1300
19	Estimated raw silk output	MT	70	83.34
20	No. of dfls proposed for large scale trial	Lakh Nos.	5.00	0.671
21	No. of Blocks/Districts adopted	No.	110	119
22	No of farmers covered	No.	26000	29660
23	Raw silk output	MT	2400	2772
24	Popularisation of Vishala, Anantha, G4 and V1	acres	300	2738.94
25	Farmers covered under 100% adoption of technology	No.	2200	2600
26	No of FFS	No.	11	*
27	No of programmes conducted	No.	196	313
28	No of farmers covered	No.	9000	16135
29	Beneficiaries trained under structured programmes, need based programme etc.	No.	1700	2159
30	Beneficiaries placed in silk sector after training	No.	1445	1547
31	Production units for biological inputs, input supply & assistance for sericulture poly-clinics.	No.	6	2
32	Establishment of Sericulture Resource Centre	No.	3	3
33	Revenue generation through commercialisation of Technology	Rs. in lakh	30	6.29608
34	Revenue generation through other methods	Rs. in lakh	100	122.1
35	Projects taken up for collaborative research [APSSRDI, IINRG Ranchi, NCL Pune, Indo-Bulgaria, Deakin University Australia)	No.	6	6

* EFC for FFS not available

Patenting and Commercialisation

Patenting	
Machine/Equipment	Status of Patent
A moutage used for production of cocoons	Patent Granted No. 267245 dated 07.07.2015
A manually operated matured worm separator	Patent Granted No. 266685 dated 26.05.2015
A pedal operated cocoon harvester	Patent Granted No. 267244 dated 07.07.2015
Seri heater	Patent filed Application No. 1711/CHE/2015 Dated 31.3.2015
Chawki Dusting machine	Patent filed Application No. 1712/CHE/2015 Dated 31.3.2015
PVC stands for chawki rearing	Patent filed Application No. 1645/CHE/2015 Dated 30.3.2015
A machine for cocoon harvesting from collapsible plastic moutage	Patent filed Application No. 201641023640 Dated 11.7.2016
A machine for cleaning and disinfection of trays for earing silkworms	Application submitted to NRDC for filing Patenting
Commercialisation	
Machine/Equipment/Products	Details of Licensee
Manually operated matured worm separator	M/s. Das & Kumars D 63/10, Mahmoorganj Varanasi - 221010 Tel. +91 542 2220414, +91 9839045745
Machine for cocoon harvesting from collapsible plastic moutage	M/s. SKB Systems 69/ 1 , Kamarajar Street, Janatha Nagar West Saravanampatty PO, Coimbatore - 641 035 Mobile: +91- 98422 03545
Serifit	M/s. Sree Rayalaseema Hi-Strength Hypo Ltd., Kurnool, Andhra Pradesh.
Nemahari	M/s. Rainbow Agri Life India Private Limited, Kadapa, Andhra Pradesh



**Inauguration of ISC-SAARC Meet
at Mysuru (25-08-2015)**

**Inauguration of Innovative Farmer's
National Workshop at Mysuru (17-11-2015)**



**Inauguration of Farmer's Workshop
at Haveri (11-03-2016)**

केंद्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान

(आई एस ओ 9001 : 2008 प्रामाणित)

CENTRAL SERICULTURAL RESEARCH AND TRAINING INSTITUTE

(ISO 9001 : 2008 Certified)

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

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

Web: www.csrtimys.res.in e-mail: csrtimys@gmail.com