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Studies On The Effect Of Light Schedules On Enzyme Activity And Economic Traits Of *Bombyx Mori* L.

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Abstract

Photoperiodism regulates the growth and various physiological mechanisms of insects. The light and dark schedules of natural day in animals induce different kinds of fluctuations in physiological mechanisms. The effects of photoperiod on enzyme activity and economic traits of *B.mori* has been studied. In this investigation, ALT enzyme content was high (516± 43.11 mg/ml) in B_2 treated group and it follows (370 ± 31.68 mg/ml) in B_4 treated group and the next level was 319 ± 27.16 mg/ml observed in B_3 treated group and the least amount was 316 ± 25.29 mg/m recorded in B_1 treated group. Economic traits such as shell ratio (9.76 percent) of B_1 treated group produce a best result of this experiment. This study report suggest that the effect of B_1 treated group of B.mori larvae was also provide a powerful result in cocoon parameters.

Key words: Photoperiod, B.mori, Enzyme activity, Economic traits

INTRODUCTION

The sericulture industry involved in the production of silk occupies an important place in the Indian economy and provides gainful occupation to lakhs of people. Most of the silk is produced from the cocoons of domesticated silkworm, *Bombyx mori* L. Environmental conditions like photoperiod, temperature, humidity, air circulation and gases show a significant interaction in this effect on the physiology of silkworm depending upon the combination of factors and developmental stages affecting growth, developments, productivity and quality of silk. Rearing performance affects growth and development of larvae and cocoon production (Thapa and Ghimire 2005).

Effect of photoperiod has also been on the certain characteristics of *B. mori* where silk moth enters an embryonic diapause under long photoperiods during the egg and young instar young stages of the preceding generation, however short days prevent the diapause (Kogure 1993) and different photoperiodic conditions and it influence the hatching pattern differently (Reddy *et al*., 2003).
The effect of different light conditions on the development of *B.mori* larvae and whether light-dark conditions influence the shell ratio and hence the silk production. The effect of light and dark on the duration of life span, cocoon weight shell weight, cocoon shell ratio of *B. mori* was studied by Iqbal *et al*., 2008. Hence the present investigation was carried out the effect of photoperiod on the enzyme activity and economic traits of *B.mori*.

MATERIALS AND METHODS

The investigation was carried out on mulberry silkworm. Disease Free Layings (DFLs) of *B. mori* (CSR CDH) were obtained from State Government Sericulture Center at Tenkasi and incubated at 27°C in ant proof racks at 70-80% humidity. The emerging caterpillars were transferred to clean bambɒo basket (25 cm diameter and 5 cm deep) with a scaffolding of paraffin paper (Krishnaswamy 1978). Third instar larvae were randomly selected and divided into 4 experimental batches and control was also setup. Each batch consisting of 5 replicates with 30 silkworms. In experimental batches, four schedules were maintained 40 (watt) light was used to maintained light. Light exposure: Batch 1(B_1): 16 hrs darkness and 8 hrs light; Batch 2 (B_2): 24 hrs light; Batch 3 (B_3): 12 hrs darkness and 12 hrs light; Batch 4 (B_4): 24 hrs Darkness. Control larvae were reared under normal environmental conditions. All the experimental and control fifth instar *B.mori* larvae randomly selected for the determination of enzymes activities:

The haemolymph was collected from punctured pro-abdominal leg of the 5th instar larvae of each treatment and control in glass tubes with heparin to prevent melanization of sample (Mahmoud 1988). Transaminase enzymes (ALT & AST): ALT transfers the amino group from α -keto acid (α -keto glutaric ac new amino acid (L-glutamate) and anew keto acid (oxalo acetic acid). GPT Transfer the amino group from D, Lalanine to α -koto acid (α -keto glutaric acid). Oxalo acetate or pyruvate reacts with 2,4-dinitro phenyl hedrazine forming Oxaloactate or pyruvate hydrazone which in alkaline medium from a brown colour which can measured Spectro photo metrically. The reaction mixture consisted of 1m1a mixture of phosphate buffer Ma-keto glutaric and 200m L-asparate, 0.2ml of haemolymph was then added to the reaction mixture. The mixture was incubated for 30 min. Then after, 10ml of 0.4 N NAOH was added. The optical density of the produced brown color is measured after 5 minutes using spectrophotometer at 520nm. The enzyme activity is expressed as mm pyruvate / gm body weight/minute. The cocoons were harvested on the fourth day after spinning at the cocoon characters were recorded in experimental, treated and control group assessment of various cocoon parameters was made as follows (Sonwalkar 1993). Biochemical contents and economic traits were analyzed by the standard deviation method and the statistical significance of the data analyzed by students **t-**test. The data in percentage over control values were analyzed. The level of significant used in t-test was $P \leq 0.05$ (Zar 1984).

RESULTS AND DISCUSSION:

Silkworms are photosensitive. They have a tendency to crawl towards dim light. They do not like either strong light or complete darkness. The larval moults is uniform when silkworms are reared in 16 hours light and 8 hours darkness. The present study investigate in the enzyme activity such as ALT and AST in haemolymph of silkworm, *B.mori.* AST was maximum (-14.56 percent) in B_2 treated group and it was low (- 46.56 percent) in B_1 treated group. ALT value was high (3.20 percent) in B_2 treated group and low (-13.12 percent) in B_1 treated group.

