

Original Research Article

Studies of the Biology and Economic Traits of Mulberry (*Bombyx mori* L.) Single CSR Hybrids on V-1 Mulberry Variety

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ABSTRACT

The experiment was conducted at Sericulture Research Unit, V.N.M.K.V, Parbhani, during 2019-20 laid in Randomized Block Design with eight treatments, replicated thrice. Disease free laying's of silkworm hybrids ($CSR_2 \times CSR_4$), ($CSR_{16} \times CSR_{17}$), ($CSR_{50} \times CSR_{51}$), ($S_8 \times CSR_{16}$), SHP₂, SHR₁, DHR₄, DHP₅ procured from Central Sericulture Research & Training Institute, Mysore was used as test hybrid against mulberry variety V-1, in present investigation. During study it was observed that hatching percentage were significantly highest in hybrid SHR₁(98.00 per cent), Minimum larval duration were observed in DHP₅ (21.49 day), weight of ten mature larvae was significantly superior in hybrid SHP₂ (38.712 g), In single cocoon weight hybrid SHR₁ (1.192 g) has shown superior performance followed by The hybrid $CSR_{50} \times CSR_{51}$ (0.267 g) recorded highest shell weight (g), The shell ratio (%) was higher in hybrid $CSR_{50} \times CSR_{51}$ (22.96 per cent) followed by SHP₂ (21.65 per cent). The hybrids DHR₄ (978.33 m), SHR₁(970 m), $CSR_{16} \times CSR_{17}$ (966.67 m) superior performance in filament length (m), hybrid $CSR_{16} \times CSR_{17}$ (0.334 g), $CSR_{50} \times CSR_{51}$ (0.306 g) recorded significantly higher filament weight, the denier value and cocoon yield/10,000 larvae brushed, moth emergence were superior in hybrid $CSR_{16} \times CSR_{17}$ (3.12) and (17.517 kg), (95.33 per cent) respectively. Highest ERR was observed in SHR₁ (94.33 per cent), $CSR_{16} \times CSR_{17}$ (93.72 per cent).

Keywords

Bivoltine Hybrids,
Economical,
Biological Traits,
V-1

Introduction

Silk is the most elegant textile in the world with unparalleled grandeur, natural sheen and inherent affinity for dyes, high absorbance, light weight, soft touch and high durability silk is known as the "Queen of Textiles" in the world. Sericulture industry combines the attributes of both agriculture and industry. It comprises three distinct activities viz. cultivation of mulberry, rearing of silkworms

and reeling of cocoons. The golden yellow coloured Muga silk is produced only in Assam throughout the world. In India silk producing states are Karnataka, Andha - Pradesh, West Bengal, Tamil Nadu, Jammu Kashmir, Bihar, Madhya Pradesh and Uttar Pradesh. Out of these Karnataka produce 45% of the countries total raw silk production and 1strank in India. Out of these three activities cultivation of mulberry and rearing of silkworms comes under agricultural sector

and the reeling of silkworm cocoon under industrial sector. Anonymous (2017)^[1]

India is the largest consumer of natural silk in the world and the demand for silk is consistently increasing in the country. As a result, the demand- supply gap is widening in mulberry raw silk. Hence, there is an urgent need to improve the production, productivity and quality of Indian silk for meeting the import substitute for domestic market and compete in the international market especially in the changing scenario of global trade. Among the Sericultural countries, India stands second in the production of silk. (Murali *et al.*, 2018^[8]). Sericulture plays a key role in the up-liftment of rural population both socially and economically. In the past two decades various technologies have been developed both in the improvement of mulberry yield and silkworm rearing technology by the efforts of scientists in order to overcome the constraints and boost the silk production of the country. India has strong sericultural base with enormous potential for boosting silk production. In India's context, stability of double cross hybrid with higher survival is more relevant than higher productivity under prevailing situation. The stability of bivoltine crop was not achieved mainly due to climate, rearing technology and socio- economic conditions. This necessitated evolution and evaluation of the double cross hybrid silkworm breeds for increased cocoon and gradable raw silk production (Joge *et al.*, 2003)^[2].

In India, about 97% of the raw mulberry silk was produced in the five Indian states namely Karnatak, Andra-Pradesh, Tamil Nadu, West Bengal and Jammu & Kashmir. (Mulberry cultivation and utilization in India 2016-17). Where Maharashtra produces 373 MT silk in year 2017-18. Sericulture is well established agro based industry, which is cost effective and remunerative. The specialty of the state is

that, it undertakes 98% of bivoltine sericulture and stood first among non-traditional states and one of the potential state in India for silk (Geiger,2000).

