PREFACE
The lepidopteron silk moth *Bombyx mori* one of the most popular beneficial insect, during its holometabolous type of metamorphosis produces the natural silk fibre from the larvae. This insect as an adaptive mechanism to variable environmental conditions through its differential span of life cycle exhibits univoltine, bivoltine and multivoltine features. Thus, the introduction of bivoltine races to tropical climates has been partially successful because the bivoltine races are originally suitable for temperate climatic condition (Murakami, 1988 a & b, 1994). As a result lack of stability of crop performance of bivoltine races was a major setback in tropics (Subramanya *et al.*, 1988). Hence, univoltines and bivoltines are adaptable to temperate environment, where as multivoltine is most suitable for tropical environment because major factor in favour of the polyvoltines seems to be that they are hardy and have the ability to survive and reproduce under varied or fluctuating tropical climatic conditions (Mal Reddy *et al.*, 2002 and Iswara Prasad *et al.*, 2002). As a result, silkworm breeders constantly attempted to introduce the variations in the population of silkworm through novel procedure of silkworm selection and hybridization by intercrossing different voltinistic groups (Mano *et al.*, 1993). Thus, more and more new silkworm genotypes are added to the vast array of gene pool of *Bombyx* silk moths and it is an estimated fact that 3000 silkworm strains are available all over the world due to various ongoing breeding programmes (Nagaraju, 2002 and Thangavelu *et al.*, 2003). These strains are regularly maintained in the germplasm stations in different parts of the world by adopting appropriate selection procedures with the knowledge of quantitative genetics. As a result, Krishnaswami *et al.* (1964), Jolly *et al.* (1965), Subramanya & Sreerama Reddy (1982), Subba Rao, (1983), Pershad *et al.* (1986), Raju & Krishnamurthy (1987), Sathenahalli, (1989), Murakami, (1990) and Datta, (1994) in their investigations reported that evaluation of genetic potentialities of different bivoltine races under tropical conditions will pave the way for future hybridization programmes.
It is an established fact that silkworm *Bombyx mori* is an model insect for gene environmental interaction and any variation in the environment will alter the homeostasis of silkworm which is reflected in the phenotypic expressions. Added to this the phenotypic system in this organism remarkably manifested the complexity for the expression of several quantitative and qualitative traits through polygenes. As a result, there are several reports available on the manifold effect of polygenes on the expression of different quantitative traits (Narasimhanna, 1976; Gamo and Hirabayashi, 1983; Tazima, 1988). In order to understand these complexities for the expression of characters several biometrical procedures are adapted in this organism to strengthen the concept of silkworm breeding so that breeders can achieve their goals. The novel procedures of adjudicating the parental races/hybrids includes heritability estimations, evaluation index, evaluation indices, selection index, co-efficient of inbreeding and most popular methods namely line x tester and diallele analysis. With the popularity of molecular biology several new technologies especially isoenzyme techniques, protein and DNA polymorphism and enzyme assay studies both at cellular and molecular level became handy for silkworm breeders to better the best. The allelic variation in enzymes particularly electrophoretic variations have provided silkworm geneticist with a much needed tool for measuring the genetic variability in germplasm stations (Hegde and Krishnamurthey, 1980; Subramanya and Sreerama Reddy, 1982; Somasundaram *et al.*, 2004 and Doddaswamy and Subramanya, 2007). Similarly, DNA markers namely random amplified polymorphic DNA (RAPD), amplified fragment length polymorphism (AFLP), micro-satellites or simple sequence repeats (SSR) and inter simple sequence repeat (ISSR), *etc* are also available to understand the DNA polymorphism. Among all the marker based techniques, the ISSR marker technique is shown to be specific, reproducible and sensitive for detecting variations among individuals between and within species (Bornet and Branchard, 2001). Apart, ISSR has been successfully used to detect variations in several plants namely *Coffea Arabica* (Rani *et al.*, 2000), peanut, *Arachis hypogaea* (Raina *et al.*, 2001), tea
(Devarumuth et al., 2002), banana (Ray et al., 2006), in *codonopsis lanceolate* (Guo et al., 2006 a), *robinia ambigura* (Guo et al., 2006 b) and in popular insects viz., cyclically parthenogenetic aphids, *Acyrthosiphon pisum* and *Pemphigus obesinymphae* (Abbot et al., 2001), mosquito *Aedes aegypti* (Abbot et al., 2001) and silkworms (Nagaraju et al., 1991; Nagaraja and Nagaraju, 1995; Nagaraju, et al., 2001; Chatterjee and Mohandas, 2003; Chatterjee and Pradeep, 2003; Dhanikachalam Velu et al., 2008; Vijayan et al., 2004c and 2006, etc). In the light of the above, it is worthwhile to understand the level of variable expressions of silkworm races/breeds with distinct characters to different environments with the background knowledge of biometrical evaluation methods and molecular genetic approaches. This has prompted the author to undertake the present research work by utilizing bivoltine and multivoltine races/breeds and mutant stocks available in the germplasm station of the Department. The results of the present investigation are presented in three chapters of the thesis.

1) The first chapter incorporates the results and information on the evaluation index during three seasons of the year by rearing bivoltine, multivoltine and mutant stocks.

2) The second chapter embodies the results of heritability studies during three seasons of the year by rearing bivoltine, multivoltine and mutant stocks.

3) In the third chapter the genetic differences in the haemolymph protein pattern and DNA polymorphism through ISSR markers among eighteen silkworm races/breeds are presented and discussed.