

Evaluation of different strains of mulberry silkworm and eri silkworm for the development of sericulture in Punjab

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ABSTRACT

The present study was conducted to evaluate different strains of mulberry silkworm and eri silkworm for the development of sericulture in Punjab during autumn and spring season. During autumn and spring season seeds of different strains of mulberry silkworm and eri silkworm were procured from Zonal Sericulture Seed Organization, Central Silk Board, Majra, Dehradun (Uttanchal) for further rearing and evaluation. The findings of the study revealed that Based on the larval period, green cocoon weight and dry cocoon weight, it can be concluded that during autumn season SxN hybrid performed better as compared to NxS, D22xD6 and D6xD22. Similarly SH₆ strain performed better as compared to NB₄D₂ during autumn season under Punjab conditions. During spring season, SH6 performed better as compared NB4D2, Doon 6 and Doon 22. In case of hybrids FC2 x FC1 and RSJ3 x RSJ1 performed better as compared other hybrids under Punjab conditions.

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Key words : Sericulture, Mulberry silkworm, Eri silkworm

INTRODUCTION

Sericulture is an agro-based cottage industry in India. It is highly labour consuming, needs less investment and inturn generates more employment and profit. It is broadly classified into two distinct types viz., mulberry and non mulberry sericulture which includes tasar, eri and muga culture.

Silkworm (*Bombyx mori* Linnaeus) is a well known insect of economic importance for production of silk, 'The Queen of Textiles'. Sericulture was introduced in India about 2000 years ago and the silkworm producing yellow silk was known since the ancient time (Mukherjee, 1912).

India which is the second largest producer of silk after China, gifted with favourable climate and rich sericulture fauna has a unique distinction of producing all the four commercial varieties of silk namely mulberry, tassar, eri and muga of which the first alone accounts for about 90 per cent of the total production. In India, which accounts for 13.5 per cent of the total silk production in the world, the mulberry silk is chiefly produced in five states viz., Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu and Kashmir.

The main deterrents of the silk quality and quantity are climatic conditions and silkworm races. In India, less number of good quality hybrids/races of silkworm is available. Punjab has good potential of producing bivoltine silk and there is scope of expansion of sericulture from sub-mountainous region to other regions of the state as

well. So keeping all in view, the present study evaluation of different strains of mulberry silkworm and eri silkworm for the development of sericulture in Punjab was conducted with the following objectives: Evaluation of different bivoltine races/hybrids of mulberry silkworm, *Bombyx mori* Linn, Evaluation of eri silkworm, *Philosamia cynthia ricini* (Boisduval) under Punjab conditions and Food consumption by different races/hybrids of mulberry silkworm and eri silkworm.

MATERIALS AND METHODS

Under Punjab conditions, the bivoltine races (two generations/year) of mulberry silkworm are being reared, one during autumn season (Aug.-Sep.) and second during spring season (Feb. – April). But major silk contribution is from spring season crop.

During spring season seeds of four races namely SH₆, NB₄D₂, Doon 6 and Doon22 and twelve hybrids viz., SH₆ x NB4D2, NB4D2 x SH6, Doon22 x Doon6, Doon6 x Doon22, FC1 x FC2, FC2 x FC1, CSR2 x CSR4, CSR4 x CSR2, CSR50 x CSR51, CSR51 x CSR50, RSJ3 x RSJ1 and CSR4 x SH6 were procured from Zonal Sericulture Seed Organization, Central Silk Board, Majra, Dehradun (Uttanchal) for further rearing and evaluation.

Evaluation of different bivoltine races/hybrids of mulberry silkworm:

Under Punjab conditions, the bivoltine races/hybrids

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(two generations/year) of mulberry silkworm are being reared, one during autumn season (Aug.-Sep.) and second during spring season (Feb.- April). But major silk contribution is from spring season crop. The available races/hybrids were procured and evaluated during both seasons.

RESULTS AND DISCUSSION

The results of the present study as well as relevant discussion have been presented under the following sub heads:

Spring season rearing:

Mulberry silkworm races:

During spring season seeds of four races namely, SH₆, NB₄D₂, Doon 6 and Doon22 were procured from Zonal Sericulture Seed Organization, Central Silk Board, Majra, Dehradun (Uttranchal) for further rearing and evaluation. The eggs of mulberry races were received during last week of February and hatching was started on 5th March.

Leaves from mulberry trees grown at Honey Bee Farm, Department of Entomology and mulberry garden were used as food for mulberry silkworm. The mulberry plants were a mixture of various varieties like Punjab local, Kanva-2 and S146. The eggs of eri silkworm hatched on 10th February and cocoon formation finished on 21st March (Table 1).

