

## **Native Germplasm Conservation – A Molecular Approach**

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India is blessed with the richest domestic animal diversity in the world. Variations in agro climatic conditions coupled with socio-economic factors of different regions resulted in the development of various genetic groups and breeds of domestic animals. Our state Kerala sustains rich livestock diversity. Among this cattle, goats, buffaloes etc. assume importance for resistance to many tropical diseases and also abiotic stress like water and fodder scarcity. But the attempts taken to study, multiply and restore these genetic resources are inadequate.

The legendry smallest cattle breed of the world, Vechur originated in the Vechur Village of Kottayam district are well known for its specific characters. The high range dwarf cattle seen in high range areas of Idukki district and reared under zero input system are used as meat animals. The Kasarkode cattle are seen in the northern parts of Kasarkode district. The manure from these animals form the main source of organic fertilizer for areca plantations in these areas. The Vadakkara animals are the native of Calicut district and are maintained as house cows.

In the era of globulisation, domestic animal diversity is recognized as one of the most important wealth of a country. The characterization and documentation of domestic animals resources have great importance. Earlier the characterization was based on phenotypes

characters, blood typing, karyotyping, immunological assay etc. which are time consuming, laborious and their power to detect genetic variations is very low.

The Vechur Cattle have been characterized biochemically. The polymorphism of blood protein, growth hormone and milk proteins such as casein and L-lactalbumin were studied. Milk characteristics with regard to fat, total solid and SNF were investigated in detail. From the studies conducted, it is proved that Vechur Cattle of Kerala have unique characteristics of its own with separate identity from other breeds of cattle. Vechur cattle stood apart in having difference with regard to its milk protein variance, composition of milk, size of fat globules and level of saturated fatty acids when compared to other cattle breeds.

The recent advance in molecular genetics enabled the analysis at DNA level providing a tool for interpretation of genetic variations that can be measured effectively within and between genetic groups. This is achieved by detecting DNA polymorphisms using suitable molecular markers.

Recent advances made by quantitative geneticist suggest that genetic gain can be achieved using genetic markers that are closely linked to genes that attribute to traits of economic importance. This is commonly practiced in MAS. One of such markers recently used is microsatellite markers. The economic traits of Vechur Cattle can be improved by selecting genetically superior animals for breeding purpose. A study was conducted to study the association of these marker alleles with milk composition and production traits in Vechur cattle.



Cushwa and Medrano (1996) established the use of various molecular genetic technologies and revolutionized the genetic analysis of livestock species. An attempt was made to characterize the dwarf cattle of Kerala using the molecular technique RAPD and to find out the genetic relationship among these groups. The study revealed that Vechur and Vatakara cattle are more similar than Kasarkode and high range dwarf or the genetic distances were more in Kasarkode and high range dwarf. But all the dwarf cattle of Kerala shared a common gene pool.

An analysis of polymorphism of the gene controlling the protein prolactin which has an association with milk and gland development was done in vechur cow using PCR – RFLP. The allelic and genotypic frequency analysis revealed that the vechur cattle exhibited high frequency of A allele which has a correlation with milk production traits.

A study to analyse the beta lacto globulin loci was done in Vechur cows. This whey protein was identified as an important genetic marker for selection and genetic improvement in dairy cattle. The study revealed two alleles A & B and its genotypes AA, AB & BB with a high frequency of B allele and BB genotype in Vechur proving the ability of this genetic group to produce high milk fat and thereby superior cheese producing ability as established in previous studies.

Rapid advances in molecular biology have had profound value in ramification for other branches of biology especially revolutionary biology. Now the primary challenge of the population geneticist is to integrate information derived from a suite of molecular markers with an

understanding of evolutionary history of the species as well as the physical and biotic forces affecting its demography. A proper understanding of the genetic make up can guide in explaining the uniqueness of each group, interrelationship between different groups and future advancements possible. The analysis of different genetic loci and its proper evaluation can help to assess its genetic architecture properly.

The developments in molecular technology have enabled the analysis and interpretation of many genetic loci, which is of great importance in characterizing different genotypes. In a study undertaken on the growth hormone, the analysis of MspI site in GH + gene using RFLP technique revealed interesting results.

The genetic analysis revealed that the allele MspI(-) is more frequent in Vechur and Kasarkode Cattle. Similar results were reported in other Indian breeds also. The association of the various genotypes with birth weight and body measurements were also worked out. This shows the preferential advantage of this genotype in future selection programmes.

In a recent study to throw more light on the properties of Vechur milk, cloning and characterisation of gene encoding the milk protein alpha-lactalbumin was undertaken. The lactalbumin is a mammary gland specific protein found in high concentration in milk of many species and has a role in regulating lactose synthesis. The sequence was found to be having 99% homology with that of Bos Taurus, 98.7% with that of Yak and 95% with sheep lactalbumin. The lactalbumin gene of Vechur showed identical structural organization with that of human, reflecting high degree



of aminoacid sequence identity. These type of analysis will help in assessing the true value of genes and genotype.

### **Malabari Goat**

Goats play a major role in modern agriculture. They are the major source of much needed protein through meat and milk. India is a rich repository of goat germplasm being home to 20 recognised breeds with a total population of 120.0 million (Livestock Census 2003). In Kerala goat rearing is an important AH practice among rural farmers. Since the average land holding is only 0.13 h, most of the farmers rear only 2-3 goats and it is mainly considered as source of supplementary income. Goat production in Kerala is centered mainly on a native breed Malabari or Tellichery a dual purpose goat breed of Northern Kerala which is evolved through centuries of natural selection. Majority of these animals are white or a combination of white with other colours and is highly prolific. The goat population in Kerala has been showing a decline trend after 1996 and at present the population in Kerala is 12.13 lakhs (Livestock Census 2003).

