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Influence of Biosafe Feed Additives on the Qualitative and Quantitative Traits of Popular Mulberry Silkworm Hybrid PM × CSR_2

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Abstract

The silkworm hybrid PM × CSR_2 fed on mulberry leaves fortified with fine flour of seven biosafe feed additives revealed that foxtail millet as dust at ratio 1 : 10 (flour : leaf) recorded maximum larval weight (3.688 g), cocoon weight (1.976 g), pupal weight (1.595 g), shell weight (0.391 g), fibroin content (74.86%), silk gland tissue somatic index (24.82), filament length (885 m), finer denier (1.96) and lesser sericin content (25.13%) when supplemented from fourth instar until spinning as compared to unsupplemented control (3.310 g, 1.752 g, 1.454 g, 0.304 g, 71.91%, 20.20, 795 m, 2.10 and 28.07%, respectively).

Key words : *Bombyx mori* L., Biosafe feed additive, Foxtail millet, Silk gland tissue somatic index.

Quality of mulberry leaves play important role in the physiology of silkworm, *Bombyx mori* L. As mulberry plants are cultivated exclusively for their foliage, there is continuous depletion in the nutrient status of the soil due to extensive cultivation practices. Unless the fertility status of the soil is improved through proper soil nutritional management, it is difficult to achieve good productivity of leaves with better quality. Leaves with low nutritive value when fed to silk worms lead to production of inferior quality cocoons. An important physiological factor in silkworm growth and silk productivity is nutrition. Nearly 70% of silk proteins produced by silkworm are directly derived from the protein of mulberry leaves. The silkworm is an exceedingly perceptive insect and speedily responds to the quality of food. Variations in the quality of mulberry leaf and environmental conditions are well reflected in the performance of the cocoon crops. Therefore, one of the possible cost effective practice is to enrich the mulberry leaves with fortifying agents.

Methods

The popular mulberry silkworm hybrid PM × CSR_2 was selected and reared at the Department of Sericulture, UAS, GKVK, Bangalore. The treatments involved supplementation of fine flour of the seven biosafe feed additives separately viz. spirulina, yeast, mushroom, grain amaranthus, proso millet, kodo millet and foxtail millet dusted at 1 : 10 (flour : leaf) ratio using sieve on M_5 mulberry variety, provided from fourth instar upto spinning once a day and other two feeds being normal (unsupplemented). The silkworm rearing experiment was conducted twice, maintaining unsupplemented control. The observations were recorded on larval weight, cocoon weight, pupal weight, shell weight, fibroin content, silk gland tissue somatic index, filament length, finer denier and sericin content, following standard procedure.

Results and Discussion

In the mulberry silkworm hybrid PM × CSR_2 significantly increased larval weight (3.688 g), cocoon weight (1.976 g), pupal weight (1.595 g), shell weight (0.391 g) silk gland tissue somatic index (24.82) were noticed due to the supplementation of (BFA_7) foxtail flour millet at 150µ particle size compared to control (3.310 g, 1.752 g, 1.454 g, 0.304 g and 20.20), respectively (Table 1).

The present findings are in tune with observations of Neelu Nangia et al. (2005) who observed increased larval weight, cocoon weight and pupal weight with ragi flour supplemented mulberry leaves. The present findings are also in line with findings of

Table 1. Influence of biosafe feed additives (BFA) on productivity parameters of mulberry silkworm hybrid PM × CSR_2.

Biosafe feed additive (BFA) (dust)	Mature larval weight (g)	Single pupal weight (g)	Single cocoon weight (g)	Shell weight (g)	Shell ratio (%)
BFA_1 : Spirulina	3.510	1.486	1.764	0.312	17.68
BFA_2 : Yeast	3.545	1.500	1.775	0.327	18.42
BFA_3 : Grain amaranthus	3.638	1.525	1.845	0.358	19.40
BFA_4 : Mushroom	3.612	1.515	1.819	0.341	18.74
BFA_5 : Proso millet	3.665	1.536	1.905	0.374	19.63
BFA_6 : Kodo millet	3.670	1.567	1.841	0.383	19.73
BFA_7 : Foxtail millet	3.688	1.595	1.976	0.391	19.80
Control	3.310	1.454	1.752	0.304	17.35
F-test	*	*	*	*	*
SE ±	0.0008	0.0006	0.0009	0.0009	0.0092
CD at 5%	0.0025	0.0019	0.0027	0.0027	0.0277

Table 1. Continued.

Biosafe feed additive (BFA) (dust)	Silk gland tissue somatic index	Filament length (m)	Denier	Fibroin content (%)	Sericin content (%)
BFA_1 : Spirulina	21.03	813	2.05	72.56	27.43
BFA_2 : Yeast	21.88	824	2.04	73.44	26.55
BFA_3 : Grain amaranthus	23.01	846	2.01	74.26	25.73
BFA_4 : Mushroom	22.49	832	2.03	73.86	26.13
BFA_5 : Proso millet	23.64	859	2.00	74.54	25.45
BFA_6 : Kodo millet	24.14	870	1.99	74.75	25.24
BFA_7 : Foxtail millet	24.82	885	1.96	74.86	25.13
Control	20.20	795	2.10	71.91	28.07
F-test	*	*	*	*	*
SE ±	0.0123	0.8165	0.0082	0.0066	0.0058
CD at 5%	0.0369	2.4480	0.0245	0.0197	0.0174

Vanitha et al. (2006) who observed increased larval weight, cocoon weight, pupal weight and shell weight in silkworm reared on mulberry leaves supplemented with 80% fine mesh ragi flour + 20% activated horsegram fine mesh flour. Subburathinam et al. (1994) also established the influence of soya protein in maximizing shell content. Manimegalai et al. (2003) reported highest shell weight,shell ratio with shoot rearing along with soya flour supplementation. The enhancement in economic characters of silkworm perhaps attributed to the reason that the biosafe feed additives were supplemented in dust form at minute particle size (150μ) which might have encouraged the larvae to accept the feed additives along with mulberry leaves, which enables silkworm to spin bigger cocoons with higher pupal and shell weight.

Silkworm hybrid reared on mulberry leaf fortified with (BFA_7) foxtail millet at 1 : 10 (flour : leaf) ratio supplemented once daily from fourth instar upto spinning recorded significantly higher silk gland tissue somatic index (24.82), filament length (885 m), finer denier (1.96), higher fibroin content (74.86%) and lower sericin content (25.13%) compared to other feed additives and also control (Table 1). The enhanced productivity parameters might be due to supplementation of biosafe feed additives, which are rich source of protein, fat, minerals and carbohydrates. Proteins in feed fortificants might have accelerated the silk protein synthesis, which in turn enhanced the potential of fibroin synthesis in silk gland. Enhancing the fibroin content of silk is an undoubted advantage in the reeling industry.

The present findings are in harmony with the findings of Sumathi et al. (2007) who observed in-

creased fibroin content, SGTSI, filament length and lower sericin content in silkworm rearing with horsegram + grain amaranthus (50 : 50) flour combination supplementation. These findings are also in tune with the observations of Vanisree et al. (1996) and Sundar Raj et al. (2000) who observed increased fibroin content, filament length, lesser sericin content and finer denier with soyabean protein supplementation. A similar trend was reported by Vanitha et al. (2006) who reported higher SGTSI, filament length, lesser sericin, higher fibroin content and finer denier on 80% fine mesh ragi flour + 20% activated horsegram fine mesh supplementation.

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