Effect of Serifeed a feed supplement enriched feed of silkworm Bombyx mori L. on its nutritional and economic parameters

M. D. Ananda Kumar and Ann Sandhya Michael

Abstract- The feed supplement "SERIFEED" dusted (1g/sq.ft.) mulberry leaves were fed to the silkworm at four different levels in adult age. The experiment were carried during 5th instar, resulted increased ingesta in control, improved digesta even as larval weight, assimilation rate efficiency, efficiency of conversion of ingested food, efficiency of conversion of digested food, cocoon parameters and cocoon yield significantly increased in treated batches. Among the treated batches one time applied/day batch gave a significant increase in the thought-out parameters when compared with the control. The results of present study clearly designate the effectiveness of feed supplement ingredients on metabolic process and nucleic acid synthesis in silk gland cells there by improves the silk content in cocoon shell of silkworm. *Bombyx mori.* L, (Kolar Gold – PM X CSR_2).

Keywords- feed supplement, serifeed, silkworm, cocoon, silk, silkworm.

1 INTRODUCTION

The leaves of Morus species are the sole source of the food for silkworm, *Bombyxmori*.L, Nutritional quality of leaves plays a vital role in determining the health and growth of the larvae. The feeding of nutritionally enriched leaves showed better growth and development of silkworm larvae, as well as directly influence on the quality and quantity of silk production [1]. Nearly 70% of the silk proteins produced by silkworm are directly derived from the protein of mulberry leaves [2]. The silkworm larvae are highly sensitive and respond sharply to the changes of the leaf quality. Variations in the quality of the mulberry leaves and climatic factors are many times reflected on the performance of the cocoon production.

Significance of research on effect of different fortification agents in silkworm nutrition can be judged from the principle of co-operating supplements [3]. Supplementary nutrients are when added to normal food increases the nutritional value of the food making it more useful (I). In recent years, several attempts has been made to fortify leaves with different beneficial nutrients such as carbohydrates [4], Proteins [5], Amino acids [6], Hormones [7], Chemicals and salts [8] and Combination of nutrients [9] to improve the quality of the cocoon crop. The earlier research works have evoked the effect of feed supplement on silkworm growth and silk productivity. However research on the synergistic action of combination of supplementary nutrients is very meager.

- Department of Biochemistry, SRN Adarsh College, Chamarajpet, Bangalore-560018. Karnataka, India, email-anupol2004@yahoo.co.in
- Physiology research laboratory, Department of Life Sciences, Bangalore University, Bangalore–560056. Karnataka, India, email-annsandhya@yahoo.co.in

Hence the present investigation is to study the effect of feed supplement- a combination of nutrients on biological parameters such has nutritional and commercial characters of silkworm *Bombyx mori*. L.

2 MATERIALS AND METHODS

The disease free layings (eggs) of silkworm hybrid, Kolar Gold – PM X CSR_2 were procured and after 3rd moult were selected for treatment and were divided into five experimental groups including control which are: T_1 – One application/day, T_2 – Two applications/day, T_3 – Three applications/day, T_4 – Four applications/day and control/maintained with out any application. The feed utilization study was confined to 5th larval instar as 80-85% of total leaf consumption is in this instar. The healthy larvae were counted daily in each replicate and unequal, unhealthy/dead larvae were removed and replace by parallel maintained stock, if any. The leftover leaf, excreta and larval weight gain were recoded daily at 10.00 A.M. From these data, the nutritional indices like, ingesta, digesta, assimilation rate efficiency (ARE), efficiency of conversion of ingested food (ECI) and efficiency of digested food (ECD) were worked out on fresh weight basis as described by Waldbauer [10].

The matured larvae were mounted and the cocoons were harvested on 5th day and used for calculation of commercial parameters such as cocoon weight, pupal weight, shell weight, shell weight percentage, filament length, weight of reeled silk were determined by the standard procedure [11]. Even cocoon production was also calculated by following the method of Rajegowda [9]. The collected data were subjected to statistical analysis of ANOVA [12].

