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रेशमकीट बीज प्रौध्योगिकी प्रयोगशाला
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NATIONAL SILKWORM SEED ORGANIZATION
Central Silk Board, Ministry of Textiles, Govt. of India
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प्रस्तावना

मुझे रेशमकीट बीज प्रौद्योगिकी प्रयोगशाला की वर्ष २०२२-२३ का वार्षिक प्रतिवेदन प्रस्तुत करने में बहुत खुशी हो रही है| यह संस्थान, केंद्रीय रेशम बोर्ड के प्रमुख संस्थानों में से एक है जो विशेष रूप से शहतूत और वन्या के रेशमकीट बीजों पर अनुसंधान करता है। बुनियादी बीज भंडार के परीक्षण के लिए कर्नाटक, आंध्र प्रदेश और तमिलनाडु में रोग सर्वेक्षण और विभिन्न बीज गुणन केंद्रों की निगरानी करके पेब्रिन रोग नियंत्रण में महत्वपूर्ण भूमिका निभा रहा है और पेब्रिन रोग मुक्तता सुनिश्चित कर रहा है। इस संस्थान के वैज्ञानिकों ने रेशम उत्पादन विभाग, कर्नाटक के साथ मिलकर कुनिगल और मगाडी शुद्ध मैसूर बीज क्षेत्रों में हालिया प्रकोप के दौरान पेब्रिन रोग के प्रबंधन में सक्रिय भूमिका निभाई है|

एस.एस.टी.एल ने बीज उत्पादन तकनीक और पेब्रिन रोग प्रबंधन पर मानव संसाधन विकास कार्यक्रम के तहत कर्नाटक, आंध्र प्रदेश और तमिलनाडु के रेशम उत्पादन विभाग के कर्मचारियों को प्रशिक्षण दिया गया। पंजीकृत बीज उत्पादक बनने के लिए हितधारकों को बीज अधिनियम के तहत प्रशिक्षण देने में भी शामिल है। बीज उत्पादन तकनीक में सहायता के लिए इस संस्थान के वैज्ञानिक एवं कर्मचारियों के कठिन प्रयासों की सराहना की जाती है।

डॉ. के.के. शर्मिला
वैज्ञानिक-डी एवं प्रभारी

Foreword



I am pleased to present the annual report of the Silkworm Seed Technology Laboratory for the year 2022-23. The Silkworm Seed Technology Laboratory is one of the premier institutes of the Central Silk Board that conducts research exclusively on silkworm seeds of Mulberry and Vanya. SSTL plays a significant role in controlling Pebrine disease by conducting disease surveys and monitoring different seed multiplication centers in Karnataka, Andhra Pradesh, and Tamil Nadu to test the basic seed stocks and ensure Pebrine disease freeness. SSTL scientists also played an active role along with the Department of Sericulture, Karnataka, in managing Pebrine disease during the recent outbreak in the Pure Mysore Seed Area of Kunigal and Magadi.

SSTL provided training to Department of Sericulture staff from Karnataka, Andhra Pradesh, and Tamil Nadu under the Human Resource Development program on seed production technology and Pebrine disease management. SSTL also participated in training stakeholders under the Seed Act to become Registered Seed Producers. The dedicated efforts of the SSTL staff are appreciated for their support in seed production technology.

Dr. K.K Sharmila
Scientist D & Incharge
NSSO

MANDATE

1. Basic, applied and strategic research in silkworm seed technology
2. Quarantine testing and certification of silkworm seed / cocoons for export and import
3. Capacity Building in the field of silkworm seed production, testing, quality assurance and policy issues
4. Pebrine disease monitoring and management

वर्ष के दौरान किये गए अनुसंधान एवं विकास कार्यों की प्रमुख उपलब्धियाँ

तसर रेशम कीट बीज संरक्षण अनुसूची को १५ मात्रा सेल्सियस पर १५ दिनों के लिए २-३ दिनों के संरक्षण के साथ विकसित किया गया, जिसे ऑन स्टेशन ट्रायल के तहत मान्य किया गया था। इस तकनीक के माध्यम से, नियमित अनाज संचालन के दौरान अनियमित रूप से उभरे कीट द्वारा दिए गए बीजों की बर्बादी को कम किया जा सकता है।

बीज क्षेत्रों में पेब्राइन रोग को नियंत्रित करने के लिए कर्नाटक, तमिलनाडु और आंध्र प्रदेश में ३२ रेशमकीट रोग निगरानी सर्वेक्षण और १६ अतिरिक्त आवश्यकता आधारित सर्वेक्षण कार्यक्रम आयोजित किए गए। ७१८0 बाइवोल्टाइन और मल्टीवोल्टाइन नमूनों के साथ कुल १८३0 लॉट का परीक्षण किया गया।

सी बी टी और बीज अधिनियम प्रशिक्षण कार्यक्रमों के तहत कुल १६७ व्यक्ति लाभान्वित हुए और रेशम उत्पादन विभाग इकाइयों में अतिरिक्त प्रशिक्षण कार्यक्रम में ३८२ व्यक्ति लाभान्वित हुए।

ई सी पी कार्यक्रम के तहत, ८ कार्यक्रम आयोजित किए गए और २७६ हितधारकों को जागरूक किया गया।

अनुसंधान एवं विकास उत्पादों की रॉयल्टी, प्रशिक्षण, और नमूना परीक्षण शुल्क के माध्यम से रुपये २१.८३ लाख राशि का राजस्व उत्पन्न हुआ।

HIGHLIGHTS OF R&D ACTIVITIES

- The Tasar egg preservation schedule developed at 15ºC for 15 days with 2-3 days of post-preservation was validated under On-Station Trial. Through this technology, wastage of erratically emerged moth-laid eggs can be minimized during regular grainage operations.

