

**CENTRAL SILK BOARD  
BENGALURU – 560 068**

**MINUTES OF THE XXIII MEETING OF THE HYBRID AUTHORIZATION  
COMMITTEE HELD ON 01.09.2021 AT CO, BENGALURU**

The XXIII meeting of the Hybrid Authorisation Committee (HAC) was held at Central Silk Board, Bengaluru on 01.09.2021 and in the absence of the Chairperson, Member Secretary, Central Silk Board, the meeting was chaired by Dr. V. Sivaprasad, Director (Tech), CSB, Bengaluru. The list of participants is enclosed at *Annexure-I*. The Committee discussed the following Agenda items and the decisions taken are detailed below.

**ITEM NO.1: CONFIRMATION OF THE MINUTES OF THE XXII MEETING OF  
THE HYBRID AUTHORIZATION COMMITTEE HELD AT  
CENTRAL SILK BOARD, BENGALURU ON 15.10 2020**

As no comments were received, the committee confirmed the minutes of the XXII meeting of HAC held on 15.10.2020.

**ITEM NO. 2: REVIEW OF FOLLOW-UP ACTION TAKEN ON THE  
RECOMMENDATIONS / SUGGESTIONS OF THE PREVIOUS  
MEETING HELD ON 15.10 2020**

The Committee reviewed and accepted the action taken report on the meeting held on 15<sup>th</sup> October, 2020 at Bengaluru with the following suggestions.

- Field/Test trials to be conducted with CTR 14 along with BDR- 10 & Daba BV as check/control for performance validation at RTRS/RECs and BTSSO. All needful measures should be undertaken to maintain the breed at respective institutes. Further, progress/ATR will be reviewed online after one month.

*Action: Director, CTRTI, Ranchi & In-charge, BTSSO, Bilaspur*

- The outcome of the concluded project MOE03001SI: A project proposal “Innovation approach for multiple cocoon crops and stabilization of Autumn crop in North west India” to be submitted for popularization/introduction of third crop in North & North Western India under TOT project on or before 15<sup>th</sup> Oct 2021.

*Action: Director (I/C), CSRTI, Pampore*

- Discussing on the performance of TT21 x TT56 (thermo-tolerant BV double hybrid), the committee suggested to consider collecting data from equal number of farmers for test & control hybrids. The hybrids need to be tested mainly in unfavourable seasons against high temperature and also compare the performance in the favourable seasons. Trials to be conducted with more number of dfls during unfavourable seasons than the favourable seasons.

*Action: Director, CSRTI, Mysuru*

### **ITEM NO. 3: REVIEW OF THE PROGRESS OF THE AUTHORIZATION TRIALS BEING CARRIED OUT BY THE INSTITUTES.**

The committee reviewed the progress of the ongoing authorisation trials and the following decisions were taken:

**MV1x S8:** The committee expressed its dissatisfaction as the field trials with MV1 x S8 could have been completed by June 2020 and suggested that the Institute should stick to the time frame. As against the target of 4.0 lakh Dfls, only 3.10 Lakh Dfls were field tested so far. The field trials with the remaining 90000 Dfls should be completed by March 2022 and submit the analysed results.

*Action: Director, CSR&TI, Mysuru; Director, NSSO Bangalore*

**S8 x CSR16:** The data on performance of S8 X CSR16, bivoltine single hybrid was presented and the perusal of data revealed that the new hybrid performed on par with the CSR double hybrid (FC1 x FC2). The Committee appreciated the efforts in evolving new hybrid to the bivoltine farmers and it could serve as an alternate hybrid to CSR Double Hybrid. The S8 x CSR16 could be utilized further in specific locations/seasons, where the existing DH is not performing well in particular. After threadbare discussion, it was observed that the performance of S8 x CSR16 across the seasons in Southern India in both pre- and post-cocoon parameters is commendable. The hybrid authorization committee authorized the S8 x CSR16 as bivoltine single hybrid for commercial exploitation. The summarized details on performance of S8 x CSR16 during the authorization trials in South India are annexed herewith for documentation purposes.

Further, committee advised CSRTI-Pampore to undertake the field trials of S8 x CSR16 in North West India during the next spring & autumn season in consultation with SDD, J&K.

*Action: Director, CSRTI, Mysuru; Director (I/C) CSRTI, Pampore & DOSs (Karnataka/Andhra Pradesh/Tamil Nadu/Telangana/ J&K)*

**12Y x BFC1:** The committee suggested documentation of 12Y x BFC1 hybrid performance with data from equal number of farmers in case of existing control also for valid comparison and completion of the trials by March 2022. The performance of test hybrid was encouraging in West Bengal & Tripura and other NE states. The cooperation and coordination received from DoS-Tripura was acknowledged for the 12Y x BFC1 production in the state.

*Action: Director, CSR&TI, Berhampore*

### **ITEM NO. 4: REVIEW OF THE PROGRESS OF NON-MULBERRY SILKWORM RACE AUTHORISATION PROGRAMMES**

**CMR-1 & CMR-2 :** As per the approved annual action plan for the year 2021-2022, CMERTI, Lahdoigarh to carry out multi-locational trials of Muga breeds *i.e.*, CMR-1 & CMR-2 during October-November 2021 (Commercial crop) and submit the statistically analyzed data during the next meeting.

