

CONCLUDED PROJECT

1.i. Project code and title : AIB:3545: Authorization Trial of silkworm hybrids in Eastern and North-Eastern India

ii. Names of the Project Investigators : Dr.A.K.Verma, as PI, Dr. N. Suresh Kumar, Dr. A.K.Saha, Dr.Y.Debaraj, RSRS, Jorhat, Dr.N.R.Rao, RSRS, Koraput, Dr.G.B.Singh, REC, Agartala ; Dr.Bidyut Choudhary, REC, Aizawal, Dr.Collin, REC, Shillong ;Dr.Das Mahapatra, REC, Deogargh ;Dr.Ganshyam Singh, REC, Bhandra ;Shri.Ramkumar, REC,Gumla ;Shri.Alok Dutta, REC, Mothabari,Dr.T Dutta Biswas, REC, Kamnagar,;Dr.D.Pandit, REC, MaheshpurRaj ;Dr.Soumen Singh, REC, Imphal. Shri.Lepcha REC, Rangpo

iii. Duration (Date of Start) - (Scheduled Date of Completion)

Date of start : August 2015

Date of completion: March 2018

iv. Name(s) of the Institute(s) and Address : Central Sericultural Research & Training Institute, Berhampore, PIN-742101 Dist.- Murshidabad, West Bengal, India

v. A list of Objectives / Goals : The main objective of the project is to test the hybrids with the farmers of Eastern and North-Eastern India for its authorization

vi. Introduction

In India, silkworm hybrids have been continuously developed and made available for commercial exploitation by many breeders all over India. However, acceptance of new hybrids by the industry depends on its suitability to a particular region or season and its performance over the ruling race/ hybrid. Therefore, to assess the productivity of silkworm hybrids and to judge their suitability to regions/ seasons, hybrids developed by the breeders are being subjected to a system of tests and subsequent authorization for wider popularization in commercial sericulture industry. Authorization of silkworm breeds grants recognition to silkworm breeds for commercial exploitation. It gives authenticity to the organization or the breeder who developed the hybrid a right to popularize the same in the field along with other authorized hybrids. Therefore, there is an urgent need to test these new hybrids with the farmers in the various climatic zones in the Eastern & North Eastern part of India under the administrative and technical control of CSR&TI, Berhampore to find out the suitability of these hybrids for authorization.

vii. Methodology Adopted

- The RSRs, RECs and respective DOSs identified the farmers in their jurisdiction for implementing the programme as per the three different schemes.
- National Silkworm Seed Organization, Bangalore to produce the quantum of testing material to the respective tests centers through its Silkworm Seed Production Centers.
- The quantum of the DFLs of Multi x Bi and Bi x Bi were distributed among them as per their capacity of the sericulture farmers and seasons as depicted in the two different schemes
- The DFLs were supplied free of cost as per plan.
- Disinfectants were supplied to the farmers free of cost.
- Training was given to all the farmers who are involved in the programme
- Field day were conducted after completion of each crop
- Resham Krishi Mela was conducted for the benefit of the farmers involved in the programme.
- Study materials in the form of pamphlets were printed in the respective local languages and distributed to the farmers.
- The respective officer in-charge of the RSRs and RECs will monitor the crop during the rearing of the hybrids with the farmers of their jurisdiction.
- Collection of the rearing data through tests centers of the rearing performance of the particular hybrid at the farmers level alongwith the meteorological data during the entire rearing period
- Three kg cocoons each from three farmers of respective areas were purchased and sent to SETH Malda, West Bengal for assessment of post-cocoon parameter
- The reeled silk of each hybrid were subjected for assessment of post cocoon parameters .
- Feed back data from individual sericulture farmers, seed production units and reelers were collected on the specific format during the programme period.
- The generated data were analysed for identification of region and season specific hybrids for its authorization

Hybrid materials selected for this programme

The newly developed hybrids developed by CSRTI, Berhampore which were found promising at laboratory level are being considered as hybrid materials for the said programme. The hybrids which have been selected is depicted in the Table 1.