- 32 Silkworm Disease Monitoring Surveys and 16 additional need-based survey programs were conducted in Karnataka, Tamil Nadu, and Andhra Pradesh to control pebrine disease in seed areas. A total of 1830 lots with 7180 bivoltine and multivoltine samples were tested.

- A total of 167 persons benefited from CBT and Seed Act training programs, and 382 persons benefited from additional training programs at DoS units.

- Under the ECP program, 8 events were conducted and sensitized 276 stakeholders.

- A sum of Rs. 21.83 lakhs revenue was generated through Royalty of R&D products, Training, and sample testing charges.

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Scientist D & Incharge, NSSO	Dr. K.K Sharmila
Scientist D & Incharge, SSTL	Dr. Veeranna Gowda (Retd. May, 2022) Dr. Chandrashekar R Hegde
Scientist-C	Dr. Sailaja Bandam Dr. R. Saravana Kumar
Scientist-B	Dr. Mala N.
Senior Technical Assistant	Mr. R. Rajasekar (Retd. May, 2022) Mr. V. Chandrashekara Reddy Mr. J. N. Chandrashekar Mr. B.V. Raviprasad Mrs. K. R. Rathnamma
Field Assistant	Mr. H. N. Harish
ADMINISTRATIVE PERSONNEL	
UDC	Mr. Chandraiah (upto Aug, 2022)
Driver	Mr. A. Sathyaseelan (Retd. June, 2022) Mr. Shivaji
Assistant Technician	Mr. M. S. Yogannachar (Retd. Dec, 2022)
Multi Task Staff	Mr. L. H. Hemanna Gowda Mr. Lakshminarayana

Dr. K.K Sharmila

PART I: ON-GOING RESEARCH PROJECTS

1. MOE 09001MI: EVALUATION OF NEW TECHNOLOGIES FOR SEED PRODUCTION IMPROVEMENT

Component-1: Test verification of technologies developed for seed /seed cocoon preservation and regulation of erratic moth emergence in Tasar silkworm (*Antheraea Mylitta*, D). [Jan 2022-Dec 2023]

Dr. Sailaja B, Vishaka G V*, Dr. J.P. Pandey and Dr. B. Srinath***

[In collaboration with BTSSO*, Bilaspur and CTR&TI, Ranchi**]

To conduct OST, Tasar DTV and DBV cocoons were obtained and maintained at CTR&TI, Ranchi. Grainage operations were carried out to collect DTV and DBV Tasar eggs, which were then preserved according to a standardized schedule. The eggs were stored at 15°C with 80-85% RH for 15 days in the dark. After the preservation period, the eggs were transferred to the incubation room where a temperature of 25°C and 80-85% RH were maintained. The preserved eggs were then supplied to the nested units in Ranchi for rearing, alongside a control batch. The rearing performance results are provided below

Performance of I DTV rearing under collaborative OST by CTRTI, Ranchi during 2022-2023

#	Name of the centre	Hatching %		Larval Duration (D:H)		V Inst. Larval Wt. (g)		No. of Cocoon harvested		Avg. Cocoon Weight (g)		Avg. Shell Weight (g)		SR %	
		T	C	T	C	T	C	T	C	T	C	T	C	T	C
1	BSM & TC, Baripada	58	62	34	31	37	37	97	234	10.3	10.6	1	1.1	9.7	10.37
2	SBT Section, CTRTI	77	75	32	30	32	30	1550	1405	8.31	9.76	0.84	0.89	10.09	9.13
3	RSRS, Dumka	27	25	0	0	0	0	0	0	0	0	0	0	0	0
	Mean ± S.D.	54.0 ± 25.24	54.0 0 ± 25.94	22.0 ± 19.08	20.0 ± 17.62	23.0 ± 20.07	22.33 ± 19.66	549 ± 868.2	546 ± 752.78	6.20 ± 5.46	6.79 ± 5.89	0.61 ± 0.54	0.66 ± 0.58	6.60 ± 5.72	6.50 ± 5.66
	t - test	*		NS		NS		**		NS		NS		NS	

OST- On Station Trial, T- Preserved layings, C- Control, * - Significant at 5 % level; ** - Significant at 1 % level

Performance of I DBV rearing under collaborative OST by CTRTI, Ranchi during 2022-2023

#	Name of the centre	Hatching %		Larval Duration (D:H)		V Inst. Larval Wt. (g)		No. of Cocoon harvested		Avg. Cocoon Weight (g)		Avg. Shell Weight (g)		SR %	
		T	C	T	C	T	C	T	C	T	C	T	C	T	C
1	BSM&TC, Baripada	58	61	34	34	37	37	86	233	11.6	11.7	1.4	1.5	12	12.8
2	SBT Sec CTRTI	82	80	31	31	35	34	1424	1290	9.17	9.7	1	0.84	10.88	8.64
3	RSRS, Dumka	70	75	38	38	38.6	39	642	478	14.16	14.09	2.14	2.02	15.11	14.33
4	RSRS, Jagdalpur	43	68	32	32	32	32	760	1070	11.33	11.25	1.25	1.25	11.03	11.11
	Mean ± S.D.	63 ± 16.68	71 ± 8.29	34 ± 3.10	34 ± 3.10	36.65 ± 2.84	35.50 ± 3.11	728 ± 549.24	768 ± 494.64	11.57 ± 2.04	11.69 ± 1.82	1.45 ± 0.49	1.40 ± 0.49	12.26 ± 1.97	11.72 ± 2.44
	t - test	**		NS		NS		**		NS		NS		NS	