3 RESULTS AND DISCUSSIONS

The results of the present work the effect of supplement 'SERIFEED' on biological parameters such as nutritional and commercial parameters in PM x CSR_2 (Kolar gold) are summarized in Figers: 1-6 and Table-I.

The mean body weight of 5th instar larvae was significantly increased in T_1 treatment, where as in other treatments there was a marginal increase when compared with the control (Fig-1, P>0.05, F-4.83, T_1-3.97±0.04, T_2-3.82±0.06, T_3-3.85±0.07, T_4-3.84±0.04 and control-3.80±0.02). The increase of body weight in T_1 treatment may be due to the fortification of leaf with the feed supplement "SERIFEED". This implies that some of the essential nutrients in the feed supplement are responsible for the larval growth and perhaps the effective utility by the larvae. Similar results were reported Jeyapaul *et al.*, [13] and Murugan *et al.*, [14] who observed a significant increase larval weight in plant extract treated batches.

In the present investigation the control batch showed increase in Ingesta (Fig-2) when compared with the other treatments (F-1.88, T_1-13.83±0.07, T_2-13.92±0.29, T_3-14.09±0.36, T_4-13.68±0.24 and control-14.17±0.16). This may be due to the silkworm larvae in control batch was fed with mulberry leaves with out any additional food made the larvae to consume more quantity mulberry leaves. Where as in treated batch the larvae were fed with mulberry leaves along with feed supplement containing nutrients which made the larvae to feed less quantity of mulberry leaves, showing decreased ingesta in treated groups. This clearly shows that, quality food is required for the better growth and development. Increased digesta (Fig-3, F-4.30, T_1-7.58±0.43, T_2-8.25±0.12, T_3-8.35±0.35, T_4-8.29±0.32 and control-7.72±0.38) and significantly increased assimilation rate efficiency (Fig-3, P>0.05, F-21.67, T_1-52.19±1.15, T_2-59.29±1.23, T_3-59.26±0.97, T_4-59.65±2.12 and control-54.19±0.38) was recorded in T_2, T_3 and T_4-treatments when compared with the control and other treatments. This can be because the larvae in treated batches show decreased ingesta, when ingestion of food decreases the passage of food through gut becomes slow and facilitates increased digestion and assimilation which ultimately results in improved assimilation rate efficiency and other corresponding efficiency parameters [15]. These results are in conformity with Jeyapaul *et al.*, [13], who observed significantly superior approximate digestibility in *Coffea arabica* (1:25 concentration) plant extract treated batch.

Significantly higher ECI (Fig-5, P>0.01, F-20.01, T_1-24.42±0.15, T_2-23.29±0.24, T_3-23.22±0.16, T_4-24.19±0.37 and control-23.06±0.21) and ECD (Fig-6, P>0.05, F-11.01, T_1-45.18±1.95, T_2-38.96±0.88, T_3-38.68±0.32, T_4-41.7±1.67 and control-40.64±1.37) were recorded in T_1 treatment when compared to the other treatments and control. This variation is due to the presence of more proteins present in feed supplement SERIFEED, time of feeding and quantity of feed supplement applied/day may affect food conversion efficiency in to body growth. This plainly emphasized that PM X CSR_2 has better efficiency of converting the ingested and digested food in to body substance. The silkworm breed, which produces one gram of cocoon or shell using minimum quantity of ingested food, is considered superior not only physiologically but also economically [15]. These findings are in conformity with Subbu Rathinam *et al.*, [16] who observed enhanced ECI and ECD in the silkworm larvae feed on mulberry leaves supplemented with single cell protein, Spirulina. Also Jeyapaul, *et al.*, [13] recorded higher ECI in plant extract of *Eichhornia crassipes* treated batch than the other plant extracts treated batch.

