

## STUDY OF PARAMETERS OF CSR-2, CSR-2 X CSR-4 AND CSR-4, COCOONS REARED WITH M5 MULBERRY LEAVES IRRIGATED BY DISTILLERY SPENTWASH

S. Chandraju<sup>1\*</sup>, GirijaNagendraswamy<sup>1</sup> and CS. Chidan Kumar<sup>2</sup>

<sup>1</sup>Department of Studies in Sugar Technology, Sir M. Visweswaraya Postgraduate Center, University of Mysore, Tubinakere, Mandya, Karnataka, India.

<sup>2</sup>Department of Chemistry, Alva's Institute of Engineering & Technology, Shobhavana Campus, Mijar, Moodbidri, South Canara Dt. Karnataka, India.

### ABSTRACT

CSR-2, CSR-2 x CSR-4 and CSR-4, silkworm reared with M5 variety of mulberry plants irrigated by raw water, 50% PTSW and 33% PTSW. The different parameters such as raw silk (%), filament length (m), reelability (%), denier and shell ratio were determined at the maturity of cocoons. It was found that the parameters were better in cocoon irrigated with 33% PTSW compared to 50% PTSW and raw water irrigations. This concludes that the mulberry plants irrigated with 33% PTSW were enriched with more nutrients for the potential growth of mulberry plants which results in the potential cocoons.

**Keywords:** Silk worm, Growth, Mulberry plant, Irrigation and Cocoon parameters.

### INTRODUCTION

Sericulture or silk farming is the rearing of silkworms *Bombyx mori* for the production of raw silk. Mulberry leaves, particularly those of the white mulberry, are ecologically important as the sole food source of the silkworm (*Bombyx mori*, named after the mulberry genus *Morus*), the pupa/cocoon of which is used to make silk. Silk is a way of life in India. Over thousands of years, it has become an inseparable part of Indian culture and tradition. No ritual is complete without silk being used as a wear in some form or the other. Silk is the undisputed queen of textiles over the centuries. Silk provides much needed work in several developing and labor rich countries. Sericulture is a cottage industry par excellence. It is one of the most labor intensive sectors of the Indian economy combining both agriculture and industry, which provides for means of livelihood to a large section of the population i.e. mulberry cultivator, co-operative rarer, silkworm seed producer,

farmer-cum rarer, reeler, twister, weaver, hand spinners of silk waste, traders etc. It is the only one cash crop in agriculture sector that gives returns within 30 days. This industry provides employment nearly to three five million people in our country. India is the second largest silk producer in the World after China. Germany is the largest consumer of Indian silk. The sericulture industry is land based as silk worm rearing involves over 700,000 farm families and is concentrated in Karnataka, Tamilnadu and Andhra Pradesh (Southern states of India). Assam and West Bengal states are also involved to certain extent<sup>1</sup>.

The silkworm, *Bombyx mori* L. is a typical monophagous insect and mulberry (*Morus* spp.) leaf is its sole food. Sericulture is an age-old land-based practice in India with high employment potential and economic benefits to agrarian families. No doubt, India is the second largest producer of mulberry silk next only to China<sup>2</sup>. Various extracts of medicinal plants have been

