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Effect of feeding mulberry variety G-4 on economic traits of bivoltine silkworm (*Bombyx mori* L.) hybrids

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Abstract
The present investigation was undertaken during August to December 2018, to study the economic traits of bivoltine silkworm hybrids on G-4 mulberry variety (*Morus alba*). The experiment was conducted in rearing house at Sericulture Research Unit, VNMKV, Parbhani laid in Randomized Block Design with eight treatments, replicated thrice. Disease free layings of silkworm hybrids ($CSR_2 \times CSR_4$), ($CSR_{16} \times CSR_{17}$), ($CSR_{50} \times CSR_{51}$), ($S_8 \times CSR_{16}$), SHP_2, SHR_1, DHR_4, DHP_5 procured from Central Sericulture Research & Training Institute, Mysore were used as test hybrid against mulberry variety G-4 in present investigation. During study it was observed that hatching percentage were significantly highest in hybrid $CSR_{16}xCSR_{17}$ (96.19 per cent), Minimum larval duration was observed $CSR_2 \times CSR_4$ (21.77). The weight of ten mature larvae was significantly superior in hybrids $CSR_{16}xCSR_{17}$ (40.44 g) and $CSR_2 \times CSR_4$ (38.40 g), In single cocoon weight hybrid $CSR_{16}xCSR_{17}$ (1.31 g) has shown superior performance. The hybrid $CSR_{16}xCSR_{17}$ (0.312g) recorded highest shell weight (g). The shell ratio (%) was higher in hybrid $CSR_{16}xCSR_{17}$ (24.17 per cent). The hybrids $CSR_{16}xCSR_{17}$ (951 m) $CSR_2 \times CSR_4$ (919 m), $CSR_{50}xCSR_{51}$ (907. m) recorded superior performance in filament length (m), hybrid $CSR_{16}xCSR_{17}$ (0.331 g) recorded significantly higher filament weight, the denier value and cocoon yield/10,000 larvae brushed were superior in hybrid $CSR_{16}xCSR_{17}$ (3.13) and SHR_1 (16.59 kg) respectively.

Keywords: Bivoltine hybrids, *Bombyax mori*. L, biology, G-4

Introduction
The silkworm, *Bombyx mori* L. is a lepidopteran economic insect which is known for the production of mulberry silk aptly named as *"The Queen of Natural Fibers*". Even though sericulture industry in India has been established as a major source among the agro-based industries, it is still in the process of achieving the required stability, since the quality and quantity of silk produced as well as the unit production of silk remains low as compared with sericulturally advanced countries.

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, Tamilnadu, Jammu Kashmir, Bihar, Madhya Pradesh and Uttar Pradesh. Out of these Karnataka produce 45% of the country total production and ranks 1st in India.

Maharashtra is a nontraditional state in sericulture producing Mulberry and Tasar silk. The specialty of the state is that, it undertakes 98% of bivoltine sericulture and stood first among nontraditional states Maharashtra is one of the potential State in India for silk production. The bivoltine sericulture development has been one of the priority sectors of Indian silk industry but its production is yet to meet the targets. The production of raw silk in the world accounts 1,77, 507.35 metric tons during 2016-17. In India during 2016-17 total mulberry Silk Production was 31906 MT. In Maharashtra state during 2016-17 the Production of raw silk was 2538 MT. (Annual report, 2016-17 CSB)

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 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) [3].

Materials and Methods

The present investigation was undertaken to Effect of feeding mulberry variety G-4 on economic traits of bivoltine silkworm (*Bombyx mori* L.) hybrids. The rearing was undertaken at rearing house of Sericulture Research Unit, Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The disease free laying's of bivoltine hybrids CSR_2×CSR_4, S_8×CSR_{16}, CSR_{50}×CSR_{51}, CSR_{16}×CSR17, SHP2,SHR_1, DHP_5 and DHR_4 utilized as treatment. The newly hatched larvae were fed with chopped pieces of fresh mulberry leaves. The leaves were chopped into small pieces of 0.5 cm and sprinkled over the newly hatched worms for their feeding. The feeding was given four times in a day. The rearing trays were cleaned daily as per recommended times.

After full development, the ripe worms were identified, as they looked translucent with creamy colour. The ripe worms ceased to eat, crawled towards periphery of the trays and tried to spin the cocoons, were handpicked and put on the Chandrika. The worms spun the cocoons within 48 to 72 hours. The pupae remained inside the cocoons till emergence. The harvesting of the cocoon was carried out on the fifth day of release of worms on netrika. Randomly selected ten cocoons of each treatment were used for recording cocoon parameters. The observations were recorded on hatching percentage, larval duration, 10 mature larvae weight, single cocoon weight, single shell weight, shell ratio, filament length, disease incidence and cocoon yield/10000 larvae brushed, Disease incidence (%) were recorded and analyzed as suggested by Panse and Sukhatme (1985) [6] and the results were interpreted. The data thus collected were statistically analysed and the results were recorded.

