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IMPACT OF VITAMIN C & E SUPPLEMENTATIONS ON 5TH INSTAR LARVAE OF CSR2XCSR4 SILKWORM *BOMBYX MORI* L.

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ABSTRACT: *Bombyx mori* L. CSR2 X CSR4 is a bivoltine cross-breed that produces more amount of silk. The body weight and gland weight of the silkworms are correlated to quantitative and qualitative production of silk. In the present study the body weight the gland weight and quantitative estimation of silk gland protein were thoroughly studied by supplementation of vitamin C and E. Increment in the body weight, gland weight and silk gland protein concentration are observed. Vitamin C supplementation is found to yield better result in concentration of silk gland protein in comparison to vitamin E.

KEYWORDS: Silkworm, Larvae, Gland, Protein, Vitamin.

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1. INTRODUCTION

Silk production is primarily an agriculture linked cottage industry. The life span of silkworm is nearly two months. Sericulture involves cultivation of mulberry plants nurturing of silkworm, collecting, reeling and weaving. *Bombyx mori* is well known as one of the most common valuable Lepidopteran insects. Silkworms are reared as native insects under controlled captivity [1]. The effects of various dietary supplements on the silkworm have been extensively studied by [2]. *Bombyx mori* is a holometabolous and monophagous insect which depends on host plant mulberry (*Morus alba* L., Family: Moraceae) leaves. These leaves are rich with vitamin C having tremendous antioxidant properties [3]. The larval stages of *Bombyx mori* exhibits highest rate of metabolism

completely dependent on nutritional value [4]. In addition to optimum temperature and humidity the quality of the mulberry leaf plays a significant role in the development of the silkworm [5]. Sericulture holds a prominent place in India [6]. The silk gland is a modified labial salivary gland. It has been divided as anterior, middle and posterior part. The anterior portion of silk gland is thin, middle portion is tubular and the posterior portion is a coiled structure. The anterior part of the gland is a thin duct devoid of secretory function. Middle silk gland secretes sericin protein consisting of fats, waxes, mineral salts and some pigments. While posterior gland deals with the synthesis of another silk protein called fibroin [7]. Sericin contributes in hardening of the fibroin thread of cocoon. The objective of the current study was to assess the impact of vitamin C and E on growth and silk gland protein concentration of silkworm particularly from the southern region of Odisha, India.

2. MATERIALS AND METHODS

A bivoltine crossbreed race (CSR2xCSR4) was collected from the silkworm rearing center of Mahendragarh of Gajapati district of Odisha. The race was reared at optimum condition of temperature at 26 ± 2^0C and humidity 80% [8]. Silkworm is monophagous feeding on mulberry leaves [9]. The dietary efficiency in larval condition is highly significant resulting in pupa, adult and production of silk [10]. Randomly one hundred silkworms were taken separately in the three different trays named as control, vitamin C and vitamin E treated. The leaves of mulberry were soaked in 1% solution of vitamin C and vitamin E separately. Then the leaves soaked with two different vitamins were air dried for 15 minutes then these leaves were fed to the fifth instar larvae of the silkworms. The tender leaves were fed to the young worms and the matured worms were fed with well matured leaves available at the bottom of the mulberry leaves [11]. Larvae from each tray were taken for measuring the weight individually with the help of digital weighing machine. The body weights of the larvae were recorded, the silkworms were sacrificed and further their silk glands were dissected out and weighed. This was repeated for seven days till the formation of cocoons. Simultaneously the estimation of the silk gland protein was recorded using Lowry's method. The experiment was repeated and the results were subjected to the statistical analysis correlating the control and treated.

3. RESULTS AND DISCUSSION

Recently, Shinde and co-workers [12] have shown the influence of retinol increasing the qualitative cocoon and silk filaments. In the current study an attempt has been made to observe the effect of vitamin C and vitamin E on the body weight, gland weight and silk gland protein. The results (table 1,2, & 3) indicate an increment in body weight, gland weight and silk gland protein throughout the fifth instar larva till the formation of cocoon. The larval development exhibit an initial feeding stage followed by a growth stage. The progressive increment in body weight, gland weight and silk gland protein might be due to the consumption of coarse leaves of mulberry followed by the