Component-2: Test verification of synthetic blend (volatiles) developed for bivoltine silkworm seed production. [Jan 2022 to Dec 2023]

Dr. R. Saravanakumar, Dr. C. R Hegde and Dr. K Chandrasekharan*, Dr. Sahadev Chouhan**

[In Collaboration with SSPC, K.R Nagar* and P2 BSF Sheshambara**]

The Silkworm Seed Technology Laboratory (SSTL), in collaboration with IIHR under project APS 3581, developed a technology to enhance egg laying in bivoltine breeds of Bombyx mori L. by using a synthetic oviposition stimulant blend. The egg yield was increased by 10% in the blend-treated batches compared to the control, but these studies were limited to FC1 X FC2 only. Therefore, this study aims to test the blends on bivoltine pure races of CSR6, CSR26, SK6, and NB4D2 to enhance egg laying.

Objective: 1. To evaluate the impact of synthetic blend on oviposition in pure breeds of CSR6, CSR26, SK6 and NB4D2.

Host plant volatiles were obtained from IIHR for spraying on egg sheets during egg laying. FC1 cocoons were obtained and the experiments were conducted. There was no enhancement in egg recovery in the treated batch.

2. APS 09002MI: Diapause induction in Muga Silkworm (*Antheraea assamensis* Helfer) (June 2022- May 2025)

Dr. R. Saravana Kumar, Dr. Rajal Debnath*, Dr. K. Indira Kumar, Shri. M. Majumder**, Dr. Vikram Kumar****,
(In collaboration with SBRL*, Bangalore and MESSO**)

Rearing Muga silkworms during unfavorable conditions to produce pre-seed and seeds for commercial crops is low in productivity. The shortage of seeds for commercial crops is reflected in the overall Muga silk production in India. Therefore, this study aims to develop long-term preservation of seed cocoons through pupal diapause induction to skip unfavorable conditions.

Objectives:

1. To determine effective diapause mechanism (classical/ molecular) in Muga silkworm. 2. To develop protocol for induction of pupal diapause in Muga silkworm

Muga seed cocoons were procured from MESSO, Assam & Meghalaya, and experiments were conducted by altering different temperatures and photoperiods (5º, 10º, 20º C with 4L: 20D, 6h L: 18h D, 10L: 14D) for four different durations (10, 15, and 20 days). Moth emergences observed in treated cocoons after 14 days of incubation at 25º C ranged from 56% to 99%. Diapause-associated genes were identified through in silico-based analysis in the whole genome of Muga silkworm by the collaborative Institute (SBRL). The circadian rhythm genes double time, shaggy, and pigment-dispersing factor were present in single copy. Period, cycle, and cryptochrome genes were identified as two copies, and three copies of timeless genes were found in Muga silkworm. Primers have been designed for target gene amplification.

3. APS 09003MI: Evaluation of reproductive performance of Eri silkworm, *Samia ricini* (Donovan) (June 2022- May 2024)

Dr. Mala N, Dr. Pratheesh Kumar P.M* and Dr. Lalitha N**
(In Collaboration with *ESSPC, Hosur & **P2 EBSF, Topatoli, Assam)

In India, eri silk contributes to 68% of the total Vanya silk production. Due to its unique features, increasing demand, easy rearing practices, and assured crop, eri-culture is being promoted across the country. In view of the above, the present study is proposed to generate sufficient data on techno-feasibility parameters considering eri silkworm rearing and seed production in different potential eri-growing states in the country. This will help to establish standards for quality commercial seed cocoons and disease-free laying (DFLs) production.

Objectives:

1. Analysis of eri seed crop performance in traditional and non-traditional areas
2. Fixation of reproductive fitness traits for eri silkworm, *Samia ricini*

Surveys have been conducted in Tamil Nadu and Assam areas involved in eri silkworm rearing activities and collected general and seed crop-related data of adopted seed rearers as per the Proforma. A total of 30 ASRs were selected in Assam and Tamil Nadu clusters adopting standard protocols under supervision. Among them, 24 ASRs were selected covering different host plantations (Castor-6, Tapioca-6, and Kesseru-6) based rearing under P2-BSF, Topatoli cluster, and 6 ASRs were selected under ESSPC, Hosur cluster (Castor-6). A total of 600 Eri dfls of C2 breed were supplied from ESSPC, Hosur at a rate of 30 dfls to each of the selected ASRs in Assam and Tamil Nadu areas during different seasons. Upon completion of rearing, the seed cocoons produced using different host plants under different climatic zones at the selected ASRs level were procured, and the cocoon and grainage parameters were recorded separately and depicted in Tables 1 and 2.

