EFFICACY OF DIET WITH VITAMIN C ON THE PROTEIN CONTENT OF SILKWORM (BOMBYX MORI. L)

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(**Received on Date: 13th April 2016** **Date of Acceptance : 3rd July 2016**)

ABSTRACT

The overall development of silkworm larvae depends on getting the required food which can be easily digested and assimilated in the body tissues properly for the silk synthesis. The present study has been demonstrated that the amount of protein of the silkworm Bombyx mori L x CSR2 and CSR races, in different tissues such as silk gland, haemolymph, Fat body and digestive system, when fed on diet with vitamin c and without vitamin c. The control group of silkworm larval fed with normal mulberry leaves. The results of the experiment revealed that, the diet with vitamin c found effective in increasing the protein content in both races i.e. L x CSR2 and CSR. The highest protein content was found to be observed in T5 in silk gland (19.6mg), in haemolymph (18.92mg), in fat body (11.62mg) and in digestive system (14.12mg) on L x CSR2. Similarly the highest protein content was observed in T5, in silk gland (15.97mg), haemolymph (16.84mg), fat body (18.88mg) and digestive system (19.41mg) on CSR races.

Key words - Diet, Vitamin C, Protein

No:of Tables: 4 **No:of References:22**

INTRODUCTION

Nutritional is an important factor influencing the ability of rearing silkworm to exhibit its genetic potential for growth and reproduction. They are greatly influenced by serveal factors such as quality of feed, daily ratio, size, feed intake and physical chemical parameters of water. Feed and feeding are the important factors influencing growth, feed utilization and tissue composition of silkworm in rearing [1]. The most important critera for silkworm feed are its protein and energy content.

The fat body of the insect plays a role in the carbohydrate and lipid metabolism comparable to their liver and adipose tissues in mammals [2, 3]. Protein metabolism is important in the silkworm because of its vital role in the determination of chemical characteristics of silk protein like fibronin and sericin [4]. Protein is the main component that produces tissues and organs of the silkworm. Silkworm utilizes protein and amino acid present in mulberry leaves to synthesize the protein specific for silk gland secretions [5]. Haemolymph proteins play an important role in insects for transport functions, as well as for their enzyme action. The synthesis and utilization of haemolymph proteins are controlled by genetic and hormonal factors [6]. Haemolymph the only extra cellular fluid in insects performs several physiological functions such as immunity, transport, and storage reserve [7].

Growth of silkworm larvae was improved significantly on feeding mulberry leaves supplemented with different nutrient including vitamins, sugar and other substances. The total protein content of the silk gland increase, while the water, total lipid and carbohydrate contents decreased [8]. " Reference [9] shows that the supplementation of soyabean protein increased the protein and amino acid content in the larval haemolymph of the silkworm *Bombyx mori*". These are also known as fortification agents or supplementary nutrients when added to the normal diet. "Reference [10] Studied the highest lipid content was recorded on soya flour 10g/kg of leaves followed by artificial diet different races".

MATERIALS AND METHODS:

The diet should contain the essential nutrients in balanced proportion to support normal growth, development and reproduction. Formulating of artificial diet can be made separately for young age and adult. Two types of diet prepared. Diet with vitamin c and diet without vitamin c. The composition of diet commonly used are given in following dry mulberry leaf powder, fat free soya bean powder, inorganic salt mixture, cellulosed powder, agar agar powder, morin, glucose, vitamin c(tablet), preservative, antiseptic, distilled water.

An experiment on artificial diet rearing of silkworm L x CSR_2 and CSR was conducted on diet with and without artificial diet in 7 treatment, upto 1st instar (T_1) ; upto 2nd instar (T_2); upto 3rd instar (T_3); upto 4th instar (T_4) and there after shifted to mulberry leaf dip in vitamin c and normal leaf feeding respectively. In T_5

larvae were fed with artificial diet throughout larval period till spinning of cocoons; in T_6 larvae were fed with artificial diet and mulberry leaf in alternative day and in control (T_0) larvae were fed with mulberry leaves throughout larval period till spinning of cocoons.

