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Influence on the Overall Performance of the Mulberry Silkworm, Bombyxmori L. CSR2 X CSR4 Hybrid Cocoon Reared with V1 Mulberry Leaves Irrigated by Distillery spentwash.

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ABSTRACT

CSR2 x CSR4 silkworm reared with V1 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 is enriched with more nutrients for the potential growth of mulberry plants which results in the potential cocoons.

Keywords: silk worm, growth, mulberry plant, irrigation, cocoon parameters.

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INTRODUCTION

The silkworm, Bombyxmori L. is a typical monophagous insect and mulberry (Morus spp.) leaf is its sole food. Man has immensely benefited from the silk produced by silkworms and subsequently researchers have always been trying to unveil the factors that can be manipulated to the benefit of the silkworm rearers [1]. 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 [2] Plants are the richest source of organic chemicals on earth and phytochemicals have been reported to influence the life and behaviour of different insects [3] Various extracts of medicinal plants have been tested by supplementation in the silkworm Bombyxmori and were seen to influence the body weight, silk gland weight and the silk thread length in Bombyxmori [4]Dietary supplementation of the leaf, flower and pod extracts of Moringaoleifera [5] and chitosan solution[6] elicited varied responses in the final instar larvae of *Bombyxmori*. Nutrition plays an important role in improving the growth and development of *B. mori* [7] [8] observed fortification of mulberry leaves with the flour of black gram and red gram to improve the larval growth and cocoon characteristics in *B. mori*. Similarly, the growth of silkworm larvae improved significantly upon feeding them with mulberry leaves supplemented with different nutrients[9]. The quantity and the quality of dietary protein has 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[10] and were influenced by the season[11]. The difference in the relative growth rate of *Aloe vera*tonic supplemented larvae from the control observed in the present study indicates that the *Aloe vera*supplementation results in higher protein utilization. [12] noticed that the growth rate and protein utilization of silkworm are high as a result of the supplementation of Miraculan, a plant growth regulator. [4] noticed 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. The economic characters of the silk cocoon were reported to improve by feeding the silkworm with mulberry leaves treated with amino acids[13],[14] observed the enrichment of mulberry leaves with calcium chloride to increase the cocoon characters like cocoon weight, shell weight cocoon /shell ratio and silk proteins. The cocoon weight increased when the silkworm larvae were fed with blood meal fortified mulberry leaves [15], [16] reported the increased of cocoon weight, when the silkworm larvae were fed with zinc and nickel fortified mulberry leaves,[17] reported the supplementation of tyrosine to enhance the cocoon weight due to the increased synthesis of DNA, RNA and proteins in silk gland. The weight and the size of cocoon shell ratio and fibroin content of the shell increased with the supplementation of the amino acid, glycine [18] reported that 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 an 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 *Coffeaarabica*leaf extracts at 1:25 concentration recorded significantly higher.

Diluted spentwash increase the uptake of nutrients, height, growth and yield of leaves vegetables and top vegetables[19],[20] and yields of condiments [21] yields of some root vegetables in untreated and spentwash treated soil [22] yields of top vegetables (creepers) [23] yields of tuber/root medicinal plants [24] yields of leafy medicinal plants [25] yields of leafy medicinal plants in normal and spentwash treated soil [26] However, no information is available on the yields of cocoon parameters of silkworms CSR2xCSR4, reared using V1 mulberry leaves cultivated by irrigation with distillery spentwash. Therefore, the present investigation was carried out to study the influence of V1 mulberry leaves cultivated by irrigating with different proportions of spentwash on the cocoon parameters of silkworms CSR2 x CSR4, reared using V1 mulberry leaves

MATERIALS AND METHODS

Materials

Mulberry plant selected for the present study was V1 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 5-10cm^3/cm^2) 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.

Methods

Disease free laying of the silkworm were obtained and raised on fresh mulberry leaves as per the new technology for silkworm rearing [27] .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 ofV1variety 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 Chloralk 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, Paraformaldehyde 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 ± 2°C and around 70 ± 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 cocoons were 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 procedures. [29]

RESULTS

The cocoon parameters were very high reared using V1 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.

DISCUSSION

Enrichment of nutrients in V1 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.

Table I: Parameters of CSR-2 x CSR-4 cocoons reared with mulberry leaves at different spentwash Irrigation.

Cocoon Parameters	Irrigation Medium		
	RW	50%PTSW	33%PTSW
Raw silk (%)	18.00±0.018	18.75±0.009	20.00±0.008
Filament length (m)	1138.00±0.006	1147.00±0.003	1150.00±0.010
Reelability (%)	79.00±0.012	81.00±0.015	85.00±0.010
Denier	2.69±0.011	2.73±0.002	3.00±0.009
Shell ratio	21.70±0.014	22.65±0.012	23.50±0.016

It was observed that the parameters of cocoons produced by rearing the silk worms using V1 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. The nutrients enhancement in plant leaves 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,

CONCLUSION

Irrigation of mulberry by using dilute spentwash (33%) without chemical fertilizer results in good quality and increased yield of cocoon; this elevates the economy of the farmers. Thus

spentwash can be used as an eco-friendly liquid fertilizer, without causing any detrimental effect to the environment.

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