Table 1: Rearing performance of C2 breed at different locations

Location	Host plant	Larval duration (Days)	Cocoon weight (g)	Shell weight (g)	Pupal weight (g)	Shell ratio %
		Mean ± SD				
Hosur, TN	Castor	19.00 ± 1.00	3.18 ± 1.26	0.48 ± 0.01	2.6 ± 0.18	15.0 ± 0.20
Topatoli, Assam	Castor	15.75 ± 0.50	3.9 ± 0.66	0.6 ± 0.05	3.3 ± 0.63	15.0 ± 2.07
	Kesseru	18.00 ± 0.40	2.8 ± 0.16	0.4 ± 0.06	2.4 ± 0.13	14.5 ± 1.93
	Tapioca	17.50 ± 0.5	3.1 ± 0.30	0.5 ± 0.05	2.7 ± 0.28	14.6 ± 1.64

Table 2: Grainage performance of C2 breed at different locations

Location	Host plant	Yld/ 100dfls	Cocoon:dfl	Fecundity No.	Hatching %
		Mean ± SD			
Hosur, TN	Castor	62.9 ± 0.36	3:1 ± 0.08	292.0 ± 10	93.3 ± 2.0
Topatoli, Assam	Castor	62.35 ± 1.19	4.2:1 ± 0.0	323.8 ± 12	88.0 ± 3.0
	Kesseru	56.45 ± 2.07	5:1 ± 0.0	302.6 ± 13	86.0 ± 2.5
	Tapioca	44.37 ± 1.54	4.8:1 ± 0.0	312.6 ± 12.5	85.0 ± 3.0

PART II: COLLABORATIVE RESEARCH PROJECT

1. AIT06006 MI: Marker assisted screening to identify silkworm Genetic resources tolerant to BmNPV AND BmBDV (Nov 2020- Jan 2024)

Dr. Ritwika sur Chaudhuri*, Dr. G. Punithavathy*, Dr. G. Lokesh*, Dr. G. Ravikumar* and **Dr. R. Saravanakumar**[**] (Collaborative project of CSGRC[*], Hosur and [**]SSTL as CI)

The project aimed to screen the silkworm germplasm stock for the presence of BmNPV and BmBDV tolerance genes using molecular markers and to validate the identified stocks through bioassay at SSTL. The study aimed to identify silkworm germplasm breeds with better disease resistance that can be utilized to develop improved silkworm hybrids.

Objectives:

1. To validate disease tolerance of the accessions through bio-assay studies at SSTL.

13 BDV- and 11 NPV-tolerant silkworm races were identified by CSGRC, Hosur through marker-assisted screening and received for bioassay studies. Virus inoculum was prepared using BDV-infected larvae collected and confirmed for the presence of viruses in the supernatant of midgut homogenate through PCR amplification. NPV concentration was quantified and optimized to 10^6 polyhedra/ml. The viruses were inoculated on 3rd instar 1st-day larvae, and rearing was conducted up to spinning. Three replications were maintained, with each replication having 200 larvae for rearing. Larval and pupal survival percentages were recorded as an average of the three replications for tolerance level. The maximum pupal survival of 48% was recorded in SK-6 against NPV, and 84% was observed in Chinese yellow against BDV.

Table 1: Survival percentage of BDV tolerant silkworm breeds

Race Name	Larval survival % Mean ± SD	Pupal survival % Mean ± SD
B-39	60.83 ± 7.371	20.33 ± 2.754
C-122	70.50 ± 6.500	55.50 ± 6.946
Chinese yellow	97.67 ± 0.764	84.17 ± 5.508
Sanish- EI (M)	7.50 ± 2.291	6.50 ± 2.646
Sanish- 18 (M)	63.83 ± 10.372	30.33 ± 6.526
JPN5xB25	48.00 ± 6.062	26.00 ± 5.635
HO(SL)	79.67 ± 5.485	66.83 ± 9.292
J2P	79.83 ± 1.258	51.17 ± 5.393
14M	97.00 ± 1.000	80.17 ± 6.007
CSR-6	11.50 ± 1.323	9.50 ± 2.500
CSR-26	22.00 ± 2.784	19.00 ± 2.784
APS-45	17.50 ± 3.041	14.50 ± 3.969
BCON-1	78.50 ± 0.866	62.17 ± 9.238

Table 2: Survival percentage of NPV tolerant silkworm breeds

Races Name	Larval survival % Mean ± SD	Pupal survival % Mean ± SD
HS6(SL)	39.00 ± 6.500	1.17 ± 2.021
R.P-II	61.17 ± 9.224	7.50 ± 4.444
SMGS-3	53.67 ± 5.204	10.67 ± 0.764
6P	46.50 ± 1.803	2.83 ± 1.155
7042	44.17 ± 4.509	1.83 ± 1.893
A	39.17 ± 5.752	0.67 ± 0.289
CNxC140	41.83 ± 3.884	11.67 ± 4.509
European M	31.00 ± 5.268	2.17 ± 0.764
SL WU-8	60.33 ± 4.481	36.67 ± 5.107
SK-6	67.67 ± 5.838	48.67 ± 4.041
PAM-117	64.00 ± 5.000	19.33 ± 5.132

2. AIB08008MI: Development and evaluation of Eri Silkworm (*Samia ricini* Donovan) Breeds/Hybrids with improved productivity

Dr. Rajal Debnath*, Dr. Ramesha*, Dr. Himanshu Dubey*, **Dr. Mala N[1],** Dr. Lalitha N[2], Dr. Reeta Luikham[3], Dr. Pratheesh Kumar[2]
(Collaborative project of SBRL*, [2]MESSO, [3]CMER&TI and SSTL[1] as CI)

Samia ricini is a non-mulberry multivoltine species of Saturnid silkworm, commercially reared multiple times a year by feeding on castor, kesseru, borpat, and tapioca leaves. With the availability of genetic variability within the eri populations, there is ample opportunity to utilize Eri bioresource for improved breed development, particularly for introducing traits that can enhance silk/protein production. The present proposal is formulated to explore the prospects of eri silkworm strains/morphotypes in a breeding program to develop crossbreeds/lines with improved silk/pupal protein traits.