The rearing was under taken as per the procedure followed by [11]. The total amount of protein content was analysed from larval silk gland, fat body, digestive system and haemolymph was estimated. The protein estimation was undertaken as per the procedure followed by [12].

RESULTS

Table-1 Protein content in Silk gland:

Treatment	L X CSR 2		CSR	
	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)
T_o	12.47 ±.040	12.47 ±.040	11.2±.115	11.2 ±.115
T_1	11.92 ±.202	14.82 ±.115	15.6 ±4.969	11.12 ±.063
T_2	14.26 ±.017	6.45 ±.023	14.41 ±.173	11.51 ±.144
T_3	11.26 ±.115	9.29 ±.051	13.29 ±.082	13.28 ±.046
T_4	14.43 ±.017	8.43 ±.017	15.63 ±.075	11.14 ±.808
T_5	18.64 ±.023	7.66 ±.923	15.97 ±.098	11.78 ±.046
T_6	13.17 ±.432	8.48 ±.274	13.74 ±.080	12.42 ±.069

Table-2 Protein content in Digestive System:

Treatment	L X CSR 2		CSR	
	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)
T_o	10.88 ±.133	10.88 ±.133	17.31 ±.005	17.31 ±.005
T_1	13.17 ±.098	12.41 ±..038	14.47 ±.035	11.23 ±0.17
T_2	12.59 ±.109	11.63 ±.057	11.28 ±.461	9.41 ±.017
T_3	8.06 ±.034	12.8 ±.244	15.26 ±.034	8.85 ±.028
T_4	12.51 ±.065	12.12 ±.069	19.2 ±.346	9.27 ±.404
T_5	14.12 ±.046	11.16 ±.069	19.41 ±.092	11.26 ±.011
T_6	12.57 ±.071	11.16 ±.023	15.42 ±.034	12.41 ±.005

Table-3 Protein content in Fat Bodies:

Treatment	L X CSR 2		CSR	
	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)
T_o	7.64 ±.023	7.64 ±.023	13.73 ±.017	13.73 ±.017
T_1	8.81 ±.005	11.06 ±.249	12.49 ±.051	6.53 ±.017
T_2	10.49 ±.051	9.21 ±.121	17.50 ±.0288	4.71 ±.005
T_3	8.45 ±.028	10.41 ±.005	15.76 ±.129	7.12 ±.011
T_4	9.67 ±.040	9.62 ±.069	16.75 ±.0288	11.24 ±.023
T_5	11.62 ±.115	8.43 ±.017	18.88 ±.046	7.12 ±.011
T_6	10.47 ±.023	8.85 ±.028	17.50 ±.057	15.21 ±.005

Table-4 Protein content in Haemolymph:

Treatment	L X CSR 2		CSR	
	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)	Diet with Vitamin C(mg)	Diet without Vitamin C(mg)
T_o	18.4 ±.057	18.4±.057	16.12±.011	16.12 ±.011
T_1	11.6 ±.173	8.87 ±.023	16.41 ±.017	8.91 ±.005
T_2	13.21 ±.005	9.21 ±.005	14.27 ±.040	9.61 ±.005
T_3	12.42 ±.017	7.24 ±.023	15.73 ±.173	10.48 ±.046
T_4	17.5 ±.115	11.67 ±.020	16.0 ±.115	9.27 ±.040
T_5	18.92 ±.028	11.23 ±.011	16.84 ±.023	10.41 ±.005
T_6	15.21 ±.005	10.49 ±.026	12.13 ±.017	12.76 ±.034

Protein content in Silk gland:

Table-1 Shows that the protein content in silk gland of Lx CSR_2 the maximum protein content in T_5 (18.64mg) was observed when the larvae fed on diet with vitamin c. The minimum amount of protein content was observed in T_1 (14.82mg) when the larvae fed on diet without vitamin c. In CSR the maximum protein content was observed in T_5 (15.97mg) when the larvae fed on diet with vitamin c and the minimum protein content in silk gland of T_1(11.12mg) was observed when the larvae fed on diet without vitamin c.

