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Role of matereological variation on the RNA content in the fat body of multivoltine silkworm *Bombyx mori* linn

[1]S. K. Gupta, [2]Sangeeta Sukla, [3]R. K. Dubey & [4]K. P. Gaur

[1]Assistant Professor, Department of Zoology Govt. Degree College, Barakhal, Santkabirnagar-272271 U.P (India)
[2]Assistant Professor, Department of Zoology, Harish Chandra P.G.College, Varanasi-221001 (India)
[3]Assistant Professor, Department of Zoology, Govt. P.G. College, Chunar Mirzapur- 231304 U.P. (India)
[4]Silkworm Laboratory, Department of Zoology, D.D.U Gorakhpur University, Gorakhpur-273009.U.P (India)

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ABSTRACT

Bombyx mori (Lepidoptera: Bombycidae) a group of insect has high economic value. Continually domestication by human leads to the insect gets loss of its productivity and more sensitive to meteorological temperature climate. The present investigation was an attempt to analyze and compare the changes in protein content of all the body tissue of fat. It was found to increase in the races of Bombyx mori during developmental stages. Matereological variation has influenced on the total RNA content in the fat body of different developmental stages of Bombyx mori. The RNA content was maximum in the fat body of 5th instar larval reared at spring, while that was less in the fat body of adult reared at winter. All these Biochemical parameters were higher in female adult moth than in male adult moth. The specific activity of these RNA content showed a similar trend like that of protein content in fat body at different development stages in Bombyx mori L growth. Published studies of silks focus on processed fibers or the optimum condition for their production. Consequently the temporal impact of meteorological temperature on biochemical properties of cocoon are either poorly understood or kept as closely guarded industrial secrets.

1. Introduction

Nistari race of *B.mori* Linn is a resistant variety of multivoltine mulberry silkworm in the Northern belt of India. The ultimate aim of developing sericulture industry is the production of standard quality of raw silk which can sustain in world market. Silk has been intermingled with the life culture of the Indians. Though India is producing all the varieties of silk i.e., dress materials, scarves/stoles, readymade garments, etc., the silk sarees are unique. Seiculture is an agro-based industry. It involves rearing of silkworms for the production of raw silk, which is the yarn obtained out of cocoons spun by certain species of insects. Chemically speaking, silk is made o proteins secreted in the fluid state by a caterpillar, popularly known as 'silkworm'. The spinning is an important process during the post embryonic development. The silk gland synthesis the protein needed for silk formation. The developing silkworm represents a dynamic system which changes continuously in its physiological and molecular properties as the morphogenesis proceeds. The synthesis of nucleic acids in the silk gland of *Bombyx mori* determines the level of silk production. Proteinaceous sphere have been observed in the fat body of the honey bee larva **(Oertell, 1930)** and in the fat body of starved mosquito larval. After the larval were feed case in **(Wigglesworth,1942)**, Accumulation of proteinaceous sphere have also been observed in the fat body from the last larval stage of the silk moth *Philosamia cynthia ricini* **(Walkar, 1966; Ishizaki, 1965)** and the larval fat body of the *Trogoderma granarium* **(Nair and karnavar, 1968).** It was found that the polysomes are not dissociated by treatment with RNAs. However, if the polysomes were treated with trypsin as well as RNA is then ribosomes were obtained **(Tsicepalis, Hayashi and Chefurka, 1967).** From this and other evidence the authors concluded that protein plays an important role in maintaining the integrity of the polysomes and RNA.

2. Materials and Method

Seed Cocoon: The seed cocoon (Pupa enclosed in silken case) of multivoltine mulberry silkworm *Bombyx mori nistari,* a native of West Bengal in India, were obtained from the silkworm grain age Behraich, Directorate of Sericulture, Uttar Pradesh, India and were maintained in play-wood trays (23 X 20 X 5 Cm) under the ideal rearing condition (**Krishnaswami, S et .al., 1973)** in the silkworm laboratory. The temperature, photoperiod and relative humidity were maintained in BOD incubator at respectively till the emergence of moths from the seed cocoons.