Objectives:

1. Generation of stable breeding lines of Eri silkworm strains/morphotypes
2. Utilization of molecular markers to develop and characterize eri hybrids with economic value

DFLs procured from ESSPC, Hosur, were kept under ideal temperature and humidity in a rearing house. After hatching, the larvae were segregated from the mixed population into different groups based on morphological characters, and cellular rearing of each morphotype was carried out by feeding them with castor. The different strains/morphotypes reared were YP (Yellow Plain), YS (Yellow Spotted), YZ (Yellow Zebra), GBP (Greenish Blue Plain), GBS (Greenish Blue Spotted), and GBZ (Greenish Blue Zebra). The parameters were recorded separately for all morphotypes and significant differences in rearing performance were found between the morphotypes (Table 1).

Table 1: Rearing performance of different strains/morphotypes of eri silkworm

Morpho type	Hatching %	Larval weight(g)	Cocoon wt (g)	Shell wt (g)	Pupal wt (g)	Shell ratio %
	Mean ± SD					
YP	92.39±4.53	6.88±0.60	3.24±0.42	0.405±0.06	2.83±0.35	12.71±0.66
GBP	83.07±3.16	7.125±0.16	3.16±0.42	0.43±0.04	2.78±0.48	13.46±0.72
YZ	92.36±3.15	8.685±0.64	3.51±0.07	0.48±0.04	3.01±0.004	13.73±1.01
GBZ	95.27±3.64	8.14±0.10	3.66±0.25	0.5±0.09	3.17±0.16	13.76±2.00
YS	85.46±2.46	7.665±0.45	3.08±0.05	0.415±0.04	2.66±0.007	13.46±1.35
GBS	88.83±6.75	7.51±0.11	3.20±0.04	0.435±0.06	2.775±0.02	13.55±1.77

PART III: PROGRAMMES OF THE INSTITUTE

1. Generation of Trained Manpower in Seed Production Technologies

Dr. Chandrashekhar R Hegde, Dr. Sailaja B, Dr. R. Saravana Kumar,
Dr. Mala N, B.V. Raviprasad

Seven training programs were organized for stakeholders under CBT on different aspects of seed technology, covering 88 stakeholders (Table 1). Three training programs under the Central Seed Act were conducted on different activities of grainages for the RSPs recommended by NSSO, Bangalore, to issue a certificate to initiate a new private grainage. In addition to the regular training programs, five trainings were exclusively conducted for RSPs/CRCs.

Table 1: Details of Training programmes conducted under CBT and Central Seed Act

#	Name of the training	Period	Total Number of Trainees			
			KAR	TN	AP	TOTAL
	Capsule / regular training programmes (approved by CBT of CSB)					
1	Monitoring of silkworm diseases and pests in seed crop (I Batch)	06-09/06/2022	12	-	-	12
2	Pebrine detection in Silkworm (I Batch)	21-23/06/2022	13	-	-	13
3	Pebrine detection in Silkworm (II Batch)	14-16/07/2022	13	2	-	15
4	Pebrine detection in Silkworm (III Batch)	16-18/08/2022	9	-	-	9
5	Pebrine detection in Silkworm (IV Batch)	01-03/09/2022	8	-	-	8
6	Artificial hatching methods for Bivoltine silkworm eggs	19-20/10/2022	10	-	12	22
7	Pebrine detection in Silkworm (V Batch)	09-11/11/2022	-		9	9
		Sub total	**65**	**2**	**21**	**88**

	Training programmes conducted under Central Seed Act for RSPs						
			KAR	TN	AP	MAH	TOTAL
1	I Batch: Silkworm Seed Production Techniques (3 Months)	21.02.2022 to 21.05.2022	1		1	3	5
2	II Batch: Silkworm Seed Production Techniques (3 Months)	14.07.2022 to 11.10.2022	1	-	-	-	1
3	III Batch: Silkworm Seed Production Techniques (3 Months)	16.07.2022 to 13.10.2022	1	-	-	-	1
		Sub total	**3**	**-**	**1**	**3**	**7**

	Training programmes conducted for RSPs/CRCs					
			KAR	TN	AP	TOTAL
1	Pebrine detection in Silkworm (I Batch)	11-13/01/2023	19	-	-	19
2	Pebrine detection in Silkworm (II Batch)	23-25/01/2023	11	-	-	11
3	Pebrine detection in Silkworm (III Batch)	08-10/02/2023	19	-	-	19
4	Pebrine detection in Silkworm (IV Batch)	27/02-01/03/2023	11	-	-	11
5	Pebrine detection in Silkworm (V Batch)	13-15/03/2023	12	-	-	12
	Sub total		**72**	**-**	**-**	**72**
		KAR	**TN**	**AP**	**MAH**	**TOTAL**
	GRAND TOTAL	**140**	**2**	**22**	**3**	**167**

1.1 Additional Training programme conducted at DoS units on pebrine disease control

#	Place	Date	No. of participants	Training imparted to
1	Bilidevalaya	28.04.2022	30	DoS, Karnataka
2	Magadi	29.04.2022	34	DoS, Karnataka
3	Model grainage-Channapatna	30.04.2022	50	DoS, Karnataka
4		18.05.2022	63	DoS, RSPs & CRCs
5	Model grainage-Mandya	30.04.2022	60	RSPs & DoS, Karnataka
6		18.05.2022	62	DoS, RSPs & CRCs
7	SSTL, Kodathi	13. 05.2022	14	DoS, Karnataka
8	Model grainage-Chadalapura	18.05.2022	69	DoS, Karnataka RSPs & CRCs
		Total	382	