**YP x GBZ & GBS x GBZ:** As per the approved annual action plan for the year 2021-2022, CMERTI, Lahdoigarh was advised to undertake the multi-locational trials of Eri breeds *i.e.*, YP x GBZ & GBS x GBZ during October-November 2021 (Commercial crop) and submit the statistically analyzed data during the next meeting.

*Action: Director, CMERTI, Lahdoigarh*

### **Finalization of norms for Vanya Silkworm Breed Authorization & Evaluation System**

Further, based on the decision of a meeting held at CO, Bangalore on 27.12.2011, the sub-committee involving respective R&D Institutes and Seed Organizations was formed to fix the norms/benchmarks for all the non-mulberry silkworms *viz.*, Muga, Eri, Tropical Tasar and Oak tasar (Annexure-II) including the proposed test centres and breed maintenance system to be followed. However, as the above norms were fixed during 2012 and the committee members opined that they need to be critically studied in view of the constraints/changes taken place over a decade. The hybrid authorization committee recommended for constituting a Sub-committee involving Directors (Vanya sector), RCS & Seed sector (BTSSO & MESSO) to re-frame and re-visit the norms/benchmarks for the Vanya silkworms.

*Action: RCS, CO, CSB, Bengaluru*

### **Status of Vanya Silkworm Breeds**

The committee suggested to prepare a status document on the maintenance of Vanya Silkworm Breeds (tasar, eri & muga) proposed for multi-locational trials/evaluation. The document may also include efforts necessary for their conservation as per breed/hybrid characteristics.

*Action: Director, CMERTI, Lahdoigarh; Director, CTR&TI, Ranchi*

### **ITEM No. 5: CONSIDERATION OF NEW HYBRIDS PROPOSED FOR AUTHORISATION TRIALS**

**CBM-01:** A promising productive double hybrid CBM-01 (BMV1 x BM010) x (BMD3 x BMFD) developed utilizing the Indian and Bulgarian genetic resources. The hybrid was evaluated in Southern India under OFT recorded an average yield of 74.3 kg as compared to 69.0 kg in FC1 x FC2 (7% improvement in yield) and higher shell% (22.86 as compared to 21.9 in FC1 x FC2). The post-cocoon parameters of new hybrid were also promising with 5.0 renditta and raw silk grade (3A-4A).

The performance of test hybrid, (BMV1 x BM010) x (BMD3 x BMFD) *vis a vis* FC1 x FC2 in Southern India was presented along with the reeling data (CSTRI – Bangalore & ARM, Siddalaghata). The satisfactory performance of (BMV1 x BM010) x (BMD3 x BMFD) for superior yield and reeling parameters, the committee accorded approval to undertake authorization trial across India. CSRTI-Mysuru was suggested to submit the authorization trial in the form of new project involving all the collaborators by 15.10.2021.

*Action: Director, CSRTI, Mysore*

**BHP3.2 × BHP8.9:** The new productive bivoltine double hybrid, BHP-DH (BHP3.2 × BHP8.9) was evaluated at different locations of E & NE region. The analysed data indicates that BHP DH performed superiorly over the popular bivoltine foundation crosses exhibiting improvement *wrt* to cocoon yield (19-23%), cocoon weight (7-8%), shell wt (12-20%) and shell percentage (5-11%). The Committee discussed the performance of the hybrid in detail and found satisfactory. As so far only 10000 dfls is completed, the Committee advised the Institute to complete the trials at a faster pace (Total: 20000 dfls) for further consideration.

*Action: Director, CSRTI, Berhampore*

**ITEM No. 6: ANY OTHER SUBJECT WITH THE PERMISSION OF THE CHAIR**

**G11xG19:** As per the approved annual action plan for the year 2021-2022, G11 x G19, a double hybrid suitable for sub-optimal conditions is scheduled to be field tested with 60,000 Dfls. So far 9,500 dfls were distributed in Kolar area and the trial is under progress. NSSO may further popularize the hybrid at suitable locations in coordination with R&D institute and DoSs.

**The Committee also deliberated important issues in hybrid authorization system followed currently and suggested the following for the perusal of competent authority:**

- The entry of new hybrids to authorisation trial, the data from OFTs should be with 20,000-30,000 dfls for Southern Zone; 15,000-20,000 dfls for rest of India.
- Institutes should conduct periodical review meetings to monitor the progress of authorization trials with the concerned agencies.
- Directors of R&D institutes to ensure timely supply of P1 layings to the designated SSPCs for seed cocoon generation and seed production as per the pre-determined schedules well in advance for smooth conduct of trials.
- The test hybrids need to be evaluated with the farmers covering districts.

The meeting ended with vote of thanks to the Chair.

Date: 23.09.2021  
Place: Bengaluru



(Rajit Ranjan Okhandiar, IFS)  
Chairperson, HAC & Member Secretary  
Central Silk Board, Bangalore.