The effective rate of cocooning percentage show a significant increase in T_1 batch when compared with the control. This variation could be due to the presence of vitamins and antibiotics in the feed supplement. These results are in conformity with result of Sundar Raj, *et al.*, [17] who recorded the higher ERC percentage in the soyabean meal supplemented batch. The average cocoon and shell weights in treated and control batches from T_1 to T_5 are shown in Table-1. The cocoon and shell weights considerably increased in treated batches when compared with the control. Among the treatments T_1 showed a significant increase in cocoon weight and shell weight, where as in other treatments there was a marginal increase when compared with the control. This may be due to the feed supplement ingredients involved in the synthesis of silk proteins and nucleic acids such as RNA and DNA in the silk gland cells there by improves the silk content in the cocoon shell [18]. The results are in conformity with Rajegowda [9] who observed higher cocoon and shell weight in 'SERIPRO' supplemented leaves fed batches. The average shell ratio in treatment T_1 showed a marginal increase when compared with

the control. These values are in concurrence with the work of Subbu Rathinum and Krishna [16] who have sprayed mineral (Iron 2.5kg/ha) that favorably influenced higher shell percentage. The average filament length and weight of the silk in T_1 batch showed a significant increase, when compared with the control and other treatments. These present findings are in conformity with the result of Chamundeswari and Radhakrishnaiah [19, 20] who observed better results in 1mg of Zinc/10g wet wt, (sprayed with 1ml of water). The cocoon yield / 100 dfls (kg), among the four treatments, T_1 batch show a significant increase of 9.2 Kg in cocoon production when compared with the control (table-1), which concur with the result of Sundar Raj, et al., [17] who harvested cocoon yield of 64.35kg/100dfls when reared on soyabean flour supplemented leaves and control group recorded only 52.16kg/100dfls.Also with Rajegowda [9] who recorded increased cocoon yield of 72.5kg/100dfls in feed supplement "SERIPRO" (combination of nutrients) treated three times/day batch and recorded 59.25kg/100dfls in control batch.

The parameters so far studied indicated significant variations among the treatments; these variations may be due to the effect of feed supplement on the metabolic activity in the silkworm larvae. The parameters increase in T_1 batch, indicated that the quantity and time of application in a day may affect the larval growth and finally reflects on cocoon production. It shows that, even one treatment /day is enough to bring considerable improvement in nutritional efficiency, cocoon production and silk productivity. Therefore from the present investigation it is very clear that, the feed supplement "SERIFEED" which has the involvement of beneficial fortifying nutrients gave a vaccination for silkworm larvae for better growth and development for the increased cocoon production.

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Table-I: Effect of feed supplement "SERIFEED" on commercial parameters and cocoon production in silkworm, *Bombyx mori*.

Treatments	ERC%	Cocoon Wt.(g)	Shell Wt.(g)	Shell Wt.%	Filament Length(m)	Filament Wt.(g)	Cocoon yield per 100dfls (kg)	Increased cocoon /100dfls(kg)
T_1	97.67	1.890	0.342	18.25	964.9	0.327	83.15	9.2
	± .333*	±0.024**	±0.008*	±0.465	±11.01**	±0.017**	±0.8735**	±2.380*
T_2	95.33	1.779	0.305	17.41	801.5	0.256	75.61	3.57
	±0.333	±0.007	±0.003	±0.453	±44.88	± 0.14	±0.1643	± 0.8850
T_3	96.00	1.789	0.299	16.73	798.9	0.257	77.30	5.26
	±0.577	±0.009	± 0.006	±0.50	±12.62	±0.002	±0.8532	± 0.8054
T_4	95.00	1.738	0.293	16.82	767.5	0.242	74.33	2.29
	± .577	± 0.043	±0.006	± .260	±26.17	±0.0069	±2.2060	±1.6628
Control	94.33	1.679	0.292	17.01	753.2	0.242	72.04	____
	±0.308	±0.019	±0.347	±0.347	± 17.55	± 0.004	±1.0415	
F-Value	0.0555	8.6260	6.3063	2.1265	11.0100	10.622	11.6479	6.0415
CD 1%	3.7907	0.2089	0.0695	3.5186	217.354	0.0927	10.4097	11.9124
at 5%	2.1996	0.1212	0.04035	2.0415	126.113	0.00076	6.040	6.9120