Table 1: Selected silkworm hybrids for post authorization trial in the Eastern and North-Eastern zone

Table 1a: Scheme-I : Bi x Bi hybrids

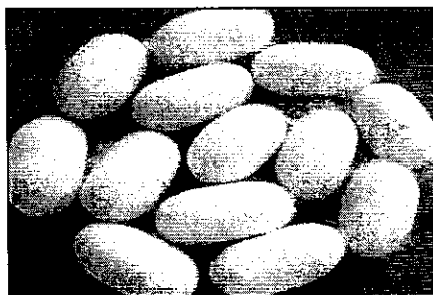
Crop	Hybrid
Falguni (Spring)	B.Con.1 x B.Con.4 SK6 x SK7
Agrahayani (Autunm)	B.Con.1 x B.Con.4 SK6 x SK7

Table 1b: Scheme-II: Multi x Bi hybrids

Crop	Hybrid
Falguni (Spring)	M6DPC x (SK6 x SK7) Nistari x (SK6 x SK7)
Baishaki (Early Summer)	M6DPC x (SK6 x SK7) Nistari x (SK6 x SK7)
Agrahayani (Autunm)	M6DPC x (SK6 x SK7) Nistari x (SK6 x SK7)

Salient features of selected hybrids

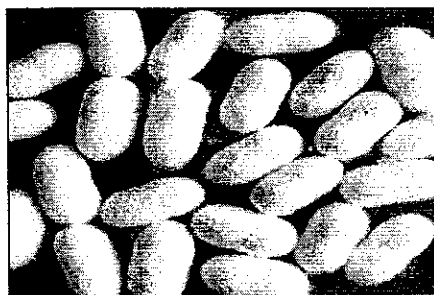
B.Con.1 x B.Con.4



Larvae and cocoons of B.Con.1 x B.Con.4

Parameters	Values
Shell percentage (%)	19.0-20
Filament length (m)	850-900
Renditta	6.5-7.0
Yield/100 dfls (kg)	50.0-55.0
Rearing condition	Temp.24-26°C;Humidity 75-80%(October- March)

SK6 x SK7



Larvae and cocoons of SK6 x SK7

Parameters	Season	
	Unfavourable	Favourable
Fecundity	473	525
Pupation rate (%)	70.50	90.50
Yield/10000Larvae(weight.)	10.100	14.600
Cocoon Weight.(g)	1.316	1.613
Shell percentage (%)	17.30	18.90
Filament length (m)	748	830

M6DPC x (SK6 x SK7)



Larvae and cocoons of M6DPC x (SK6 x SK7)

Parameters	Values
Shell percentage (%)	16.5-17.5
Filament length (m)	650-700
Renditta	9.0-9.5
Yield/100 dfls (kg)	50.0-60.0
Rearing condition	Temp.25-31°C;Humidity 75-80% (October- April)

Nistari x (SK6 x SK7)



Larvae and cocoons of Nistari x (SK6 x SK7)

Parameters	Values
Shell percentage (%)	15.5-16.0
Filament length (m)	600-650
Renditta	8.5-9.0
Yield/100 dfls (kg)	48.0-55.0
Rearing condition	Temp.25-31°C;Humidity 75-80%(October- April)

viii. Observations / Results duly indicating the output in terms of adding to knowledge; know-how / new packages/ practices / processes /products / innovations developed and their utility and advantages; etc.,

Results

Rearing performance in East and North-Eastern regions:

AIB: 3545: The project entitled “Authorization trials of silkworm hybrids in Eastern and North-Eastern India” was completed as per the mile stone. The bivoltine hybrid., B.Con.1 x B.Con.4 with SK6 x SK7 as control and the multivoltine x bivoltine hybrid, M6DPC x (SK6 x SK7) with Nistari x (SK6 x SK7) as control were tested with the farmers of West Bengal, Jharkhand, Odisha, Chattisgarh, Manipur, Assam, Meghalaya, Mizoram, Nagaland and Sikkim for two years seven months covering all the commercial crops of the respective states.

Autumn/Agrahayani 2015

During Autumn, 2015, 29100dfis of only the bivoltine control hybrid SK6 x SK7 were reared in N-E states with a production of about 41.00kg/ 100dfis whereas the average production of the same hybrid/ 100dfis at West Bengal and Jharkhand was 54.69kg after rearing 11300dfis. Also in case of multi x bi, 13000dfis of only control hybrid Nistari x (SK6 x Sk7) was reared in West Bengal with an average production of 46.47kg/ 100dfis.

Table 1. Performance of SK6 x SK7 in North-East Centres

Unit	Target	Hybrids	
		SK6 x SK7	
		Quantity	Yield/100 dfis (kg)
RSRSJorhat	8500	8500	33.7
REC,Agartala	4200	4200	36.0
REC,Aizawl	4500	4500	47.3
REC,imphal	6900	6900	46.5
REC,Shillong	4500	5000	41.3
Total/Avg.	28600	29100	41.0

Table 2. Analysis of variance for bivoltine hybrid (SK6 x SK7) in North East centers

Centers	Mean	Std Dev
Shilong	41.32 ^b	11.43
RSRS Jorhat	33.91 ^d	4.04
Aizawl	47.33 ^a	4.97
Imphal	46.48 ^a	2.12
Agartala	35.97 ^c	8.34
F val	65.84**	

Note: * indicates the significant at 1% level of significance and the super script alphabet indicates the post hoc comparison made by DMRT.