**LIST OF PARTICIPANTS IN THE XXIII MEETING OF THE HYBRID  
AUTHORIZATION COMMITTEE HELD ON 01.09.2021 AT CO, BENGALURU**

1. Dr. V.Sivaprasad, Director (Tech), CSB, Bengaluru
2. Sri. Manzoor Ahmad Qadiri, Director, SDD, Srinagar, J&K
3. Dr. K. Babulal, Director, CSRTI, Mysuru.
4. Dr. Kishor Kumar, Director, CSRTI, Berhampore
5. Dr. K.Sathyanarayana, Director, CTRTI, Ranchi
6. Dr. K.Vijayakumari, Director, CMERTI, Lahdoigarh
7. Dr. Subash V Naik, Director, CSTRI, Bangalore
8. Dr. Sardar Singh, Scientist-D & Incharge, CSRTI, Pampore.
9. Dr. P. J. Raju, Director, APSSRDI, Hindupur (For commissioner of Sericulture)
10. Smt. J. Sukumari, Joint Director, DOS, Karnataka
11. Smt. S. Pushpalatha, Deputy Director, DOS, Karnataka
12. Sri. Rama Moorthy, Deputy Director (Seed), DOS, Tamil Nadu

**Board Secretariat/Invitees:**

1. Dr. S. Manthira Moorthy, Scientist-D, RCS, CSB, Bengaluru.
2. Dr. K. B. Chandrasekhar, Scientist-D, CSRTI, Mysuru
3. Dr. Meenal, Scientist-D, CSRTI, Mysuru
4. Dr. Rudranna Gowda, Scientist-D, CSB, Bangalore
5. Dr. Rahamthulla, Scientist-D, CSB, Bangalore.
6. Sri. S. Nazeer Ahmed Saheb, Scientist-D, RCS, CSB, Bangalore.
7. Dr. M.S.Rathore, Scientist-D, BTSSO, Bilaspur
8. Dr. Madhusudhan K.N, Scientist-D, CSRTI, Mysuru
9. Dr. Prashanth Sangannavar, Scientist-C, RCS, CSB, Bangalore.
10. Dr. G.R.Manjunatha, Scientist-C, RCS, CSB, Bengaluru
11. Dr. Manjappa, Scientist-C, CSRTI, Mysuru
12. Dr. Halgunde Gowda, Scientist-B, CSB, Bangalore
13. Smt. S. Ponmari, ADS, AVP, DOS, Tamilnadu

**REPORT OF THE SUB-COMMITTEE ON STANDARDISATION OF NORMS FOR  
HYBRID EVALUATION AND AUTHORIZATION UNDER NON-MULBERRY  
SILKWORM RACE AUTHORIZATION PROGRAMME**



**CENTRAL MUGA ERI RESEARCH & TRAINING INSTITUTE  
CENTRAL SILK BOARD  
MINISTRY OF TEXTILES-GOVT. OF INDIA  
LAHDOIGARH, JORHAT, ASSAM**

**REPORT OF THE SUB-COMMITTEE ON STANDARDISATION OF NORMS FOR HYBRID  
EVALUATION AND AUTHORIZATION UNDER NON-MULBERRY SILKWORM RACE  
AUTHORIZATION PROGRAMME**

The concept of authorisation is a recent phenomenon in non-mulberry silkworm to ensure proper introduction of race/breeds/hybrid in the field. Accordingly, a sub-committee was formed to fix the norms/bench mark for all the non-mulberry silkworms namely Muga, Eri, Tropical Tasar and Oak tasar and to suggest test centres and their maintenance for authorisation of the evolved breeds/hybrids and authorisation processes as per the decision of the meeting held at C.O.,Bangalore on 27.12.2011.The first meeting of the sub-committee was held at CMER&TI, Jorhat, Assam on 27<sup>th</sup> of January 2012 under the Chairmanship of Dr.R.K.Rajan,Director, CMER&TI, Jorhat.The list of participants is appended at **Annexure-I**. The gist of the agenda wise discussion and decision taken in the meeting are as under.

#### 01.FIXATION OF NORMS / BENCH MARKS FOR DIFFERENT EVOLVED VANYA SILK RACE / BREEDS

The sub-committee after detailed discussion fixed the following norms / bench marks for different economic traits of muga, eri, tropical tasar and oak tasar silkworms (**Table-1**).

**Table-1** : Norms / bench marks fixed for different types of Vanya Silk.

Sl.No	Particulars	Muga	Eri	Tasar			Oak Tasar
				Daba		Sukinda	
				Bi-voltine	Tri-voltine	Tri-voltine	
01	Fecundity (nos)	>150	>350	>220	>220	>215	>150
02	Hatching (%)	>80	>85	>85	>85	>80	>70
03	Missing larvae (%)	NA	<10	NA	NA	NA	NA
04	Pupation (%)	>80	>90	>90	>90	>90	>80
05	Cocoon yield/dfl						
a	By number	>60	>250	>50	>60	>50	>50
b	By weight (g)	>330	>750	>550	>600	>500	>275
06	Cocoon yield/gm						
a	By number	>55	>500	>30	>30	25	40
b	By weight (g)	>300	>1500	>300	>300	225	220
07	ERR (%)	NA	>85	NA	NA	NA	>60
08	Good cocoon (%)	>80	>90	>80	>80	>80	>80
09	Cocoon weight (g)	>5.5	>3	>10	>10	>10	>5.5
10	Shell weight (g)	>0.45	>0.45	>1.5	>1.5	>1.20	>0.6
11	Shell ratio (%)	>8	>14	>15	>15	>15	>11
12	Filament length (mtr)	>400	NA	>900	>700	>700	>600
13	Filament weight (g)	>0.25	NA				>0.30
14	Filament size (d)	>5	NA	<10	<9	<9	<5.5
15	Reelability (%)	>60	NA	>60	>60	>60	>50
16	Raw silk recovery (%)	>60	>80	>60	>60	>60	>60
17	Spun Silk Recovery (%)	NA	>75	NA	NA	NA	NA
18	Boil off loss (%)	NA	<12	NA	NA	NA	NA
19	Non-breakable filament (m)	>100	NA	>200	>200	>200	>200
20	Tenacity of yarn (gm/denier)	NA	>2.5	NA	NA	NA	NA

