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Mulberry varieties for chawki rearing of *Bombyx mori* L. (Lepidoptera: Bombycidae) in subtropical conditions in India

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ABSTRACT: To identify best mulberry variety for chawkie rearing and its impact on economic characters of silkworm (*Bombyx mori* L.), experiments were conducted in three seasons viz., autumn -2019, spring -2020 and autumn- 2020, with six mulberry varieties (C-2038, Tr-23, PPR-1(S-140), S-1635, S-146 and G-2). Based on the weight of 10 mature larvae (g), cocoon yield by weight (kg), single cocoon weight (g), single shell weight (g) and shell ratio (%), S-1635 and S-140 (PPR-1) were found suitable for chawki rearing in sub-tropical conditions.

KEY WORDS: Silkworm, chawkie rearing, bioassay, biochemical analysis, moisture retention, cocoon characters

The silkworm *Bombyx mori* L. is a typical monophagous insect and mulberry is its sole food plant. The quality of mulberry leaf is one of the most important factors for the production of good cocoon crop (Ravikumar, 1988). The growth and development of silkworm larvae and the economic characters of cocoon are known to be influenced by the nutritional content of mulberry leaves (Krishnaswamy *et al.*, 1971; Machi and Katagiri, 1991; Singhal *et al.*, 2005; Rahmathulla, 2012). All through the first four instars and former half of fifth instar, the mulberry leaf consumed is invariably utilized for only its growth. The leaf consumed during latter half of the fifth instar, on the other hand, is utilized for building the cocoon (Nair and Kumar, 2004). About 92.20 per cent of the silk produced in the world is obtained from *B. mori* reared solely on mulberry leaves (*Morus* spp.). It is well-established fact that in sericulture, more than 60 per cent of the total cost of cocoon production goes towards mulberry production alone.

Mulberry varieties like S36, S41, S46, S54, S1, S146, S1635, AR12, AR14, TR10, BR2 were evaluated for nutritional potential and silkworm rearing. In recent years more new mulberry varieties like S1708, MS5, C6, C10, were evolved and variety S1708 turns out to be superior in bioassay tests compared to other varieties (Yoganandamurthy *et al.*, 2013 a, b, c). To identify best mulberry genotypes for chawkie rearing and its impact on economic characters of silkworm, experiments were conducted in three seasons viz., autumn -2019, spring -2020 and autumn- 2020, with six varieties.

Nursery of six mulberry genotypes viz; C-2038, Tr-23, S140, S1635, S 146 (as control) and G 2 was raised in January'2018. Bush (irrigated) type mulberry varieties with a spacing 3'X3' were planted in complete randomized block design replicated thrice. There were 24 plants in each variety under four treatment combinations (96 plants in each replication in three replications. Gap filling was taken

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up during the month of January, 2019. Maintenance was done as per recommended package of practices of RSRS, Sahaspur, Dehradun. Data on leaf yield, moisture per cent, moisture retention capacity after six and twelve hours, analysis of leaf quality for different biochemical parameters viz; concentration of total soluble carbohydrates (TSC), total soluble protein (TSP) and total chlorophyll content were recorded.

Moulting test of mulberry silkworm: During autumn 2019, in spring 2020 and in autumn 2020, moulting was more than 90 per cent in all six varieties, in all the three instars. Moulting per cent was recorded maximum in S-140 (PPR-1).

Bioassay studies: During autumn-2019, the cocoon yield/10000 larvae by weight (kg) was found maximum in S-1635 mulberry variety (18.440 kg). Single cocoon weight, single shell weight and S/R ratio, were 1.751g, 0.374g and 21.36 per cent, respectively, in S-1635 and were found statistically significant (Table 1). However, data recorded on other parameters such as fecundity, hatching per cent, larval period and weight of 10 matured larvae was found statistically non-significant in all the three rearing seasons.

During spring the yield/10000 larvae by weight (kg) was maximum in S-1635 (17.267 kg). The variety also recorded maximum single cocoon weight, single shell weight and S/R per cent with 1.751(g), 0.370(g) and 21.10 per cent, respectively. It was followed by S-140 and was statistically significant on all the parameters to control. Bioassay studies

Table 1. Bioassay studies during autumn-2019, spring and autumn 2020

Variety	Autumn 2019				Spring 2020				Autumn 2020			
	Yield* (kg)	SCW (g)	SSW (g)	SR %	Yield (kg)	SCW (g)	SSW (g)	SR %	Yield (kg)	SCW (g)	SSW (g)	SR %
C-2036	16.000	1.551	0.301	19.41	15.530	1.611	0.311	19.31	13.267	1.524	0.306	20.09
Tr-23	16.110	1.590	0.330	20.75	15.620	1.600	0.310	19.38	12.577	1.615	0.322	19.94
S-140	16.660	1.490	0.290	19.46	16.770	1.721	0.350	20.38	14.400	1.653	0.350	21.17
S-1635	18.440	1.751	0.374	21.36	17.267	1.751	0.370	21.10	14.550	1.637	0.350	21.38
S-146	18.220	1.720	0.340	19.77	15.557	1.620	0.321	19.82	12.967	1.613	0.333	20.65
G-2	17.220	1.601	0.320	19.99	15.533	1.630	0.331	20.31	13.130	1.630	0.340	20.86
CD	0.190	0.015	0.017	0.992	0.190	0.015	0.017	0.460	0.498	0.041	0.015	0.717

*Cocoon Yield/ 10000 larvae by weight (kg); SCW - Single cocoon weight; SSW - single shell weight; SR - shell ratio percentage

