

Effect of corticosterone on silkworm larvae, *Bombyx mori* with special reference to economic parameters

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(Received: February 02, 2009; Accepted: March 08, 2009)

ABSTRACT

This study was undertaken to estimate the economic parameters such as cocoon weight, shell weight, shell percentage, filament length, non-breakable filament length, filament denier, renditta and silk proteins like fibroin and sericin in larvae of silk worm *Bombyx mori* treated with vertebrate steroid hormone corticosterone. Significant changes were observed in economic parameters of silk worm on the administration of corticosterone.

Key words: Silkworm, corticosterone, economic parameters.

INTRODUCTION

From an economic point of view the major input in the manufacturing of raw silk is cocoons, which play an important role in the production of good quality of raw silk. A few investigators have made an attempt to investigate the useful effects of various vertebrate hormones on growth, metabolism and economic traits of silkworm, *Bombyx mori* (Ramakrishna et al., 2009; 2008). Previous studies revealed that the economic parameters such as cocoon weight, shell percentage, shell weight, filament length and filament weight were increased and the denier value was decreased in thyroid supplemented larvae (Pushparani and Bharathi, 1998). The effect of topical application with cortisone and hydrocortisone to the silkworm larvae showed significant increase in larval weight along with other enhanced larval, cocoon and adult parameters (Goudar and Kaliwal, 2001).

MATERIAL AND METHODS

The experiment was carried out on Jaya, hybrid of Pure Mysore (PM) x bivoltine (NB4D2)

variety of the silkworm, *Bombyx mori* (L). 5 mg / 1ml concentration corticosterone solution was used for the present study. The corticosterone hormone treatment was started from 1st day of the III instar to 5th day of V instar larvae, at the rate of 3 times per day.

The qualitative and quantitative parameters of cocoons viz., cocoon weight, shell weight, shell percentage, filament length, non-breakable filament length, denier, renditta, fibroin and sericin were determined following the methods as given by Sonwalker (1993).

Statistical Treatment of the Data

Statistical analysis of the data was performed by analysis of variance followed by the student – Newman – Kuels test. Students t – test was used when values of two groups were compared. Significance was established at $P < 0.001$ (Freud, 1994).

RESULTS AND DISCUSSION

Cocoon weight, shell weight, shell percentage, average filament length and non-

breakable filament length were significantly increased in hormone treated larvae over the control. Filament denier and renditta were significantly decreased over the control. The silk protein fibroin showed increased trend but sericin showed decreased trend in hormone treated larvae over the control (Table 1).

These results indicate that corticosterone enhances the growth, development and silk production. Earlier work has recorded improvement in cocoon and cocoon shell weights upon administration of Juvenile hormone compounds (Miranda *et al.*, 2002) and Juvenoid, R 394 (Sashindran Nair *et al.*, 2004). Ramakrishna *et al.*, (2008a; 2008b) reported the increased protein

fractions in bodywall and silk gland which reflects the enhancement observed in economic parameter. Shell percentage is the most important parameter in sericulture as it gives percent value of silk in the cocoon. The shell percentage showed significant elevation on administration with corticosterone over the control. Similar reports were observed with the administration of acetone macerative of *Vitis venifera* (Vittalrao *et al.*, 2003).

(Values are the mean of six individual observations. Mean, \pm S.D., + or - indicates the percent increase and decrease over control respectively. 'P' denotes the level of statistical significant)

Table 1: The table showing the economic parameters of the cocoon in both control and hormone treated larvae

S.No.	Name of the parameter	Control	Hormone treated	Percent change (%)
1.	Cocoon weight (g)	2.12 \pm 0.14	2.41 \pm 0.17	+13.67p<0.001
2.	Shell weight (g)	0.348 \pm 0.025	0.46 \pm 0.037	+32.18p<0.001
3.	Shell percentage (%)	16.41 \pm 1.49	19.08 \pm 1.78	+16.27p<0.001
4.	Average filament length (m)	961 \pm 25.48	1070 \pm 26.16	+11.34p<0.001
5.	Non-breakable filament length (m)	343 \pm 15.11	423 \pm 16.72	+23.32p<0.001
6.	Filament denier (d)	2.23 \pm 0.12	1.95 \pm 0.11	-12.55p<0.001
7.	Renditta (kg)	11.73 \pm 1.08	10.18 \pm 0.98	-15.22p<0.001
8.	Fibroin (%)	70.42 \pm 6.12	75.83 \pm 6.64	+7.68p<0.001
9.	Sericin (%)	30.58 \pm 1.41	27.67 \pm 1.11	-9.51p<0.001

Silk filament is the ultimate product of sericulture. Earlier reports also stated that the improvement in average filament length and non-breakable filament length on administration with pregnant mere serum gonadotrophin and thyroxine (Pushparani and Bharathi, 1998).

Another important economic character is denier. As the denier value was decreased the quality of silk filament was found to be superior who has much economic importance in the silk reeling industry (Sailaja *et al.*, 1997). The elevated silk filament length and reduced denier were also observed by the administration of 2, 4-dichlorophenoxy acetic acid (Goudar and Kaliwal, 2001a). Similar reports also have been observed

by the administration of juvenoid hormone (Sashindran Nair *et al.*, 2004) and thyroxine in silkworm (Ramakrishna, 2006). Renditta was an important economic character, which reflects the quality of silk filament. The renditta also significantly reduced with the treatment of corticosterone over the control.

The increased fibroin content suggests that the hormone might have accelerated the intracellular transport of fibroin, there by the increased fibroin biosynthesis and silk secretion could have accelerated. Similar reports have been observed by the administration of juvenile hormone analogue such as methoprene (Miranda *et al.*, 2002) and thyroxine (Ramakrishna, 2006). Earlier reports

also stated that the increased fibroin protein and decreased sericin protein by the administration of thyroxine (Ramakrishna, 2006) and prolactin (Bharathi and Sucharitha, 2006).

It may be concluded that, the vertebrate hormone like corticosterone seems to exert profound influences on economic parameters.

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