## 02. DESIGN FOR TESTING AT NATIONAL LEVEL (Table-2)

**Table: 2** Design for Test Rearing of Vanya Silkworm breed / hybrid.

Particulars	Parameters			
	Muga	Eri	Tasar	Oak Tasar
Test centres (nos)	06	06	06	06
Dfls to be supplied (nos) a. Test material b. Control	50 x4 (replication) = 200 50 x4 (replication) = 200	50 x4 (replication) = 200 50 x4 (replication) = 200	50 x4 (replication) = 200 50 x4 (replication) = 200	50 x4 (replication) = 200 50 x4 (replication) = 200
Plantation type	Block	Block	Block	Block
Food plant	Som	Castor	Arjun / Asan	<i>Quercus sp</i> (Oak)
Plants to be used (nos) a. Test material b. Control	450 plants (1 acre) 450 plants (1 acre) Spacing: 3x3 m	8000 plants (2 acres) 8000 plants (2 acres) Spacing: 1x1 m	3350 plants (0.5 ha) 3350 plants (0.5 ha) Spacing: 4x4 m	600 plants (1 acre) 600 plants (1 acre) Spacing : 1.2 x 1.2 m
Rearing design	RBD	RBD	RBD	RBD
Test season (2 crops / year)	Jethua (May-June) Kotia (Oct-Nov)	May-June Sept-Oct	Bivoltine : Sept-Nov Trivoltine : Nov-Jan	Mar-April April-May
Source of dfls	Breeder's station/ Multiplication centre	Breeder's station/ Multiplication centre	Breeder's station/ Multiplication centre	Breeder's station/ Multiplication centre
Egg packing	Egg box	Egg box	Egg box	Egg box
Dfls per box	50	50	50	50
Egg transportation	By person from the breeder's station	By person from the breeder's station/ Flight	By person from the breeder's station	By person from the breeder's station

## 03. IDENTIFICATION OF SUITABLE TEST CENTRES AND CROPS

**Muga silkworm:** The sub-committee identified the following 15 Test Centres of CSB and DoS in Assam, Meghalaya and West Bengal (**Table-3**) for conducting Test Rearing of muga silkworm breed / hybrid. Of these, 6 centres were proposed to be short listed based on the availability of required plantation, infrastructure and manpower. Each of these 6 selected Test Centres will rear 200 dfls of the Test material in 4 replications each with 50 dfls maintaining a control with the commercial stock with equal numbers of dfls in 4 replications in each of the two commercial crops viz. Jethua (May-June) and Kotia (Oct-Nov).



**Table: 3-** Identified CSB and DoS Test Centres in Assam, Meghalaya and West Bengal for Test Rearing of muga silkworm breed / hybrid.

State	District	Test Centres	Test seasons
Assam	Jorhat	CMER&TI, Jorhat	May-June and October-November
	Lakhimpur	REC, Lakhimpur	May-June and October-November
	Kamrup	RMRS, Boko	May-June and October-November
		Ratanpur DoS Farm	May-June and October-November
	Sibsagar	Kachari Pathar DoS Farm	May-June and October-November
	Goalpara	Agja DoS Farm	May-June and October-November
		Baida DoS Farm	May-June and October-November
	Dhemaji	Ghilamara DoS Farm	May-June and October-November
	Dibrugarh	Rangchali DoS Farm	May-June and October-November
	Meghalaya	West Garo Hills	DoS Farm Tura
MSSO P-4 unit, Tura			May-June and October-November
East Garo Hills		MSSO P-4 unit Mendipathar	May-June and October-November
		DoS Resubelpara	May-June and October-November
Ribhoi		DoS Nongpoh	May-June and October-November
West Bengal	REC, Cooch Behar	REC, Cooch Behar	May-June and October-November

**Eri silkworm:** Total 14 Test Centres located in Assam, Nagaland, Meghalaya, West Bengal, Orissa, Madhya Pradesh and Andhra Pradesh were identified for Test Rearing of the evolved "C2" and breed / hybrid of eri silkworm. As in the case of muga, 6 Test Centres were proposed to be sorted out for the Test Rearing in seasons shown in the following table (**Table-4**).

**Table: 4-** Test Centres identified in Assam, Nagaland, Meghalaya, West Bengal, Orissa, Madhya Pradesh and Andhra Pradesh for Test Rearing of "C2" and other breed / hybrids of eri silkworm.

