CHAPTER – I

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The North-East region of India has no dearth of natural resources and can very well sustain its populace. This region lies between 20-29°N latitude and 90-97°E longitude with a geographical area of 2,35,000 sq. km. This region owing to its diverse topography offers a tremendous complex variety of habitat and ecosystem. It is a mega biodiversity center and distinguished as one of the ten distinct biodiversity zones of the country.

North-east India is rich in seri-biodiversity being a natural abode for a number of sericigenous insects and their host plants, out of which four types viz., Mulberry silkworm *Bombyx mori*, Oak Tasar silkworm *Antheraea prolei*, Muga silkworm *Antheraea assama* and Eri silkworm *Philosamia ricini* (now *Samia ricini*) have been commercially exploited. Assam occupies an important position in sericulture industry in the entire North-east region. Ericulture enjoys a unique position among other sericulture activities for its typical thermal quality and soft yarn. It is believed that Assam is the original home of eri silk and being cultivated since time immemorial in the Brahmaputra valley of Assam and its adjoining foothills in the sub-Himalayan belt up to about 3000 m altitude. The preponderate eri growing areas of Assam are Hailakandi and Karimganj sub-divisions of Cachar District, entire Lakhimpur and Sivasagar Districts, Darrang district, Udalguri district, Kokrajhar, Haflong, Diphu, Boko, Rani, Borduar and Goalpara. N.E. India alone contributes more than 97% of the total eri silk production of the country.

Silkworm and pupae of many wild silkworms are consumed as food by some hill tribes in the North East region, because they provide significant protein supplements in many people's diet and more significantly these species have been exploited for the silk that their cocoons contain. Ericulture has been practiced in this region since time immemorial and have a close link with the culture and tradition of the people of this region. It is a part of their life and culture, an inherited legacy that meets partly their food...
and clothing needs rather than economic gain. The usage of eri silk is a part of their cultural heritage. The tribals of this region have been rearing the silkworm for cocoons, spinning them on 'takali' and their ancient 'charkha' and weaving four to five 'chaddars' or scarves in a year and its pupae are savoured by them as a bye-product of the industry. All this is confined to their huts in which their entire family is engaged for an excellent subsistence economy in an ideal cottage industry style. A non-descript castor crop is grown by them in their small backyard entirely for rearing the silkworm. Eri is a sturdier crop than muga but its economics depend upon the supply of zero cost castor leaves.

Eri silkworm *Philosamia ricini* primarily feeds on the foliage of castor (*Ricinus communis*), popularly known as ‘era’ in Assamese and as such the silkworm is named as ‘eri’ also called ‘eranda’ or ‘endi’. Unlike the cocoons of other silkworms, eri cocoons cannot be reeled as they are made up of entangled layers and are spun to yarn without killing the insect. Therefore eri silk is also known as ‘Ahimsa silk’.

Eri silk is sometimes named as poor man’s silk which is available at comparatively low cost and even poor persons can produce this silk at a very low investment. Sericulture is an important cottage industry which plays a dominant role in rural economy. It provides jobs and income resources for rapidly increasing population engaged in farming as well as to unemployed youths and women belonging to rural and tribal sectors. This industry also provides opportunities for earning additional income during off-season of crops, i.e, when the farmers remain almost free from agricultural activities. The topography and climatic conditions of Assam are congenial for all-round development of the industry. Over the period of last 10 years, eri silk production has increased significantly from 735 MT in 1995-96 to 1448 MT during 2004-05. Presently number of families engaged in ericulture in Assam alone is around 1.32 Lakh, which is more than two-fold than that of 1979-80. The current productivity per hectare is about 60 kg raw silk (Chakravarty et al., 2006).

The eri silkworm *Philosamia ricini* is multivoltine giving 4-6 crops in a year. Six homozygous strains were isolated on the basis of larval colour and marking, viz., yellow plain (YP), yellow spotted (YS), yellow zebra (YZ), greenish blue plain (GBP), greenish
blue spotted (GBS) and greenish blue zebra (GBZ). Cocoon colours are white, off-white and brick red depending on the food plants and ecoraces. In eri silkworm, eight ecoraces are known, viz., Borduar, Titabar, Dhanubhanga, Khanapara, Sille, Nongpoh, Mendipathar and Kokrajhar. Among these, Borduar, Titabar and Kokrajhar ecoraces are commercially exploited due to their better economic traits.

