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## Study of economic traits of different silkworm hybrids on V-1 cultivar of *Morus alba*

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### Abstract

The present investigation was conducted to study the economical traits of bivoltine silkworm hybrids on V-1 mulberry variety at Sericulture laboratory, Department of Entomology, Post Graduate Institute, Dr. P.D.K.V. Akola during 2023-2024, laid in Completely Randomized Design with seven treatments and three replications. During study, it was observed that among all the hybrids used for rearing, FC2×FC1 found the significantly superior over the rest of other hybrids tested in case of highest weight of ten mature larvae (40.20 gm), single cocoon weight (1.89 gm), single shell weight (0.38 gm), shell ratio (20.32%), which was found statistically at par with hybrid S8 X CSR16. However, these two hybrids were found significantly superior over rest of hybrids tested. In case of filament length and filament weight hybrid FC2×FC1 has shown superior performance followed by hybrid TT21 X TT56, which was statistically at par with each other

**Keywords:** Silkworm *Bombyx mori*, *Morus alba* var. V-1, bivoltine hybrids

### 1. Introduction

The word Sericulture is derived from the Greek word 'sericos' meaning 'silk' and the English word 'culture' meaning 'rearing'. (Bobade *et al.*, 2019) [2]. Silkworm is the caterpillar of adult silk moth. Sericulture or silk farming is the art and science of rearing of silkworms to produce raw silk and end product is silk. In general, the production of silk from Silkworm by rearing practices on commercial scale is called sericulture. Silk being an exclusive fibre and popular as "Queen of Textiles" and is well known for its natural colour, fine, strong, purity and unusual lustrous. The textile industry occupies a unique place in our country. Sericulture is intensively labour based, agro based commercially attractive economic activity. Sericulture activity is mainly practiced by the rural people in association with agriculture (Taufique *et al.*, 2021) [12].

India is the second largest producer of silk in the world. Among the four varieties of silk produced in 2022-23, Mulberry accounted for 75.60% (27,654 MT), Tasar, 3.60% (1,318 MT), Eri 20.09% (7,349 MT) and Muga 0.71% (261MT) of the total raw silk production of 36,582 MT. The total raw silk production in the country was 36,582 MT during 2022-23 which is 4.8% higher than the production achieved during 2021-22 (34,903 MT) and around 89.7% of the annual targeted production for the year 2022-23. The bivoltine raw silk production increased substantially by 12.1% from 7,941 MT during 2021-22 to 8,904 MT during 2022-23. Further, vanya silk, which includes Tasar, Eri and Muga silks, have reduced by 1.7% during 2022-23 over 2021-22. It is mainly due to reduction in the tasar silk production during 2022-23 compared to last year. The area under mulberry has increased by 4.5% in 2022-23 compared to previous year (Anonymous 2023) [1].

### 2. Materials and Methods

The experiment was conducted in rearing house at Sericulture Laboratory Department of Entomology, PGI, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during September 2023 to December 2023. The present investigation was undertaken to study the economic traits and biology of different silkworm hybrids on V-1 variety of *Morus alba*. Disease free laying of silkworm hybrids BFC<sub>10</sub> X BFC<sub>1</sub>, BFC<sub>1</sub> X BFC<sub>10</sub>, TT<sub>21</sub> X TT<sub>56</sub>, TT<sub>56</sub> X TT<sub>21</sub>, S<sub>8</sub> X CSR<sub>16</sub>, CSR<sub>16</sub> X S<sub>8</sub>, FC<sub>2</sub> X FC<sub>1</sub> procured from Central Sericulture Research & Training Institute, Mysore were used as test hybrid against mulberry variety V-1 as a feed of

silkworm, in present investigation.

Disease free layings (DFLs) used from Central Sericulture Research and Training Institute, Mysore were placed in 7 different trays and covered by black piece of cloth and left undisturbed for 48 hrs. for uniform growth of embryo. The rearing of silkworm races was undertaken with the use of well grown mulberry plantation of V-1, as a feed.

Krishnaswami (1978)<sup>[7]</sup> outlined an enhanced method for silkworm rearing, which was followed in the current study. Disease-free layings (DFLs) were placed in plastic trays measuring 2'x3'. The newly hatched larvae of silkworm hybrids were nourished with freshly chopped tender mulberry leaves of the V-1 variety. Throughout the rearing process, underweight larvae were consistently removed, and after the third moult, 200 healthy larvae per tray were retained in a replicated manner. The mulberry leaves were finely chopped into pieces ranging from 0.5 to 1.5 cm<sup>2</sup> and spread over the newly hatched worms for feeding, which repeated four times a day. The rearing trays were cleaned once after the first moult and twice after the second moult up to fourth moult.