Table 3. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Autumn Crop '15)

Unit	Target	Hybrids	
		N x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)
REC, Mothabari	2900	2900	40.54
REC, MP Raj	700	700	46.64
REC, Kamnagar	2900	2900	57.50
REC, Rajmahal	700	700	44.64
DoT(Seri), Malda	2900	2900	43.00
DoT(Seri), MSD	2900	2900	46.48
Total/Avg.	13000	13000	46.47

Table 4. Analysis of variance for Multi x bi hybrid (N x SK6 x SK7) in WB centers

Centers	Mean	Std Dev
REC, Mothabari	40.54 ^c	1.77
REC, Maheshpur Raj	46.64 ^b	3.27
REC, Rajmahal	44.64 ^{bc}	1.25
REC, Kamnagar	57.52 ^a	10.36
DoT, Murshidabad	46.48 ^b	10.19
DoT, Malda	48.17 ^b	3.74
F val	16.97**	

Note: * indicates the significant at 1% level of significance and the super script alphabet indicates the post hoc comparison made by DMRT.

Table 5. Performance of bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Autumn Crop '15)

Unit	Target	Hybrids	
		SK6 x SK7	
		Quantity	Yield/100 dfls (kg)
REC, Mothabari	4500	4500	52.41
REC, Maheshpur Raj	500	500	51.34
REC, Kamnagar	4500	4500	62.00
REC, Rajmahal	1800	1800	53.00
Total/Avg.	11300	11300	54.69

Table 6. Analysis of variance for bivoltine hybrid (SK6 x SK7) in WB centers

Centers	Mean	Std Dev
REC, Mothabari	52.41 ^b	3.57
REC, Maheshpur Raj	51.34 ^b	5.67
REC, Rajmahal	53.00 ^b	2.00
REC, Kamnagar	61.96 ^a	3.56
F val	97.77**	

Note: * indicates the significant at 1% level of significance and the super script alphabet indicates the post hoc comparison made by DMRT.

Spring/Falguni 2016

During Spring, 2016, 34100dfls of both the bivoltine treatment and control hybrid B.Con.1 x B.Con.4 and SK6 x SK7 were reared in N-E states with a production of 45.28 and 39.07kg/ 100dfls respectively, whereas the average production of only the control hybrid/ 100dfls at West Bengal, Odisha and Jharkhand was 49.67kg after rearing 19300dfls. In case of multi x bi, 10800 dfls of both treatment and control hybrids, M6DPC x (SK6 x SK7) and Nistari x (SK6 x Sk7) were reared in West Bengal and Jharkhand with an average production of 47.66 and 44.38kg/ 100dfls respectively.

Table 7. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Falguni Crop '16)

Unit	Target	Hybrids			
		M6DPC x (SK6 x SK7)		Nistari x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)	Quantity	Yield/100 dfls (kg)
REC,Kamnagar	2900	0	-	2900	51.86
REC,Mothabari	2900	2900	46.00	0	-
REC, Rajmahal	700	700	45.20	0	-
REC, M.P. Raj	700	0	-	700	46.07
DoT(Seri) Malda	2900	2900	45.56	0	-
DoT(Seri),Birbhum	2900	0	-	2900	36.00
DoT(Seri) , MSD	2900	0	-	2900	48.00
DoT(Seri),Nadia	700	0	-	700	42.05
ZSSO, Malda	2900	2900	52.45	0	-
REC, Bhandra	700	700	52.87	0	-
REC, Gumla	700	700	41.27	0	-
Total/Avg.	20900	10800	47.66	10100	44.38

Table 8. Performance of bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Falguni Crop '16)

Unit	Target	Hybrids	
		SK6 x SK7	
		Quantity	Yield/100 dfls (kg)
REC,Kamnagar	4500	4500	54.88
REC,Mothabari	4500	4500	53.50
REC, Rajmahal	1800	1800	54.18
REC, M.P. Raj	500	500	54.12
ZSSO, Malda	5300	5300	54.45
RSRS, Koraput	900	900	39.00
REC, Deogargh	900	900	47.80
REC, Bademaringa	900	900	39.43
Total/Avg.	19300	19300	49.67

Table 9. Performance of bivoltine hybrids in North-Eastern states under Authorization Trial of silkworm hybrids (Falguni/Spring Crop '16)

