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APPLICATION OF FEED ADDITIVES ON YOUNGAGE SILKWORM *BOMBYX MORI*. L AND ITS EFFECT ON COCOON PARAMETERS

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ABSTRACT
Chawki rearing is a vital aspect of the sericulture industry for the development of healthy larvae and for harvesting successful good cocoon crop. 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. Keeping in view, the above facts, an attempt was made to increase the growth of young age silkworm and cocoon yield using suitable mulberry variety food additives. Hence, to fulfil the above needs experiment was conducted to find out suitable food additives for young age silkworm to increase cocoon parameters. The results showed that, the cocoon weight was maximum when the larval feeding was supplemented with soya flour 10g / kg of leaves among all the hybrids with highest of 2.053g followed by 1.800g,1.77g, 1.395g and 1.293g on CSR2 x CSR4, PM x CSR2, APM1 x APS8 and APM2 x APS12 respectively as compare to control. The highest shell weight of 0.383g and 0.513g was recorded in CSR2 x CSR4, (CSR6 x CSR26) x (CSR2 x CSR27) respectively on soya flour 10g / kg of leaves followed by PM x CSR2, APM2 x APS12 and APM1 x APS8 (0.332,0.278g and 0.274g). Supplementation of soya flour 10g / kg of leaves improved the shell ratio and the highest was recorded in APM2 x APS12 and (CSR6 x CSR26) X (CSR2 x CSR27) (21.47g and 24.99g) followed by CSR2 x CSR4, APM1 x APS8 and PM x CSR2 and lowest shell ratio was recorded on control among all the treated hybrids.

KEYWORD: Chawki rearing, *Bombyx mori,* shell weight, cocoon yield, food additive.

INTRODUCTION

In Silkworm rearing, Chawki is considered as one of the important stage from which a successful cocoon crop is ensured. The first three instars are highly sensitive and require at most care for their growth and development. Chawki rearing needs optimum environmental conditions which can sustain the outbreak of silkworm diseases avoiding crop failures during late age rearing (Bedford, 1944; Jolly, 1987). Environmental factors such as temperature, humidity, light, air current and food influence the growth and development of early instar larvae (Benchamin and Nagaraj, 1987). Owing to the high cost of artificial diet, introduction of these techniques in India is very limited. Hence an economically cheaper technique which could still improve cocoon character and production is needed (JOCV, 1980). Ito (1980) stated that rich sources of dietary proteins like soy protein are known to promote growth and to improve the economic character of the silkworm. Supplementation of flour diets increased the larval weight, silk gland weight and commercial cocoon characters as compared to non-supplemented check (Ganga and Gowri, 1990). Salimath *et al.* (2007) reported improvement in quantitative and qualitative traits when supplementation of mulberry leaves was done with additional nutrients. Soybean flour proved to be a good supplement for getting quality cocoons.

MATERIALS AND METHODS

Studies have been taken up to evaluate the food additives for chawki rearing to increase cocoon parameters. The materials and methods adopted are described below.

Preparation for rearing

Before commencement of rearing, the rearing room and appliances were thoroughly cleaned and the floor was washed with five per cent bleaching powder solution. The whole room was disinfected by spraying with 2.5 per cent Sanitech in 0.5 per cent slacked lime solution (Dandin *et al*., 2003).

Experiment on food supplements / additives for young age silkworm

Studies were carried out on enriching the mulberry leaves with soya flour, corn flour, horse gram flour to improve the silkworm nutrition. Experiments were conducted with five silkworm hybrids *viz.,* PM x CSR2, APM1 x APS8, APM2 x APS12, CSR2 x CSR4 and (CSR6 x CSR26) x (CSR2 x CSR27).

This experiment was conducted in Completely Randomised Design with three replications. In each treatment, 100 larvae were treated in each replication against the soya flour, corn flour, horse gram flour in two doses of 10g / kg of leaves and 5g / kg of leaves. The treatments are as follows.