Table 1 : Comparative performance of different races of mulberry silkworm and eri silk worm

Races	Larval period (Days)	Green cocoon weight (g/10 cocoons)	Dry cocoon weight (g/10 cocoons)
SH6	47.56	4.05	0.85
NB4D2	51.27	3.98	0.80
DOON 6	49.26	2.94	0.47
DOON 22	50.26	3.21	0.55

During spring season, the longest larval period was observed in NB4D2 (51.27 days) followed by Doon 22 (50.26 days), Doon 6 (49.26 days) and SH6 (47.56 days). The highest green cocoon weight was observed in SH6 (4.05 g/10 cocoons) followed by NB4D2 (3.98 g/10 cocoons), Doon 22 (3.21 g/10 cocoons) and Doon 6 (2.94 g/10 cocoons).

SH6 yielded the maximum dry cocoon weight (0.85 g/10 cocoons) followed by NB4D2 (0.80g/10 cocoons) and Doon 22 (0.55 g/10 cocoons). The minimum dry cocoon weight was recorded in Doon 6 (0.47 g/10

cocoons). Based on the larval period green cocoon weight and dry cocoon weight, it can be concluded that SH6 performed better as compared NB4D2, Doon 6 and Doon 22 during spring season under Punjab conditions.

Mulberry silkworm hybrids:

During spring season, twelve hybrids viz., SH6 x NB4D2, NB4D2 x SH6, Doon22 x Doon6, Doon6 x Doon22, FC1 x FC2, FC2 x FC1, CSR2 x CSR4, CSR4 x CSR2, CSR50 x CSR51, CSR51 x CSR50, RSJ3 x RSJ1 and CSR4 x SH6 were procured from Zonal Sericulture Seed Organization, Central Silk Board, Majra, Dehradun (Uttranchal) for further rearing and evaluation (Table 2).

Table 2 : Comparative performance of different hybrids of mulberry silkworm

Hybrids	Larval period (Days)	Green cocoon weight (g/10 cocoons)	Dry cocoon weight (g/10 cocoons)
SH6 x NB4D2	36.89	6.32	1.10
NB4D2 x SH6	36.71	5.37	0.86
DOON6 x DOON22	35.66	4.66	0.70
DOON 22 x DOON6	35.47	5.12	0.92
FC1 x FC2	36.70	6.19	98.00
FC2 x FC1	36.51	7.20	1.43
CSR2 x CSR4	35.39	6.77	1.11
CSR4 x CSR2	35.23	6.54	1.16
CSR50 x CSR51	37.56	6.52	1.15
CSR51 x CSR50	36.47	6.43	1.13
RSJ3 x RSJ1	37.28	7.00	1.32
CSR4 x SH6	34.19	5.92	0.99

The data in Table 2 and Fig. 2 show that longest larval period was observed in CSR50 x CSR51 (37.56 days) and RSJ3 x RSJ1 (37.28 days) followed by SH6 x NB4D2 (36.89 days), NB4D2 x SH6 (36.71 days), FC1 x FC2 (36.70 days), FC2 x FC1 (36.51 days), CSR51 x CSR50 (36.47 days), Doon6 x Doon22, (35.66 days) Doon22 x Doon6 (35.47 days), CSR2 x CSR4 (35.39 days), CSR4 x CSR2 (35.23 days) and CSR4 x SH6 (34.19 days), respectively.

The highest green cocoon weight was observed in FC2 x FC1 (7.20 g/10 cocoons), followed by RSJ3 x RSJ1 (7.00g/10 cocoons), CSR2 x CSR4 (6.77 g/10 cocoons), CSR4 x CSR2 (6.54 g/10 cocoons), CSR50 x CSR51 (6.52 g/10 cocoons), CSR51 x CSR50 (6.43 g/10 cocoons), SH6 x NB4D2 (6.32 g/10 cocoons), FC1 x FC2 (6.19 g/10 cocoons), CSR4 x SH6 (5.92 g/10 cocoons), NB4D2 x SH6 (5.37 g/10 cocoons), Doon22 x Doon6 (5.12 g/10 cocoons) and Doon6 x Doon22 (4.66 g/10 cocoons), respectively (Fig. 2).



Fig. 1 : Rearing of different hybrids of mulberry silkworm



Fig. 2 : Cocoons of hybrids mulberry silkworm

The maximum dry cocoon weight was recorded in FC2 x FC1 (1.43 g/10 cocoons) and RSJ3 x RSJ1 (1.32 g/10 cocoons) followed by CSR4 x CSR2 (1.16 g/10 cocoons), CSR50 x CSR51 (1.15 g/10 cocoons), CSR51 x CSR50 (1.13 g/10 cocoons), CSR2 x CSR4 (1.11 g/10 cocoons), SH6 x NB4D2 (1.10 g/10 cocoons), CSR4 x SH6 (0.99 g/10 cocoons), FC1 x FC2 (0.98 g/10 cocoons), Doon22 x Doon6 (0.92 g/10 cocoons).

The minimum dry cocoon weight was recorded in NB4D2 x SH6 (0.86 g/10 cocoons), Doon6 x Doon22 (0.70 g/10 cocoons). Based on the larval period green cocoon weight and dry cocoon weight, it can be concluded that the FC2 x FC1 and RSJ3 x RSJ1 performed better as compared other hybrids.

