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Genetic Polymorphism of Some Blood Proteins in Saanen Goats

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Abstract

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Genetic variations of 4 protein loci (transferrin, haemoglobin, amylase and ceruloplasmin) in 70 Saanen goats from Balikesir province of Turkey were investigated by means of horizontal starch gel electrophoresis. Two loci, transferrin (Tf) and haemoglobin (Hb) were found to be polymorphic. Other loci amylase (Amy) and ceruloplasmin (Cp) did not show polymorphism. In all polymorphic loci, the observed genotype frequencies were not significantly different from those expected from Hardy-Weinberg equilibrium.

Key words: Transferrin, haemoglobin, ceruloplasmin, amylase, polymorphism, Saanen goats

Introduction

Although the biochemical polymorphism of blood proteins in farm animals has been investigated by many researchers, data on goats is relatively less. Among goat breeds, relatively few data on biochemical polymorphism have been reported in Saanen goats (Braend and Tucker, 1988; Wang *et al.*, 1990), which have been imported to increase the amount and to improve quality of goat products in Turkey. Therefore, the blood protein types of the animals which were

imported to Turkey is unknown. The present paper reports genetic polymorphism of blood protein loci (Tf, Hb, Amy and Cp) in Saanen goats raised in Balikesir province of Turkey.

Materials and Methods

Heparinized blood was obtained by jugular venipuncture from 70 Saanen goats maintained in Balikesir province of Turkey. The blood was separated into plasma and red cells by centrifugation. Red cells were washed three times in saline solution and lysed with distilled water. Both plasma and red cell haemolysates were stored at -20C prior to the electrophoretic analysis. Separation of blood proteins were carried out

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by horizontal starch gel electrophoresis using previously described methods, hemoglobin (Gahne *et al.*, 1960); transferrin (Kristjansson, 1963); ceruloplasmin and amylase (Annunziata and Iorio, 1990). Allelic frequencies were calculated by direct counting methods (Nei, 1987). The χ^2 (Chi-square) tests were used to check whether the populations were in Hardy-Weinberg equilibrium.

Results and Discussion

Of the four genetic loci studied, two (Tf and Hb) turned out to be polymorphic in the population. Each of these polymorphic loci gave two alleles (Table 1).

Transferrin (Tf)

After electrophoretic separation of serum proteins, three phenotypes (TfAA, TfAB and TfBB) were observed. The TfAA genotypes were predominant in the population (56/70) and TfBB genotyped occurred in only one individual, remaining 13 being TfAB. Frequencies of Tf^A and Tf^B alleles were 0.89 and 0.11, respectively. There were no differences between expected and observed numbers of the transferrin phenotypes in the present study. Great differences exist

between the goat breeds studied, but up to now Tf^A allele has been reported as the most frequent in different breeds (Elmaci and Asal, 2000; Elmaci, 2003; Nyamsamba *et al.*, 2003; Balcioglu *et al.*, 2005).

In goats, four co-dominant transferrin allele Tf^A, Tf^B, Tf^C and Tf^D have been described (Elmaci and Asal, 2000; Menrad *et al.*, 2002). Tf^C and Tf^D allele have been discovered in some different goat breeds with an extremely low frequency (Elmaci and Asal, 2000; Menrad *et al.*, 2002). One of the reasons for failure to observe Tf^C and Tf^D may be that the sample size was small.

Haemoglobin (Hb)

In goats two haemoglobin variants namely Hb^A and Hb^B have been described of which Hb^A was the most common. Most of the world's goat breeds are either fixed for the Hb^A allele (Elmaci and Asal, 2000; Menrad *et al.*, 2002) or with Hb^A frequencies being considerably higher than those of Hb^B (Menrad *et al.*, 2002; Elmaci, 2003). In the present study, two genotypes and two genetic variants of haemoglobin were found and the frequencies of Hb^A and Hb^B were detected as 0.98 and 0.02, respectively. At the Hb locus, the most common genotype was HbAA (67/

Table 1

Phenotype distributions and mean gene frequencies among Saanen goat population and results of the test for tetogeneity of deviations from HWE

| Locus | Observed | Expected | Test of HWE | Gene frequency |
|--------------------|----------|----------|-----------------|-----------------------|
| Transferrin | | | | |
| AA | 56 | 55.447 | $\chi^2=0.0694$ | Tf ^A =0.89 |
| AB | 13 | 13.706 | NS | Tf ^B =0.11 |
| BB | 1 | 0.847 | | |
| Haemoglobin | | | | |
| AA | 67 | 67.228 | $\chi^2=0.0526$ | Hb ^A =0.98 |
| AB | 3 | 2.744 | NS | Hb ^B =0.02 |
| BB | | 0.028 | | |
| Amylase | | | No polymorphism | |
| Ceruloplasmin | | | No polymorphism | |

HWE: Hardy-Weinberg equilibrium, NS: Non significant.

70). The Hb^B allele was found exclusively in heterozygous HbAB genotype and there were no HbBB animals. According to allelic frequencies calculated in the present study, the Hb^A was almost close to fixation limits. The extremely low frequency of the Hb^B allele in Saanen goat means that it may be a stage in transient polymorphism in which the common allele is being replaced by this allele. Also, the small sample size in this study may be a factor that might have caused frequency drift, which could then have resulted in greater differences in frequency of occurrence. The observed genotype frequencies were not significantly different from Hardy-Weinberg equilibrium.