Training on Pebrine detection

2. SILKWORM DISEASE SURVEYS

Dr. Veeranna Gowda, Dr. Chandrashekhar R Hegde, Dr. Sailaja B,
Dr. R.Saravana Kumar, Dr. Mala N, B.V. Ravi Prasad, Rathnamma and H. N. Harish

SSTL scientists were involved in a disease survey in three southern states: Karnataka, Tamil Nadu, and Andhra Pradesh, along with scientists from APSSRDI and KSSRDI. They inspected seed crops, ASR crops, and DoS Farms. A total of **1830 lots with 7180 samples** of larval/pupal/mother moths were tested and reported.

2.1. Joint Silkworm Disease Monitoring Survey (JSDMS)

SSTL scientists visited seed areas in three southern states (Karnataka - Kunigal / Magadi, Anekal, and Attibele; Andhra Pradesh - Madanapalli / Hindupur; Tamil Nadu - Hosur / Denkanikottai) in different seasons.

1. KARNATAKA

#	Place of visit	Bivoltine Lots/samples	Multivoltine Lots/samples	Disease incidence
1	Kunigal/ Magadi	-	613 / 1095	Kunigal -1 sample Magadi - 1 sample
2	Anekal/ Attibele	35/ 67	-	No Pebrine
	Total	**648 / 1162**		**2 Sample**

2. ANDHRA PRADESH

#	Place of visit	Bivoltine Lots/samples	Multivoltine Lots/samples	Disease incidence
1.	Madanapalle	11/38	2/16	No pebrine
2.	Hindupur	17/56	-	No pebrine
	Total	**30/110**		**No pebrine**

3. TAMILNADU

#	Place	Bivoltine Lots/samples	Multivoltine Lots/samples	Disease incidence
1.	**Hosur/ Denkanikottai**	**58/136**	**-**	**No Pebrine**
	Total	**58/136**		**No Pebrine**

2.2. Silkworm disease monitoring surveys of seed and commercial crop rearings of south Indian states - Collaboration with CSR&TI, Mysuru, NSSO and DoS, Karnataka

1. Silkworm Disease Monitoring At BSF's of Tamilnadu

#	Place of visit	No. of lots / samples	Disease incidence
1	P2 BSF, Yelagirihills	14/280 (Egg shell)	No Pebrine
2	P3 BSF, Avalapalli	10/ 20	No Pebrine

2. Moth and Egg Shell Testing at CSGRC, Hosur

#	Sample	Bivoltine Accn. / Samples	Multivoltine Accn. / Samples	Disease incidence
1	Egg shell	138/138	84/84	No Pebrine
2	Moth	127/2265	105/2057	1 sample
3	Total	454/ 4544		0.049 %

3. Need based additional Pebrine Disease Survey

#	Place	Bivoltine lots/samples	Multivoltine lots/samples	Disease incidence
1	Kunigal / Magadi	-	337 / 649	04 lots Pebrine in Kunigal (Summer)
2	Chikkballapura	24/24	179/179	2 lots Pebrine in MV (Summer)
3	RSP/CRC	-	76/76	4 lots Pebrine in CB (Rainy season)
	Total	616/ 928		10 lots pebrine



Anekal Seed area



Hindupur seed area



Hosur seed area

3. EXTENSION ACTIVITIES

During the reporting period, 03 Awareness and 05 Technology Demonstration programs were conducted for the benefit of Sericulture Department staff in the southern States. A total of **276** persons were sensitized (Table 3).

Table 3: Details of Extension Communication Programmes

Programmes	No. of events	Persons sensitized
Technologies Demonstration		
1. Demonstration on Mother moth examination	01	15
2. Demonstration on disinfection and hygiene	01	13
3. Embryo isolation techniques	01	14
4. Pebrine detection methods in silkworm	01	16
5. Demonstration on Acid treatment of Bivoltine eggs	01	24
Total	**05**	**82**
Awareness programme		
1. Silkworm diseases and management	01	63
2. Pebrine detection methods in silkworm	10	69
3. Pebrine diseases management and disinfection	01	62
Total	03	194
Grand Total	**06**	**276**



Chadalapura grainage, Chikkaballapura



Model grainage, Mandya, DoS, KA

TESTING OF SILKWORM SAMPLES & DISINFECTANTS

Dr. R. Saravana Kumar and K.R. Rathnamma

The Silkworm Seed Technology Laboratory is recognized under the Central Seed Act to conduct quarantine testing and issue quarantine certificates for exporting silkworm eggs to other countries. The SSTL provides services to stakeholders by testing disinfectants and samples of larvae, pupae, and egg shells in the Silkworm Seed Pathology division. Additionally, the embryonic health of silkworm eggs is tested at the Silkworm Seed Technology and Physiology division.

❖ Quality testing of disinfectants

12 samples of Decol received from M/s. Kamath Chlorotech (04), M/s. Durga Biotech (01), and DoS Karnataka (07) were tested for quality standards.

❖ Egg shell testing:

4 samples of egg shells from P2 BSF, Yelagiri Hills, were tested for pebrine disease freeness.

❖ Larval testing:

62 larval samples received from different farmers, DoS Karnataka, and Tamil Nadu were tested to find disease incidence.