The silkworm undergoes four moults throughout its larval growth phase, completing its growth in five stages. The interval between two moults is referred to as an 'instar', resulting in a total of 'five' instars in the silkworm's lifespan. During moulting, the worms temporarily cease feeding, and as a result, food is not provided during this period. Moulting typically takes place over a period of 20 to 30 hours. Followed by each moult, a bed disinfectant called Vijetha, applied at the rate of 4 kg per 100 DFLs to prevent diseases, and feeding resumed after a half-hour interval.

Once the silkworms reached maturity, they displayed distinct characteristics, appearing translucent with a creamy coloration. At this stage, the matured worms ceased feeding, migrated towards the edges of the trays, and initiated cocoon spinning. These matured worms were manually picked and placed on netrika for cocoon spinning. The spinning process typically occurred within a timeframe of 48 to 72 hours. The pupae remained inside the cocoon till emergence. The harvesting of cocoon was carried out on the fifth or sixth days of release of worms on netrika for spinning the cocoon. To record cocoon parameters, ten cocoons were randomly selected from each treatment for observation.

The observations were recorded on the larval weight of 10 mature larvae, larval period, single cocoon weight, single shell weight, shell ratio, ERR by weight, cocoon filament length etc. The observations were recorded on Single cocoon weight (g), Single shell weight (g), Shell ratio, ERR (%), Cocoon filament length (m), Cocoon filament weight (g), Denier, and weight of ten matured larvae. The data obtained were analyzed and the percentage values were transformed to angular values and analyzed, and the result obtained was interpreted.

### 3. Results and Discussion

#### 3.1 Weight of 10 matured larvae (g)

Significantly maximum ten matured larval weight was found in hybrid FC2 X FC1 (40.20 gm/10 matured larvae) which was found statistically at par with hybrid S8 X CSR16 (39.00 gm/10 matured larvae). However, these two hybrids were found significantly superior over rest of hybrids tested. Next best hybrids were CSR16 X S8 (38.33 gm/10 matured larvae) and hybrid BFC1 X BFC10 (36.80

gm/10 matured larvae) which were at par with each other. Significantly next best hybrid was TT56 X TT21 (36.40 gm/10 matured larvae) which was statistically at par with hybrid BFC10 X BFC1 (35.67 gm/10 matured larvae) and hybrid TT21 X TT56 (35.53 gm/10 matured larvae). The findings of present experiment are quite similar with the findings of Thore *et al.* (2023)<sup>[11]</sup> who recorded the weight of ten matured larvae in hybrid FC2 X FC1 (40.25 gm). Trilekha *et al.* (2024)<sup>[14]</sup> recorded highest ten matured larval weight in hybrid FC2 X FC1 (51.96 gm) over rest of other hybrids tested. Similar findings were observed by Khaire (2023)<sup>[6]</sup> and Mele (2023)<sup>[10]</sup> in their experiments.

#### 3.2 Single cocoon weight (g)

Significantly highest single cocoon weight was found in bivoltine hybrid FC2 X FC1 (1.89 gm), which was found statistically at par with hybrid S8 x CSR16 (1.85 gm). These two hybrids were observed significantly superior to rest of other hybrid tested. Next best hybrid was CSR16 X S8 (1.83 gm). Hybrid BFC10 X BFC1 (1.53 gm), hybrid BFC1 X BFC10 (1.52 gm) and hybrid TT21 X TT56 (1.51 gm) were statistically at par with each other regarding single cocoon weight parameter. The lowest single cocoon weight was found in hybrid TT56 X TT21 (1.46 gm). The result of present investigation is in accordance with Thore *et al.* (2023)<sup>[11]</sup> who recorded single cocoon weight in hybrid FC2 X FC1 (1.69 gm) and Trilekha *et al.* (2024)<sup>[14]</sup> recorded highest single cocoon weight in hybrid FC2 X FC1 (2.02 gm) in their experiment. Likewise, Mele (2023)<sup>[10]</sup> and Khaire (2023)<sup>[6]</sup> also reported the single cocoon weight in hybrid FC2 X FC1 (1.83 gm) and (1.69 gm) respectively in their research work.

#### 3.3 Single shell weight (g)

Significantly highest single shell weight was found in the hybrid FC2 X FC1 (0.38 gm), however hybrid S8 X CSR16 (0.36 gm) was found at par with each other. These two hybrids were superior to rest of other. The second-best hybrid was CSR16 X S8 (0.33 gm) which was statistically at par with hybrids BFC1 X BFC10 (0.31 gm), TT21 X TT56 (0.30 gm) and hybrid TT56 X TT21 (0.30 gm). The lowest single shell weight was observed in hybrid BFC10 X BFC1 (0.29 gm). The above results are in conformity with Thore *et al.* (2023)<sup>[11]</sup> who recorded the single shell weight in hybrid FC2 X FC1 (0.34 gm). Mele (2023)<sup>[10]</sup> and Khaire (2023)<sup>[6]</sup> reported the weight of single shell in hybrid FC2 X FC1 (0.38 gm) and (0.34 gm) respectively.