T 1 – Soya flour 10 g / kg of leaves
T 2 – Soya flour 5 g / kg of leaves
T 3 – Corn flour 10 g / kg of leaves
T 4 – Corn flour 5 g / kg of leaves
T 5 – Horse gram flour 10 g / kg of leaves
T 6 – Horse gram flour 5 g / kg of leaves

T 7 – Control

Required quantity of mulberry leaves and soya flour, corn flour, horse gram flour were weighed and mixed with mulberry leaves and fed to second instar larvae as first feed.

Observations on Cocoon Parameters

Cocoon and shell weights (g) were recorded using sensitive electronic balance (Anamed).

Cocoon shell ratio (%): It was worked out as follows

$$\text{Shell ratio (\%)} = \frac{\text{Shell weight (g)}}{\text{Cocoon weight (g)}} \times 100$$

Statistical analysis

The data collected from various experiments were statistically analyzed using either Completely Randomised Design (CRD) or Factorial Completely Randomised Design (FCRD) as described by Panse and Sukhatme (1957).

RESULTS AND DISCUSSION

Cocoon characters

Silkworm enters its third developmental stage namely cocoon (Shell + Pupa) from egg and larva, and it is an important phenomenon as for as silk industry is concerned.

The results showed that all treatments were effective in increasing the cocoon weight (Table 1). Among the treatments, soya flour 10g / kg of leaves recorded the highest cocoon weight of 1.770g followed by soya flour 5g/kg of leaves (1.730g), corn flour 10g/kg of leaves (1.703g) and least cocoon weight of 1.530g and 1.527g was observed in horse gram flour 5g/kg of leaves and control respectively and were on par in PM x CSR2. In CSR2 x CSR4 the highest cocoon weight of 1.800 g was observed on soya flour 10g/kg of leaves and soya flour 5g/kg of leaves (1.743g) followed by corn flour 10g/kg of leaves (1.690g) and the least cocoon weight was recorded on, Horse flour 5g/kg of leaves and control (1.583g and 1.579g respectively), and were statistically on par. In APM1 x APS8, among the treatments the soya flour 10g/kg of leaves recorded the highest cocoon weight of 1.395g followed by soya 5g/kg of leaves (1.372g) and the lowest was observed on control (1.283g). The different feed additives were effective on the cocoon weight of silkworm race APM2 x APS12. Among the treatments, soya flour 10g/kg of leaves recorded the highest cocoon weight of 1.293g, followed by, soya flour 5g/kg of leaves (1.278g) and the lowest was observed on control (1.157g). In (CSR6 x CSR26) x (CSR2 x CSR27), all the treatments were effective in increasing the cocoon weight. Among the treatments, the soya flour 10g/kg of leaves recorded the highest cocoon weight of 2.053g followed by soya flour 5g/kg of leaves (1.977g) and minimum was recorded on control (1.777g). The present results fall in line with the findings of Sekar (1995) who reported that the higher doses of 10.0g or 12.5g or 15.0g / kg supplemented with mulberry leaves and fed at the final instar resulted in good cocoon attributes, which varied from race to race and the cocoon weight was maximum when the larval feeding was supplemented with 10g, 12.5g and 15.0g / kg in the bivoltine and hybrids.

TABLE1. Cocoon weight (g) of silkworm *B. mori* reared on feed additives

Treatment	*Cocoon weight (g) in silkworm hybrids*				
	PM x *CSR2*	*CSR2* x *CSR4*	*APM1* x *APS8*	*APM2* x *APS12*	*(CSR6* x *CSR26)* x *(CSR2* x *CSR27)*
Soya flour10g / kg of leaves	1.770a	1.800a	1.395b	1.293b	2.053a
Soya flour 5g / kg of leaves	1.730b	1.743b	1.372c	1.278c	1.977c
Corn flour10g / kg of leaves	1.703c	1.690c	1.331d	1.266d	1.903d
Corn flour 5g /kg of leaves	1.670d	1.660d	1.327e	1.252e	1.880d
Horse gram flour10g / kg of leaves	1.620e	1.591e	1.301f	1.245f	1.840e
Horse gram flour 5g /kg of leaves	1.530f	1.583e	1.288g	1.239f	1.810f
Control	1.527f	1.579e	1.283h	1.157g	1.777g
SEd	0.0080	0.0063	0.0017	0.0080	0.0114
CD (0.05)	0.0169	0.0133	0.0036	0.0170	0.0242

