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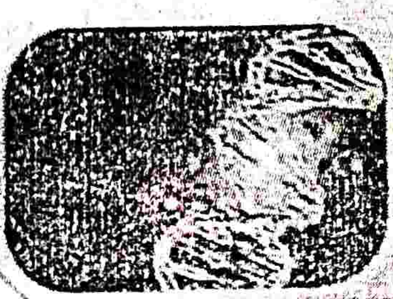

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CONTENTS

KEY NOTE ADDRESS

Influence of Temperature and Light on the growth parameters of silkworm, *Bombxy mori* L.

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Abstract

The mulberry silkworm (*BombyxmoriL.)* is very delicate, highly sensitive to environmental fluctuations and unable to survive in extreme natural fluctuation in temperature. The environmental conditions vary day to day and season to season highlight the requirement of physical parameters like temperature, light and humidity for sustainable cocoon production. Temperature plays a vital role on the growth of the silkworm. The present study was carried out to find the effect of light and temperature on growth parameters such as food consumption, assimilation, tissue growth, AD, ECD and ECI of silkworm, *B.mori*.Food consumption (5114.20±255.31 mg), assimilation (4930.13±214.33 mg), tissue growth (1690.48±83.57 mg) and AD (96.40±7.16 %), ECD (34.28±2.81 %) and ECI(33.05±1.27 %) was increased when larvae exposed to 0 watts 2 minutes and temperature was 26.4±0.59. Silkworm is the cold-blooded animal, temperature will have a direct effect on various physiological activities.

Key words: Silkworm, Temperature, Light, Growth Parameter

1. Introduction

Silk is one of the nature's gifts to mankind, the silkworm, *B.mori* is poikilothermic insects facilitate the understanding of the adaptability of insect environment (Thilagavathi*et al.*, 2013). Various environmental factors such as food, light, temperature, humidity, air flow, light and pathogens exert a combined effect upon their physiological activities (Rahmathulla, 2012).

Food consumption and utilization is influenced by various factors including atmospheric temperature and humidity prevailing at the time of rearing (Benchamin and Jolly, 1986). High efficiency of conversion in silkworm larvae reared at low temperature (Shen, 1986). The effect of temperature on leaf – silk conversion and reported that low temperature (26°C) throughout the rearing period favored higher bivoltine silkworm (Muniraju et al., 1999). The efficiency of food ingested and converted to larval body matters varied prominently among different hybrids and under different feeding and environment conditions (Rahmathulla et al., 2004). Multivoltine, bivoltine races have better yield potential and produce superior quality of silk but do not survive under extreme climatic conditions.

Low temperature is always letter than high temperature with reference to productivity of silkworm and larval duration for different instars (Datta et al., 2001). Majority of the economically important genetic traits of silkworms are qualitative in nature and that phenotypic expression is greatly influenced by environmental factors such as temperature, relative humidity, light and nutrition (Wu and Hou, 1993). Humidity plays a vital role in silkworm rearing and its role in both direct and indirect. The combined effect of both temperature and humidity largely determines the satisfactory growth of the silkworms and production of good quality cocoons. The current investigation highlights the influence of light and temperature on the energy parameter of silkworm, *B.mori*.

2. Materials and Methods

The present investigation was carried onmulberry silkworm *B.mori*.Disease Free Layings (DFLs) of *B.mori* (PMXCSR$_2$) were obtained from the State Government Sericulture Centre at Thenkasi and were incubated at 27°C in ant proof racks at 70-80% humidity.Since the experiments required continuous maintenance of the test species, silkworms were reared in the laboratory itself in accordance with the procedure adopted by Krishnaswami (1978).

The present study has been aimed at investigating energy parameters of the silkworm, when exposed three different light schedules. The third instar larvae were selected randomly and grouped into twelve different batches for experiments. Control was also setup. Each grouped into 5 replications each with 25 larvae. In experimental groups 3 light intensity schedules (0, 15 and 60 watts / 2, 4, 6 and 8 minutes) were imposed during morning at third, fourth and fifth instar larvae. The temperature was recorded. The energy parameters of silkworm caterpillars (V instars) were analyzed based on the methods developed by Waldbauer (1968).All the data were analyzed statistically by t-test (Zar, 1984).