Materials and Methods

The experiment was conducted in Randomized Block Design with eight treatments and three replications. Each replication consisted of 100 silkworms. The field experiment was undertaken during August to December 2019-20 to study on economic traits and biology of bivoltine silkworm hybrids on V-1 variety of *Morus alba*. Material: Disease free laying of silkworm Single hybrids (CSR₂×CSR₄), (CSR₁₆× CSR₁₇), (CSR₅₀×CSR₅₁), (S₈×CSR₁₆), SHP₂, SHR₁, DHR₄, DHP₅ procured from Central Sericulture Research & Training Institute, Mysore were used as test hybrid against mulberry variety V-1 as feed of silkworm, in present investigation. The observation were recorded on Ten Larval weight (g), Single cocoon weight (g), Single cocoon weight (g), Single cocoon weight, Single shell weight, Cocoon shell ratio (%), Cocoon yield / 10,000 larvae brushed by weight, Cocoon filament length, Cocoon filament weight, Fecundity, Hatching percentage, Denier, Moth emergence (%), Effective rate of rearing, Pupal duration(days).and result were interpreted. The data thus collected were statistically analyzed suggested by Panse and Sukhatme (1985)^[3] and the results were recorded.

Results and Discussion

Investigation pertaining to the “Studies of the biology and economic traits of mulberry (*Bombyx mori* L.) single CSR hybrids on V-1 Mulberry variety” Sericulture Research Unit, V.N.M.K.V, Parbhani, during 2019-20. The hybrid SHR₁ shown the highest percentage of hatching (98.00 per cent) followed by hybrid

SHP2 (97.80 per cent), S8x CSR16 (97.49 per cent), DHR4 (96.49 per cent), CSR50xCSR51 (94.32 per cent) and DHP5 (93.67 per cent). The lowest hatching percentage was recorded in hybrid CSR16x CSR17 (92.47 per cent) and CSR2xCSR4 (88.48 per cent). Bobade *et al.*, (2019)^[4] reported that hatching percentage were significantly highest in hybrid CSR₁₆xCSR₁₇ (96.19 per cent). Paighan (2012) and Shinde (2010)^[5] observed 93.67 and 94.15 per cent hatching in bivoltine hybrid CSR₁₆xCSR₁₇ which was significantly superior in their experiment.

The highest fecundity observed in treatment SHP2 (479.33 eggs), followed by CSR50xCSR51 (476.00 eggs), SHR1 (466.00eggs), DHP5 (451.67eggs), DHR4 (436.00eggs) (434.00), S8xCSR16 (428.00eggs) and CSR2xCSR4 (434.eggs) show lowest fecundity. Bobade (2019)^[4] observed that minimum larval duration were observed in CSR₂xCSR₄ (21.77) days.

The bivoltine hybrid DHP5 (21.49 days) had shown the shortest larval duration which was SHP2 (21.67 days), DHR4 (21.69 days), SHR1 (21.71 days), S8x CSR16 (22.10 days), CSR16xCSR17 (22.19 days), CSR2xCSR4 (22.38 days).

The treatment CSR50x CSR51 (22.66 days) shown longest larval duration in days. The bivoltine silkworm hybrid recorded lowest pupal duration SHP2 (09.51 days) and followed by SHR1 (09.59 days), DHR4 (09.81 days), DHP5(09.89 days), CSR16x CSR17 (10.17 days). Tekule (2018)^[6] observed that weight of 10 mature larvae highest in CSR₁₆xCSR₁₇ (37.92g) and DHP₅ (36.96 g). The highest 10 mature larval weight recorded in SHP2 (38.712g), SHR1 (37.744g), DHR4 (37.650g), CSR2xCSR4 (37.514g), CSR16xCSR17 (37.438g), CSR50xCSR51 (37.424 g), S8xCSR16

(37.360 g) the lowest larval weight recorded in DHP5(37.036g). The highest significant cocoon weight was found in bivoltine hybrid SHR1 (1.192g), CSR50x CSR51 (1.181g), S8XCSR16 (1.176 g), SHP2 (1.158 g), CSR16x CSR17 (1.136 g), CSR2x CSR4 (1.136g) was the lowest value.