PART IV: GENERAL / OTHER ACTIVITIES

1. Farm Management

Dr. Chandrashekar Hegde & J. N. Chandrashekar, STA

Maintenance of approximately 4 acres of cultivable land to accommodate mulberry and non-mulberry host plants to meet the leaf requirements for ongoing or proposed new projects and conducting rearings.





Castor plantation





Mulberry plantation

2. Bivoltine Seed Cocoon Production

Dr. Sailaja Bandam, Dr. Mala N and B.V. Raviprasad

Under the revenue generation programme, one batch of double hybrid and two batches of FC1 and FC2 seed crops of bivoltine were reared. The seed cocoons generated were supplied to the Ramanagara cocoon market and SSPC, NSSO. The amount generated was accounted for under revenue.

REARING PERFORMANCE OF BIVOLTINE SEED CROPS

Crop No.	Race / FC	No. of Dfls	Crop yield		SCW (g)	SSW (g)	SR (%)
			by No.	Wt. (Kg)			
1	FC2 x FC1	50	24,780	42.00	1.64	0.44	26.86
2	FC1	25	10,645	16.50	1.62	0.35	21.60
	FC2	25	7,830	13.50	1.72	0.37	21.46
3	FC1	25	4,690	7.00	1.49	0.33	22.45
	FC2	25	9,660	14.00	1.44	0.32	22.29

3. Tree Plantation

Economically important trees such as Jamun, Jackfruit, Pongamia, Shivane, Beete Mara, Tore Matti, Kadu Badami, etc. (total 1,728 tree saplings) were planted and maintained in approximately 12 hectares of area as part of soil conservation in the vacant area. The maintenance of these tree plantations continued during the year 2022-2023 with the cooperation of the Forest Department.

4. राजभाषा कार्यान्वयन/ Official Language Implementation

डॉ। माला एन और हरीश एच एन

संस्थान ने अपने प्रयासों के माध्यम से भारत सरकार, गृह मंत्रालय, राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम के अनुसार केंद्र सरकार के कार्यालयों में हिंदी नोटिंग सहित निर्धारित 55% लक्ष्य के तुलना में 84.77% का लक्ष्य प्राप्त किया है। इस संस्थान द्वारा दिनांक 29.06.2022 को हिन्दी कार्यशाला का आयोजन किया गया तथा श्रीमती. जयश्री, सहायक निदेशक (राजभाषा), रारेबीसं, केंरेबो, बेंगलुरु को अतिथि व्याख्यान देने के लिए आमंत्रित किया गया था। हिन्दी पखवाडा/दिवस दिनांक 14.09.2022 से 27.09.2022 तक रेशमकीट बीज प्रौध्योगिकी प्रयोगशाला द्वारा आयोजित किया गया। रेशमकीट बीज प्रौध्योगिकी प्रयोगशाला में क्रमश: 30.06.2022, 14.09.2022, 26.12.2022 और 25.03.2023 को चार राजभाषा कार्यान्वयन समिति के बैठकें आयोजित की गईं।

The Institute has achieved 84.77% of the assigned target of 55% along with notations towards the Hindi correspondences to Central Government offices as per OLIC Annual programs of the Ministry of Home Affairs. A Hindi workshop was organized by this Institute on 29.06.2022, and Smt. Jaishree, Assistant Director (OL), NSSO, CSB, Bengaluru, was invited to deliver a guest lecture. SSTL organized Hindi Pakhwada / Hindi Fortnight from 14.09.2022 to 27.09.2022. A total of four OLIC meetings were conducted at SSTL on 30.06.2022, 14.09.2022, 26.12.2022, and 25.03.2023, respectively.

Hindi Workshop on 29.06.2022



Hindi Pakhwada 14.09.2022 to 27.09.2022











PART V: PUBLICATIONS

1. Sailaja B, Sudhakara Rao P, Vishaka GV, Khamar Taj, Rathore MS, Manjunatha G. R, Vijayakumari KM, Mishra RK, Sathyanarayana K and Chandrashekar R Hegde (2022). Development of short term egg preservation schedule for Tasar silkworm, *Antheraea mylitta* (Drury). *Plant archives,* 22 Special issue (VSOG):185-187. **[NAAS rating-4.73]**

2. Sailaja B*, Sudhakara Rao P, Vishaka GV, Khamar Taj, Rathore MS, Vijaya Kumari KM, Mishra RK, Sathyanarayana K and Chandrashekar Hegde (2022). Photo phase impact on tasar seed cocoon preservation and period of silk moth, *Antheraea mylitta* (Drury) emergence. *The Pharma Innovation Journal* 2022; SP-11(8): 1230-1231. [NAAS RATING: 5.23]

3. Sailaja B, Gogoi D K, Sudhakara Rao P, Rajesh Kumar, Vijaya Kumari K M, Mishra R K, Manjunatha G R, Khamar Taj and Chandrashekar Hegde (2022). Development of short-term seed preservation schedule for Muga silkworm, A*ntheraea assamensis* (HELFER). National Seminar on climate smart sericulture 2022 "Approaches for sustainable sericulture", Page No: 44.

4. R. Saravanakumar, J. Anupama, B. Sailaja, K. M. Ponnuvel and C. R. Hegde (2022). Studies on identification and infectivity of various microsporidian isolates collected from B*ombyx mori* L sericulture areas. National Seminar on climate smart sericulture 2022 "Approaches for sustainable sericulture", Page No: 101 (Poster presentation).

