The lepidopteron mulberry silk moth, *Bombyx mori* has attracted the attention of mankind since time immemorial as they are used in the production of silk. Sericulture has considerable socio-economic relevance in India largely due its suitability to small and marginal farms holdings, self-employment, low cost investment, quicker returns together with high market demand which ultimately contribute to the growth of silk industry in the country. Though, India has a long history of sericulture producing all the four types silk namely mulberry, tasar, eri and muga yet, the mulberry sericulture proved to be highly economically viable agro based cottage industry having greater employment potential to rural folks.

Silk production in India attained a rapid stride in the past three decades placing the country in the second position among the silk producing countries in the world. However, the bulk of silk production is of crossbreed polyvoltine x bivoltine type which is lacking in quality of raw silk in terms of International standards. The domestic consumption is estimated to cross 25,000 MT by the end of eleventh five year plan, of which around 10,000 MT would be of warp quality bivoltine silk which is required for the power loom sector. In addition to save foreign exchange and also to achieve a significant increase of the export of silk fabrics and to create further diversification in silk textiles vis-à-vis to give higher returns to the farmers, the production of quality bivoltine silk is imperative. In order to meet these demands, ambitious plans were drawn and implemented to fill this demand and supply by increasing bivoltine silk production. The modern techniques enable the breeders to improve the desirable genotypes of known genetic constitution with an objective of increasing the productivity of plants and animals of economic interest. Added to this, application of the principles of genetics in understanding the hereditary nature of the commercial characters followed by appropriate selection have contributed a great deal in improving the productivity in sericulture, agriculture, horticulture, poultry, piggery, etc. The breeding of silkworm races probably dates back to the beginning of the history of the silkworm rearing, but
have made great progress rather recently. The quality and quantity of the silk produced by different races of silkworm not only depends on their genetic endowment but also on the agro-climatic conditions to which they are exposed. In India several bivoltine races namely KA, NB4D2, NB7, NB18 and CSR2, etc., though are known for their high silk content produced under congenial climatic conditions, yet are found to exhibit poor viability during unfavorable climatic conditions particularly in the pre-monsoon season leading to frequent failure of cocoon crops. Some of the multivoltine races like Pure Mysore and npnd are being commercially exploited in tropical and temperate belts respectively are known for their higher viability and low productivity. Thus, in the absence of suitable bivoltine races with higher viability and multivoltine races with higher productivity, their hybrids are being commercially exploited with lesser yield due to inherent genetic limitation of their parents and it is well known that majority of the quantitative traits of silkworm are under the control of polygene which are vulnerable to environmental influences. Therefore, there is a need for evolving superior bivoltine races which could provide a spectrum of new breeds to suit the climatic conditions of tropics possessing higher viability and moderate cocoon productivity.

In India, high yielding bivoltine silkworm strains are developed through inbreeding of the hybrids obtained from other countries followed by selection for various yield attributes under laboratory conditions (Krishnaswami, 1983; Nagaraju et al., 1987; Basavaraja et al., 1995; Datta et al., 1997, 2000a, 2000b, 2001). The silkworm strains thus developed are utilized to obtain hybrids of polyvoltine x bivoltine and bivoltine x bivoltine hybrids for commercial exploitation at the farmers level in different parts of the country, who often fail to provide optimum conditions that are required for full genetic manifestation of the races. As a result of this, it is estimated that only 40% of genetic potential of these breeds are realized in India (Nagaraju, 2002). Therefore, the need was felt to undertake the present research programme to improve bivoltine races for the commercial exploitation. In addition, the improved
breeds and their respective parents were subjected to isoenzyme studies for both alpha and beta esterase. The results of the breeding experiments along with biochemical studies are presented in the following three chapters.

Chapter I: Includes heritability studies on two bivoltine pure races namely NB₄D₂ and KA, two multivoltine races Pure Mysore and npnd to understand heritability of twelve quantitative traits such as fecundity, hatching percentage, larval weight, larval duration, yield by weight, cocoon weight, shell weight, shell ratio, in addition to a few post cocoon parameters. Suitable statistical procedures were applied to the data generated.

Chapter II: Embodies the studies on two productive breeds NB₄D₂ and KA races, which were crossed with multivoltine races Pure Mysore and npnd stocks. Simultaneously reciprocal crosses of the above races were made and the performance of the progenies after backcrossing and inbreeding for 12 generations were analyzed. At every generation, rigid selection was applied to select non-diapause eggs, white coloured cocoons having uniform built and shape and progenies exhibiting highest effective rate of rearing resembling the multivoltine parents. The improved lines derived from hybridization experiments utilizing NB₄D₂ as one of the parents in the foundation cross are denoted as NB₄D₂ - I, NB₄D₂ - II and the improved lines extracted from the cross where KA is used as one of the parents are denoted as KA- I and KA-II.

Chapter III: This chapter incorporates the results of rearing the improved lines in three seasons of the year (Pre-monsoon, monsoon and post-monsoon) along with the control NB₄D₂ and KA races in order to study their performances in different seasons. The economic characters such as fecundity, hatching percentage, larval duration, larval weight, yield by number, yield by weight, single cocoon weight, shell weight, shell ratio, filament length, filament size and pupation rate were analyzed in the four improved lines NB₄D₂-I and NB₄D₂-II, KA-I and KA-II along with KA and NB₄D₂. Parallelly
by following the techniques of Davis (1964), Gamo (1983) and Wu et al. (1993) and the haemolymph of larval stages of improved lines of NB₄D₂ and KA were subjected to isoenzyme analysis of alpha and beta esterase. A comparison was made for the expression of this enzyme activity both in the control batches and the improved lines of NB₄D₂ and KA since, isoenzyme are good biochemical markers and now it is established fact that, esterase activity in larval stages has relevance to survival ability.