State	District	Test Centres	Test Seasons
Assam	Jorhat	CMER&TI, Jorhat	May-June, Sept-Oct
	Kamrup	Borduar Eri Seed Farm	May-June, Sept-Oct
		Goalpara	Dhanubhanga Govt. Eri Farm
	Kokrajhar	Adabari Govt Eri Farm	July-Aug, Oct-Nov
	Udalgiri	Govt. Eri Farm, Sapekhafi	July-Aug, Oct-Nov
	Karbi-Anglong	REC, Diphu	July-Aug, Oct-Nov
		Sonitpur	
	Dhakuakhana	Eri Seed Grainage, Dhakuakhana	July-Aug, Oct-Nov
Nagaland	Dimapur	Dhansiripar Eri Farm	May-June, Sept-Oct
Meghalaya	Ribhoi	Eri Seed Grainage Nongpoh	May-June, Sept-Oct
West Bengal	Jalpaiguri	Eri Farm Jalpaiguri	May-June, Sept-Oct
Orissa	Bhubaneswar	ESG, Khurda	May-June, Sept-Oct
Madhya Pradesh	Hosangabad	Piperia	May-June, Sept-Oct
Andhra Pradesh	Mehboobnagar	RERS, Shadnagar	Aug-Sept, Oct-Nov

**Tropical Tasar:** The following Test Centres were identified in 9 different states for Test Rearing of Daba (BV), Daba (TV) and Sukinda (TV) breeds of tropical Tasar silkworm. As in the case of muga and eri, 6 suitable centres out of these will be selected for the test rearing (**Table-5**).

**Table: 5-** Test Centres identified for Test rearing of Tropical Tasar Silkworm breed.

Race	States	Test Centres	Season
Daba Bivoltine	Jharkhand	CTR&TI, Ranchi, RTRS, Dumka / REC Hatgaria, PPC Bengabad	September- November
	Chattisgarh	RTRS, Jagdalpur / REC Katghora	
	Orissa	RTRS, Baripada / REC Bangriposi, PPC, Thakurmunda	
	West Bengal	REC, Purulia	
	Andhra Pradesh	RTRS, Warangal / REC Bhadrachalam	
	Maharashtra	RTRS, Bhandara	
	Madhya Pradesh	BSMTC, Balaghat	
	Bihar	BSMTC, Bhagalpur	
	Uttar Pradesh	REC, Robertsganj/Jhansi	
Daba Trivoltine	Jharkhand	RTRS, Dumka/REC Hatgaria	Nov-Jan
	Chattisgarh	RTRS, Jagdalpur / REC Katghora	
	Orissa	RTRS, Baripada / REC Bangriposi, PPC, Thakurmunda	
	West Bengal	REC, Purulia	
	Andhra Pradesh	RTRS, Warangal / REC Bhadrachalam	
	Maharashtra	RTRS, Bhandara	
	Madhya Pradesh	BSMTC, Balaghat	
	Bihar	BSMTC, Bhagalpur	
	Uttar Pradesh	REC, Robertsganj/Jhansi	
Sukinda	Jharkhand	RTRS, Dumka/REC Hatgaria	June-January
	Chattisgarh	RTRS, Jagdalpur / REC Katghora	
	Orissa	RTRS, Baripada / REC Bangriposi, PPC, Thakurmunda	
	West Bengal	REC, Purulia	
	Andhra Pradesh	RTRS, Warangal / REC Bhadrachalam	
	Maharashtra	RTRS, Bhandara	
	Madhya Pradesh	BSMTC, Balaghat	
	Bihar	BSMTC, Bhagalpur	
	Uttar Pradesh	REC, Robertsganj/Jhansi	

**Oak Tasar** : 10 Test Centres were identified for the Test rearing of Oak Tasar breed / hybrid in the states of Assam, Nagaland, Manipur, Uttarakhand, Himachal Pradesh and Jammu & Kashmir during March-April and April-May. It was decided to select 6 suitable centres for conducting Test rearing of the Oak Tasar breed / hybrid (**Table-6**).

**Table: 6-** Test Centres identified for Test rearing of Oak Tasar Silkworm breed / hybrid.

State	District	Test Centre	Season
Assam	Dima Hasao	REC, Umranchi	March-April
Nagaland	Phek	REC, Kikrumba	March-April
Manipur	Imphal	RTRS, Imphal	March-April
	Snapati	REC, Yaikongpao	March-April
	Imphal	DoS Farm, Khonghampat	March-April
	Ukhrul	Hundung, DOS Farm	March-April
Uttarakhand	Nainital	RTRS, Bhimtal	April-May
	Chamoli	REC, Gopeswar	April-May
Himachal Pradesh	Palampur	REC, Palampur	April-May
J & K	Batote	RTRS, Batote	April-May

### 03. TRAINING OF TEST CENTRE SCIENTISTS /TECHNICAL STAFF

The sub-committee decided that the scientists / technical staff of the Test Centres be imparted intensive practical training on silkworm rearing and seed production as well as the modalities of the Test Rearing for a period of 10 days at the following institutes / stations (Table-7).

**Table-7** : Proposed locations for training of Scientists / Technical Staff of Test Centres.

Sl.No	Sector	Location	Duration (days)
01	Muga	CMER&TI, Jorhat and RMRS, Boko	10
02	Eri	CMER&TI, Jorhat and RERS, Mendipathar	10
03	Tropical Tasar	CTR&TI, Ranchi	10
04	Oak Tasar	RTRS, Imphal	10

### 04. MONITORING OF TEST REARING

- ✓ Joint Committee comprising members from CSB and DoS would be formed in each state to monitor the Test Rearing.
- ✓ Breeder should be given access to each Test Centre at any time for monitoring the Test Rearing.
- ✓ A Co-ordinator should be identified for co-ordination of the test for each sector.

