INTRODUCTION

Sericulture is the art and science of producing mulberry leaves and rearing silkworms for the production of silk. Indian sericulture presents a picture of a well knit agro-based cottage industry. It is an important means of employment generation and provides regular short term income to small and marginal farmers of rural India. Sericulture has been making great strides in the country, benefiting end users. Over thousands of years silk has been an inseparable part of Indian culture and tradition.
With the establishment of the Central Silk Board and continued research and development by various institutes, the Indian silk industry has been making steady and sustained progress. With the availability of improved technologies for mulberry cultivation, silkworm rearing and improvement in silk productivity, sericulture has become a lucrative and remunerative enterprise.

India ranks second, after China, among the mulberry silk producing countries of the world. India succeeded in producing 13,000 metric tonnes of raw silk from 2.5 lakh hectares of mulberry plantation with the capability of providing employment to over five million persons (Sarkar, 1995). Though we are in the second position, we stand way back as far as the quality and the quantity of silk are concerned. Therefore we need to improve the quality and the quantity of the silk produced by adopting modern scientific techniques to commercially exploit this industry. The whole success of the industry depends upon the nutrition given to the silkworm.

Nutrition involves chemical and physiological activities which transform food elements into body elements. Insect nutrition is concerned primarily with the bio-chemical substances present in foodstuff necessary to
set in motion and maintain long series of metabolic processes that provide energy and metabolites for growth, development and other vital functions (House, 1966). Legay (1958) stated that silkworm nutrition is considered the major area of research in sericulture. Pant (1978) has clearly envisaged that utilizing nutritional data for exploitation of beneficial insects like silkworm has a great scope and stressed that the quality and the quantity of silk yield can be greatly increased through proper dietary management.

Silkworm, *Bombyx mori* L. is an oligophagous insect that feeds mainly on the leaves of the mulberry plant. The successful harvest of quality cocoons depends exclusively on the nutrition of the silkworm (Nagesh and Devaiah, 1996). It has been proved beyond doubt that *B. mori* requires certain carbohydrates, proteins and minerals for normal growth, survival and for increased silk production. If these essential nutrients were not present in the required amount in the mulberry leaves, the silkworms feeding on them encountered problems and defects in larval growth and silk synthesis (Sengupta *et al.*, 1972)

It is the primary aim of every sericulturist to boost the production of quality cocoons. The growth and development
of the mulberry silkworm, and subsequent cocoon production depend mainly on the nutritional composition of the mulberry leaves (Krishnaswami et al., 1971). Several studies have shown the importance of quality of mulberry leaves in silkworm rearing (Das and Prasad, 1974 and Dwivedi, 1992). The better the quality of the leaves, the greater are the possibilities of obtaining good cocoon crops. Thus, it appears to be very simple, clear and logical that to boost the production of silk, improved quality of leaf or mulberry variety has to be ensured in silkworm rearing. Different varieties of mulberry exhibit differences in the quality of the leaves. Hassanein and Shaarawy (1962b) and Sinha et al. (2003) observed significant variations in the nutritional value of the leaves of different mulberry varieties.

The nutritive value of mulberry leaves varies considerably depending on the age of the leaves, the season of cultivation, the manures and fertilizers used for cultivation etc., and these differences are reflected in the silkworm cocoon crop (Krishnaswami et al., 1970a and b; Benchamin and Jolly, 1986; Benchamin and Anantharaman, 1990; and Bongale et al., 1991).
The importance of research on the effect of different fortification agents on silkworm nutrition has been studied by House (1966). A significant development in the research on silkworm nutrition started with the formulation of artificial diet. Such studies increased because, in most temperate areas of the world, mulberry leaves were not available throughout the year. However, in India, since the growth of the mulberry is continuous, enormous quantities of leaves are produced all through the year. Hence attention is paid to the enrichment of the mulberry leaves with nutrients. The improvement of silk production by enriching silkworm nutrition through fortification of the mulberry leaves yielded promising results (Kumararaj et al., 1972; and, Alagumalai et al., 1999a and b).