tested by supplementation in the silkworm *Bombyx mori* and were seen to influence the body weight, silk gland weight and the silk thread length in *Bombyx mori*<sup>3</sup> and chitosan solution elicited varied responses in the final instar larvae of *Bombyx mori*.<sup>4</sup> Nutrition plays an important role in improving the growth and development of *B. mori*.<sup>5</sup> Fortification of mulberry leaves with the flour of black gram and red gram to improve the larval growth and cocoon characteristics in *B. mori*.<sup>6</sup> The quantity and the quality of dietary protein have long been considered to be important in the growth of the silkworm. Higher growth rate as well as weight gain can be observed in higher protein utilized group and the relative growth rate varied among the different breeds of the silkworm<sup>7</sup> were influenced by the season.<sup>8</sup> A strong correlation between the growth of silkworm and the silk production in the silkworm after the treatment with plant extracts and attributed the growth promoting effect of the plant extracts to the stimulation of biochemical processes leading to protein synthesis.<sup>3</sup> The cocoon weight increased when the silkworm larvae were fed with blood meal fortified mulberry leaves.<sup>9</sup> The increase of cocoon weight when the silkworm larvae were fed with zinc and nickel fortified mulberry leaves.<sup>10</sup> Supplementation of tyrosine to enhance the cocoon weight due to the increased synthesis of DNA, RNA and proteins in silk gland.<sup>11</sup> The weight and the size of cocoon shell ratio and fibroin content of the shell increased with the supplementation of the amino acid, glycine<sup>12</sup> administration of JH analogue, Methaprene, to fifth instar larvae of *B. mori* through hypodermic injection increased the shell weight by 16 percent over the control. Improvement in economic characters of silkworm was also noticed with folic acid administration. Sevarkodiyone has reported a greater stimulatory effect resulting in an increase in shell weight by 30.7 per cent over the control with the supplementation of aqueous leaf extracts of some plants along with mulberry leaves. The silkworm larvae fed on mulberry leaves treated with

*Coffea arabica* leaf extracts at 1:25 concentration recorded significantly higher. Diluted spentwash increase the uptake of nutrients, height, growth and yield of leaves vegetables<sup>13,14</sup> and yields of condiments<sup>15</sup>, yields of some root vegetables in untreated and spentwash treated soil<sup>16</sup> yields of top vegetables (creepers)<sup>17</sup> yields of tuber/root medicinal plants<sup>18</sup> yields of leafy medicinal plants<sup>19</sup> yields of leafy medicinal plants in normal and spentwash treated soil<sup>20</sup>. However, no information is available on the yields of cocoon parameters of silkworms CSR-2, CSR-2 x CSR-4 and CSR-4, reared using M5 mulberry leaves cultivated by irrigation with distillery spentwash. Therefore, the present investigation was carried out to study the influence of M5 mulberry leaves cultivated by irrigating with different proportions of spentwash on the cocoon parameters of silkworms CSR-2, CSR-2 x CSR-4 and CSR-4, reared using M5 mulberry leaves.

#### MATERIALS AND METHODS

Mulberry plant selected for the present study was M5 variety. The land was ploughed repeatedly (3 to 4 times) to loosen the soil and all gravel, stones and weed were removed to get the fine soil. The ridges and furrows are made at a distance of 1.0 m, sets were planted at a distance of 0.6 m (set to set) along the row and irrigated (by applying 5-10 cm<sup>3</sup>/cm<sup>2</sup>) with raw water (RW), 50% and 33% SW at the dosage of once in fortnight and rest of the period with raw water (depends upon the climatic condition), without the application of any external fertilizer (either organic or inorganic). Harvesting of the leaf is done by plucking individual leaf during cooling hours of the day which is 50-60 days old. These fresh leaves are used to rear silk worms.

Disease free laying of the silkworm were obtained and raised on fresh mulberry leaves as per the new technology for silkworm rearing.<sup>21</sup> After third moult, the larvae were acclimatized to the laboratory conditions by rearing them during the fourth instar in plastic trays of size 26 x 20 x 6 cm. During this period, they were fed four times a day. Sufficient ventilation was ensured to the larvae by placing the trays one above the other crosswise. Coolant gel bags were used to bring down the temperature and wet synthetic foam pads