3. Result and Discussion

The success of the sericulture industry depends upon several variables, but environment conditions such as biotic and abiotic factors are of particular importance. Among the abiotic factors, temperature plays a major role on growth and productivity of silkworm (Benchamin and Jolly, 1986). The temperature has a direct correlation with the growth of silkworm and wide fluctuation of temperature is harmful to the development of silkworm. Rice in temperature increase various physiological functions and with a fall in temperature, the physiological activities decreases. Increase temperature during silkworm rearing particularly in late instars accelerates larval growth and shortens the larval period. On the other hand, at low temperature, the growth is slow and larval period is prolonged.

In the present investigation, Food consumption (5114.20±255.31 mg), assimilation (4930.13±214.33 mg), tissue growth (1690.48±83.57 mg) and AD (96.40±7.16 %), ECD (34.28±2.81 %) and ECI(33.05±1.27 %) was increased when larvae exposed to 0 watts 2 minutes and temperature was 26.4±0.59. These energy parameters were significantly increased 25.42, 38.39, 91.58, 10.38, 38.66 and 53.10 per cent respectively, when compared to control. This work was supported by Takeuchi *et al.* (1964), who was reported that there was an increase in intake of mulberry leaves during late age with a decrease in rearing temperature. Food consumption has a direct influence on the weight of larvae, cocoon, pupa and cocoon shells. Larvae of silkworm do not prefer either strong light or complete darkness but usually light phase, in contrast to the dark phase, activate the larvae. The silkworm larvae are fed in complete darkness during the life cycle, their larval duration is longer and cocoon quality becomes poor (Patil and Gowda, 1986).

Trivedi and Nair (1998) also supported this statement, and these two parameters are ultimate indices to evaluate the production efficiency of silkworm in terms of the production of cocoon shell percentage in relation to the food consumed. Rahmathulla*et al.* (2004) observed that the efficiency of food ingested and converted to larval body matter varied prominently among different hybrids and under different feeding and environmental conditions. Similarly, studied of silkworm breeders found that low temperature is always better than higher temperature with reference to productivity of silkworm and larval duration for different instars (Pandey and Tripathi, 2008).

In our present work, minimum food consumption (3206.37±227.53 mg) was observed when the larvae exposed to 6 minutes (60 watt) and temperature was 32.2±1.83 but assimilation (2621.12±209.30 mg), tissue growth (790.59±49.03 mg), AD (80.28±6.92 %), ECD (30.16±2.76 %) and ECI (24.21±1.98 %) was observed,when the larvae exposed to 8 minutes (60 watt) and temperature was 32.6±2.08. This report was accepted by Rahmathulla (2012) and who suggested that the optimum temperature for normal growth of silkworm is between 20°C and 28°C and the desirable temperature for maximum productivity ranges from 23°C to 28°C. Temperature above 30°C [illegible] affects the health of the silkworm.

Table 1: Energy parameters of *B.mori* larvae (V instar) exposed to 6 (watt) in various minutes

Minutes	Temperature (°C)	Food consumption (mg)	Assimilation (mg)	Tissue growth (mg)	AD (%)	ECD (%)	ECI (%)
Control	26.0± 0.31	4076.63± 203.77	3560.20± 174.03	880.10± 56.30	87.33 ±5.31	24.71± 1.33	21.59± 1.33
2	26.4±0.59	5114.20±255.31 (25.42)	4930.13±214.33 (38.39)	1690.48± 83.57 (91.58)	96.40± 7.16 (10.38)	34.22± 2.31 (38.46)	33.08± 1.23 (54.99)
4	26.7±1.03	4961.48± 193.64 (21.69)	4728.04± 209.18 (32.69)	1567.31± 74.33 (79.50)	94.93± 6.87 (8.01)*	33.56± 2.53 (35.75)	31.26± 1.83 (47.59)
6	27.3±0.27	4900.16± 189.05 (19.76)	4539.33± 166.39 (27.41)	1500.60± 80.11 (71.32)	92.63± 7.23 (6.06)*	33.25± 2.50 (34.50)	30.80± 2.83 (42.66)
8	27.5±0.97	4873.29± 193.27 (18.87)	4600.80± 178.41 (29.13)	1489.93± 93.66 (68.92)	94.40± 8.23 (8.09)*	32.38± 2.11 (30.96)	30.57± 2.07 (41.82)