Various nutrients such as proteins, amino acids, minerals, vitamins, carbohydrates, antibiotics and hormones have been supplemented along with mulberry leaves to improve silk production (Horie et al., 1971; Kamioka et al., 1971; Mathavan et al., 1984; Alagumalai et al., 1991a; and, Chauhan and Singh, 1992). Of the many nutrients tested, dietary protein acts as an important determinant of insect growth, survival and population dynamics (Alagumalai et al., 1991b; Felton et al., 1992; and, Karowe and Martin, 1993). Among the various dietary protein
Supplements tested, casein, egg albumin, glutan and soya flour are the most attractive sources in terms of cost and quality and have been extensively studied and generally recommended for fortifying purposes (Gupta et al., 1977). The biochemical constituents of soyabean are: 43.29 percent protein, 19.50 percent fat, 20.90 percent carbohydrates, 4.60 percent minerals, 240 mg calcium, 690mg phosphorous and 11.50 mg iron (Subramanian, 2002). As per the FAO standards, soyabean protein is rich in essential amino acid content (Gupta et al., 1977) and it is rich in lysine.

Highly nutritive soyabeanmeal was added to the artificial diet of the silkworm as a source of protein (Ito et al., 1975). In fact high dietary levels of soyabean protein positively influences the larval growth and the cocoon yield (Subbarao et al., 1989). Owing to high cost of artificial diets, Subbarao et al. (1989) used raw soya flour as a supplement along with mulberry leaves to enhance the larval growth and the cocoon yield.

The effect of graded levels of protein in the diet on growth, silk production and nitrogen metabolism have been observed by several workers. Horie and Watanabe (1983) and Chapman (1982) reported that dietary protein was effective in increasing the economic characters only up to
an optimal level. Further each species of insect differs in its optimal protein requirement for its growth and reproductive vigour. Reports on insect nutrition have emphasised the need to determine the optimal dose of a chosen dietary protein to clearly understand its impact on the development process of growing larvae (Burgess et al., 1991 and Roychoudury and Roychoudury, 1995).

In the larvae of holometabolous insects, storage proteins are the major haemolymph proteins which play a pivotal role as reservoir for amino acids that are utilised for larval and adult development during metamorphosis (Levenbook, 1985). Tojo et al. (1980) have established the importance of storage proteins in insect development. Synthesis of storage protein in the larval fat body is related to the larval feeding activity (Riddiford and Hice, 1985).

Studies of nutritional parameters such as consumption, digestion and utilization of food in insects reflect the nutritional status of insects (Waldbauer, 1968). A perusal of the literature brings out the fact that dietary protein has a great impact on various nutritional parameters that is manifested in larval and pupal characters of insects such as Philosamia ricini (Pant et al., 1986), Antheraca pyrolei
Nutritional studies of silkworm with respect to silk protein (Fukuda *et al.*, 1963), body weight gain (Udea and Suzuki, 1967), economic characters (Kamioka *et al.*, 1971), cocoon productivity (Takano and Arai, 1978), silk production (Muthukrishnan *et al.*, 1978), ovariole length, egg hatchability and fecundity (Vanishree *et al.*, 1996) have shown that such parameters depend on qualitative and quantitative variations of protein in the feed.

In the sericulture industry, the improvement of the quantum production of the cocoons as well as the quality is very important. Previous studies revealed that the protein in artificial diet influences silk production by accelerating the larval growth (Kamioka *et al.*, 1971). Cocoon characters are important to determine the quality of the yield and for fixing the rate prior to marketing.

A considerable gap exists between the results obtained in the lab and the field. To bridge this gap, an effective extension service is needed. “Lab-to-Land” is the key word of any extension process. All research efforts become futile if they do not reach the farmers (Das *et al*. 1993 a and b). Therefore, for the successful utilization of any research
finding, technology transfer from lab to land is essential. To determine the validity of the lab experiments, it is essential to calculate the cost and return at the farm level by the cost benefit ratio (CBR).

Objectives of the present study are:

® To study the biochemical composition of the leaves of different varieties of mulberry plants such as V1, MR2, S34 and M1.

* To study the effect of V1, MR2, Ss, and M3 mulberry varieties on the larval characters, cocoon characters and reproductive parameters of *Bombyx mori* L. and selection of suitable mulberry variety.

* To find out the effect of soy protein supplementation on the growth parameters of *B.mori* feci on V1 mulberry variety.

® To analyse the protein profile of the haemolymph and fat body of *B.mori* fed on supplemented feed.

® To prepare the energy budget of *B.mori* fed on supplemented feed (soy protein).

® To study the economic characters of larvae and pupae of *B.mori* fed on soy protein.

® To conduct a lab to land field trial.