Figures followed by similar letters are not different statistically at 5% level

Shell weight

The results showed that all treatments were found effective in increasing the shell weight (Table 2). Among the treatments, the soya flour 10g/kg of leaves and soya flour 5g/kg of leaves recorded the highest shell weight of 0.332g and 0.318g respectively and the lowest of 0.261g were recorded on control in PM x CSR2. Soya flour 10g/kg of

leaves showed the highest shell weight of 0.383g among all the treatments followed by soya flour 5g/kg of leaves (0.359g), corn flour 10g/kg of leaves (0.344g) and the lowest of 0.301g were recorded on control in CSR2 x CSR4.

In APM1 x APS8, all the treatments were effective in increasing the shell weight. Soya flour 10g/kg of leaves recorded the highest shell weight of 0.274g followed by soya flour 5g/kg of leaves (0.265g) and corn flour 10g/kg of leaves (0.246g). The lowest of 0.218g was recorded on control. Among the treatments, soya flour 10g/kg of leaves recorded the highest shell ratio of 0.278g followed by soya flour 5g/kg of leaves (0.266g) and control (0.216g) recorded the least shell weight in APM2 x APS12. In (CSR6 x

CSR26) x (CSR2 x CSR27), soya flour 10g/kg of leaves recorded the highest shell weight of 0.513g followed by soya flour 5g/kg of leaves (0.467g) and corn flour 10g/kg of leaves (0.427g) the lowest of 0.363g was recorded on control and these treatments were statistically different among themselves. While, PM x CSR2 showed well response on both soya flour 10g / kg of leaves. Similar results were obtained by Subburathiam *et al*. (1992) who reported that supplementation of hydrolysed soya bean increased the shell weight (0.35g) compared to control (0.25g).

TABLE 2. Shell weight (g) of silkworm *B. mori* reared on feed additives

Treatment	*Shell weight (g) in silkworm hybrids*				
	PM x *CSR2*	*CSR2* x *CSR4*	*APM1* x *APS8*	*APM2* x *APS12*	*(CSR6* x *CSR26)* x*(CSR2* x *CSR27)*
Soya flour10g / kg of leaves	0.332a	0.383a	0.274b	0.278b	0.513a
Soya flour 5g / kg of leaves	0.318b	0.359c	0.265c	0.266c	0.467c
Corn flour10g / kg of leaves	0.311c	0.344d	0.246d	0.249d	0.427d
Corn flour 5g /kg of leaves	0.294d	0.331e	0.244d	0.240e	0.417d
Horse gram flour10g / kg of leaves	0.283e	0.314f	0.231e	0.235f	0.397e
Horse gram flour 5g /kg of leaves	0.272f	0.311g	0.223f	0.231g	0.383f
Control	0.261g	0.301h	0.218g	0.216h	0.363g
SEd	0.0020	0.0012	0.0013	0.0013	0.0055
CD (0.05)	0.0042	0.0024	0.0028	0.0028	0.0117

Figures followed by similar letters are not different statistically at 5% level

Shell ratio

Supplementation of soya flour 10g / kg of leaves improved the shell ratio among all the treated hybrids and the highest shell ratio was recorded in and (CSR6 x CSR26) x (CSR2 x CSR27) of 24.99g followed by APM2 x APS12, CSR2 x CSR4, APM1 x APS8 and PM x CSR2 of 21.47g, 21.27g, 19.62g and 18.73g respectively. Followed by Soya flour 5g/kg of leaves of 23.61g, 20.84g, 20.61g, 19.32g and 18.36g on (CSR6 x CSR26) x (CSR2 x CSR27), APM2 x APS12, CSR2 x CSR4, APM1 x APS8 and PM x CSR2 respectively (Table3). The lowest shell ratio was recorded in un treated batches. Comparable results were reported by Ganga and Gowri (1990) who stated that the supplementation of flour diet increased the shell ratio. Present study was supported by Krishnan *et al.* (1995) who reported that soya protein supplementation increased the shell ratio.