The main physical characteristics of this breed has been well studied and documented. These are medium sized with convex fore head. The ears are long and drooping on both sides. The adult female weigh about 20 - 25 kg. and male 30 – 35 Kg. The milk production is only ½ - 1 kg per day but animals yielding 1 – 1½ kg is not rare. Normally the kidding rate is thrice in a period of 2 years and produce 65% twins or triplets. The age at first kidding is 8 m and interkidding period is 14 m.

In the world goat production scenario the potential of Indian goat breeds has been recognised and for which GOI has sanctioned conservation and improvement programmes. Malabari is the only breed selected from the peninsular region for the said programme. This shows the importance of this highly prolific dual purpose breed. At present a project AICRP on Improvement of Malabari goat is in progress at CASAGB. The main objectives of this project is to characterize and evaluate this breed with an aim to improve the overall performance. The scheme promises to supply superior Malabari goat germ plasm to interested goat farmers of Kerala. The 1st step in the conservation and exploitation of domestic animal diversity is a comprehensive knowledge of the existing genetic variability and partitioning this variability among groups. Hence conservation of genetic variability is of prime importance

In Kerala there exist different population of Malabari goats in different parts of the state. Thus the 1st step is to analyse the genetic diversity existing among different goat populations of Kerala and for which polymorphism studies of blood proteins, milk proteins etc. were attempted but this protein polymorphism markers failed to give a conclusive picture of genetic relationship. Hence attempts were made to study the different populations at molecular level using DNA analysis and microsatellite markers.

The 3 populations of Malabari goats in Kerala Viz. Thalassery, Badagara and Tanur were subjected to molecular analysis. The study suggested a closer relationship between Thalassery and Badagara but Tanur population was found to be widely separated from either population in



molecular make up. Though Tanur population was different from other two, the high prolificacy exhibited by Tanur goats was a desirable character which needs to be explored further with a view of conservation and development for the benefit of average Indian farmer.

Another study on growth hormone gene was conducted and its selection advantage was analyzed. The growth hormone gene due to its impact on lactation and growth process is a perfect choice as marker associated with somatotrophic axis. The investigation concentrated to study the growth and survivability of GH MspI genotype in Malabari goats in different centers. The study confirms a strong heterozygote advantage for the GH/MspI  $\pm/ -$  genotype and also the absence of GH/ MspI  $-/-$  genotype in Malabari goats. Thus the inference implicit that there exist a strong selective force to maintain a heterozygous advantage for GH/MSPI genotype in Malabari goat population.

Breeds are formed as a result of centuries of natural & artificial selection. Breed often possess gene combinations for special adaptation to disease resistance and harsh environmental conditions and managerial practices. Existence of large gene pool and an analysis of genetic diversity is of much importance in conservation and improvement of breeds. The study using physical characteristics revealed that goat populations are not distinct or rather more uniform in Kerala. However biochemical and molecular analysis revealed variations between different groups (or populations) with no correlation with geographical distance. Thus a selection within each populations for traits of economic importance like

body weight, milk production etc. is the best method to improve the performance of goats in Kerala.

### Attappady Black

Attappady Black goats are found exclusively in Attappady area, an isolated hilly region in Palghat District of Kerala and are popular as the goats of the tribes in Attappady. These goats have unique characteristics and reared entirely on grazing for meat purpose. The total population of Attappady Black in its breeding tract was estimated to be 9350, which is only 40% of the total goat population.

These animals are black in colour with bronze coloured eyes. Ears are medium in length (13.5cm) drooping over the lateral side of the neck. Horns are curved laterally upward and backward and present in both sexes. The tail is normally bunchy type and curved. The average body length, height at withers, height at rump, chest girth and paunch girth in the adult stage were found to be  $67 \pm 0.8$ ,  $80 \pm 0.8$ ,  $76 \pm 0.8$ ,  $71 \pm 1.3$ ,  $75 \pm 1.3$  cm in males and  $63 \pm 0.4$ ,  $69 \pm 0.4$ ,  $71 \pm 0.3$ ,  $69 \pm 0.4$ ,  $75 \pm 0.3$  cm in females respectively. Adult male and female weigh about  $35 \pm 1.1$  and  $31 \pm 0.4$  kg. respectively. These animals have all potential to be developed into an excellent meat breed.

Due to indiscriminate breeding, the purity of this group is getting diluted. Therefore there is an urgent need for the conservation and genetic improvement of this unique goat genetic resource of India.



Awareness of the value of genetic resources is an essential component in exploiting genetic diversity. Several markers can be used to determine the overall evolutionary divergence and also the similarities and differences between different genetic groups in an area. Micro satellite markers are proved to be the most desirable to establish genetic divergence between genotypes and thereby characterize the germplasm at molecular level.

An attempt was made for characterization and genetic distancing in different goat breeds. The dendrogram constructed based on genetic distances revealed that Attappady goats were distant from Malabari and other non-descript goats of Kerala. This information would prove to be useful for planning further breeding programme and formulating effective conservation strategies for genetic diversity.

In general, we have inherited a wide variety of genetically diverge livestock from our ancestors. This exceptionally rich and diverge genetic estate place a special responsibility on every one of us for their protection ,sustainability and up gradation . The spectacular advances in molecular DNA technology have provided unique tool for assessing the real value of a genotype and help in its conservation and up gradation. Thus let us make use of all these tools and keep our diversity forever.