Result and Discussion

Investigation pertaining to the "Effect of feeding mulberry variety G-4 on economic traits of bivoltine silkworm (*Bombyx mori* L.) hybrids." was carried out at 'Sericulture research unit', Department of Agril. Entomology, College of Agriculture, V.N.M.K.V, Parbhani, during 2018.

The highest hatching percent was recorded in the hybrid CSR_{16}xCSR_{17} (96.19 per cent) followed by hybrid SHP_2 (94.41per cent) CSR_{50}xCSR_{51} (92.52 per cent), DHP_5 (92.34 per cent) and SHR_1 (90.89 per cent).The lowest hatching percentage was recorded in hybrid CSR_2×CSR_4 (89.64 per cent.) which was at par with DHR_4 (90.40 per cent), SHR_1 (90.89 per cent). Paighan (2012) [5] and Shinde (2010) [9] observed 93.67 and 94.15 per cent hatching in bivoltine hybrid CSR_{16}xCSR_{17} which was significantly superior in their experiment. Also Vidhate (2009) [10] and Salunke (2003) [8] observed that bivoltine hybrid CSR_{16}xCSR_{17} was superior with hatching percentage (95.22 and 97.22 per cent respectively) in their experiment. The present findings are in conformity with the above researchers.

The maximum fecundity was observed in treatment T_4 i.e. CSR_{16}×CSR_{17} (559.33 eggs) bivoltine silkworm hybrid which was at par with treatments T_2 i.e. S_8×CSR_{16} (520.00), T_5 i.e. SHP_2 (531.33) and T_1 i.e. CSR_2×CSR_4 (550.00) fallowed by T_3 i.e. CSR_{50}×CSR_{51} (501.33), T_7 i.e. (DHP_5 480.00) and T_8 i.e. DHR_4 (475.00). The lowest fecundity was recorded in treatment T_6 i.e. SHR_1 (418.00 eggs) bivoltine silkworm hybrid.

The bivoltine hybrid CSR_2×$CSR_4$4 (21.77 day) had shown the shortest larval duration which was at par with S8xCSR16 (22.94), CSR50xCSR51 (22.41), SHP2 (21.85), SHR1 (22.20) and DHR4 (22.57) followed by CSR16xCSR17 (23.42), S8xCSR16 (22.94). The treatment DHP5 (23.83) shown longest larval larval duration. Salunke (2003) [8] reported that under favourable condition the bivoltine hybrid CSR18 x CSR19 recorded significantly shortest larval duration (21.43 days) than all other bivoltine hybrids. Vidhate (2003) [11] had observed the larval duration of CSR_{18} x CSR_{19} (21.68 days) as significantly superior than others. Rayar (2010) [7] observed 23.95 days larval developmental period in CSR2×CSR4.

The treatment T_4 i.e. CSR_{16}×CSR_{17} bivoltine silkworm hybrid recorded significantiy lowest pupal duration (09.45 days) and it was at par with treatments T_2 i.e. S_8×CSR_{16} (09.92), followed by T_1 i.e. CSR2×CSR4 (10.22), T_6 i.e. SHR_1 (10.35), T_3 i.e. CSR_{50}×CSR_{51} (10.98), T_8 i.e. DHR_4 (11.10), T_5 i.e. SHP_2 (11.13 days). The highest pupal duration T_7 i.e. DHP_5 (11.94 days) was recorded in treatment bivoltine silkworm hybrid.

The mean weight of ten mature larvae indicated that larval weight varied in the range of 33.88 to 40.44 g in different hybrids (Table 5 & fig.5). The performance of bivoltine hybrid CSR_{16}xCSR_{17} (40.44 g) was observed significantly superior over rest of hybrids followed by CSR_2xCSR_4 (38.40 g), CSR_{50}xCSR_{51} (37.15 g), S_8×CSR_{16} (36.74 g), SHP_2 (35.22 g) SHR_1 (34.66 g) and DHR_4 (33.98 g). The lowest weight of ten mature larvae was recorded in DHP_5 (33.38 g). The result are in conformity with Shinde (2010) [9] in this experiment bivoltine hybrid CSR16xCSR17 (43.85g) recorded highest larval weight. Paighan (2012) [5] recorded that maximum larval weight was recorded in CSR_{16}xCSR_{17} (34.70 g) over the rest of the hybrids tested.