### 05. DATA COLLECTION FROM TEST REARING (Table:8)

Sl.No	Characters	Muga	Eri	Tasar	Oak Tasar
1	Fecundity (nos)	Will be provided by the source	Will be provided by the source	Will be provided by the source	Will be provided by the source
2	Hatching (%)	To be recorded by the test centre for each dfl separately (3 days)	To be recorded by the test centre for each dfl separately (3 days)	To be recorded by the test centre for each dfl separately (3 days)	To be recorded by the test centre for each dfl separately (3 days)
3	Pupation (%)	Based on good cocoons harvested	Based on good cocoons harvested	Based on good cocoons harvested	Based on good cocoons harvested
4	Cocoon yield/dfl	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
a	By number	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
b	By weight (g)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
5	Cocoon yield / gm	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
A	By number	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
B	By weight (g)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
6	ERR (%)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
7	Good cocoon (%)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
8	Cocoon weight (g)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
9	Shell weight (g)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre

10	Shell Ratio (%)	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
11	Filament length (mtr)	To be analysed at the CSB institute	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
12	Filament weight (g)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
13	Filament size (d)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
14	Reelability (%)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
15	Raw silk recovery (%)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
16	Spun Silk recovery (%)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
17	Boil off loss (%)	To be analysed at the CSB institute	To be recorded by the test centre	To be recorded by the test centre	To be recorded by the test centre
18	Non-breakable filament length (m)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
19	Tenacity (gm/d)	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute	To be analysed at the CSB institute
20	Meteorological data during the rearing and grainage period	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre
a	Temperature°C Max Min	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre
b	Relative humidity (%) Max Min	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre
c	Rainfall (mm)	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre	To be recorded daily by the test centre

**Application format for Race / Hybrid authorization: Presented at Annexure-II**

## 06.GUIDELINES FOR UNDERTAKING RACE / BREED AUTHORIZATION IN NON-MULBERRY SILKWORM

1. Pre-evaluation of the identified Test Centres Training needs to be done by a committee to assess the plantation and infrastructure before taking up the trial.
2. Grainage parameters like moth emergence, deformed moths, natural mating, oviposition behaviour, cocoon:dfi ratio should be considered by all the test centres.
3. Cent percent moth examination should be done followed by adoption of Centrifugal method to produce dfis.
4. Dfis should be supplied at least two days before hatching with prior information to the centre.
5. Trials should be conducted in different geo-climatic conditions.
6. CSB institutes would take up the lead to plan, organize and execution of the programme.
7. DoS, state Research Institutes and the Universities wherever applicable may associate to execute the programme effectively.
8. The dfis of evolved breed and the control should be from the same source as far as possible.
9. Data should be recorded in the provided format.
10. Testing should be carried out maintaining a control (local popular variety / race) for comparison.
11. Test centres should have sufficient recommended food plants along with the rearing infrastructure.
12. Egg transportation should be carried out either by person or through established courier.
13. Budget provision may be kept for up gradation of the infrastructure facilities in the test centres.
14. A team comprising of a breeder other than the progenitor of the test material, a statistician and a representative of the institute should visit the test centres periodically.
15. The test centres should follow certain periodical guidelines given by the breeder.
16. Assessment of test materials should be based on the benchmark values.
17. After the test is conducted, the concerned breeder / organization must provide the details on the genesis and the local test results in the prescribed format for final notification.
18. The period of test should be intimated to all test centres / breeder's centre with details of programme, requirements, specifications and guidelines for follow up well in advance.

**, Dr.R.K.Rajan**

Director & Chairman,

Race Authorisation Sub-Committee of Vanya Silks,

CMER&TI, Jorhat

FORMAT-I

FORMAT FOR RACE /HYBRID AUTHORISATION FOR NON MULBERRY SILKWORM

To

THE MEMBER SECRETARY  
CENTRAL SILKBOARD  
BTM LAYOUT, MADIVALA  
BANGALORE-560068

NAME OF THE BREEDER(S):

INSTITUTE/STATION/UNIVERSITY:

TYPE OF SILKWORM	ERI	MUGA	TASAR	OAK TASAR
NAME OF RACE/HYBRID				
SUITABLE REARING SEASON				
SPECIAL IDENTIFYING CHARACTERISTICS				
VOLTINISM				
PARENTAL SOURCE				
BREED / HYBRID CHARACTERISTICS				
SUITABLE FOOD PLANT				
REGIONS RECOMMENDED				
NATURE OF REARING				

FORMAT- II

PERFORMANCE OF THE COMMERCIALY EXPLOITED SILKWORM BREED/ECORACES

A. PRE COCOON CHARACTERISTICS

PARTICULERS	ERI	MUGA	TASAR	OAK TASAR
HABITAT (Including climatic conditions: Temperature, humidity, rainfall etc. and seasons: Summer, rainy and winter)				
HABIT				
SUITABLE CLIMATIC CONDITION FOR REARING:				
TEMPERATURE°C				
HUMIDITY (%)				
FECUNDITY				
HATCHING %:				
COLOUR OF NEWLY HATCHED LARVA				
LARVAL TRAITS (BODY COLOUR/MARKED /PLAIN ETC.)				
FEEDING BEHAVIOUR				
MOULTING BEHAVIOUR				
I-III LARVAL INSTAR DURATION				