Hoffman and Subramanian (2005) found in their experimental on the role of light exposure on the final stages of development of *Anopheles stephensi* that there was a significant reduction in the development of adult mosquitoes when larvae were bred in the absence of light compared with the control group bred in alternating 12 hrs light and 12 hrs dark. It has been observed that electric light can affect the behavior of nocturnal insects. Economically important genetic traits of silkworm are qualitative in nature and that phenotypic expression is greatly influenced by environmental factors such as temperature, relative humidity, light and nutrition influenced (Ramesha *et al*.,2009). The result of the present work shows the impact of photoperiod on the enzyme activity and economic traits of *B.mori*. Effect of photoperiod on economic traits of *B.mori* was presented in Table 2. The cocoon weight was 250 ± 92.61 mg in control larvae. It was high (1304 ± 116.50 mg) in B_1 treated group, but low (1090 ± 85.27 mg) in B_2 treated group. The pupal weight was maximum (1050 ± 74.09 mg) in B_1 treated group but minimum (988 ± 87.64 mg) in B_2 treated group compared to control (1080 ± 78. 14mg). Shell weight was high (230 ± 17.32 mg) in B_1 treated group, but low (162 ± 14.81 mg) in B_2 treated group when compared to control (220 ± 19.88 mg). In control shell ratio of control was 17.60 ± 1.37%. It was maximum (19.30 ± 1.79%) in B_1 treated group but minimum (14.86 ±1.28%) in B_2 treated group.

Table 3 was indicated cocoon characters of *B. mori* exposed to light. Cocoon length and width of control larvae was 2.7± 0.11 and 1.00 ±0.04 cm. It was maximum (3.30±0.22 and 1.80 ± 0.17) in B_1 treated group, but minimum (2.40± 0.19 and 1.50 ± 0.13 cm) in B_2 treated group. Cocoon size uniformity of control larvae was 168.70 ± 13.85 cm. It was high (183.30 ± 15.38cm) in B_1 treated group but low (160.00 ± 13.39 cm) in B_2 treated group. This work was in agreement with Ithoh *et al.* (2004) and who suggested that the larvae is kept

dark expressed significantly better results than the larvae in light in respect of cocoon weight, shell weight, shell ratio, percent sex ratio, percent mortality and fecundity.

Table 1 Effect of photoperiods on the biochemical content, ALT and AST in the haemolymph of silkworm, *B.mori* (V instar)

Photo period	Soluble protein (mg/ ml)	Soluble fats (mg/ml)	AST	ALT
Control	2.42 ± 0.16	96 ± 8.72	607±0.45	304±23.68
B_1	2.66 ± 0.20 (9.91)*	71 ± 0.59 (-26.00)	316 ±25.29 (-46.56)	281±28.41 (-7.36)
B_2	2.35 ± 0.24 (-2.89)	109 ± 0.95 (13.52)*	516 ±43.11 (-14.56)	314 ±30.4 (3.20)
B_3	2.61 ± 0.22 (7.85)	81 ±0.73 (-15.60)	319 ±27.16 (-46.08)	268 ±24.8 (-11.52)
B_4	2.51 ± 0.22 (3.71)	84 ± 0.68 (-12.48)	370 ±31.68 (-3.92)	263 ±20.3 (-13.12)

Percent deviation over control value in parentheses N=30 *significant
All other deviation not significant at P≤0.05 (t-test)

Table 2 Effect of photoperiod on economic traits of *B.mori*

Photoperiod	Cocoon weight (mg)	Pupal weight (mg)	Shell weight (mg)	Shell ratio (%)
Control	1250.00 ± 92.61	1030.00±78.14	220± 19.38	17.6± 1.37
B_1	1304.00±116.50 (4.32)	1052.00 ± 74.00 (1.98)	252.00 ± 23.06 (14.4)*	19.32± 1.79 (9.76)*
B_2	1090.00 ± 85.27 (-12.8)	928.00 ± 87.64 (-9.18)	162.00±14.81 (-26.1)	14.86± 1.28 (-15.56)
B_3	1273.00 ± 101.78 (1.84)	1043.00 ± 83.03 (1.17)	230.00 ± 17.32 (4.5)	18.06± 1.50 (2.61)
B_4	1118.00± 109.77 (-10.56)	930.00 ± 70.98 (-9.0)	188.00±15.91 (-14.4)	16.81±1.41 (-4.48)

Percent deviation over control value in parentheses N=30 *significant
All other deviation not significant at P≤0.05 (t-test)

Table 3 Cocoon characters of *B.mori* exposed to light

Photo period	Cocoon length (cm)	Cocoon width (cm)	Length / Width ratio %	Cocoon size uniformity
Control	2.70 ± 0.11	1.60±0.09	1.687± 0.12	168.70 ± 13.85
B_1	3.30±0.22 (22.21)*	1.80±0.17 (12.5)*	1.833±0.15 (8.65)*	183.30 ± 15.38 (8.61)*
B_2	2.40±0.19 (-11.10)	1.40±0.12 (-12.5)	1.600±0.13 (-5.15)	160.00 ± 13.3 (-5.13)
B_3	2.90±0.15 (39.77)	1.70.0.12 (6.25)	1.705±0.10 (1.06)	170.50 ± 16.07 (1.06)
B_4	2.50±0.18 (-7.40)	1.50±0.13 (-6.25)	1.666±0.14 (-1.24)	166.60 ± 14.30 (-1.23)

Percent deviation over control value in parentheses N=30 *significant
All other deviation not significant at P≤0.05 (t-test)

CONCLUSION

Environmental conditions like photoperiod, air circulation in this effect on the physiology of silkworm depending upon the combination of factors and developmental stages effecting growth developments, productivity and quality of silk. This study report suggested that the effect of B_1 treated group of *B.mori* larvae was provide a powerful result in cocoon parameters. This light schedule is produce a good performance of *B.mori* larvae. It is very useful for farmers to reared silkworm larvae in the perfect light schedule.

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