#### 3.4 Cocoon shell ratio (%)

Significantly maximum shell ratio observed in the hybrid FC2 X FC1 (20.32 per cent) which was statistically at par with hybrids BFC1 X BFC10 (20.14 per cent), TT56 X TT21 (20.13 per cent), TT21 X TT56 (19.68 per cent) and hybrid S8 X CSR16 (19.68 per cent). The second-best hybrid was BFC10 X BFC1 (18.70 per cent) which was statistically at par with hybrid CSR16 X S8 (18.06 per cent) which recorded lowest cocoon shell ratio. The results of present investigation are in accordance with Thore *et al.* (2023)<sup>[11]</sup> who recorded 20.63% shell ratio in hybrid FC2 X FC1. Bobade *et al.* (2019)<sup>[2]</sup> reported 21.32% shell ratio in hybrid S8 X CSR16. Similar results were obtained by Mele (2023)<sup>[10]</sup> and Khaire (2023)<sup>[6]</sup> in their experiments.

### 3.5 Filament length (m)

Highest filament length was recorded by hybrid FC2 X FC1 (989.29 m) which was statistically at par with hybrid TT21 X TT56 (955.13 m) these both hybrids were superior to rest of hybrids tested. The next best hybrid was TT56 X TT21 (902.44 m) and which was at par with hybrid S8 X CSR16 (868.05 m). The hybrid CSR16 X S8 recorded (854.19 m) filament length followed by hybrid BFC10 X BFC1 (781.48 m) and hybrid BFC1 X BFC10 (761.62 m) which was showed lowest filament length. The findings regarding filament length correlate with findings of Thore *et al.* (2023) [11] who observed that the filament length in hybrid FC2 X FC1 was 972.5 m which is quite similar with the above result. Similar findings were observed in the research of Mele (2023) [10] and Khaire (2023) [6] who reported 953 m

and 973 m length in hybrid FC2 X FC1.

### 3.6 Filament weight (g)

Observation on filament weight revealed that significantly highest filament weight obtained in hybrid FC2 X FC1 (0.32 gm) which was statistically at par with hybrid TT21 X TT56 (0.30 gm) and hybrid TT56 X TT21 (0.29 gm). However, hybrid FC2 X FC1 was found to be superior to rest of hybrid tested. The next best hybrid was found CSR16 X S8 (0.28 gm) which was statistically at par with hybrid S8 X CSR16 (0.27 gm), hybrid BFC1 X BFC10 (0.27 gm) and hybrid BFC10 X BFC1 (0.25 gm). Similar results were found by Thore *et al.* (2023) [11] who reported filament weight 0.28 gm in hybrid FC2 X FC1. Similar findings were observed in the research of Mele (2023) [10] and Khaire (2023) [6].

**Table 1:** Economical traits of bivoltine silkworm hybrids on V-1 mulberry variety.

Sr. No.	Treatments	10 mature larval weight (g)	Single cocoon weight (g)	Single shell weight (g)	Cocoon shell ratio (%)	Filament length (m)	Filament weight (g)
1	BFC <sub>10</sub> X BFC <sub>1</sub>	35.67	1.53	0.29	18.70 (25.62)	781.48	0.25
2	BFC <sub>1</sub> X BFC <sub>10</sub>	36.80	1.52	0.31	20.14 (26.66)	761.62	0.27
3	TT <sub>21</sub> X TT <sub>56</sub>	35.53	1.51	0.30	19.68 (26.34)	955.13	0.30
4	TT <sub>56</sub> X TT <sub>21</sub>	36.40	1.49	0.30	20.13 (26.65)	902.44	0.29
5	S <sub>8</sub> X CSR <sub>16</sub>	39.00	1.85	0.36	19.68 (26.33)	868.05	0.27
6	CSR <sub>16</sub> X S <sub>8</sub>	38.33	1.83	0.33	18.06 (25.15)	854.19	0.28
7	FC <sub>2</sub> X FC <sub>1</sub>	40.20	1.89	0.38	20.32 (26.79)	989.29	0.32
	SE (m) ±	0.59	0.01	0.01	0.32	12.77	0.01
	CD at 5%	1.79	0.04	0.03	0.96	38.75	0.03
	CV (%)	2.73	1.40	4.46	2.10	2.53	5.04

### 4. Conclusion

Among all the seven hybrids used for rearing, FC2×FC1 showed the best results for weight of ten mature larvae, single cocoon weight, single shell weight, shell ratio, filament length, filament weight. Based on economical and overall performance it can be concluded that the bivoltine hybrid FC2×FC1 reared on mulberry variety V-1 was found superior over all other hybrids tested under Vidarbha condition.

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