The highest cocoon weight was found of hybrid CSR₅₀xCSR₅₁ (0.267g) SHP₂ (0.250g), S₈xCSR₁₆ (0.248g), the hybrids SHR₁ (0.237g), DHP₅ (0.237g), CSR16xCSR17 (0.236g) CSR2xCSR4 (0.245g), the lowest shell weight was recorded in hybrid and DHR₄ (0.235g). Basavraja *et al.*,(1983)^[7] in his experiment recorded shell ratio of bivoltine hybrids CSR₂xCSR₄ (21.16 per cent), CSR₂xCSR₆ (2.09 per cent), and CSR₁₈xCSR₁₉ (24.1 per cent) respectively.

The highest shell ratio was observed in CSR50x CSR51 (22.96 per cent), SHP2 (21.65 per cent), CSR2xCSR4 (21.60 per cent), S8xCSR16 (22.12 per cent), CSR16xCSR17 (20.77 per cent) SHR1 (19.87per cent), DHP5 (19.83 per cent), DHR4 (19.46 per cent) shown the lowest shell ratio was observed in all hybrids. Tekule (2018)^[6] found that the highest shell ratio in hybrid CSR₂xCSR₄ (20.15per cent) than the other hybrids. The filament length (m) result revealed that bivoltine hybrid DHR4 (978.33 m), SHR1 (970 m), CSR16x CSR17 (966.67 m), DHP5 (966.67 m), CSR50x CSR51 (956.67 m), shown the higher value of the filament length. The hybrids S8x CSR16 (926.26 m), SHP2 (916.67 m), CSR2x CSR4 (893.33 m) recorded lower filament length. The highest cocoon filament weight was recorded by CSR16xCSR17 (0.334 g), CSR50x CSR51 (0.306 g), SHP2 (0.297 g), DHR4 (0.292 g) followed by S8xCSR16 (0.291 g), CSR2xCSR4 (0.290 g), SHR1(0.286 g) bivoltine silkworm hybrids (Table 1 and 2).

Table.1 The effect of feeding mulberry variety V1 of bivoltine silkworm (*Bombyx mori* L.) hybrids.

Sr. No .	Treatment	Larval duration (days)	Ten Larval weight (g)	Single cocoon weight (g)	Cocoon shell Ratio (%)	Single shell weight (g)	Cocoon yd/10,000 larvae brushed by wt (kg)	Cocoon filament length (m)
1	CSR ₂ ×CSR ₄ (C)	22.38	37.481	1.136	21.60	0.245	12.581	893.23
2	S ₈ ×CSR ₁₆	22.10	37.360	1.176	21.12	0.248	13.829	926.26
3	CSR ₅₀ ×CSR ₅₁	22.66	37.424	1.181	22.96	0.267	14.826	956.67
4	CSR ₁₆ ×CSR ₁₇	22.19	37.438	1.136	20.77	0.236	17.517	966.67
5	SHP ₂	21.67	38.721	1.158	21.65	0.250	13.585	916.67
6	SHR ₁	21.71	37.744	1.192	19.87	0.237	12.378	970.00
7	DHP ₅	21.49	77.036	1.195	19.83	0.237	14.082	966.67
8	DHR ₄	21.69	37.650	1.212	19.46	0.235	14.748	978.33
	SE ±	0.52	1.204	0.002	0.53	0.010	0.534	19.03
	CD at 5%	1.58	2.204	0.006	1.60	0.015	1.156	57.71
	CV at 5%	4.10	3.931	2.829	4.38	3.502	4.605	3.48

*Angular Transformed Values

Table.2 The effect of feeding mulberry variety V-1 on CF,F,HP,ME,D ERR,PD of bivoltine silkworm (*Bombyx mori* L.) hybrids