Days( D:Hr)				
Temperature(°C)				
IV-V LARVAL INSTAR DURATION Days( D:Hr) Temperature(°C)				
TOTAL LARVAL DURATION Days( D:Hr) Temperature(°C)				
WEIGHT OF MATURE LARVA(g)				
LARVAL MORTALITY (%)				
MISSING LARVAE (%)				
SURVIVABILITY (%)				
COCOON YIELD/ DISEASE FREE LAYING(No.)				
GREEN COCOON YIELD /100 DISEASE FREE LAYING(Kg)				
PUPATION RATE (%)				



## B. COCOON CHARACTERISTICS

TRAITS	ERI	MUGA	TASAR	OAK TASAR
SINGLE COCOON WEIGHT(g)				
SINGLE COCOON SHELL WEIGHT(g)				
COCOON SHELL RATIO				
COCOON COLOUR				
COCOON SHAPE				
GRAIN				
LENGTH OF PEDUNCLE				
WEIGHT OF PEDUNCLE				
PUPATION RATE				
SINGLE COCOON FILAMENT LENGTH (m)				
SINGLE COCOON FILAMENT WEIGHT (g)				
DENIER				
REELABILITY(%)				
BOIL-OFF LOSS				
RAW SILK RECOVERY %				
No. OF COCOONS REQUIRED TO PRODUCE 1 Kg RAW SILK				
ABSOLUTE SILK YIELD(g)				

C. EGG PRODUCTION PARAMETERS

TRAITS	ERI	MUGA	TASAR	OAK TASAR
PUPATION RATE(%)				
SPINNING TO EMERGENCE SPAN Days Temperature Humidity				
PUPAL WEIGHT(g)				
EMERGENCE % Day wise				
COUPLING BEHAVIUIOR				
COUPLING % Natural  Artificial				
FECUNDITY(No)				
NUMBER EGGS/GRAM				
EGG LAYING SPAN\				
COCOON:DFL RATIO				
HATCHABILITY (%)				
REMARKS				

Breeders Signature

**Hybrid Authorization Trial of S8 x CSR16,  
A New Bivoltine Silkworm Hybrid in South India  
(AIB 01002 MI; 2015-2020)**

❖ S8 x CSR16, bivoltine single hybrid was developed by crossing S8 with CSR16 at CSRTI, Mysore during 2015. The parental stocks are S8 (Oval) [Parentage: CSR204 x CSR27] & CSR16 (Dumbbell) [Parentage: (C135 x N134) x J14]. A total of 5, 03,550 dfls of S8 x CSR16 were evaluated through large scale field trials among farmers in Southern states in two phases (2015-2018: 2,03,500 dfls & 2018-2020: 3,00,050 dfls). P1 dfls were supplied by CSRTI-Mysuru to NSSO-Bengaluru for seed cocoon generation and commercial seed production. The dfls were distributed to farmers by CSRTI-Mysuru and its nested units in coordination with respective DOSs. The data on S8 x CSR16 performance was recorded including the post-cocoon parameters by CSTRI-Bengaluru.

❖ Performance of S8 x CSR16 in a Nutshell

No. of farmers: 2152

Dfls Tested: 5.04 lakhs

States: Karnataka, Andhra Pradesh, Telangana, Tamil Nadu & Maharashtra

Average cocoon yield: 67.9 Kg /100 dfls (> 80% farmers harvested 60kg and above)

Shell ratio: ~21%

**Renditta: 6.0 – 7.0**

Silk grade: 2A-3A

❖ Details on S8 x CSR16 Performance

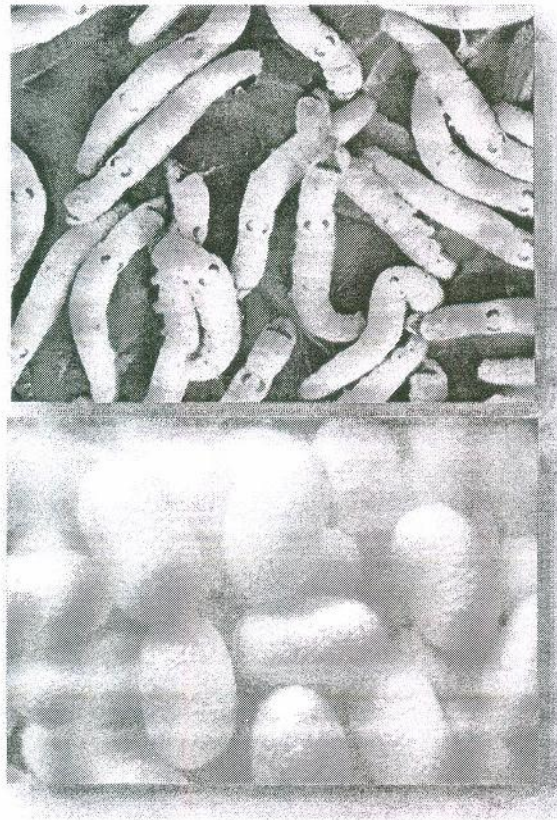
Grainage Performance of S8 x CSR16				
SSPC/Centre	Lots (Nos)	P1 Dfls (Nos)	Hybrid Dfls Production (Nos)	Egg Recovery/ Kg Cocoons (g)
Ramanagaram	12	2685	201750	62.20
Chintamani	2	475	52000	65.92
Hindupur	1	300	21250	56.49
Bangalore	1	270	24150	54.77
CSRTI-Mysore	1	10	900	60.00
<b>Total/Avg.</b>	<b>17</b>	<b>3740</b>	<b>300050</b>	<b>59.88</b>

