PREFACE

All you need in this life is ignorance and confidence. And then success sure.

- Mark Twain
PREFACE

Sericulture has a tremendous potentiality to help rural people to make their economy viable especially in the developing countries, where agriculture continues to be the main industry. As an agro-based industry, sericulture needs low investment, offers more employment opportunities and realizes more profits. Another definite advantage of sericulture over other crops is the transfer of high value from rich to the poorer section of the society.

The knowledge of nutritional studies on the silkworm, *B. mori* and the leaf consumption, digestion and utilization of mulberry leaves will have a greater impact on the silkworm growth, development and in turn reflect on the quality of the seed and silk. Improving the nutritional status of the feed to alter the physiology of the larvae to produce more silk can enhance the efficiency of silkworm rearing (Pallavi and Kaliwal, 2004; Bhattacharya et al., 2006). Food consumption in insects is influenced by number of exogenous and endogenous factors (Scriber and Slansky, 1981; Bernays and Simpson, 1982). Nutritional factors strongly influence most aspects of insects existence including physiology, behavioral ecology and evolution (Slansky, 1982). Studies on consumption, digestion and utilization of food in insects are of fundamental importance for proper understanding of nutrition in insects (Waldbauer, 1964).

It is very important to regulate the water content. Difference in the water content either too high or too low will result in the disruption of physiological activities. Excess water results in excretion of more salts causing ostomic haemolymph
pressure and pH to decline. Low water content results in hampering of normal physiological activities like irreversible coagulation of cell substance resulting in the death of the silkworm (Nirwani, 1995; Bhattacharya et al., 2006).

The raw silk production per hectare of land is about 52 kg in China, 40 kg in Japan and just 14 kg in India (Bajpeyi et al., 1991). The low productivity is mainly attributed to low mulberry yield and poor quality of leaf. It is well known that sericulture has undergone sea change and has started wearing a new look (Krishnaswamy et al., 1978). It has been reported that the cocoon crop of the silkworm, B. mori depends on the vigor of its breed, which in turn is further influenced by the quality of the leaf fed to the silkworm (Venugopal et al., 1987). To boost up silk production some supplements are essential to the silkworm, along with its feed. A variety of sugar, proteins, amino acids, lipids, vitamins and hormones etc. have been tried as supplements by a number of investigations to increase the quality and quantity of silk (Nagarajan and Radha, 1990; Masilamani et al., 1991; Bajpeyi et al., 1991). Many investigators have also reported an attempt on supplementation of inorganic chemical compounds with the mulberry leaves. Supplementation with cobalt has been found to increase the larval weight, shell weight and effective rearing rate of rearing (Narasimhamurthy and Govindappa, 1988). It has also been reported that the calcium, magnesium and iron when added to mulberry leaves increased the rearing rate and silk content in the cocoon (Bajpeyi et al., 1991), zinc supplementation has also increased the length, width, weight of the cocoon (Chamundeswari and Radhakrishnaiah, 1994). In recent years, many attempts have been made to fortify the leaves with nutrients, by
spraying antibiotics, juvenile hormones, plant products with JH mimic principles, antijuvenile hormones, dusting with botanical, vertebrate hormones, phytohormones, food additives, protein rich flours etc. This supplementation is to improve the quantity, quality of silk and egg laying capacity of female moth.

The feeding of various chemical substances along with the artificial diet or with the mulberry leaves soaked in the solutions of various chemicals has been reported to cause beneficial as well as harmful effects in the silkworm, *B. mori*. It has been reported that the silkworm larvae fed with mulberry leaves soaked in mineral salts like potassium iodide, cobalt chloride (Chakraborti and Medda, 1978 a, b), magnesium (Lokanath *et al.*, 1986), copper sulphate, nickel chloride (Magadum, 1987; Padaki, 1991) zinc and nickel (Chamundeswari and Radhakrishnaiah, 1994) brought about an increase in the economic parameters, such as larval weight, silkgland weight, cocoon weight, cocoon shell weight and egg productivity.

The silkworm larvae accumulate large quantity of fuel reserves in various tissues and it is endowed with a unique biochemical adaptation to conserve nutritional reserves available during the active larval stage. The carbohydrates and proteins are very essential for pupal and adult development and are obtained from the fat body and haemolymph stored during the last larval instar. Thangavelu and Bania (1990) have reported that supplementation with rainwater and minerals stimulate metabolic activity of the silkworm, *B. mori*. It has also been reported that the silkworm larvae fed with mulberry leaves supplemented with multi- minerals increases the total protein contents
of the silkworm, *B. mori* (Etebari and Fazilati, 2003). It has been suggested that supplementation with minerals changes the fat body protein, glycogen, haemolymph protein, trehalose and fat body total lipids of the silkworm, *B. mori* (Dasmahapatra *et al.*, 1989; Goudar and Kaliwal, 2001b). Hence, it is evident that oral supplementation with metals and salts influences the economic parameters and biochemical constituents of the silkworm, *B. mori*.

Nitrogen, which is the main component of amino acids and proteins, is one of the essential elements for the growth and development of insects, which generally is obtained by feeding although that some insects are able to maintain their need in some other processes. Silkworm uses 65% of absorbed nitrogen through V instar for silk production. Therefore, nitrogen sources present in the diet can have high effects on larval growth and cocoon production (Horie and Watanabe, 1983; Unni *et al.*, 2000). Zaman *et al.*, (1996) have demonstrated that mulberry leaves enrichment with 2% nitrogen causes the weight increase of the silkworm larvae. Karowe and Martin (1989) have reported that the relative growth of *Spodoptera eridania* is independent from the amount of nitrogen in the diet. Main studies on mulberry leaves supplementation with nitrogenous compounds and amino acids and the evaluation of their effects on silkworm rearing have been conducted (Sarkar and Absar, 1995; Yeasmin *et al.*, 1995; Zaman *et al.*, 1996; Basit and Ashfaq, 1999; Etebari, 2002; Etebari and Fazilati, 2003).

Therefore, the present investigation was undertaken to study the effect of minerals and nitrogenous compounds on the silkworm growth and development. The thesis is divided into six chapters as shown below -
I) Influence of potassium carbonate ($K_2CO_3$), magnesium carbonate ($MgCO_3$) and their mixture on food budget and water utilization (budget) of the silkworm, $B. mori$ L.

II) Effect of potassium carbonate ($K_2CO_3$), magnesium carbonate ($MgCO_3$) and their mixture on economic traits of the silkworm, $B. mori$ L.

III) Fortification of potassium carbonate ($K_2CO_3$), magnesium carbonate ($MgCO_3$) and their mixture on biochemical contents of the silkworm, $B. mori$ L.

IV) Impact of arginine, histidine and their mixture on food budget and water utilization (budget) of the silkworm, $B. mori$ L.

V) Application of arginine, histidine and their mixture on economic traits of the silkworm, $B. mori$ L.

VI) Supplementation with arginine, histidine and their mixture on biochemical contents of the silkworm, $B. mori$ L.

A few important references have been cited in the preface, however each chapter has a specific introduction, materials and methods, results and discussion where all the pertinent literature is cited. To avoid disruption in the flow of the text, tables, graphs and figures are placed at the end of each chapter. The inferences drawn in the present study are based on food budget, water budget, economic traits and biochemical contents. Hence, the present investigation was undertaken to study the effects and their mechanism of minerals and nitrogenous compounds on food budget, water utilization, economic traits and biochemical contents of the silkworm, $B. mori$ L.