Evaluation of eri –silkworm, *Philosamia cynthia ricini* (Boisduval):

The performance of eri silkworm, *Philosamia cynthia ricini* (Boisduval) was studied during the period from August 2008-March 2009.

In July, 2008 the eggs of eri silkworm were procured from the Eri Silkworm Seed Production Centre, Dehradun.

The eggs were kept in Petri dishes having moist paper at bottom and covered with fresh young leaves of castor. The newly hatched larvae were shifted to rearing trays and were fed with young leaves of castor. Most of the larvae (> 90%) died at immature stage due to some mysterious disease, the identity of which could not be established even by Dehradun centre. A small percentage of larvae could survive. Again in August the eggs were procured from same source and further rearing was initiated (Table 3).

Table 3 : Performance of eri silkworm from August 2008-March 2009 under Punjab conditions

Generation	Period	Duration (days)
I	03 Aug.– Sept. 15	43
II	Sep. 16- Nov. 14	60
III	Nov. 15-Feb. 9	86
IV	Feb. 10-Mar. 21	40

The eri –silkworm completed four continuous generations from August 2008-March 2009, so the life cycle was completed four times (Table 3). The smallest life cycle (40 days) was recorded during 10 Feb -21 Mar (fourth generation). Second generation was of 60 days (Sept- Nov). During winter months the life cycle was prolonged and it was 86 days during Nov-Feb (third generation).

Food consumption by different races/hybrids of mulberry silkworm and eri silkworm:

The data in Table 4 indicates the food consumption by different races/hybrids of mulberry silkworm and eri silkworm. The data shows that food consumption by mulberry races was higher than mulberry hybrids. The maximum food consumption was observed in SH6 (47.14) followed by Doon 6 (45.95), Doon 22 (44.98) and NB4D2 (41.42).

The maximum food consumption in case of mulberry hybrids was recorded in CSR50 x CSR51 (36.78) followed by FC1 x FC2 (36.68), Doon6 x Doon22 (36.32), NB4D2 x SH6 (36.17), FC2 x FC1 (36.05), RSJ3 x RSJ1 (35.31), CSR51 x CSR50 (35.29), CSR4 x CSR2 (34.43), Doon22 x Doon6 (34.07), SH6 x NB4D2 (32.87), CSR2 x CSR4 (32.07) and CSR4 x SH6 (31.42).

Food consumption by Eri silkworm during the fourth generation (Feb. March) varied from 31.92 to 17.26 g leaves per larva and mean food consumption was 26.10g/ larva

Conclusion:

During spring season, SH6 performed better as

Table 4 : Food consumption by different races/hybrids of mulberry silkworm and eri silkworm during whole life cycle

Kinds of silkworm	Races or hybrids	Leaf consumption (g)/10 larvae					Mean
		R1	R2	R3	R4	R5	
Mulberry races	SH6	43.08	55.09	51.09	46.33	40.12	47.14
	NB4D2	36.96	44.94	34.15	45.75	45.30	41.42
	DOON 6	42.56	50.09	42.32	55.23	39.56	45.95
	DOON22	46.22	51.23	38.97	44.05	42.37	44.98
Mulberry silkworm hybrids	SH6 x NB4D2	31.11	32.45	40.55	30.25	29.99	32.87
	NB4D2 x SH6	35.92	33.56	42.16	28.99	40.22	36.17
	DOON6 x DOON22	35.56	31.26	41.78	31.45	41.56	36.32
	DOON 22 x DOON6	34.37	34.13	29.99	29.99	41.87	34.07
	FC1 x FC2	36.67	35.45	29.98	45.65	35.67	36.68
	FC2 x FC1	32.19	32.25	42.25	39.65	33.92	36.05
	CSR2 x CSR4	32.57	32.54	31.69	30.98	32.57	32.07
	CSR4 x CSR2	40.23	35.68	29.97	34.29	31.98	34.43
	CSR50 x CSR51	35.87	33.56	42.16	32.12	40.22	36.78
	CSR51 x CSR50	33.36	35.62	33.58	32.68	41.25	35.29
	RSJ3 x RSJ1	32.19	32.25	42.25	35.96	33.92	35.31
CSR4 x SH6	32.32	29.54	28.54	32.46	34.26	31.42	
		Leaf consumption (g)/ larvae					
Eri silk worm		17.26	25.77	31.92	26.82	28.76	26.10

compared NB4D2, Doon 6 and Doon 22. In case of hybrids FC2 x FC1 and RSJ3 x RSJ1 performed better as compared to other hybrids under Punjab conditions. The eri –silkworm completed four continuous generations from August 2008-March 2009. During winter months the life cycle was prolonged and it was 86 days during Nov-Feb (third generation). The maximum food consumption was observed in SH6 followed by Doon 6, Doon 22 and NB4D2. The maximum food consumption in case of mulberry hybrids was recorded in CSR50 x

CSR51(36.78) followed by other hybrids. So it was concluded that SH₆, SH6xNB4D2, FC2 x FC1 and RSJ3 x RSJ1 performed better under Punjab condition.

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