Note:- Values presented in parentheses are Mean± Standard error
T_1-One application/day, T_2-Two applications/ day, T_3-Three applications/ day, T_4-Four applications/ day
**-Significant at 1% level and * -Significant at 5% level.
ERC-Effective rate of cocooning,

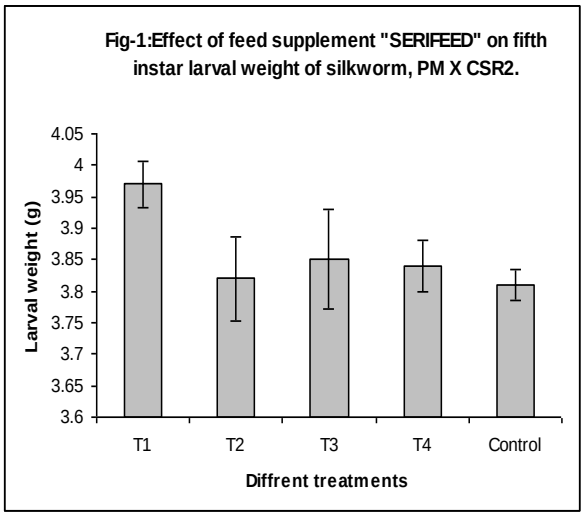
Fig-1:Effect of feed supplement "SERIFEED" on fifth instar larval weight of silkworm, PM X CSR2.
Larval weight (g)
4.05
4
3.95
3.9
3.85
3.8
3.75
3.7
3.65
3.6
T1
T2
T3
T4
Control
Diffrent treatments

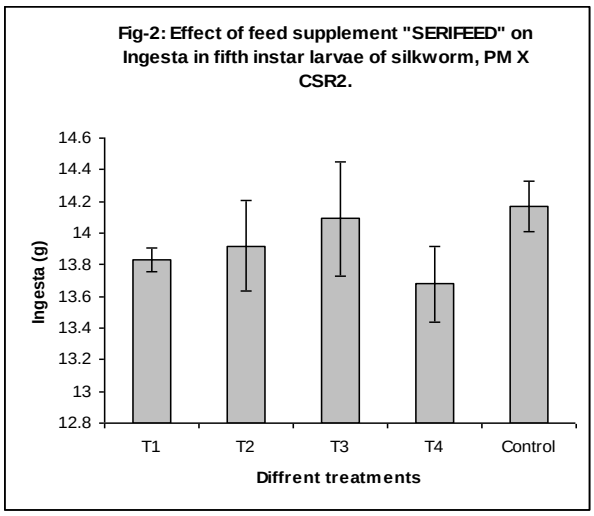
Fig-2: Effect of feed supplement "SERIFEED" on Ingesta in fifth instar larvae of silkworm, PM X CSR2.
Ingesta (g)
14.6
14.4
14.2
14
13.8
13.6
13.4
13.2
13
12.8
T1
T2
T3
T4
Control
Diffrent treatments

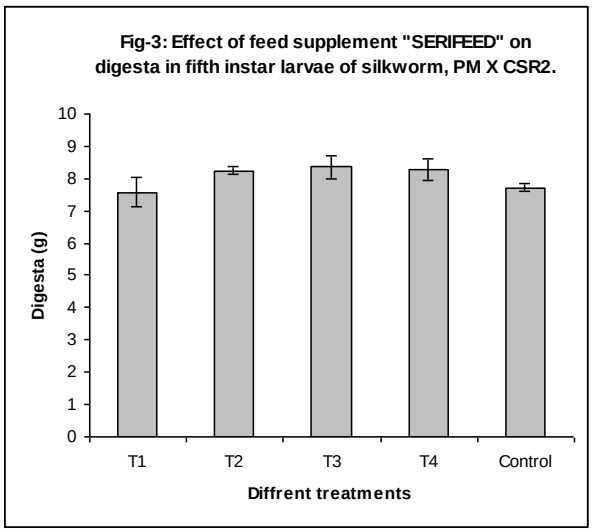
Fig-3: Effect of feed supplement "SERIFEED" on digesta in fifth instar larvae of silkworm, PM X CSR2.
Digesta (g)
10
9
8
7
6
5
4
3
2
1
0
T1
T2
T3
T4
Control
Diffrent treatments

