African Journal of Basic & Applied Sciences 5 (5): 228-231, 2013
ISSN 2079-2034

DOI: 10.5829/idosi.ajbas.2013.5.5.75117

Influence of Turmeric Extract on the Growth and Commercial Parameters of *Bombyx mori* L. (Lepidoptera: Bombicidae)

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Abstract: Influence of turmeric extract collected from the rhizomes of *Curcuma longa* L. on the growth and commercial parameters of *Bombyx mori* L. was experimented. This study was carried out with the freshly moulted fifth instar larvae of the mulberry silkworm. Experimental rearing was carried out with 360 larvae of uniform size recruited from the stock that were reared and acclimatized to laboratory conditions. These larvae were formed into replicates and placed separately in the rearing trays. The turmeric extracts elicited better response in the growth characteristics of the final instar larvae of the mulberry silkworm. The extract having 0.2 per cent concentration resulted significantly higher larval growth cocoon weight. Maximum shell weight and shell ratio were noted in the treatment with the turmeric powder extract treatments. The fibroin content also showed significant increase as a result of the dietary supplementation of turmeric powder extract. The overall performance of *B. mori*with response to influence of turmeric powder extract treatments observed in the present study and the evaluation index values worked out showed that both the growth and commercial parameters could be improved in the mulberry silkworm with the supplementation of the extracts of turmeric.

Key words: Silk Worm · Mulberry · Turmeric Extract Supplementation

INTRODUCTION

Silk is one of the nature's gifts to mankind produced by silkworm. Among silkworms the most commercially exploited one are mulberry silkworm *Bombyx mori* L., silk is a natural fiber secreted for the protection of pupae in the p rocess of completing their life cycle. The larvae of *B. mori* L., is an elongated caterpillar commonly called as mulberry silkworm. Larvae are monophagous and feed only on mulberry plants. Mulberry leaves is the sole food plant for the silkworm *B. mori* L. The fresh and nutritive quality of mulberry leaf plays an important role on the development of worm stabilizing the cocoon production and silk productivity [1]. Also noticed plant extract of *Coffea arebica, Althernathera sessillis* and *Eichorniacrassipes* to stimulate the growth and increase silk yield [2]. Mulberry is the sole food plant of silkworms (*B. mori* L., Lepidoptera: Bombycidae) and its leaf quality has a great role in silkworm rearing, which in turn affects the overall silk production. In India, sericulture is mostly practiced in tropical region which is contributing more than 60% of the total country's silk production. It is mainly due to congenial climate conditions and many high yielding mulberry genotypes evolved time to time. These genotypes have been characterized for leaf surface parameters under tropical climatic conditions which are serving as a useful tool for mulberry improvement programs [3]. Turmeric is a medicinal plant extensively used in ayurvedic, unani and siddha of medicine [4]. The influence of turmeric powder extract on the growth and rearing performance of the silkworm *B. mori*. and commercial characteristics of the cocoon produced.

MATERIALS AND METHODS

The fourthinstar larvae of mulberry silkworm *Bombyx mori* L. Commercial cross breed race LxCSR2is chosen for the present study. The silkworm larvae were obtained from a farmer practicing Sericulture with help of the sericulture training Centre of Tamil Nadu Sericulture Development Board at Srivilliputtur, Tamil Nadu, India. The silkworm larvae obtained were transported to the laboratory safe under cool condition. The worms were acclimatized to the rearing condition by rearing them

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throughout the fourth instar inside the rearing chamber. Fresh healthy mulberry leaves of MR2 variety of *Morusalba*, were collected from the nearby sericulture farm during morning hours. They were stored in laboratory under cool conditions using wet gunny bags to retain its freshness. The rhizomes of turmeric were processed and powdered in a mixer grinder at slow speed. Ten gram of this powder were taken and dissolved in boiled water using magnetic stirrer for 15 minutes. The extract was then filtered through a fine nylon mesh. The powder was dissolved to get five different concentrations, such as 0.2, 0.4, 0.6, 0.8 and 1.0 percent were by dissolving 200, 400, 600, 800 and 1000 mg of the powder separately in 100 ml distilled water commercial sugar (1g) was added to each of the solution as a feeding stimulant [5]. Experimental rearing was carried out with 360 larvae of uniform size recruited from the stock that has been reared and acclimatized. These larvae were formed into triplicates and placed separately in the rearing trays. This rearing involved to basic observations on growth and cocoon characteristics and growth of larvae and mother moth of silkworm in response to the dietary supplementation. Notable these are the active principle of turmeric (*Curcuma longa* L.).