Percent deviation over control values in parentheses
N=25

* not significant

All other deviations significant at P≤ 0.05 (t-test)

Table 2: Energy parameters of B.mori larvae (V Instar) exposed to 15 (watt) in various minutes

Minutes	Temperature (°C)	Food consumption (mg)	Assimilation (mg)	Tissue growth (mg)	AD (%)	ECD (%)	ECI (%)
Control	26.0±0.31	4076.63±201.77	3560.20±174.03	880.00±56.10	87.33±5.31	24.71±1.83	21.58±1.37
2	27.5±1.39	4783.21±283.11 (16.95)	4390.62±250.09 (23.25)	1455.19±48.07 (64.99)	91.79±8.10 (6.46)*	33.14±2.08 (34.05)	30.42±2.55 (40.92)
4	27.8±1.04	4697.38±229.38 (14.89)	4380.60±274.83 (22.97)	1400.32±58.91 (58.79)	93.25±7.89 (6.77)*	31.96±2.69 (29.29)	29.81±1.38 (38.10)
6	28.4±1.87	4669.07±301.93 (14.21)	4237.67±289.47 (18.96)	1371.22±64.33 (55.50)	90.76±8.49 (3.92)*	32.35±2.54 (30.86)	29.36±1.08 (36.02)
8	29.6±1.56	4579.65±288.74 (12.07)	4100.72±220.91 (15.13)	1283.47±69.30 (45.59)	89.54±7.11 (2.53)*	31.29±2.48 (26.58)	28.02±1.42 (29.81)

Percent deviation over control values in parentheses

N=25

* not significant

All other deviations significant at P≤ 0.05 (t-test)

Table 3: Energy parameters of *B.mori* larvae (V instar) exposed to 60 (watt) h various minutes

Minutes	Temperature (°C)	Food consumption (mg)	Assimilation (mg)	Tissue growth (mg)	AD (%)	ECD (%)	ECI (%)
Control	26.0 ±0.31	4076.63± 201.77	3560.20± 174.03	880.00 ± 56.10	87.33 ±5.31	24.71± 1.83	21.58 ± 1.37
2	31.6±2.00	4293.00± 169.48 (5.19)	3871.33± 167.87 (8.71)	1209.32± 49.30 (37.21)	90.17 ± 7.21 (3.25)	31.23± 2.00 (26.34)	28.16 ± 1.07 (30.46)
4	31.9±1.97	4029.23± 215.90 (-1.13)	3620.80± 221.44 (1.69)	1109.97± 51.89 (25.98)	89.86 ± 6.93 (2.89)	30.65± 2.28 (23.99)	27.54 ± 1.56 (37.59)
6	32.2±1.83	3206.37± 227.53 (-20.88)	2940.22± 198.08 (-17.35)	902.57 ± 48.90 (2.55)	91.69 ± 8.09 (4.99)	30.69± 2.09 (24.15)	28.14 ± 1.72 (30.37)
8	32.6±2.08	3264.63± 209.10 (-19.48)	2621.12± 209.30 (-26.29)	790.59 ± 49.03 (-10.10)	80.28 ± 6.92 (-8.07)	30.16± 2.76 (22.01)	24.21 ± 1.98 (12.17)

Percent deviation over control values in parentheses

N=25

* not significant

All other deviations significant at P≤ 0.05 (t-test)

4. Conclusion

The growth and development of silkworm is greatly influenced by environmental conditions. The biological characters influenced by ambient temperature and light. Different environmental fluctuations affect the performance of *B.mori*.The present investigation indicates 0 watt (2 minute) light exposure produce significant improvement in energy parameters of *B.mori*. Generally as the temperature increases, larval weight decreases. High temperature did not favour the productivity.

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