Trakia Journal of Sciences, Vol. 2, No. 2, pp 38-40, 2004

Available online at:
http://www.uni-sz.bg

ISSN 1312-1723

Original Contribution

GENETIC STRUCTURE OF ILE DE FRANCE SHEEP BREED IN BULGARIA ACCORDING TO THE TRANSFERRIN AND HEMOGLOBIN POLYMORPHOUS GENETIC SYSTEMS

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ABSTRACT

The study included 264 Ile de France sheep reared in the Research Institute of Cattle and Sheep Breeding in Stara Zagora. The blood samples taken from Vena Jugularis were examined using starch-gel electrophoresis. Genotypes (%) that were observed and expected, as well as the criteria of correspondence (χ^2) and genetic frequency of the alleles corresponding to the transferrin and hemoglobin genotypes were explored. We observed 5 transferrin alleles - TF^A, TF^B, TF^C,TF^D and TF^E - controlling 11 genotypes. The lack of genetic equilibrium in the flock was due to the big disparity among the number of observed and expected genotypes. Two hemoglobin alleles - HB^A end HB^B - controlling three genotypes were determined. The lack of considerable difference between the number of observed and expected hemoglobin genotypes indicated the genetic equilibrium of the population. The big difference between the frequencies of the two alleles can be used as a source of genetic diversity.

Key words: Ile de France, Transferrin, Hemoglobin, Polymorphism, Genetic Structure

INTRODUCTION

The genetically determined polymorphous systems in sheep blood and the opportunities for using them as genetic markers make it possible to conduct studies related to the breed structure, as well as the changes that had occurred in them in the processes of introduction and selection. A number of scientists have conducted research in that area (1-7).

The Ile de France breed is so far the only specialized sheep breed that has been successfully introduced and well adapted to the conditions in Bulgaria. Though reared in small flock the population is kept pure on the basis of pure breeding, regular import of dams and sires, as well as frozen semen.

The objective of the research was to study the current genetic structure of the sheep population of the Ile de France breed in Bulgaria according to the transferrin and hemoglobin polymorphous genetic systems.

MATERIAL AND METHODS

The research was conducted in 2001 with 264 sheep from the Ile de France breed reared in the Scientific Research Institute in Cattle and Sheep Breeding in Stara Zagora. Blood samples were taken from their jugular veins and subjected to the starch gel electrophoresis according to Tjankov (2). Following this the following parameters were obtained: the genotype categories, the conformity criterion (χ^2), the observed and expected phenotypes and the gene frequency of the alleles that corresponded to the transferrin and the hemoglobin genotypes.

RESULTS AND DISCUSSION

According to the transferrin polymorphous genetic system we found 5 alleles that produced a total of 11 genotypes. Four (4) of these were homozygous and the remaining 7 heterozygous (**Table 1**). The TfDD genotype constituted the highest proportion, 12.5% of the total 264, among the homozygous genotypes. This statistic translated to a proportion of 26.99% homozygous animals. And this was within the limits for the sheep breeds in Bulgaria. On the other hand, the TfCD genotype constituted the highest

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proportion of 22.35% among the seven heterozygous forms. From results obtained so far, using the observed and expected values, the conformity criterion (χ^2), it can be stated that the transferrin system has shown an absence of genetic equilibrium among the herd ((χ^2 = 33,99).

Using the hemoglobin system two alleles, that produced three genotypes (**Table 2**), were established The most frequent were the homozygous HbBB genotype animals that constituted 52,27% by proportion. There was no considerable difference between the number of the observed and expected hemoglobin genotypes, showing that the population was in genetic equilibrium according to the hemoglobin system.

Table 1. Observed and Expected transferrin genotypes

Genotypes	Observed	%	Expected
Tf AA	26	9,85	27,05
BB	5	1,89	1,67
CC	7	2,65	14,33
DD	33	12,50	35,27
AB	15	5,68	13,44
AC	47	17,80	39,37
AD	55	20,83	61,77
BC	3	1,14	9,78
BD	13	4,92	15,35
BE	1	0,38	0,08
CD	59	22,35	44,96
Total	264	100	

The allocation by genotypes and by categories of animals for the two studied genetic systems is shown on **Table 3**. According to the transferrin system there were considerable differences in the number of genotypes only between the rams and the other categories.

Table 2. Observed and Expected hemoglobin genotypes

Genotypes	Observed	%	Expected
Tf AA	26	9,85	21,88
BB	138	52,27	133,88
AB	100	37,88	108,24
Total	264	100	

According to the hemoglobin system there were no differences in the number of recorded genotypes and degrees of freedom. However, we found high χ^2 values in the ewes – 21,02 and in the ewe lambs – 13,65. It is noteworthy that in the dam group as a whole the value of χ^2 was low – 1,07. This could be accounted for by the reallocation of the animals by genotypes in the two categories and this caused the slight difference between the observed and the expected genotypes and low χ^2 for the breed as a whole. The latter gave us good reason to suggest that the population as a whole was in equilibrium according to the hemoglobin genetic system, although there were some sources of genetic diversity in it.

Of all five transferrin alleles Tf^D allele was the most frequent with 0.365 in proportion. The Tf^E allele was the least frequent with 0,002 in proportion (**Table 4**). According to the hemoglobin system the frequency of the Hb^B allele was greater with 0,712 in proportion.

Table 3. Genotypes and χ^2 according to categories

Categories	Transferrines				Hemoglobins			
	n	geno-types	level of freedom	χ^2	n	geno-types	level of freedom	χ^2
Rams	14	7	3	6,38	14	3	1	1,02
Ewes	158	10	6	13,45	158	3	1	21,02
Ewe lambs	92	10	5	23,83	92	3	1	13,65
Total females	250	11	6	32,47	250	3	1	1,07
Total of the breeds	264	11	6	33,99	264	3	1	1,53

Table 4. Gene frequency of transferrin and hemoglobin alleles according to categories

Categories	nTf	Tf^A	Tf^B	Tf^C	Tf^D	Tf^E	nHb	Hb^A	Hb^B
Rams	14	0,286	0,179	0,250	0,286	-	14	0,179	0,821
Ewes	158	0,351	0,079	0,250	0,320	-	158	0,234	0,766
Ewe lambs	92	0,272	0,065	0,201	0,457	0,005	92	0,397	0,603
Total females	250	0,322	0,074	0,232	0,370	0,002	250	0,294	0,706
Total of the breeds	264	0,320	0,080	0,233	0,366	0,002	264	0,288	0,712

CONCLUSIONS

The population was characterized by the presence of 5 transferrin alleles Tf^A, Tf^B, Tf^C, Tf^D and Tf^E, which produced 11 genotypes, 4 of which were homozygous and 7 heterozygous. Two hemoglobin alleles, Hb^A and Hb^B were found. These hemoglobin alleles produced three hemoglobin genotypes, 2 of which were homozygous.

According to the transferrin system the population was not in genetic equilibrium due to the large variation in number between the Observed and Expected genotypes and the high value of χ^2 that was 33,99.

According to the hemoglobin system there was genetic equilibrium. However, the presence of differences between the frequencies of the two alleles by categories could be a source of genetic diversity.

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