Unit	Target	Quantity supplied	Hybrids	
			B.Con.1 x B.Con.4 Yield/100 dfls (kg)	SK6 x SK7 Yield/100 dfls (kg)
RSRS Jorhat	9700	9700	42.18	39.42
REC, Agartala	5000	5000	39.60	38.00
REC, Aizawl	4500	4500	48.70	37.60
REC, Imphal	6900	6900	47.80	39.45
REC, Dimapur	1000	1000	46.50	38.24
REC, Shillong	4500	4500	48.17	42.52
REC, Rangpo	2500	2500	44.00	39.00
Total/Avg.	34100	34100	45.28	39.07

Baisakhi 2016

Only multi x bi rearing was undertaken during Baisakhi (April) crop in West Bengal and Jharkhand. 7900 dfls of the treatment and 30200dfls of the control hybrids, M6DPC x (SK6 x SK7) and Nistari x (SK6 x Sk7) were with an average production of 41.54 and 39.00kg/100dfls respectively.

Table 10. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Baisakhi Crop '16)

Unit	Target	Hybrids			
		M6DPC x (SK6 x SK7)		Nistari x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)	Quantity	Yield/100 dfls (kg)
REC, Kamnagar	8000	1200	50.80	6800	50.10
REC, Mothabari	8000	1000	41.04	7000	39.01
REC, Rajmahal	2000	550	42.10	1450	40.20
REC, M.P. Raj	700	150	35.73	550	36.64
DoT(Seri) Malda	8000	1000	40.82	7000	34.62
DoT(Seri), Birbhum	2900	1000	33.48	1900	30.25
DoT(Seri), MSD	2900	1000	50.60	1900	46.00
DoT(Seri), Nadia	1500	1000	36.58	500	33.22
ZSSO, Malda	6000	1000	42.75	5000	41.00
Total/Average	40000	7900	41.54	30200	39.00

Autumn/Agrahayani 2016

During Autumn, 2016, 24600dfis of the bivoltine treatment hybrid B.Con.1 x B.Con.4 and 8700dfis of the control hybrid SK6 x SK7 were reared in N-E states with a production of 45.89 and 43.09kg/ 100dfis respectively, whereas the average production of only the treatment hybrid/ 100dfis at West Bengal, Odisha and Jharkhand was 47.98kg after rearing 19300dfis. In case of multi x bi, 16500 dfis of the treatment hybrid M6DPC x (SK6 x SK7) and 4000dfis of the control hybrids, Nistari x (SK6 x Sk7) were reared in West Bengal and Jharkhand with an average production of 48.78 and 46.23kg/ 100dfis respectively.

Table 11. Performance of bivoltine hybrids in North-Eastern states under Authorization Trial of silkworm hybrids (Autumn Crop '16)

Unit	Target	Hybrids			
		B.Con.1 x B.Con.4		SK6 x SK7	
		Quantity	Yield/100 dfis (kg)	Quantity	Yield/100 dfis (kg)
RSRS Jorhat	8500	8000	40.82	500	40.25
REC, Agartala	4200	4200	40.90	-	-
REC, Aizawl	4500	4000	48.70	500	46.30
REC, Imphal	6900	6400	47.50	500	45.20
REC, Dimapur	2200	2000	43.56	200	43.33
REC, Shillong	4500	-	-	4500	45.50
REC, Rangpo	2500	-	-	2500	41.00
Total/Avg.	33300	24600	45.89	8700	43.09

Table 12. Performance of bivoltine hybrids in West Bengal Jharkhand and Odisha under Authorization Trial of silkworm hybrids (Autumn Crop '16)

Unit	Target	Hybrids	
		B.Con.1 x B.Con.4	
		Quantity	Yield/100 dfis (kg)
REC, Mothabari	4500	4500	51.87
REC, Maheshpur Raj	500	500	47.93
REC, Kamnagar	4500	4500	65.05
REC, Rajmahal	1800	1800	51.31
ZSSO, Malda	5300	5300	58.68
Total/Avg.	16600	16600	54.97
RSRS, Koraput	900	900	41.44
REC, Baremaranga	500	500	40.40
REC, Dhenkikota	1300	1300	41.15
Total/Avg.	2700	2700	41.00
Overall Average	19300	19300	47.98

Table 13. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Autumn Crop '16)

Unit	Target	Hybrids			
		M6DPC x (SK6 x SK7)		Nistari x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)	Quantity	Yield/100 dfls (kg)
REC,Kamnagar	2900	1800	58.07	1100	55.05
REC,Mothabari	2900	2500	45.70	400	45.48
REC, Rajmahal	700	500	46.94	200	43.20
REC, M.P. Raj	900	700	44.64	200	45.05
DoT(Seri) Malda	2900	2500	45.22	400	45.50
DoT(Seri),Birbhum	2900	2500	48.50	400	46.25
DoT(Seri) , MSD	2900	2500	46.00	400	43.00
DoT(Seri),Nadia	1500	1000	52.00	500	49.00
ZSSO, Malda	2900	2500	43.00	400	43.55
Total/Average	20400	16500	48.78	4000	46.23