5. N. Mala and K. Vijila (2022). Studies on optimization of lipase production by bacillus licheniformis isolated from gut of silkworm, *Bombyx mori* L supplemented with feed additives. National Seminar on climate smart sericulture 2022 "Approaches for sustainable sericulture", Page No: 134 (Poster presentation).

6. Chandrashekar Hegde (2022). Issues, challenges and strategies for quality silkworm seed production in sericulture seed sector with respect to climate change. National Seminar on climate smart sericulture 2022 "Approaches for sustainable sericulture", Souvenir: Page No: 59-61.

7. Sailaja B, Sudhakara Rao P, Vishaka GV, Khamar Taj, Rathore MS, Manjunatha G. R, Vijayakumari KM, Mishra RK, Sathyanarayana K and Chandrashekar R Hegde (2022). Development of short term egg preservation schedule for Tasar silkworm, Antheraea mylitta (Drury). National Symposium on Vanya sericulture: Oppotrunities galore, Souvenir cum book of abstracts**:** Page No: 139 (Oral presentation)

8. Ahmed S.A., Gogoi B., Neog K., Singh B.K., Mala N and Sarmah M.C. 2022. Borpat (*Ailanthus grandis* Prain) for climate smart ericulture. National Seminar on Climate Smart Sericulture-2022 Approaches for Sustainable Sericulture, P-74.

PART VI: SEMINARS / TRAININGS / WORKSHOPS/ PROGRAMMES

#	Title of Programme	Venue and Date	Persons Participated
1	Development of Entrepreneurial skills for Promotion of Sericulture Industry-Webinar	MANAGE, Hyderabad, 22.04.2022	Dr. Sailaja Bandam
2	Workshop on Intellectual Property Rights	CSB, Bangalore, 23.05.2022	Dr. Sailaja Bandam, Dr. Mala. N
3	Social Media Management - Webinar	CSB, Bangalore, 01.06.2022	Dr. Chandrashekar R. Hegde Dr. Sailaja Bandam
4	GeM Training	CSB, Bangalore, 08.07.2022	Dr. Chandrashekhar R Hegde Dr. Sailaja Bandam, Dr. Mala. N
5	CSB Young scientists meet	CSB, Bangalore, 14.07.2022	Dr. R. Saravanakumar, Dr. Mala. N
6	21st Pebrine committee meeting-Virtual mode	CSR&TI, Mysuru, 27.07.2022	Dr. Chandrashekar R. Hegde Dr. Sailaja Bandam Dr. R. Saravanakumar
7	National Seminar on climate smart sericulture 2022 "Approaches for sustainable sericulture"	NIFT, Bangalore, 6/7-10-2022	Dr. Sailaja Bandam Dr. R. Saravanakumar Dr. Mala. N
8	National Symposium on Vanya sericulture: Oppotrunities galore	CTR&TI, Ranchi 28/29-10-2022	Dr. Sailaja Bandam
9	Hindi Workshop	SSTL, Kodathi 29.06.2022	SSTL officials / officers
10	Hindi Fortnight/Hindi Diwas	SSTL, Kodathi	SSTL officials / staff
10	66th RCC meeting	CSB, Bangalore 5/6-04-2022	Dr. Veeranna Gowda Dr. Sailaja Bandam,
11	67th RCC meeting	CSB, Bangalore 9/10-11-2022	Dr. Chandrashekar R. Hegde
12	Training on mulberry and silkworm Germplasm management	CSGRC, Hosur 9/10-01-2023	Dr. Sailaja Bandam
13	Eri Resham Krishi vigyana mela	ESSPC, Hosur 31-01-2023	Dr. Chandrashekar R. Hegde
14	Action plan meeting for the year 2023-2024	16/17-02-2023	Dr. Chandrashekar R. Hegde Dr. Sailaja Bandam
15	54th RC meeting of SSTL	SSTL, Kodathi 10.03.2023	Dr. K. Sashindran Nair, NSSO and all SSTL Scientists
16	16th RAC meeting of SSTL	CSB, Bangalore 29.03.2023	RAC Members and SSTL Scientists

Awards & Prize: During the period under report **two scientists received First prize** in oral and poster presentations in National Symposium/Seminars.



Vanya sericulture: Oppotrunities galore held on 28/29-10-2022 and organized by CTR&TI, CSB at Ranchi.



National Seminar on climate smart sericulture 2022 “Approaches for sustainable sericulture” held on 6/7-10-2022 and organized by CSB at NIFT.

PART VI: Revenue generation

A sum of Rs. 21.83 lakhs generated as revenue from different sources for the financial year 2022-23 and remitted to Central Office.

REVENUE GENERATION DURING THE YEAR 2022-2023

#	Particulars	Amount (Rs.in lakhs)
1	Royalty received for Decol and CRH	18.51
2	Quality analysis/ testing of products	0.03
3	Cut cocoons	0.50
4	Income from Hostel rent, Training course fee, etc.	2.79
Total		**21.83**

Training programme conducted under CBT





RSP/CRC Training



16th RAC meeting of SSTL



Vigilance awareness programme conducted on National Unity Day on 31-10-2022

Under Swachh Bharat activities cleaned roads surroundings near to the Institute





Visitors:

1. Thirteen students with faculty from Sri Krishna Devaraya University, Anantapur, visited on 13.07.2022.
2. Fifty students with five faculty members from Narayana Techno School, Bellandur, Bangalore, visited on 14.02.2023.