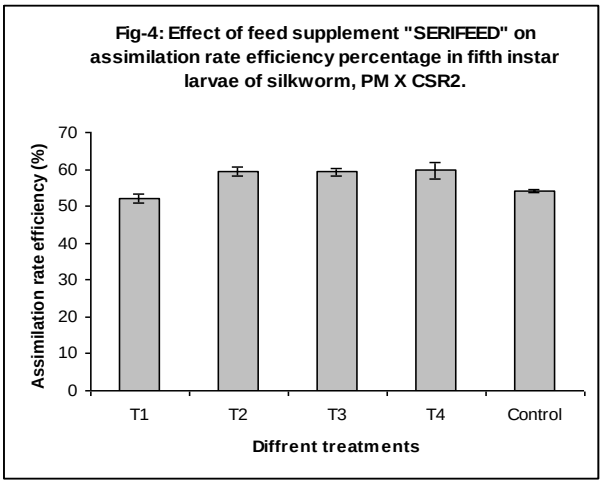
Fig-4: Effect of feed supplement "SERIFEED" on assimilation rate efficiency percentage in fifth instar larvae of silkworm, PM X CSR2.
Assimilation rate efficiency (%)
70
60
50
40
30
20
10
0
T1
T2
T3
T4
Control
Diffrent treatments

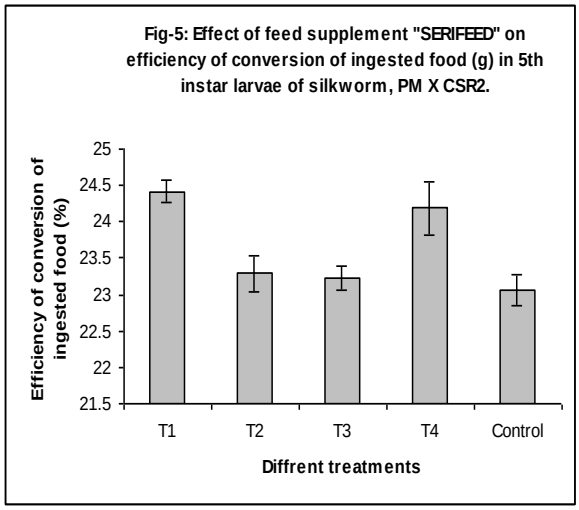
Fig-5: Effect of feed supplement "SERIFEED" on efficiency of conversion of ingested food (g) in 5th instar larvae of silkworm, PM X CSR2.
Efficiency of conversion of ingested food (%)
25
24.5
24
23.5
23
22.5
22
21.5
T1
T2
T3
T4
Control
Diffrent treatments

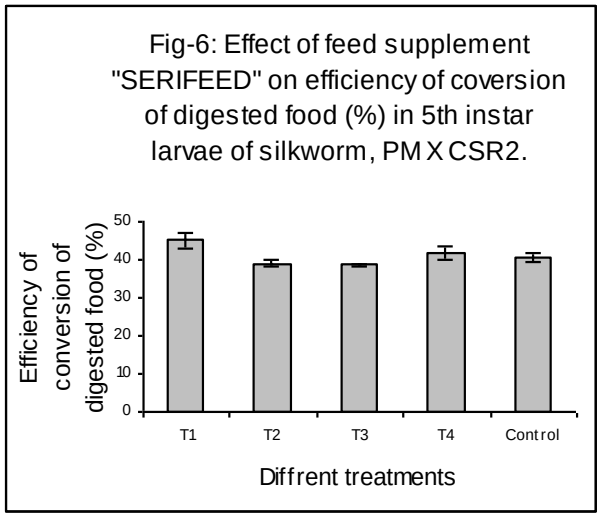
Fig-6: Effect of feed supplement "SERIFEED" on efficiency of coversion of digested food (%) in 5th instar larvae of silkworm, PM X CSR2.
Efficiency of conversion of digested food (%)
50
40
30
20
10
0
T1
T2
T3
T4
Control
Diffrent treatments