Spring/Falguni 2017

During Spring, 2017, 33300dfls of only the bivoltine treatment hybrid B.Con.1 x B.Con.4 was reared in N-E states with a production of 48.64kg/ 100dfls, whereas the average production of the treatment and control hybrid/ 100dfls at West Bengal, Odisha and Jharkhand were 55.63 and 53.05kg after rearing 19300 and 1600dfls respectively. In case of multi x bi, 32000 dfls of the treatment hybrid M6DPC x (SK6 x SK7) and 3400dfls of the control hybrids, Nistari x (SK6 x Sk7) were reared in West Bengal and Jharkhand with an average production of 47.45 and 44.03kg/ 100dfls respectively.

Table 14. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Falguni Crop '17)

Unit	Target	Hybrids			
		M6DPC x (SK6 x SK7)		Nistari x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)	Quantity	Yield/100 dfls (kg)
REC,Kamnagar	2900	2500	55.72	400	54.50
REC,Mothabari	2900	2500	48.20	400	41.00
REC, Rajmahal	700	500	48.32	200	41.65
REC, M.P. Raj	700	500	46.33	200	43.95
DoT(Seri) Malda	2900	2500	47.85	400	42.00
DoT(Seri),Birbhum	2900	10500	48.50	400	42.50
DoT(Seri) , MSD	2900	2500	44.25	400	41.98

DoT(Seri),Nadia	700	3500	52.50	200	49.00
ZSSO, Malda	2900	6500	41.50	400	43.25
REC, Bhandra	1400	1000	41.32	400	40.45
Total/Avg.	20900	32000	47.45	3400	44.03

Table 15. Performance of bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Falguni Crop '17)

Unit	Target	Hybrids			
		B.Con.1 x B.Con.4		SK6 x SK7	
		Quantity	Yield/100 dfis (kg)	Quantity	Yield/100 dfis (kg)
REC,Kamnagar	4500	4000	64.24	500	63.70
REC,Mothabari	4500	4000	58.50	500	52.45
REC, Rajmahal	1800	1600	57.06	200	52.00
REC, M.P. Raj	500	400	50.25	100	48.60
ZSSO, Malda	5300	5000	57.25	300	58.80
RSRS, Koraput	900	900	30.00*	-	-
REC, Dhenkikota	900	1300	40.50	-	-
REC, Bademaringa	900	500	20.50*	-	-
Total/Avg.	19300	19300	55.63	1600	53.05

Table16. Performance of bivoltine hybrids in North-Eastern states under Authorization Trial of silkworm hybrids (Falguni/Spring Crop '17)

Unit	Target	Quantity	Hybrids
			B.Con.1 x B.Con.4
			Yield/100 dfis (kg)
RSRS Jorhat	9700	9700	42.00
REC, Agartala	5000	4200	55.00
REC, Aizawl	4500	4500	50.00
REC, Imphal	6900	6900	49.00
REC, Dimapur	1000	1000	46.13
REC, Shillong	4500	4500	49.70
REC, Rangpo	2500	2500	37.00
Total/Avg.	34100	33300	48.64

Baisakhi 2017

31100 dfls of the treatment and 17900dfls of the control hybrids, M6DPC x (SK6 x SK7) and Nistari x (SK6 x Sk7) were reared in West Bengal and Jharkhand with an average production of 42.72 and 39.00kg/ 100dfls respectively in respect of multi x bi hybrids.

Table 17. Performance of multivoltine x bivoltine hybrids in West Bengal and Jharkhand under Authorization Trial of silkworm hybrids (Baisakhi Crop '17)

Unit	Target	Hybrids			
		M6DPC x (SK6 x SK7)		Nistari x (SK6 x SK7)	
		Quantity	Yield/100 dfls (kg)	Quantity	Yield/100 dfls (kg)
REC,Kamnagar	11900	7500	51.80	4400	51.16
REC,Mothabari	10000	6250	43.72	3750	42.56
REC, M.P. Raj	500	350	40.23	150	39.03
DoT(Seri) Malda	8000	5000	45.00	3000	35.00
DoT(Seri),Birbhum	2900	2000	42.50	900	40.00
DoT(Seri) , MSD	7000	5000	42.50	2000	39.50
DoT(Seri),Nadia	2700	1000	50.00	1700	47.50
ZSSO, Malda	6000	4000	41.00	2000	42.87
Total/Average	49000	31100	42.72	17900	39.00

Consolidated Performance Of Bi x Bi at North-Eastern States:

The overall performance of the new bi x bi hybrid B.Con1xB.Con 4 in NE states was significantly better than the control SK6xSK7. The cocoon production/ 100dfls was 48.09 and 43.12kg respectively.

