BLOOD PROTEIN POLYMERPHISM IN MALABARI GOATS

Goat production in Kerala is centered mainly on its native breed “Malabari”, a dual-purpose goat of North Kerala. The animals have predominant breed characteristics of white and a combination of white with black and brown. They are mostly long eared and horned with convex forehead and have rounded udders with funnel shaped pointed teats. There exist significant difference between populations of this breed with regard to traits of economic importance and hence the data obtained from any particular population cannot be extrapolated to the breed as a whole.

One way to study this genetic diversity is by the determination of genetic variability through polymorphism studies. Polymorphism in a population assures a pool of genetic variability, for if none exists, there would be no progress made through selection and breeding. This accentuates the need to study polymorphism between breeds as well as within breeds. Polymorphism studies can be undertaken at various levels, viz., expressed protein studies to the genic level studies.

The protein variants have their use in the study of origin and evolution of breeds of livestock. These markers have proved to be useful for parentage determination and population analysis (Groselande et al., 1990).

Blood samples of 300 Malabari goats belonging to three different goat populations, 100 each at Tanur, Thalassery and Badagara, formed the materials for the present study.

Sodium Dodecyl Sulphate Polyacrylamide gel electrophoresis (SDS-PAGE) was used for visualising albumin and transferrin bands. Eight percent of the resolving gel and five percent of the stacking gel were used for the preparation of the SDS polyacrylamide gel. Tris-glycine electrophoresis buffer was used in the top and bottom reservoirs. Fifteen microlitres each of the serum samples were loaded in the wells and electrophoresed at 85 V for four hours. The gel was stained with Coomassie Brilliant Blue for 30 min and was destained overnight in destaining solution.

Native PAGE was employed for typing ceruloplasmin, amylase and carbonic anhydrase. Tris borate EDTA buffer was used in the top and bottom reservoirs. Fifteen microlitres of the serum was loaded in the wells and electrophoresed at 85 V for three hours. The allelic frequencies were estimated by the method of Nguyen et al. (1992).

On electrophoresis, transferrin variants showed distinct movement towards anodic end of the electrophoretogram revealing two electrophoretically distinct transferrin types. The fast moving one was designated as TfA and slow moving band was designated as TfB in accordance with the nomenclature of Trehan et al. (1981). Phenotypes TfAA and TfBB were represented by two bands each on the polyacrylamide gel, while phenotypes AB were represented by three bands. Faster band of TfBB corresponded with slower band of TfAA.

Individual animals were found to possess either one or both the transferrin types. Transferrin AB phenotype could be observed in Tanur and Badagara populations, unlike in Thalassery population, where all the animals typed were of TfAA type. No TfBB phenotype could be detected in the present study. Out of the 100 animals studied in the Tanur area, 99 animals were of TfAA type and only one was of TfAB. In Thalassery all the 100 animals belonged to TfAA type. In Badagara, of the 100 animals studied, 95 were of TfAA while five belonged to TfAB type.

The gene frequency of TfA was high in Tanur and Badagara populations (0.995 and 0.974, respectively) while that of TfB was 0.005 and 0.026, respectively. In pooled population, gene frequency of TfA and TfB were 0.990 and 0.010 respectively. In the total population studied, a predominance of the TfA variant could be detected. The above finding is in
agreement with the observations of Fesus et al. (1983) who reported that majority of the goat breeds in the world have gene frequency of TfA more than that of TfB. Similar results in exotic breeds were given by Menrad et al. (1994) in Boer and improved Fawn goats and Canatan and Boztepe (2000) and Elmaci (2003) in hair goats of Turkey.

In contradiction to the present findings with regard to the gene frequency, predominance of TfA allele has been reported by Baruah and Bhat (1980) in Jamunapari and Barbari goats. As against the finding of only two alleles with regard to transferrin locus as evinced by the present study, many authors have reported the presence of more than two variants for transferrin alleles in goats, viz. Bhat (1987) in Pashmina goats, Kumar and Yadav (1988) in Jhakrana, Kutchi, Marwari and Sirohi goats and Pepin and Nguyen (1994) in West African goats.

In the present study, the transferrin locus was in Hardy-Weinberg equilibrium which is in agreement with Trehan et al. (1981), in Alpine, Sannen, Nubian, Alpine x Beetal and Sannen x Beetal cross breds.

Two bands each were observed for albumin in all the animals studied, a fast moving band designated as AlF and a slow moving band AlS, revealing absence of polymorphism at albumin locus. The study agrees with the findings of Shamsuddin et al. (1986) in Malabari goats. Two albumin variants in goats have already been reported by Tunon et al. (1989) in Spanish goat breeds, Vankan and Bell (1992) in Cashmere goats and Ertugrui and Akyuz (2000) in Angora goats, but with higher degree of polymorphism at the locus.

Single band could be observed for ceruloplasmin, amylase and carbonic anhydrase in all the animals studied, indicating absence of polymorphism at the three loci studied.

With regard to ceruloplasmin locus, similar findings were reported by Bhat (1986) in Jamunapari and Sirohi breeds, Bhat (1987) in Changthangi and Chegu breeds and Tunon et al. (1989) in Spanish goat breeds.

In contrast to the above findings polymorphism at ceruloplasmin locus were reported by Elmaci (2003) in hair goats of Turkey. But the frequency of the variant allele was very low (0.027).

The finding with regard to carbonic anhydrase polymorphism is in agreement with the observations of Casati et al. (1990) in Sarda breeds and Pepin and Nguyen (1994) in five breeds of goats viz. French Alpine, French Saanenn, Guadeloupean Cresole, Guinean and West African Sahel.

Single band indicating absence of polymorphism at amylase locus was observed in Jamunapari and Sirohi goats (Bhat, 1986) and in Turkish hair goats (Elmaci, 2003). Two variants for amylase locus were observed by the above workers; the frequency of the variant allele was very low.

Summary

Malabari goat populations of Tanur, Thalassery and Badagara were studied for blood protein polymorphisms to investigate the similarities and differences between these populations. Two variants for transferrin (TfA and TfB) were detected with a predominance of TfA in the population. All the goats from Thalassery population belonged to TfAA type. In the present study only two phenotypes as regards transferrin locus could be observed, (TfAA and TfAB) with the notable absence of TfBB. No polymorphism was observed for albumin, ceruloplasmin, amylase and carbonic anhydrase loci in all the animals tested.

References


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