SUMMARY
The aim of the thesis is to characterize *A. proylei* and its breeds in terms of morphology, cytogenetics and molecular parameters and to identify the superior breeds for commercial exploitation. Therefore, the present investigation was undertaken with the following objectives: (1) morphological characterization of *A. proylei* and its breeds *viz.*, PRP2, PRP3, PRPs, PRP12, RPP4 and Blue; (2) study of the rearing performances of *A. proylei* and its breeds; (3) cytogenetical characterization of *A. proylei* and its breeds; (4) estimation of genetic diversity among them through molecular analysis.

The colour of the body of *A. proylei* and breeds PRP3 were pale green; PRP2 was apple green; PRP3, PRP12, RPP4 were light green and that of breed Blue was bluish green. The cocoons were light brown in colour; ovoid in shape and peduncle was present on one end. The important characters of a cocoon like weight of cocoon, pupa and shell weight showed significant variation among the breeds. Highest cocoon weight was found in PRP3, highest pupal weight and shell weight in PRPs. All the breeds had higher values in cocoon characters over that of *A. proylei*. The silk percentage was significantly higher in RPP4 over others. Significant variation was found in the wing span of *A. proylei* and breeds. Striking variation in the ground colour of wing was observed among the breeds. In case of male moth of *A. proylei* and breed, Blue, the ground colour was greyish brown; greenish brown in PRP2, PRP12 and RPP4; brown in PRP3, PRPs. Ground colour of the wing of female moths of *A. proylei* and all the breeds were brown but in breed, Blue, the ground colour was light brown. Ocellus was found in both forewing and hindwing of the silkmoths. Hyaline spot was present in the middle of the ocellus which was transparent and it is a unique character of these breeds. Wing venation of both forewing and hindwing of *A. proylei* and breeds were found to be the same.

Dendrogram constructed using Between Linkage Method based on morphometric measurements revealed the relationship between the *A. proylei* and breeds. Two main branches were observed in the dendrogram where one branch was divided into two clusters and another branch singly composed by breed, Blue. One
cluster was composed of PRP₂, PRP₁₂, *A. proylei* and RPP₄. The other cluster was composed of PRP₃ and PRP₅. The breed, Blue was found in the other branch, separately from other breeds. The result of the cluster analysis showed that PRP₂, PRP₁₂, *A. proylei* and RPP₄ had close similarities; PRP₃ and PRP₅ had close similarity. However breed, Blue had no close similarity with any other breeds.

In spring crop, PRP₁₂ recorded a highest fecundity (164.33); RPP₄ recorded highest hatching % (85.16 %); highest cocoon yield/dfl and ERR % was recorded in Blue (55.29 and 43.21 % respectively). Cocoon weight was recorded maximum in PRP₅ (6.82 g); shell weight was found to be highest in PRP₅ (0.73 g). Shell ratio and filament length was found to be highest in RPP₄ (10.83 and 708.33 m respectively). There was a significant difference among the breeds in all the traits at 5% significance level. In autumn crop, RPP₄ recorded highest fecundity, hatching %, cocoon yield/dfl and cocoon weight with a value of 184.67, 75.67, 23.67 and 6.64 respectively. Highest ERR % was recorded in Blue with a value of 17.33. Shell weight and filament length was found to be highest in PRP₅ with a value of 0.7 g and 668.33 g respectively. The highest shell ratio was found in PRP₃ with a value of 10.74. There was a significant difference among the breeds in all the traits at 5% significance level.

From the present investigation it was found that spring crop showed higher performance in seven economic traits among the eight economic traits. The traits which showed higher values were hatching (%), cocoon yield/dfl, ERR (%), cocoon weight, shell weight, shell ratio and filament length. Fecundity was found to be higher in autumn crop only. The rearing performances of these breeds were not same in both the crops. Analysis of the data of rearing performances of *A. proylei* and breeds revealed that RPP₄, PRP₁₂, PRP₅ and Blue showed better performances both in spring and autumn crop and were superior in most of the traits over the parent *A. proylei*.

The type of chromosomes found in *A. proylei* and breeds was holokinetic *i.e.*, the chromosomes were without localized centromere. The haploid number of chromosomes of *A proylei* and the breeds remained the same as n = 49. From the karyotype constructed it was found that the chromosomes of *A. proylei*, PRP₃, PRP₁₂ and RPP₄ were found to be more condensed than those of PRP₂ and PRP₅ which were smaller and thinner. From the meiotic study it is evident that the general course of
meiosis of *A. proylei* and breeds was fairly uniform. Early prophase *i.e.*, leptotene stage was characterized by the formation of synizetic knot where chromosome threads could not be distinguished from each other. Pairing of chromosomes was observed in zygotene stage. Isopycnotic and positively heteropycnotic bivalents were observed in breeds like PRP2, PRP5 and PRP12. Positively heteropycnotic bivalents also observed in diplotene of PRP2, PRP5 and RPP4. Single chiasma was present per bivalent during diplotene/diakinesis of *A. proylei* and breeds.

The ISSR primers used in the present investigation produced high polymorphic bands. The percentage of polymorphism detected with each primer was as high as 85.7% to 100%. The Nei’s genetic distance between the breeds ranges from 0.2624 to 0.6397. The lowest distance was observed in PRP2 and *A. proylei* whereas the highest distance was observed in *A. proylei* and RPP4. The dendrogram constructed based on the UPGMA cluster analysis of Nei’s genetic distance revealed two branches. One branch was comprised of three clusters which was group as: Group I which was comprised of *A. proylei* and PRP2; Group II which was consisted of two sub groups, first sub group comprised of PRP3 and Blue and second was comprised of PRP5 and Group III which was comprised of PRP12 and RPP4. *A. frithi* which was taken as an outgroup in the present study was found separately in another branch.

It can be concluded from this study that though similarity was observed in most of the stages of life cycle, significant variation was observed in economic traits. The breeds, PRP5, PRP12, RPP4 and Blue show better performances in both spring and autumn season. Among them RPP4 was best performer in spring crop and PRP5 in autumn season. In the molecular analysis, RPP4 was found to be distantly related from other breeds. The breeds (PRP5, PRP12, RPP4 and Blue) which were having better rearing performances does not show close relationship among others. So these breeds *viz.*, PRP5, PRP12, RPP4 and Blue could be exploited for commercial production of oak tasar silk and could be used for further breeding programmes.

It may be concluded from the present investigation that PRP5, PRP12, RPP4 and Blue are superior breeds among others and molecular analysis shows distant relationship among them. Therefore these breeds could be exploited for commercial production of oak tasar silk and could be used for further breeding programmes. It can
also be concluded from the present investigation that the parent, *A. proylei* has lower performances than that of their breeds. It is recommended that the best season for rearing of the oak tasar silkworm is the spring season.

It may be suggested from the present investigation that the characterization of the breeds with respect to the selected characters for economic importance can be made for further study of cloning to multiply the desired breeds with the identified genes; which in turn will help in the enhancement of yield/production of cocoons to increase the silk production in the state. The present investigation provides the information about the variation among the breeds, superiority and genetic relationship among the superior breeds which will help in the breeding programmes and conservation of germplasm. Further, the information will help in the commercial exploitation of the abundantly available oak flora of Manipur and other sub-Himalayan states which will enhance the economy of the poor hill tribes as well as the economically backward communities residing in the foot hills of the state.