A STUDY ON THE BIOCHEMICAL AND IMMUNOLOGICAL RESPONSES OF SILKWORM *SAMIA RICINI* FED ON DIFFERENT HOST PLANTS

THESIS

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SUMMARY

Eri silkworm, *Samia ricini,* being domestic, is largely preferred by the farmers of Kokrajhar district. The rearing of eri silkworm is closely associated with the tradition and culture of the Bodo society and it occupies a distinct place in the socio-economic status of the local inhabitants of Kokrajhar district. Rearing of eri silkworm is practiced mainly by the tribal inhabitants of the district. Sericulture being one of the oldest agro-industries provides employment and helps in generating income to the rural and marginal poor inhabitants. Ericulture is predominantly popular mostly because it can be reared indoor unlike the other silkworms, making it suitable for the women to carry out rearing along with the household chores. The art of rearing silkworms, reeling, and weaving silk fabrics is associated to the tradition of the Bodos. The eri silkworm not only produces silk but also provides nutrition through its pupa when consumed. The pupa of eri silkworm is considered a delicacy by the tribals of Kokrajhar, particularly Bodos.

Host plants play a crucial role in providing nutrition for growth and development of the silkworm. The eri silkworm feeds on a variety of host plants however, the rearers mostly prefers the primary host plant, *Ricinus communis* (castor) for rearing of eri silkworm. But the seasonality and cost of planting castor plant becomes expensive for the farmers. Therefore, evaluation and utilization of alternate host plants during the scarcity of primary host plant, *R. communis* is necessary to carry our ericulture continuously throughout the year and increase the silk production.

The present study has been undertaken with a broad aim to evaluate the growth parameters of the eri silkworm based on the types of host plants used and the effect of the host plants on the biochemical, nutritional, and immunological response of the silkworm. Firstly, the effect of host plant was studied on the total and differential haemocyte count. Secondly, the effect of host plants was studied on the economic parameters, biochemical and nutritional content of the silkworm. Lastly, the study on the antioxidant scavenging capacity and immunological responses of *S. ricini* was done based on the types of host plants used for rearing.

Literature and field survey was carried out to study the various host plants used by the rearers for ericulture. Based on the local availability and effectiveness, the rearing of the eri silkworm were done on four different plants namely, *Manihot esculenta* (Sample T), *Gmelina*

arborea (Sample G), *Heteropanax fragrans* (Sample K) and *Carica papaya* (Sample P) were selected for present study along with *R. communis* (Sample C).

The total and differential haemocyte count of the haemolymph of the silkworm reared using different host plants was studied. Variation was observed on the total haemocyte count indicating the influence of host plants. The effect of host plant was also seen on the larval and pupal duration of the silkworm. The silkworms reared using *R. communis* showed shorter larval and pupal duration while the silkworms reared using *C. papaya* showed longer larval and pupal duration. Seasonal variation was also found to affect the larval and pupal duration. Similarly, the difference in the fecundity, hatchability, effective rate of rearing, emergence rate and survival rate were also studied based on the different host plants used. The cocoon parameters were also studied.

The biochemical content of *S. ricini* like protein, carbohydrate, and mineral were also studied. The estimation of proximate composition clearly demonstrated the nutritional significance of eri silkworm pupae as a valuable protein source and fat source with a notable amount of dietary fibre content. The quality of protein is contingent upon the arrangement of amino acids. The amino acid derivatives of larvae of eri silkworm were analyzed using high-performance liquid chromatography (HPLC). It was observed that the eri silkworm contains almost all of the 17 known amino acids. These amino acids were discovered to be of higher quality compared to certain animal and vegetable proteins, such as chicken eggs and sunflower. To analyze the fatty acid profile of the sample, the lipid was treated with methanol and chloroform to convert it into a methyl ester. The fatty acid content of the eri pupae was then analyzed using gas chromatography-mass spectrometry (GCMS) on an n-hexane extract. The fatty acid composition was determined to be similar for nearly all the fatty acids.

Antioxidants are an exclusive group of compounds that could impede oxidation and significantly contribute to limiting the possibility of various disease outbreaks. The antioxidant capacity of eri silkworm larvae was evaluated using several conventional antioxidant assays, including DPPH, ABTS, and reducing power. The results demonstrated that the methanolic extract of eri silkworm larvae exhibited a strong ability to eliminate free radicals. The immune response of the silkworms reared using different host plants was studied through enzyme assays like Glutathione S-transferase and Catalase enzyme activity. Silkworms possess various defence mechanisms even though they do not have humoral immune system. The

immunological capacity of the silkworms and the effect of host plants on the immunity of the silkworm, *S. ricini* was studied.

Therefore, with the finding of the present study it can be concluded that the host plants play a very crucial role in the rearing and productivity of eri silkworm. The host plants used for rearing were found to influence the overall growth and development as well as the biochemical parameters of *S. ricini.* The variation in the temperature during different season was also found to influence the growth of the silkworm. *R. communis* being the primary host plant was found to be superior in terms of the growth, biochemical and nutritional content of the silkworm. Moreover, the performance of *M. esculenta* and *H. fragrans, G. arborea* and *C. papaya* were also found to be comparable to that of the primary host plant. Therefore, these host plants may also be considered as an alternative food plant for rearing *S. ricini* during the scarcity of *R. communis* to enhance the silk production as well as to increase the production of added products of *S. ricini*.