Table 18. Consolidated data on testing of B.con1 x B.con 4 and SK6xSK7 at North Eastern states (Including both Phase-I and Phase II)

Sl. No	Location	B.Con1xB.Con 4		SK6xSK7-check	
		dfls	Cocoons (kg/100 dfls)	dfls	Cocoons (kg/100 dfls)
Phase -I (2014-15)					
1	North Eastern region	5600	48.89*	1400	44.01
Phase-II (2015-17)					
2	North Eastern region	92000	47.29*	37800	42.23
	Grand Total	97600	48.09*	39200	43.12
CD (5%) – 3.61*					

Consolidated Performance Of Bi x Bi at West Bengal, Odisha and Jharkhand:

Here also the overall performance of the new bi x bi hybrid B.Con1xB.Con 4 was significantly better than the control SK6xSK7. The cocoon production/ 100dfis in West Bengal, Odisha and Jharkhand were 57.04 and 54.10kg; 41.50 and 39.40kg and 53.54 and 49.40kg respectively

Table 19. Consolidated data on testing of B.con1 x B.con 4 and SK6xSK7 at West Bengal (including both Phase-I and Phase II)

Sl. No	Location	B.Con1xB.Con 4		SK6xSK7-check	
		dfis	Cocoons (kg/100 dfis)	dfis	Cocoons (kg/100 dfis)
Phase -I (2014-15)					
1	West Bengal	4000	54.62*	1000	53.05
Phase-II (2015-17)					
2	West Bengal	14300	55.28*	14300	51.42
		14300	58.53*	1300	54.55
		13000	60.00*	1300	57.32
	Grand Total	45600	57.14*	17900	54.10
CD (5%) – 2.48*					

Table 20. Consolidated data on testing of B.con1 x B.con 4 and SK6xSK7 at Odisha (Including both Phase-I and Phase II)

Sl. No	Location	B.Con1xB.Con 4		SK6xSK7-check	
		dfis	Cocoons (kg/100 dfis)	dfis	Cocoons (kg/100 dfis)
Phase -I (2014-15)					
1	Odisha	2000	42.57	500	41.21
Phase-II (2015-17)					
2	Odisha	2700	42.08	2700	40.38
		2700	41.00	600	38.52
			40.50	600	37.41
	Grand Total	45600	41.50	17900	39.4
CD (5%) – NS					

Table 21. Consolidated data on testing of B.con1 x B.con 4 and SK6xSK7 at Jharkhand (Including both Phase-I and Phase II)

Sl. No	Location	B.Con1xB.Con 4		SK6xSK7-check	
		dfis	Cocoons (kg/100 dfis)	dfis	Cocoons (kg/100 dfis)
Phase-I (2014-15)					
1	Jharkhand	1600	56.52*	400	51.04
Phase-II (2015-17)					
2	Jharkhand	2300	54.15*	2300	51.17
		2300	49.62*	300	45.21
		2000	53.65*	300	50.10
	Grand Total	8200	53.54*	17900	49.40
CD (1%) – 2.74"					

Consolidated Performance of Multi x Bi at West Benga and Jharkhand:

The overall performance of the new multi x bi hybrid M6DPC x (SK6xSK7) was significantly better than the control N x SK6xSK7 at West Benga and Jharkhand. The cocoon production/ 100dfis were 47.96 and 44.37kg and 45.91 and 41.93kg respectively.

Table 22. Consolidated data on testing of M6DPC x (SK6xSK7) and N x (SK6xSK7) at West Bengal (Including both Phase-I and Phase II).

Sl. No	Location	M6DPC x SK6xSK7		N X SK6xSK7	
		dfis	Cocoons (kg/100 dfis)	dfis	Cocoons (kg/100 dfis)
Phase-I (2014-15)					
1	West Bengal	99000	50.76	30000	46.89
Phase-II (2015-17)					
2	West Bengal	46700	45.81**	57450	42.41
		15300	48.55**	3600	45.83
		30000	45.92**	2600	44.33
	Grand Total	191000	47.96**	93650	44.37
CD (1%) – 0.71"					

Table 23. Consolidated data on testing of M6DPC x (SK6xSK7) and N x (SK6xSK7) at Jharkhand (Including both Phase-I and Phase II).