Performance of S8 x CSR16 (2015-2018 under OFT)						
State	Dfls Tested (Nos)	Farmers (Nos)	Cocoon Yield/ 100 dfls (Kg)	Cocoon Wt. (g)	Shell Wt (g)	Shell Ratio (%)
Karnataka	97950	470	74.02	1.875	0.401	21.40
Andhra Pradesh	50050	190	70.33	1.856	0.402	21.70
Tamil Nadu	55500	249	76.83	1.919	0.403	21.00
<b>Total/ Avg.</b>	<b>203500</b>	<b>909</b>	<b>73.72</b>	<b>1.883</b>	<b>0.402</b>	<b>21.37</b>
CSR2xCSR4 (Control)	48600	261	65.60	1.810	0.380	21.00

Performance of S8 x CSR16 (2018-2020 under Hybrid Authorization Trials)						
State	Dfls Tested (Nos)	Farmers (Nos)	Cocoon Yield/ 100 dfls (Kg)	Cocoon Wt. (g)	Shell Wt (g)	Shell Ratio (%)
Karnataka	152250	642	73.16	1.820	0.403	22.02
		CV%	14.3	6.0	9.3	3.5
Andhra Pradesh	43200	218	67.33	1.722	0.357	20.74
		CV%	4.1	6.1	7.9	3.7
Tamil Nadu	102600	377	70.01	1.746	0.375	21.54
		CV%	5.26	5.46	6.19	3.39
Maharashtra	2000	6	61.10	1.874	0.362	19.30
		CV%	6.0	3.5	0.58	4.09
<b>Total/Avg.</b>	<b>300050</b>	<b>1243</b>	<b>67.88</b>	<b>1.792</b>	<b>0.377</b>	<b>21.06</b>
<b>FC1 x FC2 (Control)</b>	<b>144975</b>	<b>894</b>	<b>68.31</b>	<b>1.768</b>	<b>0.366</b>	<b>21.25</b>

Performance of S8 x CSR16 – Reelability & Silk Quality Parameters (n=22)			
Parameter	Karnataka	Andhra Pradesh	Tamil Nadu
Cocoon Wt. (g)	1.607	1.550	1.463
Shell Wt. (g)	0.354	0.320	0.310
Shell Ratio (%)	22.04	20.64	21.16
Avg. Filament Length (m)	948	783	868
NBFL (m)	803	580	746
Denier	2.74	2.65	2.52
Reelability (%)	85.47	73.00	83.75
Renditta	6.17	7.10	6.50
Raw Silk (%)	15.62	14.3	15.6
Raw Silk Recovery (%)	75.65	68.45	71.32
Winding breaks/10 skeins	2-4	2-5	2-4
Average Size (d)	20.08-22.43	21.09-21.13	19.04-22.56
Standard Size Deviation	1.28-1.58	1.48-1.60	1.27-1.60
Maximum Deviation (d)	1.80-3.20	3.2-3.4	1.90-3.10
Evenness Variation -I (stripes)	60-130	130-140	70-130
Cleanness (%)	96-99	93-94	93-98
Neatness (%)	92-98	90-92	93-97
Tenacity (gpd)	3.7-3.9	3.8-3.9	3.7-4.0
Elongation (%)	18-23	18-18.5	19-23
Cohesion (Strokes)	61-86	61-68	60-75
Grade	2A-3A	2A	2A-3A

S8 x CSR16 – Crop Yield Frequency Distribution (Kg/100 Dfls)								
State	Farmers (Nos)	≤ 40	41-50	51-60	61-70	71-80	81-90	≥ 90
Karnataka	642	2	14	75	190	190	164	7
Andhra Pradesh	218	3	24	55	80	53	2	1
Tamil Nadu	377	0	0	28	177	163	9	0
Maharashtra	6	0	0	3	3	0	0	0
<b>Total</b>	<b>1243</b>	<b>5</b>	<b>38</b>	<b>161</b>	<b>450</b>	<b>406</b>	<b>175</b>	<b>8</b>
<b>Share (%)</b>		<b>0.40</b>	<b>3.06</b>	<b>12.95</b>	<b>36.20</b>	<b>32.66</b>	<b>14.08</b>	<b>0.64</b>



- ❖ S8 x CSR16 overall performance indicates that it is on par with the ruling double hybrid (FC1 x FC2) and better than single hybrid (CSR2 x CSR4).

The new bivoltine single hybrid, S8 x CSR16 is recommended for rearing in all the seasons in South India. This could be an alternative to CSR2 x CSR4 and also in seasons where double hybrid is not utilized. S8 x CSR16 could also be evaluated in other regions of the country.

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