supplementation of vitamins predominantly vitamin C. Leaves with extra nutritional diet were fed to the fifth instars larvae of silkworms. Ascorbic acid increases the silk yield of the mulberry silkworm *Bombyx mori* L. [13]. The mulberry leaves enriched with vitamin E did not show significant effect on food consumption in silkworm larvae. Similar result was also validated by Mosallanejad and others [14]. The silk production is mainly dependent on the larval nutrition and quality of mulberry leaves which plays an effective role in producing good quality of cocoon [15]. Vitamins present in mulberry leaves satisfy minimum need of silkworm. But the amount of vitamins present in the mulberry leaves varies on the basis of environmental conditions [16]. The effects of vitamin supplementation on the growth of *Bombyx mori* L. have been investigated earlier [17]. Nutritional background of the larva mainly influenced the status of the resulting larva, pupae, adult and fibre [18-19]. Supplementation of vitamins as extra nutritional diet worked out best in the present study (Fig.1-3).

Fig 1: Fifth instar larvae feeding mulberry leaves (control)

Fig 2: Silkworms after feeding vitamin C

Fig 3: Silkworms after feeding vitamin E

Table 1: Changes in the body weight (gm)

5th Instar Duration	Body Weight		
	CSR2 x CSR4		
	Vitamin C	Control	Vitamin E
1st Day	0.8924± 0.0026	0.7644±0.0012	0.7352±0.0027
2nd Day	0.9616±0.0023	0.8646±0.0026	0.8156±0.0010
3rd Day	1.2888±0.0026	1.1284±0.0028	1.1144±0.0034
4th Day	2.2250±0.0011	2.1948±0.0014	2.1814±0.0017
5th Day	2.3506±0.0015	2.2672±0.2258	2.1090±0.0053
6th Day	2.3516±0.0017	2.3310±0.0021	2.2894±0.0019
7th Day	2.3354±0.0064	2.3080±0.0026	2.2702±0.0031

Table 2: Changes in the Gland weight (gm)

5th Instar Duration	Gland Weight		
	CSR2 x CSR4		
	Vitamin C	Control	Vitamin E
1stDay	0.0716±0.0023	0.0522±0.0013	0.0334±0.0021
2nd Day	0.1150±0.0019	0.972±0.0026	0.0832±0.0036
3rd Day	0.2094±0.0028	0.1646±0.0015	0,1588±0.0012
4th Day	0.3962±0.0011	0.3230±0.0028	0.2908±0.0023
5th Day	0.7088±0.0022	0.6806±0.0024	0.6230±0.0068
6th Day	0.8760±0.0015	0.8568±0.0017	0.7816±0.0010
7th Day	0.8796±0.0022	0.8712±0.0050	0.7896±0.0031

Table 3: Changes in the concentration of protein (µg/whole gland)

5th Instar Duration	Protein Concentration		
	CSR2 x CSR4		
	Vitamin C	Control	Vitamin E
1st Day	5.5786 ± 0.1828	4.686±0.1921	4.3614±0.1262
2nd Day	9.5547±0.1195	9.0069±0.1094	6.5016±0.1596
3rd Day	13.3279±0.1499	12.5773±0.0988	11.3601±0.1970
4th Day	19.3325±0.1276	15.8636±0.15163	14.5045±0.13224
5th Day	24.7895±0.1420	24.3026±0.2666	23.4810±0.1983
6th Day	40.1460±0.1308	38.8579±0.1722	38.2087±0.2533
7th Day	41.1502±0.2045	40.0750±0.1225	39.4766±0.2178

Correlation was found in the body weight, gland weight and protein concentration of the gland [20]. Silkworms were reared to produce more silk fibroin from the posterior silk gland [21]. The silkworm larva fed on artificial diet returned better results in earlier studies [22-26]. In the present study vitamin C showed encouraging result with increased protein content. Similar result was also reported by some investigators [27] though excessive amount of vitamin C supplement may have some negative impression [28] with controlled temperature [29-30].

4. CONCLUSION

Supplementation of vitamin C to the silk larva yields better result in concentration of silk gland protein in comparison to vitamin E. So it can be suggested that different sericulture farms of Odisha more specifically the southern districts of the state can use vitamin C for better enhancement of silk production.

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CONFLICT OF INTEREST

Currently there is no conflict of interest.

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