Copulation: Moths have a tendency to pairs immediately after the emergence of silken case with releases Bombycol pheromone by female moth thus they allowed with their mates for copulation. A total of 200 pairs each containing one male and one female from newly emerged moths, were allowed to mate at 25±1ºC, 12±1 hrs light and 80±5% RH condition. After four hours of mating, the paired coupled moths were decoupled manually. The male moths were dies after copulation and female dies after ovipositor of eggs.

Ovipositor: The gravid females laid eggs on the sheet of paper in dark condition at 26±1ºC temperature and 80±5% RH. After 24 hours of egg lying, the female moths were individually in mortar with pestles and blood smears were examined by microscope under magnification of 15X45 for the detection of bacterial, viral, fungal and protozoan pathogens.

The disease free laying (DFLs) thus prepared were treated with 2% formalin for 15 minutes to increase the adhesiveness of eggs on the paper sheet and surface disinfection. Thereafter, the eggs sheet with eggs laid; was thoroughly

washed with running water to remove formalin and eggs were dried in shade. The dried eggs thus obtained were taken for various temperature experimental conditions. To observe the influence of temperature on the acid and alkaline phosphates enzymes in fifth instar larvae and pupae of *Bombyx mori.*

The newly DFLs just after primary processing were kept in static variation of temperature Winter, Spring & Summer chronologically in separate groups to BOD incubator maintained at spring temperature, humidity & photoperiod in a day. The estimation of RNA was performed according **Schneider (1957)** by using orcinol reagent and standard curve were drawn using different concentrations of yeast RNA as standard. Statistical analyzed by slandered error.

3. Results:

Total RNA contents in fat body:-

The data presented demonstrate the changes in the level of total RNA content in the fat body of *Bombyx mori* during deferent development stage and varying matereological regimes the total RNA content in the fat body of 4th instar larvae was influenced by the matereological temperature variations. With the variation in temperature from winter to spring, the total RNA content increase from 0.84 µg/mg at10ºC to the maximum level of 2.12µg/mg at spring. But further increase in matereological temperature from spring to summer caused gradual decreased in the total RNA contents. The total RNA contents in the fat body of 5th instar larvae were also influence by the matereological variations. With the increasing matereological temperature from winter to spring the total RNA content increase gradually from 0.92µg/mg at winter to the maximum level of 2.42µg/mg at spring. While further increase in temperature from spring to summer, caused gradual decreased in total RNA content. The total RNA content in the fat body of pupae stage was also influenced by the variations of metrological factors. With the matereological variations from winter to spring the RNA content increase slightly 0.81 µg/mg at winter, to the maximum level of 1.94 µg/mg at spring , while further increase in temperature above spring caused gradual decrease in total RNA content which reached to 0.84 µg/mg at summer. The RNA content in the fat body of adult stage was also influenced by the matereological variation. With the increasing matereological temperature from winter to spring, the total RNA contents increase slightly from 0.67 µg/mg at winter to the maximum level of 4.68 µg/mg at spring.