RESULTS AND DISCUSSION

Mulberry leaves is the sole food plant for the silkworm *Bombyx mori* L. The fresh and nutritive quality of mulberry leaf plays an important role on the development of worm stabilizing the cocoon production and silk productivity. In order to improve the quality of silk and quantity of cocoons it is necessary to enrich the nutrient quality of mulberry leaves. This can be achieved by the supplementation of mulberry leaves with extra nutrients. The use of plant extracts in sericulture will serve as an alternate source to get more number of cocoons, silk and will enrich the economy [6]. Nutrition, particularly as it relates to the physiology of digestion, is the most fundamental and important challenges in the sericulture. Effective culture cannot occur unless a species can be grown quickly and economically. Scientists have tried alternative food for the rearing of silkworm, but they were not cost effective. So they used some nutrients, minerals and vitamins as food supplements. Mulberry leaves have been supplemented with various nutrients for silkworm feeding to promote silk quality and quantity. In the present study, the mean larval weight of the final instar larvae was increased when compare to the control, this is due to the turmeric powder extracts [7]. A strong correlation between the growth of silkworm and silk production in the silkworm after the treatment with plant extract and attributed to the growth promoting effect of the plant extract of some of the biochemical process of protein synthesis. The quantity and quality of dietary protein has long been considered to be important in the insect growth of the silkworm [8]. In the present study, the weight of the cocoon were found increased over the control (46.12) in the experimental sets that had received the supplementation of 0.2(69.92), 0.4(48.21), 0.6(47.38), 0.8(45.84) and 1.0(41.93) per cent turmeric powder extract. This indicates that the turmeric powder extract is capable of influencing the cocoon parameters. The enrichment of mulberry leaves with calcium chloride to increase the cocoon characters like cocoon weight, shellweight cocoon/shell ratio and silk proteins (Fibroin and Sericin) [9]. The cocoon volume got reduced due to the dietary supplementation of turmeric powder extract. An increase in the cocoon volume has also been noticed with the supplementation of curry leaf extracts to the final instar larvae of the mulberry silkworm *B. mori* L. [10]. Decrease in the weight of shell was noticed in the present study. The shell weight values decreased in the order of 29.66 and 26.06 per cent for 0.01 per cent and 0.02 per cent treatment. The fibroin content significantly increased due to the dietary supplementation of turmeric powder extract [11]. The dietary supplementation of wheat and rice flours resulting an increase in fibroin content of the silkworm. The average of the evolution index values clearly indicate that although, this turmeric powder extract increase some growth and cocoon parameters, only a marginal increase was noticed in the experimental sets over the control [12]. The overall performance of *B. mori* with response to influence of turmeric powder extract treatments observed in the present study and the evaluation index values worked out showed that the parameters observed were increased in the set that received of turmeric powder extract treatments. Therefore, the improvement of the growth and cocoon characteristics of the silkworm *B. mori* when their final instar larvae were supplemented with this turmeric powder extract may be attributed to the medicinal properties of three plant extracts. Screening of various growth promoting tonics are readily available in the market may thus prove useful in augmenting commercial silk production. This study was only to find out the possibilities of growth and rearing rearing performance of silkworm, *B.mori* with the supplementation of turmeric powder extract.

Table 1: Overall performance of 4th instar larvae of the silkworm *Bombyx mori* (L x CSR2) response to turmeric powder extract

		Turmeric extract concentration (%)				
Parameter	Control	0.2	0.4	0.6	0.8	1.0
Mean larval weight (mg live weight/larva)	2041 ± 26	2075 ± 29	2124 ± 41	2069 ± 54	2050 ± 50	2062 ± 45
Relative Growth rate	0.125 ± 0.017	0.127 ± 0.05	0.127 ± 0.014	0.128 ± 0.001	0.128 ± 0.001	0.128 ± 0.001
Effective rate of rearing (%)	100	87.67 ± 6.24	95.00 ± 7.07	91.67 ± 8.50	90.00 ± 4.08	91.67 ± 6.24
Larval consumption index	0.339 ± 0.094	0.334 ± 0.08	0.350 ± 0.026	0.334 ± 0.090	0.343 ± 0.019	0.325 ± 0.013
Average pupal weight (mg dry weight / pupal)	322 ± 58	412 ± 35	305 ± 13	314 ± 15	324 ± 16	302 ± 9
Mother moth weight (mg live weight/moth)	317 ± 50	346 ± 21	330 ± 43	323 ± 24	363 ± 40	313 ± 37
Average cocoon weight (mg wet weight/cocoon)	1879 ± 69	2334 ± 20	1908 ± 80	1819 ± 52	1862 ± 92	1786 ± 67
Average cocoon volume (cm^2)	5.37 ± 2.36	4.91 ± 2.49	4.82 ± 2.31	4.50 ± 0.62	4.40 ± 1.07	4.29 ± 0.56
Average shell weight (mg dry weight/shell)	224 ± 54	201 ± 41	202 ± 42	201 ± 13	200 ± 13	200 ± 58
Cocoon shell ratio (%)	11.9 ± 2.8	10.68 ± 1.8	10.62 ± 2.24	10.62 ± 0.86	10.78 ± 0.81	11.17 ± 3.25
Silk fibroin content (mg dry weight/shell)	90 ± 0.004	109 ± 5	109 ± 8	108 ± 8	112 ± 5	113 ± 5
Silk flament length (cm)	797 ± 58.50	870 ± 17.51	937 ± 22.31	962 ± 23.37	977 ± 6.68	1010 ± 8.16

Table 2: Evaluation Index Values (%) calculated for influence turmeric powder extract on the growth and commercial parameters of 4th instar larvae of the silkworm *Bombyx mori* (L x CSR2)

		Turmeric extract concentration (%)				
Parameter	Control	0.2	0.4	0.6	0.8	1.0
Mean larval weight	39.99	51.66	68.47	49.60	43.08	47.20
Relative Growth rate	31.47	48.57	48.57	57.13	51.13	57.13
Effective rate of rearing	66.48	38.43	55.40	47.69	43.83	41.69
Larval consumption index	51.74	45.93	64.54	45.93	56.40	35.46
Average pupal weight	48.10	69.94	43.97	46.16	48.58	43.24
Mother moth weight	42.16	57.32	48.95	45.29	66.21	41.62
Average cocoon weight	46.12	69.92	48.21	47.38	45.84	41.93
Average cocoon volume	66.33	54.86	52.62	54.64	42.15	39.40
Average shell weight	59.57	65.72	44.53	43.85	43.16	54.92
Cocoon shell ratio	67.22	38.23	45.65	45.65	48.34	57.28
Silk fibroin content	30.13	52.56	52.56	51.38	56.10	60.76
Silk flament length	33.64	42.93	51.46	54.65	56.56	41.62
Average	48.58	53.01	52.08	49.11	50.62	47.48

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