The eri silkworm is a polyphagous insect which feeds on a variety of food plants. The primary food plants are *Ricinus communis* (Castor) and *Heteropanax fragrans* (Kesseru). Some of its secondary food plants are *Plumeria acutifolia* (Gulancha), *Gmelina arborea* (Gamari), *Manihot utilissima* (Tapioca), *Alianthus glandulosa* (Bar Kesseru), *Carica papaya* (Papaya) etc.

Both castor and kesseru support high cocoon yield of economic level in ericulture. In kesseru, leaf harvest in commercial scale is possible only twice a year, but it is less prone to attack of pests and diseases. Castor is an annual crop, and in block plantation the cultivation is to be repeated every year. Many farmers therefore resort to take only limited number of crops in a year, or reduce scale of rearing or even go for interchanging of food plants depending on the leaf availability. In spite of its drawbacks, castor is preferred for its rearing performance. The secondary host plant, tapioca can be utilized for eri silkworm rearing throughout the year except in winter. Results with this plant are equally good when compared with castor and kesseru, but exclusive rearing on gulancha and gamari leaves are not encouraging.

It is a well known fact that growth and development of silkworm and the economic characters of cocoons are influenced to a great extent by the nutritional contents of the leaves as food for silkworm. The food quality relevant to all the aspects of rearing performance including growth, development and reproductive potentiality mainly depend on nutritional composition which includes both the absolute and relative amount of proteins, amino acids, lipids and fatty acids, carbohydrates, steroids, minerals and vitamins etc. The quality of food directly influences the growth and development of the silkworm and ultimately the quality and quantity of silk produced by them. The importance of quality of leaf on growth and development of silkworm has been greatly
stressed by Yokoyama (1963). Better the quality of leaves, greater are the possibilities of obtaining a good cocoon crop. The most important physiological factor in silkworm growth and silk production is nutrition. Normally, food plants contain all the biochemical constituents for the insects and their influence on the quality and quantity of silk fiber is considered to be very important (Unni et al., 1966). The formation of silk proteins during growth of the silkworm larvae was studied by Fukuda et al. (1959) and found that 70% of the silk protein produced by *Bombyx mori* is directly taken from mulberry leaves and the rest is derived from tissue and blood.

In recent times, supplementation or fortification of food plant leaves is a technique in sericulture research. Fortification of leaves by supplementing nutrients and using them for feeding the silkworm is a useful technique to increase their economic value. Several attempts have been made to supplement the mulberry leaves with additional nutrients to get more silk yield. Improving quality and quantity of eri silk may be possible in the light of the trials carried out by many workers with the silkworm *Bombyx mori*.

Plant extracts as supplementation show a marginal tendency to improve many of the biological characters such as larval weight, pupal weight, cocoon weight, shell weight and shell percentage (Murugan et al., 1998). Jeyapaul et al. (2003) found significant influence of plant extracts on biological parameters of silkworm *Bombyx mori* such as cocoon weight, pupal weight, shell weight and shell ratio.

Although literatures are available on improvement of quantity and quality of silk by enriched mulberry leaves supplemented with extra nutrients, report on fortification of leaves with leaf extract is scanty. It can be employed by the rearers to enrich the nutritional value of the primary food plants, supplementing them with the extract of secondary food plants as the silkworms always prefer their primary food plant leaves. Supplementation with leaf extract is a cost effective technique to improve cocoon characters thereby increasing silk production.

Considering the above facts and factors, the present experimental study has been designed to assess the rearing performance of eri silkworm on the two primary food
plants, castor and kesseru, supplemented with the extract of three different secondary food plants viz., gamari, gulancha and tapioca with the following objectives:

i) Biochemical analysis (moisture content, crude protein, soluble carbohydrate and crude fat) of the two primary food plant and the three secondary food plant leaves at different seasons.

ii) Study of the changes in different parameters of rearing performance (larval length, larval weight, larval duration, cocoon weight, shell weight, shell ratio, ERR and fecundity).

iii) Biochemical analysis of total protein content and carbohydrate content of haemolymph and silk gland of the fifth instar control and extract supplemented larvae.

iv) Study of the spinning performance of the cocoons and the physical properties of the fiber and yarn obtained in control and treated groups.

It is expected that the findings of the present research work will explore the possibilities of using secondary food plant supplementation, which is eco-friendly, freely and easily available, to increase silk production, both at the qualitative and quantitative level.