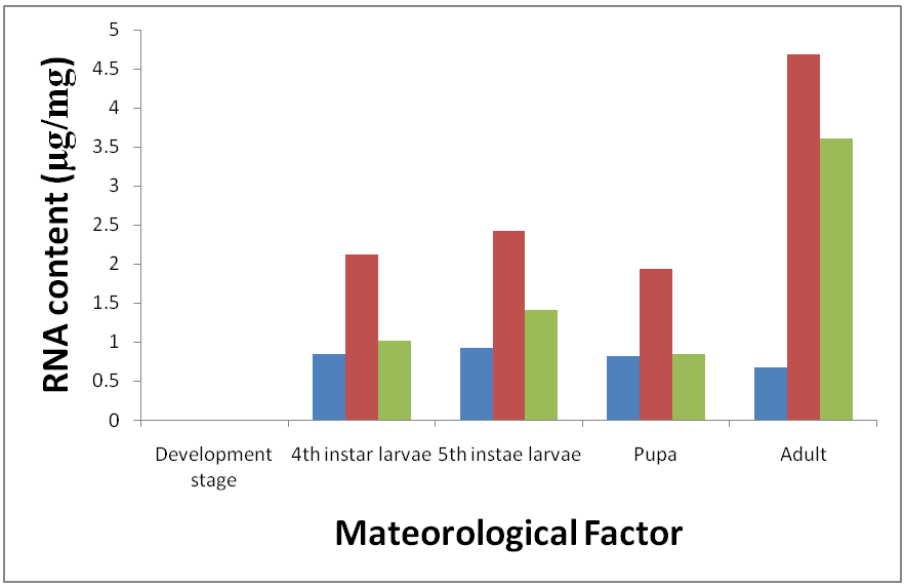

Fig:-1 Effect of matereological factor on the RNA Content in the fat body of different developmental stage of *Bombyx mori*

Table:-1 Effect of matereological factor on the RNA content in (µg/mg) in the fat body of different developmental stages of Bombyx mori.

Meteorological Factor			
Developmental Stages	**Winter**	**Spring**	**Summer**
4th instar larvae	0.84 ± 0.028	2.12 ± 0.042	1.01 ± 0.032
5th instar larvae	0.92 ± 0.021	2.42 ± 0.041	1.41 ± 0.021
Pupa	0.81 ± 0.022	1.94 ± 0.031	0.84 ± 0.031
Adult	0.67 ± 0.024	4.68 ± 0.027	3.61 ± 0.024

***Each value represents mean ± S.D of six replicates.**

4. Discussion

The level of RNA content in the fat body of *B.mori* during different developmental stages is influenced by the matereological variation. The RNA content in the fat body with the varying matereological was found to be of increasing trend from winter to spring which decreased above summer.

The maximum level of tolal RNA content was noticed in the fat body obtained from the 4th instar larvae reared at spring while that was minimum in the fat body obtained from

the adult *B.mori*, A high rate of RNA synthesis was observed in the fat body of *Hyalophera cecropia* **(Wyalt and Linzen 1965)** and *Antheria pernoyii* **(Barth, Bunyard and Hanilfon, 1964)** during the early phases of adult development, The factors apart from hormones affected the nucleic acid metabolism in the insect **(Whatt and wyatt, 1971).** The increases of RNA content in the fat body during the late 3rd instar are rather puzzling of fat body **(Price, 1969).** As in Calliphora fat body as increase in RNA content also takes place in the 3rd instar larval of *Lueilia cuprina* **(Birth, 1967)** and in mosquito **(Lang, Lace, Lennie, Crregory and Jefferron, 1965).** In the larval fat body RNA synthesis is low at the time of a moult increased during the early and mid instars period and subsequently falls during the later parts of the instart.

During the pupal period, specially subsequently of the pherate development of the adult silkworm **(Butz, 1970**). Injury to diapausing pupal results in an increased rate of RNA synthesis in most of their tissue (**Church et al., 1966).**

5. Conclusion:

Thus it may infer that matereological variation influenced the RNA content in the fat body in different developmental stages of *Bombyx mori.* Especially temperature affects the biochemical changes and also affects the cocoon morphology as well as its stiffness and strength, which we attribute to altered spinning behavior and sericin curing time.The acid phosphate activity participate by temporal effect of temperature on silkworm midgut protease activity which stop the molting and alkaline phosphate is affect the metabolic efficiency of silkworm haemolymph. Biochemical changes affect cocoon coloration, perhaps due to tanning agents. Thus the optimum activity of the acid phosphate and alkaline phosphate during fifth instar stage has a relevance to the process of silk synthesis, silkworm larval growth and its production, particularly during this stage and if the larva is optimum meteorological factor spring there would be a further increase in productivity of silk. Our findings demonstrate environmentally induced quality parameters that must not be ignored when analyzing and deploying silk cocoon, silk filaments or silk derived bio-polymers.

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