TABLE 3. Shell ratio (%) of silkworm *B. mori* reared on feed additives

Treatment	*Shell ratio (%) in silkworm hybrids*				
	PM x *CSR2*	*CSR2* x *CSR4*	*APM1* x *APS8*	*APM2*x *APS12*	*(CSR6* x *CSR26)* x *(CSR2* x *CSR27)*
Soya flour10g / kg of leaves	18.73a	21.27a	19.62b	21.47b	24.99a
Soya flour 5g / kg of leaves	18.36b	20.61c	19.32c	20.84c	23.61b
Corn flour10g / kg of leaves	18.23b	20.37d	18.50d	19.63d	22.41c
Corn flour 5g /kg of leaves	17.62cd	19.96e	18.41d	19.16e	22.16cd
Horse gram flour10g / kg of leaves	17.78c	19.73f	17.75e	18.85ef	21.55de
Horse gram flour 5g /kg of leaves	17.45d	19.66f	17.31f	18.61f	21.17ef
Control	17.11e	19.04g	17.01g	18.59f	20.45f
SEd	0.1550	0.0832	0.1193	0.1963	0.3923
CD (0.05)	0.3286	0.1765	0.2530	0.4161	0.8317

Figures followed by similar letters are not different statistically at 5% level

REFERENCES

Bedford, E.C.G. (1944) Continuous rearing of silkworm. *J. Ent. Soc. S. Afr*., 7: 68-72.

Benchamin,K.V and.Nagaraj, C.S. (1987) Silkworm rearing techniques. In: Appropriate Sericulture Techniques (ed.) M.S. Jolly. ICTRETS, Mysore, 63-160.

Dandin, S.B., Jayant Jayaswal and Giridhar, K. (2003) Handbook of Sericulture technologies. Central Silk Board, Bangalore. 287 p.

Ganga, G and Gowri, G. (1990) Flour diet to the silkworm to optimize cocoon characters. *Indian Silk*, **29**:3-14.

Ito,T. (1980) Dietary requirements of the silkworm, *Bombyx mori* L. and its artificial diets. *XVI Int. Cong. Entomol. Abr.,* Tokyo, Japan. 448.

Japan Overseas Co-operation Volunteers (1980) *Text Book of Tropical Sericulture.* Tokyo: 387.

Jolly, M.S. (1987) Chawki rearing concept, organization and management. *Indian Silk*, **25**(9):32-37

Krishnan, M., Subburathinam, K.M. and Janarthan, S. (1995) Effect of hydrolyzed protein (P-Soyatose) on haemolymph protein profile, larval and pupal characters of the silkworm, *Bombyx mori* L. (Lepidoptera:Bombycidae), *Sericologia*, **35**:227-235.

Panse,V.G. and Sukhatme, P.V. (1957) *Statistical Methods for Agricultural Workers*. ICAR Publication, New Delhi. 328 p.

Salimath, N.R., Shashikumar, S. and Badiger, M.S. (2007) Soybean- An Alternative supplementation food for quality cocoon production. *Indian Silk,* **45**:14-15.

Sekar,K. (1995) Foliar supplementation of soya flour for improving the silk yield of mulberry silkworm, *Bombyx mori* L. *M.Sc. Thesis*, Tamil Nadu Agricultural University, Coimbatore, 117 p.

Subburathinam,K.M., Janarathanan S. and Krishnan, M. (1992) Nutritional response of mulberry silkworm to different levels of soya bean protein. Abstract of National Conference of Mulberry Sericulture Research held on Dec. 10-11' 1992, CSR&TI, Mysore.