The cocoon weight was recorded in the range of 1.12 to 1.31 g. The highest significant cocoon weight was found in bivoltine hybrid CSR_{16}xCSR_{17} (1.31g) and it was at par with SHP_2 (1.25g), DHP_5 (1.25 g), CSR_{50}xCSR_{51} (1.23 g), S_8XCSR_{16} (1.22 g) and SHR_1 (1.19 g) followed by SHR_1 (1.19g), CSR_2×CSR_4 (1.16 g).The single cocoon weight was lowest in the hybrid DHR_4 (1.12 g). Vidhate (2013) [11] The bivoltine hybrid CSR_{16}xCSR_{17} showed maximum single cocoon weight (1.98 g) and found significantly superior over rest of hybrids. Akio (2000) also reported hybrid CSR_{16}xCSR_{17} superior in single cocoon weight. The present findings are in conformity with the above researchers.

The highest shell weight was recorded by the bivoltine hybrid CSR_{16}xCSR_{17} (0.312 g) followed by SHP_2 (0.267g), CSR_{50}xCSR_{51} (0.267g), S_8xCSR_{16} (0.257g), DHP_5 (0.257 g), CSR_2xCSR_4 (0.241 g) and SHR_1 (0.239). The lowest shell weight was recorded in hybrid DHR_4 (0.229 g). Paighan (2012) recorded highest shell weight in CSR_{16}xCSR_{17} (0.340 g). Shinde (2010) [9] and Vidhate (2009) [10] observed that hybrid CSR_{16}xCSR_{17} recorded maximum shell weight of (0.391 g) and (0.393 g) and found superior over rest of hybrids. Akio (2000) and Salunke (2003) [8] recorded highest shell weight in CSR_{16}xCSR_{17} bivoltine hybrid

The shell ratio was recorded in the range of 19.77 to 24.17 per cent. The significantly highest shell ratio was observed in CSR_{16}×CSR_{17} (24.17 per cent) which is followed by the CSR_{50}xCSR_{51} (21.80 per cent), SHP_2 (21.79 per cent), S_8×CSR_{16} (21.32 per cent), DHR_4 (20.64 per cent), DHP_5 (20.54 per cent).The lowest shell ratio was observed in hybrid SHR_1 (19.77 per cent). Basavraja (1983) in his experiment recorded shell ratio of bivoltine hybrids CSR_2xCSR_4 (21.16 per cent), CSR_2xCSR_6 (2.09 per cent), and CSR_{18}xCSR_{19} (24.1 per cent) respectively.

The bivoltine hybrid CSR_{16}xCSR_{17} (951 m) recorded higher

filament length over the rest of hybrids and it was at pat with CSR_2xCSR_4 (919 m) followed by $CSR_{50}xCSR_{51}$ (907 m), SHP_2 (874 m), S_8xCSR_{16} (867 m), SHR_1 (854 m) and DHR_4 (821.00 m). The lowest filament length was recorded by hybrid DHP_5 (790 m). Paighan (2012) [5] and Shinde (2010) [9] in their experiment hybrid $CSR_{16}xCSR_{17}$ recorded highest filament length (903 m) and (940 m) respectively. Vidhate (2009) [10] observed in his experiment $CSR_{16}xCSR_{17}$ highest filament length (950 m).

The cocoon filament weight of bivoltine silkworm hybrids varied in the range of 0.261 to 0.331 g. The significantly highest cocoon filament weight was recorded by treatment T4 i.e $CSR_{16}×CSR_{17}$ (0.331 g) bivoltine silkworm hybrid followed by T1 i.e. CSR_2xCSR_4 (0.306 g), T1 i.e. $CSR_{50}×CSR_{51}$ (0.298 g), T5 i.e. SHP_2 (0.291 g), T2 i.e. S_8xCSR_{16} (0.284 g), T8 i.e. DHR_4 (0.281g) and T6 i.e. SHR_1 (0.278 g). The lowest cocoon filament weight was recorded in treatment T7 i.e. DHP_5 (0.261 g) bivoltine silkworm hybrid.

The denier of bivoltine silkworm hybrids was observed in the range of 2.92 to 3.13. The highest denier was recorded by treatment T4 i.e. $CSR_{16}×CSR_{17}$ (3.13) bivoltine silkworm hybrid which was at par with treatment T8 i.e. DHR_4 (3.07) followed by treatment T5 i.e. SHP_2 (2.99), T1 i.e. $CSR_2×CSR_4$ (2.99), T7 i.e. DHP_5 (2.97), T2 i.e $S_8×CSR_{16}$. (2.94) and T6 i.e. SHR_1 (2.94). The lowest denier was recorded in treatment T3 i.e. $CSR_{50}×CSR_{51}$ (2.92) bivoltine silkworm hybrid.

The cocoon yield/10000 larvae brushed varied from 11.36 to 16.59 kg. The significantly higher cocoon yield was observed in the hybrid $CSR_{16}×CSR_{17}$ (16.59 kg) which was followed by check DHR_4 (15.31 kg), $CSR_{50}XCSR_{51}$ (13.79 kg), DHP_5 (13.21 kg) and S_8xCSR_{16} (12.99 kg).The lowest cocoon yield was recorded in control treatment SHR_1 (11.36 kg) which was at par with CSR_2xCSR_4 (12.34 kg) and SHP_2 (12.55 kg).