Table 2. Moisture content of leaves during 2020

Variety	Spring		Autumn	
	*Leaf (g)	Moisture (%)	* Leaf (g)	Moisture (%)
C-2036	143	74.470	187	75.45
TR-23	136	72.694	138	74.74
S-140	212	76.343	255	77.17
S-1635	126	75.165	159	74.24
S-146	138	74.413	140	73.53
G-2	133	73.056	168	75.16
CD	29.8	1.522	8.3	1.68

*Fresh wt. of 25 leaves

Table 3. TSC, TSP and total chlorophyll of the varieties (mg/ g dwt)

Variety	TSC	TSP	Chlorophyll
S-1635	301.55	48.01	3.46
G-2	288.51	40.44	2.83
S-140	294.05	48.16	4.33
C-2038	244.50	30.40	2.84
Tr-23	255.58	48.06	3.63
S-146	251.99	37.73	3.73
CD	17.26	4.18	0.56

140 followed by Tr-23 and S-1635. Total chlorophyll content was maximum in S-140 followed by S-146, Tr-23 and S-1635. Concentration of TSC, TSP and total chlorophyll were found significant to control (Table 3).

Assessment of post cocoon parameters: During spring 2020, S-1635 and S-140 were found at par with others; however filament length was maximum in S-140. During autumn 2020, S-1635 and S-140 were found at par with others, however filament length was found maximum in S-1635. There were no differences in denier, renditta and Reelability among the genotypes (Table 4).

Table 4. Assessment of post cocoon parameters among varieties in spring and autumn

Variety	Filament length (m)		Denier		Renditta		Reelability (%)	
	spring	autumn	spring	autumn	spring	autumn	spring	autumn
C-2038	1070	821	2.6	2.5	7.95	7.50	80.04	78.67
Tr-23	926	924	3.0	2.5	7.08	6.50	82.13	81.35
S-140	1096	903	2.7	2.6	7.54	7.59	80.10	78.16
S-1635	901	937	2.4	2.4	7.50	7.07	79.79	81.21
S-146	798	859	2.6	2.4	6.54	7.21	81.96	80.20
G-2	958	936	2.8	2.8	9.03	6.77	79.06	80.22

during autumn revealed that yield/10000 larvae were higher in S-1635 variety (14.550 kg). The single cocoon weight, single shell weight and shell ratio percentage, 1.637(g), 0.350(g) and 21.38 per cent, respectively, were also higher in S-1635 followed by S-140 and it was found significant on all the parameters (Table 1).

Moisture and moisture retention capacity: During spring-2020 mean moisture (%) and mean moisture retention capacity (%), after 6 hours and 12 hours was found maximum in S-140 (PPR-1) followed by S-1635 and was significant on all the parameters to control. During autumn 2020 mean moisture per cent, after twelve hours was found maximum in S-140 and more than 60 per cent after twelve hours in S-1635 and was found significant on all these parameters to control (Table 2).

Bio-chemical analysis: TSC was higher in S-1635 followed by S-146 and G-2. TSP was higher in S-

As per the objective to identify best mulberry variety for chawkie rearing and its impact on economic characters of cocoon, varieties S-1635 and S-140 were found suitable for sub-tropical conditions.

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REFERENCES

Krishnaswamy S., Kumararaj S., Vijayaraghavan K. and Kasiviswanathan K. (1971) Silkworm feeding trail for evaluation of the quality of mulberry leaves as influenced by variety, spacing and nitrogen fertilization. Indian Journal of Sericulture 9(1): 79-89.

Machi M. and Katagiri K. (1991) Varietal difference in nutritive value of mulberry leaves for rearing silkworms. JARQ 25: 202-208.

Nair J.S. and Kumar S.N. (2004) Artificial diet for silkworm. *Bombyx mori* L. – retrospection through the decade. Indian Journal of Sericulture 43(1):1-17.

Rahmathulla V.K. (2012) Management of Climatic Factors for Successful Silkworm (*Bombyx mori* L.) Crop and Higher Silk Production: A Review. Psyche: A Journal of Entomology. Open Access. ID 121234. https://doi.org/10.1155/2012/121234.

Ravikumar C. (1988) Western Ghats as a bivoltine region – Prospects, Challenges and Strategies for its development. Indian Silk 26(9): 39-54.

Singhal B.K., Dhar A., Tripathi P.M., Qadri S.M.H., Saxena N.N., Bindroo B.B. and Khan M.A. (2005) Leaf nutritional quality in different plantation types of mulberry *(Morus* sp.) in Indian subtropics. Advances in Tropical Sericulture. Proceedings on National Conference on Tropical Sericulture for Global Competitiveness, C.S.R.T.I., Mysore. pp. 153-156.

Yoganandamurthy V.N., Ramesh H.L., Lokesh G., Munirajappa and Dayakaryadav B.R. (2013a) Assessment of six mulberry (*Morus*) germplasm varieties through moulting and bioassay parameters by using cross breed silkworms *Bombyx mori* L. for commercial exploitation in Kolar district, Karnataka. International Research Journal of Biological Sciences 2(9): 69-75.

Yoganandamurthy V.N., Ramesh H.L. and Munirajappa (2013b) Impact of feeding selected mulberry germplasm varieties on silkworm *Bombyx mori* L. through bioassay techniques for commercial exploitation. Asian Journal of Natural and Applied Sciences 2 (4): 56-64.

Yoganandamurthy V.N., Ramesh H.L., Munirajappa and Dayakaryadav B.R. (2013c) Nutritional quality assessment of ten mulberry (*Morus*) germplasm varieties through moulting test, silkworm rearing technique and economical characters of bivoltine silkworms (*Bombyx mori* L) for commercial exploitation. International Research Journal of Natural Sciences 1(2): 11-22.

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