

## **BLOOD BIOCHEMICAL POLYMORPHISM IN ANGORA GOAT BREED**

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### **SUMMARY**

*Biochemical polymorphism for 5 genetic markers (Tf, Am, Hb, Cp and Es-A) in the blood of 231 Angora goats were analysed with starch-gel electrophoresis. Of the five genetic system studied three were monomorphic (Hb, Cp and Es-A) and two polymorphic (Tf and Am). Gene frequencies of the two polymorphic genetic markers were calculated.*

**Keywords:** *Angora goat, biochemical polymorphism, transferrin, haemoglobin, amylase, ceruloplasmin, aryl esterase.*

### **INTRODUCTION**

A number of genetic markers such as blood protein system have been found to exhibit heterogeneity in different species. The polymorphic blood genetic markers supply some useful information in studies of animal breeding, like relationship, structure of breeds and their evolution. Information about the genetic variation of blood proteins have also been used as indirect selection if there were some relationships between blood proteins and some economically important quantitative traits.

Biochemical polymorphism of the blood proteins have been studied in numerous different goat breeds population (Watanabe and Suzuki, 1966; Braide and Enyenihi, 1969; Fechter and Pretorius, 1970; Watanabe and Suzuki, 1973; Watanabe *et al.*, 1979; Fesüs *et al.*, 1983; Barbancho *et al.*, 1984; Ugrar *et al.*, 1986; Bhat, 1986;1987; Tunon *et al.*, 1987 &1989; Panda and Patro, 1987; Shamsuddin *et al.*, 1988 and Wang *et al.*, 1990), but such studies on Angora goats have been very limited.

The aim of this paper was to describe the electrophoretic variation of five genetic markers (Tf, Am, Hb, Cp and Es-A) in the blood of Angora goats from Turkey. Biochemical polymorphisms have been studied to characterize this breed.

### **MATERIAL AND METHODS**

Data from a total of 231, one to seven years old, Angora Goats from Yerkey Animal Research Institute (Yozgat) were analysed. Blood samples were collected from vena jugularis into test tubes containing sodium heparin solution. 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  $-20^{\circ}\text{C}$  until the electrophoretic studies were carried out. Whatman No 3) filter papers were used for inserts which were placed 3-3.5 cm from cathode. Of the five blood proteins analysed separation of four blood proteins were carried out by horizontal starch-gel electrophoresis by methods utilised for Transferrins (Kristjansson, 1963), Haemoglobins (Meyer, 1963), Amylase (Trowbridge and Hines, 1979) Ceruloplasmin (Kristjansson, 1963). The tube test developed by Tucker *et al.* (1967), was used for Aryl esterase (Es-A) activity in the plasma

## RESULTS AND DISCUSSION

### *Transferrin (Tf)*

Four transferrin phenotypes TfAA, TfAB, TfBB and TfAC were observed (Table 1) in this study. Yaman (1980) and Erkoç *et al.* (1987) reported the same alleles in Angora goat in Turkey. But Uğrar *et al.* (1986) reported only TfA and TfB alleles in Angora goat from Turkey. The results of the present study showed that the frequency of TfA allele was higher than the other alleles.

**Table 1. Frequency of alleles at transferrin (Tf) locus in Angora goat breed in Turkey**

Phenotype	Gene frequency						
	TfAA	TfAB	TfAC	TfBB	TfA	TfB	TfC
N	145	78	2	6	0.801	0.195	0.004
231							

In different goat breeds studied for four alleles of transferrin only three TfA, TfB and TfC were found by several authors (Watanabe and Suzuki, 1973; Garzon *et al.*, 1976; Barbancho *et al.*, 1984; Garzon *et al.*, 1985; Bhat, 1986; 1987; Shamsuddin *et al.*, 1988 and Selvaraj *et al.*, 1991). TfD allele has only been discovered in South African Angora goats and some Indonesia and Malaysia Native Goats (Osterhoff *et al.*, 1972 and Selvaraj, 1991).

### *Amylase (Am)*

Amylase polymorphism was first described in Angora goats by Fechter and Pretorius (1970) and Osterhoff and Ward-Cox (1972). Fesüs *et al.* (1983), Bhat (1986), Tunon *et al.* (1987 & 1989) and Trakovicka (1991) described Amylase alleles variants in some native goat breeds also. However, polymorphism at this locus is not described in many goat breeds (Bhat, 1987; Tunon *et al.*, 1987 & 1989).

Three Amylase phenotypes, AmAA, AmAB and AmBB, were found (Table 2) in Angora goat population in the present study. The phenotype AmB (which has more cathodic mobility on gel) was detected in only one animal.

### *Haemoglobin (Hb)*

Haemoglobin is one of the most thoroughly investigated protein molecules. Haemoglobin polymorphism has been found in most breeds of goats (Garzon *et al.*, 1976; Yaman, 1976, Tucker *et al.*, 1983; Barbancho *et al.*, 1984; Erkoç *et al.*, 1987;

Tunon *et al.*, 1987 & 1989). In goats, two haemoglobin variants, namely HbA and HbB, were described of which HbA was most common. In Angora goat, two Hb variants (HbA and HbB) were detected in previous studies (Osterhoff and Ward-Cox, 1972; Osterhoff *et al.*, 1972; Yaman, 1976 and Erkoç, 1987).

Polymorphism has not been demonstrated in the present study. All individuals had the same haemoglobin type, it was not possible to identify this type on reference to standard. Since Khanolkar *et al.* (1963), Watanabe *et al.* (1979) and Tucker and Clarke (1980) showed that HbA of goat and HbB of sheep had the same electrophoretic mobility. The HbB of sheep was used as reference sample and haemoglobin band observed in our Angora goats was identified as HbA type.

**Table 2. Frequency of alleles at amylase (Am) locus in Angora goat breed in Turkey**

Phenotypes	Gene frequencies				
	AmAA	AmAB	AmBB	AmA	AmB
N					
231	198	32	1	0.93	0.07

#### *Ceruloplasmin (Cp) and Aryl esterase (Es-A)*

Like previous studies in different goat breeds (Fesüs *et al.*, 1983; Bhat, 1986 & 1987 and Tunon *et al.*, 1989) polymorphism of ceruloplasmin has not been demonstrated in the studied Angora goat population, all individuals had the same type. Trakovicka (1991) detected CpA and CpB variants in native goats of Czechoslovakia.

All goat samples were negative when tested in the tube test (Tucker *et al.*, 1967) for the presence of aryl esterase (Es-A) activity in agreement with Fesüs *et al.* (1983).

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الاستدلال علي ظاهرة تعدد المظاهر الوراثية عن طريق التغيرات الكيميائية الحيوية في دم ماعز الأنجورا

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تمت دراسة خمس من الواسمات الوراثية (Tf, Am, Hb, Cp, Es-A) في عينات دم لعدد ٢٣١ من ماعز الأنجورا ، باستخدام طريقة الهجرة الكهربائية ، للاستدلال علي ظاهرة تعدد المظاهر الوراثية . ومن النتائج أتضح أن هناك ثلاثة من الواسمات أحادية الصورة (Hb, Cp, and Es-A) و اثنان متعددي الصور (Tf and, Hb) . تم حساب التكرار الجيني للواسمين الوراثيين نوى التأثير متعدد الصور.