Sl. No	Location	M6DPC x SK6xSK7		N X SK6xSK7	
		dfis	Cocoons (kg/100 dfis)	dfis	Cocoons (kg/100 dfis)
Phase -I (2014-15)					
1	Jharkhand	6400	47.19	2100	45.25
Phase-II (2015-17)					
2	Jharkhand	3150	41.93*	4250	40.60
		1200	46.79*	400	42.12
		2000	47.72*	800	41.08
Grand Total		12750	45.91*	7550	41.93
CD (5%) - 4.74'					

When all the findings of different states for bi x bi and multi x bi was analysed, it was observed that both the hybrids have shown an enhanced production of 7.76% and 8.99% respectively against their control.

Table 24. Consolidated data on testing of B.con 1 x B.con 4 and M6DPC x (SK6xSK7) for considering them towards their authorization (Including both Phase-I and Phase II).

S L	Location	B.con1xB.con 4 (Dfls)		SK6xSK7		M6DPCx (Sk6xSK7)		N x (Sk6xSK7)	
		dfis	Cocoon (kg/100 dfis)	dfis	Cocoons(kg/100 dfis)	dfis	Cocoons(kg/100 dfis)	dfis	Cocoons(kg/100 dfis)
1	West Bengal	45600	56.92* (5.54%)	16600	53.93	191000	47.96** (8.09%)	93650	44.37
2	Odisha	10100	41.61 (3.05%)	2700	40.38	No multi x bi rearing			
3	Jharkhand	8200	53.54* (5.45%)	3000	50.77	12750	45.91** (9.49%)	7550	41.93
	North-East region	145600	48.17* (12.49%)	39200	42.82	No multi x bi rearing			
	Grand Total	209500	50.68* (7.89%)	62000	46.97	203750	47.03	101200	43.15
t statistics - 6.59**						t statistics - 4.29**			

Figure in parenthesis denotes gain % over control

Reeling performance of silkworm hybrids tested under Authorization Trail project (AIB: 3545):

Cocoon samples of all the hybrids under trail were purchased from farmers after completion of each crop and was subjected for reeling analysis by the private reeler through out sourcing. The data was analyzed by SCTH Malda. The average performance of all the crops is given as under.

Table 25. Reeling Character of test hybrids

Name	Season	Filament Length (m)	Filament size (d)	Reelability (%)	Raw Silk	Neatness
B.Con.1 x B.Con.4	Autumn (Oct.- Nov.)	780 - 832	2.69	87.0	13.30	88.72
	Spring- Feb-March	790- 865	2.52	88.24	13.65	90.0
SK6 x SK7	Autumn (Oct. - Nov.)	700 -750	2.71	85.1	12.8	86.0
	Spring- Feb-March	748 - 800	2.81	85.4	13.0	86.5

Table 26. Reeling Character of test hybrids

Name	Season	Filament Length (m)	Filament size (d)	Reelability (%)	Raw Silk	Neatness
M6DPC x (SK6 x SK7)	Autumn (Oct. - Nov.)	665	2.85	82.3	12.85	88.0
	Spring- Feb-March	702	2.48	86.3	12.90	86.0
Nistari x (SK6 x SK7)- Check	Autumn (Oct. - Nov.)	550	2.75	80.4	10.5	80.5
	Spring- Feb-March	600	2.88	82.2	10.9	84.0

Grainage performance of test hybrids

The grainage performance the test hybrids at various SSPCs of NSSO is as given below:

Table 28. Grainage performance of test hybrids

SSPC	Actual cocoons procured			Pairs	Dfls	Pairs %	Dfls %	Egg yield	
	By No.	By wt.	Cocoon per kg (No.)					Total (g)	Per kg cocoon (g)
B.Con.1 x B.Con.4									

Malavalli	521200	783.76	665	200140	178250	38.4	34.2	45630	58.22
SK6 x SK7									
K.R.Nagar	492254	715.48	688	199953	189025	40.62	38.4	42257	61.42

Table 29. Grainage performance of test hybrids

SSPC	Actual cocoons procured			Pairs	Dfls	Pairs %	Dfls %	Egg yield	
	By No.	By wt.	Cocoon per kg (No.)					Total (g)	Per kg cocoon (g)
M6DPC x (SK6 x SK7)									
Ramnagara	352795	405.53	870	128850	96200	36.52	27.3	30482	75.17
N x (SK6 x SK7)									
Hindupur	586233	627.80	934	225650	208450	38.49	35.6	45213	72.02

ix. Discussion

Eastern India, especially the state of West Bengal experiences extreme variation in temperature, relative humidity and rainfall. According to climatic conditions, the commercial seasons are broadly divided into two, favourable and unfavourable. The former falls between October to March, when the climatic conditions are congenial for silkworm rearing. Autumn (Nov) and Spring (Feb) crops come during this period. April (Baisakhi), commercial crop is also considered as partially congenial for silkworm rearing in terms of prevalence of low humidity. On the other hand, the unfavourable period with prevailing high temperature and humidity conditions starting from May to September are not conducive for silkworm rearing of June-July (Shravani) and Aug-Sep (Badhuri & Aswina) crops. Because of high temperature and humidity as well as rainfall, most of the rearers are compelled rear indigenous breed, Nistar, which is very low productive with poor quality. But suitable multi x bi hybrid can successfully be reared during autumn and spring seasons of the plains, which could increase the silk production. The present study has corroborated the idea that new hybrids other than Nistari based hybrids can successfully be reared in West Bengal and similarly new bivoltine hybrids in North –Eastern states and during favourable seasons in West Bengal can also be reared successfully.