Protein content in digestive system:

Protein content in digestive system presents on Table-2. In L x CSR_2 the larvae reared on diet with vitamin c the highest protein content was observed under the treatment T_5 (14.12mg) the lowest protein content was observed on T_3 (8.06mg) the larvae fed on diet with vitamin c. In CSR the highest protein content was observed on T_5 (19.41mg) when the larvae fed on diet with vitamin c and the lowest protein content was observed on T_3 (8.85mg) the larvae fed on diet without vitamin c.

Protein content in fat bodies:

In fat body, the supplementation of vitamin c in the diet enhances the amount

of protein content among all the treatments in both races. In both races the highest was recorded in T_5 (11.62mg) in L x CSR_2 and (18.88mg) in CSR. In both the races lowest amount of protein was recorded in T_1 (8.43mg) in L x CSR_2 and T_2 (4.71mg) in CSR. Table-3.

Protein content in Haemolymph:

In L x CSR_2 the maximum protein content was recorded in larvae fed on diet with vitamin c T_5 (18.92mg) in and minimum protein content was recorded in larvae fed on diet without vitamin c T_1 (8.87mg). In CSR the highest protein content was observed in larvae fed on diet with vitamin c T_5 (16.84mg) and the lowest protein content was observed in larvae fed on diet without vitamin c T_1 (8.91mg). Table-4.

DISCUSSION:

Nutritional efficiency in larval stages significantly influences the resulting pupae and adult particularly in lepidopteron insects, where in adult is a non-feeding stage [13]. "Reference [14] opined that, proteins are biomolecules plays a fundamental and physiological role in growth and development of silkworms and synthesis of silk proteins in silk gland during larval development". "Reference [15] reported that haemolymph acts an amino acids reservoir between midgut and silk glands, supplied amino acids to silk gland for silk synthesis". Midgut tissue of silkworms plays an important role in active absorption of food constituent's viz., proteins and amino acids from digested mulberry leaves. The midgut proteins help in growth and development of silk gland, reproductive organs in silkworms and increase the assimilation and conversion rates during 5th instar larval development [16]. In insects fat body is the principal site of protein synthesis and is the major haemolymph proteins [17]. Fat body in insect larvae function both as a storage centre for fat, carbohydrate and protein and is the principle site for intermediatory metabolism of proteins in the final instar [18, 19].

Among the various chemical constituents of the internal tissues and oxygen of both races, the maximum was found in the silkworm larvae fed with diet with vitamin c. (T_5). The present findings clearly demonstrated the perturbation in protein content of the silkworm *(Bombyx mori)* in different tissues like silk gland, haemolymph, digestive system and fat body, when fed on diet with vitamin v and without vitamin c and mulberry leaves. The result of the present study indicated that the diet with vitamin c of both races significantly increased the total protein content in silk gland, haemolymph, fat body and digestive system of the silkworm.

Ascorbic acid (vitamin c) entering into the silk gland, haemolymph, fat body and Intestinal cells initiate the protein elevations depending upon the tissue. Because of the changes in the protein content the body size of the silkworm also showed variations. Several researchers demonstrated phagostimulatory effect of vitamins in insects. In the present investigation, the silk gland registers more protein content when compared to other tissues in both races and the experimental worms of diet with vitamin c. The silk gland

is a reservoir for two important silk proteins such as fibroin and sericin [20]. "Reference [21] observed the maximum haemolymph protein (95.02%) and muscle protein (61.40%) and fat body protein (88.40%) when the larvae fed with 2% folic acid and 1% ascorbic acid, which are in good agreement with my result. Ascorbic acid is a potential stimulator of protein synthesis in the silkworm tissues and hence it could be used at lower concentration for the benefit of sericulture industry [22].

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