Table 1: Study of bivoltine silkworm for the economic traits of new CSR hybrids

Treatments	Growth parameter				
	Hatching (%)	Larval duration (Days)	Fecundity (days)	Pupal duration (days)	10 mature larval weight (g)
$CSR_2×CSR_4$ (C)	95.67 (78.02)	21.77	550.00	10.22	38.40
$S_8×CSR_{16}$	97.48 (80.80)	22.94	520.00	09.92	36.74
$CSR_{50}×CSR_{51}$	93.49 (75.30)	22.41	501.33	10.98	37.15
$CSR_{16}×CSR_{17}$	83.30 (65.67)	23.42	559.33	09.45	40.44
SHP_2	60.81 (51.80)	21.85	531.33	11.13	35.22
SHR_1	95.16 (77.05)	22.20	418.00	10.35	34.66
DHP_5	64.36 (53.35)	23.83	480.00	11.94	33.38
DHR_4	90.91 (72.39)	22.57	475.00	11.10	33.98
SE ±	2.45	0.43	14.52	0.24	0.42
CD at 5%	7.50	1.31	44.05	0.73	1.28

Table 2: Study of bivoltine silkworm for the economic traits of new CSR hybrids

Treatments	Economic Traits						
	Single cocoon weight (g)	Single shell weight (g)	Shell ratio (%)	Filament length (m)	Filament weight (g)	Denier	Cocoon yield per 10,000 larvae
$CSR_2×CSR_4$ (C)	1.16	0.241	20.63 (26.98)	919.00	0.306	2.99	12.34
$S_8×CSR_{16}$	1.22	0.257	21.32 (27.47)	867.67	0.284	2.94	12.99
$CSR_{50}×CSR_{51}$	1.23	0.267	21.80 (27.81)	907.00	0.298	2.92	13.79
$CSR_{16}×CSR_{17}$	1.31	0.312	24.17 (29.42)	951.00	0.331	3.13	16.59
SHP_2	1.25	0.267	21.79 (27.81)	874.00	0.291	2.99	12.55
SHR_1	1.19	0.239	19.77 (26.37)	854.00	0.278	2.94	11.36
DHP_5	1.25	0.257	20.54 (26.92)	790.00	0.261	2.97	13.21
DHR_4	1.12	0.229	20.64 (26.99)	821.00	0.281	3.07	15.31
SE ±	0.03	0.01	0.599	11.492	0.003	0.040	0.353
CD at 5%	0.09	0.02	1.818	34.859	0.009	0.122	1.071

References

1. Annonymous. Annual report Central Silk Board, 2016-17.
2. Basavraja HK, Jolly MS, Vijayakumar HV, Vindhya GS, Noamani MKR, Nagaraju J. Studies on bivoltine double hybrids. Natl. Semi. Silk Res. Dev., C.S.B., Bangalore, 1983, 14.
3. Joge PG, Pallavi SN, Naseema Begum S, Mahalingappa, KC, Malikarjuna, Dandin SB. Evaluation of double hybrid of silkworm, *Bombyx mori* L. in the field. National Conference on Tropical Sericulture for global competitiveness, CSR & TI, Mysore, 2003, 26
4. Krishnaswami S. The first decade of bivoltine revolution. Indian Silk. 1978; 18(7):7-11.
5. Paighan PD. Studies on performance of mulberry silkworm, 2012.
6. Panse VG, Sukhatme PV. Satistical methods for Agricultural workers. ICAR, New Delhi, 1985.
7. Rayar SG. Evaluation of bivoltine silkworm hybrids suitable to nontraditional sericulture region of Karnataka. Karnataka J Agric. Sci. 2010; 23(5):798-799.
8. Salunke SG. Performance of multi x Bi and Bi x Bi Hybrids of mulberry silkworm (*Bombyx mori* L.) under Marathwada conditions. M.Sc. (Agri.) Thesis, MAU, Parbhani, 2003.
9. Shinde. Studies on performance of mulberry silkworm *(Bombyax mori* L.) hybrids under Marathwada conditions. M.Sc. (Agri.) Thesis, MAU, Parbhani, 2010.
10. Vidhate GS. Evaluation of bivoltine mulberry silkworm (*Bombyx mori* L.) hybrids under Marathwada condition. M.Sc. (Agri.) Thesis, MKV, Parbhani. College of Agriculture, Raichur, 2009.
11. Vidhate JR. Performance of some mulberry silkworm hybrids under Marathwada region. M.Sc. (Agri.) Thesis, MAU, Parbhani, 2003.