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Full Length Research Paper

Influence on the overall performance of the mulberry silkworm *Bombyxmori L*. Kolargold cocoon reared with V1 mulberry leaves irrigated with distillery spent wash

S. CHANDRAJU[1], GIRIJANAGENDRASWAMY[1] and C. S. CHIDAN KUMAR[2]

[1]Department of Studies in Sugar Technology, Sir M. Visweswaraya Postgraduate Center, University of Mysore, Tubinakere, Mandya -571402, Karnataka, India
[2]Department of Chemistry, Alva's Institute of Engineering & Technology, Shobhavana Campus, Mijar, Moodbidri -574 225, South Canara District, Karnataka, India

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Kolar Gold 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.

Key words: Silk worm, Growth, Mulberry plant, Irrigation, Cocoon parameters.

INTRODUCTION

The silkworm, Bombyx mori 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 (Nair and Kumar, 2004). 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 (Vijayaprakash and Dandin, 2005). Plants are the richest source of organic chemicals on earth and phytochemicals have been reported to influence the life and behavior of different insects (Rajasekaragouda *et al.,* 1997).

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 (Murugan *et al.,* 1998). Dietary supplementation of the leaf, flower and pod extracts of Moringa oleifera (Rajeswari and Isaiarasu, 2004) and chitosan solution (Bin Li *et al.,* 2010) elicited variedresponses in the final in star larvae of *Bombyx mori*. Nutrition plays an important role in improving the growth and development of *B. mori* (Kanafi *et al*., 2007). Alagumalai *et al.* (1991) 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 (Sarker, 1993 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 (Magadum *et al*., 1996) and were influenced by the season (Isaiarasu and

Corresponding Author: E-mail: chidankumar@gmail.com

Suriabraman., 1999). 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. Sundaramahalingam *et al.* (1998) noticed that the growth rate and protein utilization of silkworm are high as a result of the supplementation of Miraculan, a plant growth regulator. Murugan *et al.* (1998) 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 (Sridhar and Radha, 1986). Subburathinam *et al*. (1990) 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 bloodmeal fortified mulberry leaves (Matsura, 1994). Chamudeswari and Radhakrishnaiah (1994) reported theincreased of cocoon weight, when the silkworm larvae were fed with zinc and nickel fortified mulberry leaves. Majumdar and Medda (1995) 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 coccon shell ratio and fibroin content of the shell increased with the supplementation of the amino acid, glycine (Isaiarasu and Ganga, 2000) reported that administration of JH analogue, Methaprene, to fifth in star 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 (Chandraju *et al.,* 2007; Basvaraju and Chandraju, 2008) and yields of condiments (Chandraju and Chidan Kumar, 2009), yields of some root vegetables in untreated and spentwash treated soil (Chidan Kumar *et al.,* 2009), yields of top vegetables (creepers) (Chidan Kumar *et al.,* 2009), yields of tuber/root medicinal plants (Nagendraswamy *et al.,* 2010), yields of leafy medicinal plants (Nagendraswamy *et al.,* 2010), yields of leafy medicinal plants in normal and spent wash treated soil (Chandraju *et al.,* 2010), However, no information is available on the yields of cocoon parameters of silkworms Kolar Gold, 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 Kolar Gold, reared using V1 mulberry leaves.

MATERIALS AND METHODS

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.

Disease free laying of the silkworm were obtained and raised on fresh mulberry leaves as per the new technology for silkworm rearing (Dandin *et al.,* 2000). 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 bagswere used to bring down the temperature and wet synthetic foam pads were used to enhance the relativehumidity near the larval bed within the optimum level. A Thermo-Hygrometer was used to record the temperatureand relative humidity near the larval bed. Fresh and healthy leaves ofV1variety ofmulberry were used in the present study.

The leaves were harvested daily from the mulberry garden during the early hours of theday and stored cool to maintain its freshness until use using wet gunny cloth in a wooden chamber. Disinfectionwas 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 wasdisinfected by spraying 2% formalin solution 3 days prior to the commencement of rearing. The rearing materialssuch as trays and mountages were washed with Chloral solution. Dettol solution was used to wash the handsbefore and after handling the worms during the time of rearing. A bed disinfectant powder prepared by grindingLime Powder, Paraformaldehyde and Benzoic acid in 97:2:1 ratio was dusted mildly on the worms daily after bedcleaning. Dead

Table 1: Parameters of Kolar Gold cocoon reared with mulberry leaves at different spentwash Irrigation.

Cocoon Parameters	Irrigation Medium		
	RW	50%PTSW	33%PTSW
Raw silk (%)	13.00±0.019	14.42±0.011	15.60±0.009
Filament length (m)	731.67±0.009	825.00±0.010	864.66±0.007
Reelability (%)	85.30±0.014	87.20±0.012	88.90±0.010
Denier	2.60±0.013	2.69±0.007	2.75±0.014
Shell ratio	18.66±0.015	19.6±0.011	20.78±0.013

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 larvaeof 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 quantitativeparameters were measured by the procedures given by Sonwalkar (1993).

RESULTS

Parameters such as raw silk, filament length, reelabality, denier and shell ratio were found to be good considerably in the case of cocoons reared by feeding mulberry leaves irrigated by 33% SW irrigation compared with the cocoons reared by mulberry leaves irrigated by 50% SW and raw water irrigations (Table-1). This could be due to the potential growth of mulberry plants by the absorption of NPK (plant nutrients) present in spentwash at higher dilution (33%). Thus the leaves (irrigated by 33% SW) fed to worms, favor the healthy and potential growth of silkworms effectively, as a result, and improve the characteristics of different parameters of cocoons.

DISCUSSION

Distillery spentwash is enriching with major plant nutrients such as N, P & K, which are prime essential for the potential growth of plants. At more dilution (33%), mulberry plants can easily absorbs the nutrients present in spentwash effectively and in turns the potential growth of silkworms. Naturally, healthy and potential silkworms will produce the high yield of silk and good characteristics in its different parameters such as filament length, reelabality, denier and shell ratio.

Since spentwash is enriched with N, P & K., during cultivation mulberry plants by spent wash irrigation, does not requires any external fertilizers (either or organic), this minimizes the cost of cultivation and elevates the economy of the farmers. Hence, spentwash serves as a liquid fertilizer without any adverse effect on soil and environment.

CONCLUSION

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 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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