x. Inference / Recommendations

Based on the overall performance at farmers field, during favourable seasons (Agrahayani, Falguni and Baishaki) it is recommended to rear the multivoltine hybrids, M6DPC x (Sk6 x SK7) in West Bengal and Jharkand states. With regard to bivoltine hybrids, it was recommended to rear B.Con.1 x

B.Con.4 in West Bengal, Jharkand North Eastern states. Both the hybrids have been authorized by HAC of Central Silk Board on 19.02.2018.

xiv. Summary

In India, earlier the race authorization programme was conducted with very limited quantity of the test hybrids in different state and central government farms. Of late, it was felt that testing of limited quantity of the test hybrids will not reflect the real performance of the hybrids. Therefore, it was decided to test large quantity (2 lakh dfls of the test hybrids) at the farmers level and based on the performance hybrids will be authorized in respective zones. Hence, this programme has been formulated to give a new shape and impetus to the sericulture industry for the Eastern & North Eastern Zone. Authorisation of both the hybrids has given a major relief to the sericulture industry of the states.

XV. Budget and Expenditure detail:

Sl.No.	Item	Amount
1	Cost of dfls (including airlifting charges)	1924091
2	Cost of cocoon samples	369383= 00
3	Cost of Labex/ Vijetha	876966
4	Cost of Bleaching Powder	595309
9	Cost for reeling (Outsourcing)	72135=00
10	Travel	182930
11	Contingency	197397
Total (Phase-II)		4218211=00
Total (Phase-I)		28,26,291=00
Phase-I+ Phase-II(Budget-72,00000) Total:		7044502=00
Unspent Amount		155498=00

xvi. CERTIFICATE

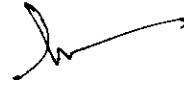
Certified that the study has been carried out and financial expenditure incurred for executing the study are in accordance with the declaration/certification unknotted at the time of submission of the proposal and sanction obtained from the central office.

Signature of the Principal Investigator and Co-investigator(s):



Signature of Principal Investigator (PI)

Dr. A. K. Verma, M.Sc., Ph.D.
Senior Scientist
In-charge, Sericulture Section
Ministry of Textiles, Government of India
Berhampore, West. B.

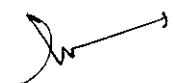


Signature of Director *v/c*

निदेशक / Director *v/c*
केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
Central Sericultural Research & Training Institute
केन्द्रीय रेशम बोर्ड/Central Silk Board
बहरमपुर-742101, Berhampore-742101
मुर्शिदाबाद(प.वं.)/Murshidabad (W.B.)

Signature (with comments, if any) of Director / Executive authority

The project has been concluded without any deviation of milestones and obtained the results as per the objectives proposed. Based on the overall performance, both qualitative & quantitative, at farmers level during different seasons both the hybrids, i.e., Multi x Bi - M6DPC x (SK6 x SK7) and Bi x Bi - B.Con.1 x B.Con.4 have been authorized for Eastern and North Eastern states by Hybrid Authorization Committee.



DIRECTOR V/c
CSR&TI, BERHAMPORE
(Office seal)

निदेशक / Director V/c

केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान
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Comments of the 48th RAC of CSR&TI Berhampore::

Observations/ Suggestions of RAC	Action taken
The performance of newly developed hybrids should be evaluated by supplying additional dfls at different locations and seasons, if possible.	Additional dfls of B.Con.1 x B.Con.4 has been supplied to RSRS, Jorhat, RSRS-Koraput, DOS-Murshidabad, DOS-Malda, DOS-Uttarakhand, REC-Mothabari during different seasons. The range of cocoon production per 100dfls was 50 to 60kg as reported.
Cocoon price per kg and economic analysis should be presented to reflect the advantage of adoption of new hybrids.	There are no much difference between treatment and control cocoon rate. In case of M x B it is Rs.10/- to 20/- and in B x B Rs.20- to 40/- per kg. But an increased production of 5 to 10 kg more cocoons fetch about Rs.2000/- to Rs.4000/- more in per 100dfls cocoon production.