were used to enhance the relative humidity near the larval bed within the optimum level. A Thermo-Hygrometer was used to record the temperature and relative humidity near the larval bed. Fresh and healthy leaves of M5 variety of mulberry were used in the present study. The leaves were harvested daily from the mulberry garden during the early hours of the day and stored cool to maintain its freshness until use using wet gunny cloth in a wooden chamber. Disinfection was carried out prior to the commencement of silkworm rearing as a precautionary measure against pathogens, which may remain in the rearing room and are likely to infect the silkworm. For this, the rearing room was disinfected by spraying 2% formalin solution 3 days prior to the commencement of rearing. The rearing materials such as trays and mountages were washed with Chloral solution. Dettol solution was used to wash the hands before and after handling the worms during the time of rearing. A bed disinfectant powder prepared by grinding Lime Powder, Para formaldehyde and Benzoic acid in 97:2:1 ratio was dusted mildly on the worms daily after bed cleaning. Dead larvae if any, during the course of rearing were immediately removed and discarded properly. fed with untreated mulberry leaves. Thus, the larvae in both the control and experimental trays were reared with equal quantities of leaves. The temperature and relative humidity were maintained at about  $26 \pm 2^{\circ}\text{C}$  and around  $70 \pm 10$  per cent respectively. Several parameters were studied to assess the growth and the cocoon characteristics of *B. mori*. The mature larvae of the experimental sets were isolated and mounted on separate plastic mountage (Netrika). They were left undisturbed for four days to spin the cocoon. The cocoon was harvested. Then cocoons were collected after harvest and cleaned by removing litter. Trials were conducted thrice, cocoon parameters such as raw silk percentage, filament length, reelability, denier and shell ratio were determined, recorded by taking the average values. These quantitative parameters were measured by the standard procedures.<sup>22</sup>

## RESULTS

The cocoon parameters were good, reared using M5 variety mulberry plant leaves cultivated by 33% SW irrigation, and moderate in 50%, while comparatively poor in RW (Table-1). In our previous studies also found that 33% SW irrigation favors the growth, yield and nutrients of plants. This could be due to the maximum absorption of NPK by the plants at 33% dilution. In the case of 50% SW irrigation the yields were low.

Enrichment of nutrients in M5 mulberry leaves cultivated by 33% influence healthy growth of silkworms contains comparatively high proportion of natural protein fiber secreted by silkworms in the form a thread, Fibroin – inner core comprising 75% of silk, Sericin - outer gum comprising 25% of silk.

## CONCLUSION

It was observed that the parameters of cocoons produced by rearing the silk worms using M5 variety of mulberry leaves cultivated by irrigation in 33% SW were maximum and moderate in 50% SW and minimum in RW irrigations. It concludes that, in 33% SW irrigation the plants are able to absorb maximum amounts of nutrients (NPK) both from the soil and the spentwash resulting high yield and enhance the nutrients in plants leaves which in turn influence the better growth of silk worms containing higher proportion of silk proteins yields spinning of long silk threads in cocoons resulting in increased weight of cocoons, minimizes the cost of cultivation, and increase the parameter values of cocoons resulting in high silk production, this elevates the economy of the farmers, since cultivation of mulberry is made without using fertilizer.

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**Table1: Study of parameters of CSR-2, CSR-2 x CSR-4 and CSR-4 cocoon reared with M5 mulberry leaves irrigated by distillery spentwash**

Cocoon Parameters	CSR-2			CSR-2 x CSR-4			CSR-4		
	RW	50%PTSW	33%PTSW	RW	50%PTSW	33%PTSW	RW	50%PTSW	33%PTSW
Raw silk (%)	19.60 ±0.012	20.10 ±0.014	21.50 ±0.011	20.00 ±0.013	21.20 ±0.007	23.50 ±0.006	16.75 ±0.018	18.55 ±0.009	19.22 ±0.009
Filament length (m)	1000.50 ±0.006	1180.00 ±0.007	1225.67 ±0.006	1147.00 ±0.004	1200.00 ±0.002	1290.00 ±0.009	750.65 ±0.006	900.00 ±0.006	1010.45 ±0.006
Reelability (%)	80.90 ±0.010	86.23 ±0.012	90.20 ±0.013	85.00 ±0.008	87.00 ±0.013	90.00 ±0.012	76.00 ±0.013	78.12 ±0.013	83.25 ±0.012
Denier	3.00 ±0.013	3.21 ±0.005	3.98 ±0.009	2.57 ±0.012	2.65 ±0.001	3.32 ±0.010	3.19 ±0.015	3.29 ±0.006	3.39 ±0.011
Shell ratio	24.80 ±0.012	26.63 ±0.010	28.70 ±0.010	23.50 ±0.011	23.90 ±0.013	25.20 ±0.017	21.30 ±0.013	22.00 ±0.012	23.10 ±0.012

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