Amylase (Amy)

Most breeds studied did not exhibit polymorphism at this locus. In goats two co-dominant amylase alleles (Amy^A and Amy^B) have been described so far (Nyamsamba *et al.*, 2003; Elmaci and Asal, 2000; Elmaci, 2003). But Mendrat *et al.* (2002) found a new phenotype with the allele Amy^A and Amy^C in two animals. The most common amylase variant is Amy^A, presents in all studied goat breeds with high frequencies. Our results confirmed earlier studies that the Saanen population studied was found to be monomorphic because of all individuals had same amylase genotype.

Cerruloplasmin (Cp)

Studies of goat cerruloplasmin have been very limited. The two co-dominant alleles, namely Cp^A and Cp^B were described, the slower one with very low frequencies. Majority of earlier studies detected no polymorphism, although in Turkish Hair Goat and Czechoslovakia native goat population frequencies the Cp^A was calculated to be 0.719 and 0.970, respectively (Trakovicka, 1991., Elmaci, 2003). Like previous studies polymorphism of cerruloplasmin has not been demonstrated in the present study in Saanen population.

In earlier investigation on same

population, α_s-Cn, β-Cn, κ-Cn and α-La loci were found to be monomorphic and only one individual was heterozygous for β-Lg locus (Turkyilmaz, 2002). The results of the present study and previously obtained by Turkyilmaz (2002) for same population showed that genetic variability of Saanen goats investigated is very low. One of the reasons for failure to observe genetic variation at the studied loci may be that sample size was too small. Also, historically, because of limited traffic, the population may occur with the composition of inbred individuals. Therefore, it is reasonable that genetic variation in this population was very low.

References

- Annunziata, M. and Iorio, M. 1990. Polymorphism of transferrin, amylase and ferritin detected by an improved starch gel electrophoresis method in Italian water buffaloes reared in Southern Italy. *J. Genet. and Breed.*, 44: 169-172.
- Balcioglu, M.S., Karabağ, K., Elmaci, C. and Yolcu, H.I. 2005. Transferrin polymorphism in Turkish hair goats. *Indian Vet. J.*, 82: 628-629.
- Braend, M. and Tucker, E. M. 1988. Hemoglobin types in Saanen goats and Barbary sheep: genetic and comparative aspects. *Biochem. Genet.*, 26: 511-518.
- Elmaci, C. and Asal, S. 2000. Blood biochemical polymorphism in Angora goat breed. *Egyptian J. Anim. Prod.*, 37: 31-36.
- Elmaci, C. 2003. Some genetic markers in native hair goats of Turkey. *Indian Vet. J.*, 80: 233-235.
- Gahne, B., Rendel, J. and Venge, O. 1960. Inheritance of β-globulins in serum and milk from cattle. *Nature*, 186: 907-908.
- Kristjansson, K.F. 1963. Genetic control of two pre-albumins in pigs. *Genetics.*, 48: 1059-1063.
- Menrad M., Stier, C.H., Geldermann, H. and Gall, C.F. 2002. A study on the Changthangi Pashmina and the Bakerwali goat breeds in Kashmir I. Analysis of blood protein polymorphisms and genetic variability within and between the populations. *Small Rumin. Res.*, 43: 3-14.
- Nei, M. 1987. *Molecular Evolutionary Genetics*. Columbia University Press. New York.
- Nyamsamba, D., Nomura, K., Nozawa, K., Yokohama, M., Zagdsuren, K.Yo. and Amano, T. 2003. Genetic relationship among Mongolian native goat

- populations estimated by blood protein polymorphism. *Small Rumin. Res.*, 47: 171-181.
- Trakovička, A. 1991. Polymorphism of serum ceruloplasmine and amylase in goat. 15th Genetical Days. Ceske Budejovice, Czechoslovakia.
- Turkylmaz, T. 2002. The milk protein polymorphism in Saanen goats with high milk yielding. Ph.D. Thesis, Uludag University, Institute of Health Sciences, Bursa, Turkey.
- Wang, S., Foote, W.C. and Bunch, T.D. 1990. Transferrin and haemoglobin polymorphism in domesticated goats in the USA. *Anim. Genet.*, 21: 91-94.
- सेनिज एल्मासी, यासेमिन ओनर, ओज्हान तुर्कीलमाज, मेल्लेम सेतिना। सानन बकरियों में रुधिर प्रोटीनों की आनुवंशिक बहुरूपता। तुर्की के बालिकेसिर प्रांत की 70 सानन बकरियों के 4 स्थानिकों (ट्रान्सफेरिन, हीमोग्लोबिन, एमाइलेज और सेरुलोप्लाज्मिन) की आनुवंशिक विविधताओं की समतल स्टार्च जेल वैद्युत कण संचलन द्वारा खोज की गयी। दो स्थानिक ट्रान्सफेरिन और हीमोग्लोबिन में बहुरूपता पायी गयी। अन्य दो (एमाइलेज और सेरुलोप्लाज्मिन) स्थानिकों में बहुरूपता नहीं पायी गयी। सभी बहुरूपी स्थानिकों में हार्डे-वेनबर्ग साम्य से प्रेक्षित जीन प्ररूपी बारंबारता में सार्थक अंतर नहीं था।