Sr.No.cc	Treatment	Cocoon filament weight (g)	Fecundity (no.)	Hatching percentage (%)	Moth emergence (%)	Denier	Effective rate of rearing	Pupal duration (days)
1	CSR ₂ ×CSR ₄ (C)	0.090	422.6	88.48	94.83	2.91	86.93	10.63
2	S ₈ ×CSR ₁₆	0.29	428.00	97.49	94.75	2.82	89.47	10.38
3	CSR ₅₀ ×CSR ₅₁	0.306	476.00	94.32	92.58	2.88	87.20	10.51
4	CSR ₁₆ ×CSR ₁₇	0.334	434.00	92.47	95.33	3.12	93.72	10.17
5	SHP ₂	0.297	479.33	97.80	92.50	2.93	90.95	09.51
6	SHR ₁	0.286	466.00	98.00	88.67	2.65	94.33	09.59
7	DHP ₅	0.269	451.67	93.67	92.00	2.52	90.93	09.89
8	DHR ₄	0.292	436.00	96.49	94.50	2.69	83.01	09.81
	SE ±	0.00	12.21	1.46	1.05	0.097	1.00	00.28
	CD at5%	0.002	37.02	4.42	3.17	0.211	3.04	00.86
	CV at5%	3.400	04.71	2.66	1.94	4.234	1.94	04.87

Angular Transformed Values

The lowest cocoon filament weight was recorded in DHP5 (0.269 g) bivoltine silkworm hybrid. The results revealed that the significant values of denier of bivoltine silkworm hybrids was observed for CSR16×CSR17 (3.12 per cent), CSR2×CSR4 (2.91 per cent), SHP2 (2.93 per cent), CSR50×CSR51 (2.88 per cent), S8×CSR16 (2.82 per cent), DHR4 (2.69 per cent), SHR1 (2.65 per cent), and lowest for DHP5 (2.52 per cent) in the percentage form. Padhgan (2012) and Shinde (2010)^[5] in their experiments on hybrid CSR₁₆×CSR₁₇ recorded highest filament length (903 m) and (940 m) respectively.

The result of cocoon yield/10000 larvae brushed revealed that higher cocoon yield was observed in the hybrid CSR16×CSR17 (17.517 kg), CSR50× CSR51 (14.826 kg), DHR4 (14.748 kg), DHP5(14.082 kg) and S8×CSR16 (13.829 kg) SHP2(13.585 kg) and CSR2×CSR4 (12.581 kg), SHR(12.378 kg). The highest ERR was observed in SHR1 (94.33 per cent), CSR16×CSR17 (93.72 per cent), SHP2 (90.95 per cent), DHP5 (90.93 per cent) followed by S8×CSR16 (89.47 Per cent) than CSR50×CSR51(87.20 per cent), CSR2×CSR4 (86.93 per cent). Bobade (2019)^[4] observed that hybrid CSR16×CSR17 (16.59 kg) shown the highest cocoon yield (kg) per 1000 larvae. Tekule (2018)^[6] found that the highest cocoon yield (kg) per 1000 larvae SHR₁ (15.40 Kg) hybrid.

The lowest ERR was recorded for DHR4 (83.01 per cent) bivoltine silkworm hybrid. The highest moth emergence was observed in the CSR16×CSR17 (95.33 per cent), CSR2×CSR4 (94.83), S8×CSR16 (94.75 per cent), DHR4 (94.50 per cent), CSR50×CSR51 (92.58 per cent), SHP2 (92.50 per cent), DHP5 (92.00 per cent). The lowest moth emergence was observed for SHR1 (88.67 per cent) bivoltine silkworm hybrid.

The maximum fecundity was observed in hybrid SHP₂ (479.33 eggs) followed by hybrid CSR₅₀×CSR₅₁ (476.00eggs). Highest hatching per cent was recorded in the hybrids SHR₁ (98.00 per cent) followed by hybrid SHP₂ (97.80 per cent). Hybrid DHP₅ (21.49 days) had shown the shortest larval duration followed by SHP₂ (21.67days). The hybrid SHP₂ recorded lowest pupal duration (09.51 days) followed SHR₁ (09.59days).The hybrid SHP₂ (38.712 g) was observed significantly superior hybrid followed by SHR₁ (37.744g). Highest shell weight was recorded by the bivoltine Hybrid CSR₅₀×CSR₅₁ (0.267 g) followed by SHP₂(0.250 g).The highest significant cocoon weight was found in bivoltine hybrid DHR₄ (1.212 g). Highest shell ratio was observed inCSR₅₀CSR₅₁ (22.96 per cent) and maximum yield was observed in the hybrid CSR₁₆×CSR₁₇ (17.517 kg) which was followed by DHR₄ (14.748kg).The hybrid DHR₄ (978.33 m) and SHR₁(970.00 m), recorded higher filament length. The highest cocoon filament weight was given by CSR₁₆×CSR₁₇ (0.334 g) and CSR₅₀× CSR₅₁(0.306

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