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Short Note

Stability Analysis of Bivoltine and Double Hybrid Silkworm, *Bombyx mori* L.

S. Manimegalai* and G.R. Aruna[1]
*Department of Sericulture, Tamil Nadu Agricultural University, Coimbatore-641 003
[1]Grama Chethana Training Centre, BAIF, Dharwad, India

Stability studies conducted with the mulberry silkworm, *Bombyx mori* L. revealed that the double hybrid, [(CSR6 x CSR26) x (CSR2 xCSR27)] performed better for cocoon length, cocoon breadth, larval weight, cocoon weight, shell weight, shell ratio and survival percentage compared to the bivoltine hybrid, CSR2 x CSR4 when reared at two different environmental conditions *viz.*, room temperature and humidity (25±10ºC and 65±5 % RH) and higher temperature and humidity conditions (34±10ºC temperature and 85±5 % RH).

Key words: *Bombyx mori*, double and bivoltine hybrid, environmental conditions, economic parameters

The Indian sericulture industry depends mainly on multivoltine races. India being a tropical country with fluctuating temperature and humidity conditions, estimation of phenotypic stability is considered as one of the most important aspects for sustainable productivity of silkworm breeds. Double hybrid silkworm breeds are known for their superior qualitative as well as quantitative traits. Among the various environmental conditions, temperature, relative humidity and photoperiod were the most important which influenced the growth and productivity of silkworm. High temperature influenced larval duration, survival rate, cocoon weight, pupation, fecundity and number of unfertilized eggs (Pillai and Krishnaswami 1987).

Many important quantitative characters such as viability and cocoon traits decline sharply when temperature exceeds 280C (Suresh Kumar *et al.,* 1999; Suresh Kumar *et al.,* 2002) and, generally it is observed that bivoltine hybrids are susceptible to variations of temperature and relative humidity conditions (Palit *et al.*, 2003). Since the double hybrid is recently introduced in western region of Tamil Nadu, it is essential to evaluate its performance at higher temperature and humidity conditions to study their adaptability to extreme tropical conditions. Hence, in the present investigation, the effect of high temperature and high humidity on survival of silkworms.

Materials and Methods

Laboratory experiments were conducted during February- March, 2008 at Department of Sericulture, Tamil Nadu Agricultural University, Coimbatore to study the effect of high temperature and high humidity on the performance of double hybrid,[(CSR6 x CSR26) x (CSR2 x CSR27)] and bivoltine hybrid, CSR2 x CSR4. Rearing of silkworm hybrids were carried out in four replications till second day of fifth instar. Four hundred larvae per replication were counted and retained after third moult. On the third day of fifth instar, hundred larvae were separated from each bed for thermal treatment.

For the thermal treatment, the larvae were maintained in plastic trays and kept in Versatile Environmental Test chamber at 34±10ºC temperature and RH 85±5 % until spinning. Feeding was provided thrice a day with fresh mulberry leaves. Temperature of 25±10ºC and RH of 65±5% was maintained at the time of spinning. Cocoon harvest was carried out on the seventh day of spinning and observations were made on the subsequent day. The methodology adopted was a slight modification over the method by Suresh Kumar *et al.* (2003a). Observations recorded were survival percentage, cocoon weight, cocoon shell weight, shell ratio, length of cocoon and breadth of cocoon. The length and breadth of cocoons were measured using Vernier callipers. Paired t-test for stability analysis (length and breadth of cocoons) was carried out using SPSS package. Completely Randomised Design was followed for analysis of economic parameters as per method suggested by Panse and Sukhatme (1967).

Results and Discussion

The data on cocoon uniformity and economic parameters of double hybrid and bivoltine hybrid at thermal exposure is presented in Table 1 and 2 respectively. The highest length (3.51cm) and breadth (2.04cm) of the cocoon was recorded in [(CSR6 x CSR26) x (CSR2 x CSR27)] and significantly lesser length (3.23 cm) and breadth (1.87 cm) was observed in CSR2 x CSR4 at room temperature (25±10ºC and 65±5 % RH). At temperature of 34 ±10ºC and 85±5 % RH, there was significant

*Corresponding author

Table 1. Cocoon uniformity of (CSR6 x CSR26) x (CSR2 x CSR27) and CSR2 X CSR4 at two different temperature and humidity conditions

Silkworm Breeds	Treatments			
	25±1ºC and 65± 5% RH		34 ±1ºC and 85 ±5 % RH	
	Length (cm)	Breadth (cm)	Length (cm)	Breadth (cm)
(CSR6 x CSR26) x (CSR2 x CSR27)	3.51	2.04	3.25	2.19
CSR2 x CSR4	3.23	1.87	2.95	1.68

*Significant at P=0.05, Data represents the mean of four replications.

reduction in length and breadth of cocoon on both [(CSR6 x CSR26) x (CSR2 x CSR27)] (3.25 cm and 2.19 cm) and CSR2 X CSR4 (2.95 cm and 1.68 cm), however double hybrid was found to be superior than bivoltine hybrid.

According to Suresh Kumar *et al.* (2003a) temperature is considered to be one of the environmental factors which is a trend setter.

In the present investigation, irrespective of breeds, the length and breadth of cocoons were significantly lower at a temperature of 34±10ºC and 85 ± 5% RH. This result agrees with the findings of Nanje Gowda and Mal Reddy (2006). The lack of cocoon uniformity at high temperature rearing was also reported by Suresh Kumar *et al.* (2003b).

At 34 ±10ºC and 85 ±5 % RH, [(CSR6 x CSR26) x (CSR2 x CSR27)] performed significantly better, recording higher survival percentage (89.81%), larval weight (4.45 g), cocoon weight (1.74 g), shell weight (0.36 g), and shell ratio (20.68%) than CSR2 X CSR4 (86.97%, 3.89g, 1.67g, 0.33g, 19.76%).This result finds support by the findings of Suresh Kumar *et al.* (2005).

In both the hybrids, reductions in economic parameters were observed in the present study at high temperature and humidity conditions than at room temperature. The present result fall in line with findings of Palit *et al.*, (2003). Under both laboratory and rearing conditions at farmers holdings, temperature and RH will not exceed above

Table 2. Economic parameters of (CSR6 x CSR26) x (CSR2 xCSR27) and CSR2 X CSR4 at two different temperature and humidity conditions

Temperature and Relative humidity	Breeds	Survival %	Larval weight (g)	Cocoon weight (g)	Shell weight (g)	Shell ratio (g)
34 ±1ºC and 85±5 % RH	(CSR6 x CSR26) x (CSR2 xCSR27)	89.81^{c}	4.45^{b}	1.74^{c}	0.36^{c}	20.68^{b}
	CSR2 X CSR4	86.97^{d}	3.89^{c}	1.67^{d}	0.33^{d}	19.76^{c}
25±1ºC and 65±5 % RH	(CSR6 x CSR26) x (CSR2 xCSR27)	95.55^{a}	4.78^{a}	2.05^{a}	0.48^{a}	23.41^{a}
	CSR2 X CSR4	94.10^{b}	4.44^{b}	1.98^{b}	0.41^{b}	20.71^{b}

Means followed by similar letter(s) are not significantly different (P=0.05), Data represents the mean of four replications.

32ºC and 75 % RH respectively. Hence, the problem of reduction in economic parameters will not be encountered. This is supported by Suresh Kumar *et al.* (2003b) who reported that double hybrids performed better than single hybrids and pure races both at room temperature and high temperature treatment.

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