

STUDY OF THE GENETIC STRUCTURE OF THE POPULATIONS OF SHEEP AND POULTRY ON THE BASIS OF IMMUNOGENETIC MARKERS

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Abstract

In this work the results of the genofund structure and the possibility of using of immunogenetic markers, β -Lg, O_v, Cn etc in selection are given. For this reason the breed, lines, hybrids of various kinds of sheeps and poultry were studied on the basis of such exponents as frequency of alleles and genotypes, genetic similarity of population, genetic balance, the structure of polymorphic system of blood albumen and milk of sheep and polymorphic blood systems and albumen of hen eggs.

At sheeps was founded polymorphism lactoproteins αS_1Cn , βCn , kCn , βLg . In the locus αS_1Cn , there are three alleles which are most typical for the type αS_1Cn^B –0,9354. In the locus βCn there are two alleles which have been discovered in the type βCn with the frequency of 0,5988. The loci of the genes kCn and βLg are characterized by two alleles which are most often found in the type kCn 0,7581 and βLg^A 0,6776. In our research applied on sheep, the polymorphism of the αS_1Cn , βCn , kCn , βLg milk proteins have been established

At hens crosses hybrids Albo-70, Roso SL 2000 and Roso 93 in the systems of hemoglobin, transferrins and ceruloplasmins were characterized by the presence of two alleles: A and B. The frequency of occurrence of alleles is different: in the system of hemoglobin the allele Hb^A has a higher frequency –0,9000–0,9875. In the system of transferrins the allele Tf^B is found more often –0,7625–0,7879. The advantage of allele Cp^A has been proved in the locus of ceruloplasmins as well.

Thus the ascertained polymorphism of the milk proteins may be widely used as a biochemical test to evaluate the state of the breed gene pool as for predicting the productive qualities of these animals.

Key words: allele, frequency, genotype, polymorphic system, locus

INTRODUCTION

Currently the searching of different genes as markers allows to hold purposeful selection, revealing the most useful genotypes. The study of albumen's polymorphism in economically profitable loci represents the first step to the modern approach of domestic animal breeding [9]. Such an approach allows to reveal correlation of polymorphous features with productive quality of hens, deducibility of chickens, viability, etc [8].

In sheep breeding milk albumen β -LG is an object of great interest, its locus can be used as a marker for diagnosing contents fat and protein of sheep's productivity milk [4, 5]. The results of some investigations point out that sheep milk with BB genotype of β -

LG is characterized by higher per cent of protein and larger output of cheese [2, 3].

The purpose investigations – study polymorphic systems in milk of sheep's and blood of poultry and the aim of possible use the genetic marker in selection.

MATERIALS AND METHODS

The experiments on hen crosses Albo 70, Roso SI 2000, Roso 93 (n=40) which are used in Open Corporate Enterprise "Avicola-Nord". For holding the investigations samples were selected in order to study the polymorphous blood systems Hb, Tf, Cp.

On the example of populations of sheep of Karakul breed (n=31), on sheep breeding farm "Tevit" of village Maksimovka, New Annensk region, inheritably specified

albumen types α_1S_1Cn , βCn , kCn , βLg . The investigation was held on the base of Agricultural University of Moldova, Kishinev. The defining of genetic variants of albumens was carried out with the help of electrophoresis on starchy gel on the basis of O. Smith's [6] method and Zhebrovsky [7]. For defining the genetic distance between the crosses Mayal-Lingstrem formula was used.

The biometrical processing was held on the basis of commonly used methods [1].

RESULTS AND DISCUSSIONS

In hen system of hemoglobine 2 alleles Hb^A and Hb^B were found. They have higher frequency for Hb^A 0,9000-0,9875 type (table 1).

Table 1.
 The frequency of alleles of albumen's loci of hens of different crosses

System protein	Allele	Crosses		
		Albo 70-	Roso SL 2000	Roso SL 93
Hemoglobin (Hb)	A	0,9875	0,9000	0,9250
	B	0,0125	0,1000	0,0750
Transferin (Tf)	B	0,7879	0,7625	0,7625
	C	0,2125	0,2375	0,2375
Ceruloplasmin (Cp)	A	0,5250	0,5379	0,5250
	B	0,4750	0,4625	0,4750

In a transferine system we discovered 2 Tf^B и Tf^C alleles with the highest frequency of Tf^B allele. The frequency of Tf^B allele was in limits of 0,7625-0,7879, the highest – 0,7879 was observed in hen population Albo-70. In the same population Tf^C had the lowest index–0,2125. What concerns the hens of Roso SL 93 and Roso SL 2000, they had the same frequency of two alleles meaning was identical, which prove common origin.

The next analyzed polymorphous system was ceruloplasmin, in the locus of which two alleles – Cp^A and Cp^B - of approximately equal frequency, with a small advantage of Cp^A allele–0,5379 of hens Roso SL 2000 were found. The rest two populations had the same frequency of Cp^A allele – 0,5250.

The presence of two alleles lead to the formation of three genotypes: Hb^{AA} , Hb^{AB} , Hb^{BB} . Roso SL 2000 and Roso SL 93 crosses had predominantly homozygous AA genotype- 35 individuals (87,5%), but heterozygous AB genotypes in these populations had— 2 and 4 individuals accordingly. BB genotype in Roso SL 2000 population had 3 individuals (7,5%), but Roso SL 93 – 1 individual (2,5%). The hens of Albo 70 cross revealed only 2 types of AA genotypes – 39 individuals (97,5%) and AB – 1 individual (2,5%).

The results χ^2 (1,02 – 1,73) show genetic balance in investigated populations (table 2).

Table 2
 The frequency of alleles of loci of albumen system of hens of various crosses

Crosses	The frequency of χ^2			The frequency of χ^2			The frequency of χ^2					
	genotypes of Hb			genotypes of Tf			genotypes of Cp					
	Hb^{AA}	Hb^{AB}	Hb^{BB}	Tf^{CC}	Tf^{BC}	Tf^{BB}	Cp^{AA}	Cp^{AB}	Cp^{BB}			
Albo 70	39 (39,00)	1 (0,98)	– (1,00)	1,02	29 (24,83)	5 (13,38)	6 (17,00)	1,83	19 (11,01)	4 (19,99)	17 (9,02)	2,19
Roso SL 93	35 (37)	4 (5,55)	1 (6,00)	1,3	28 (23,25)	5 (14,48)	7 (19,00)	2,08	16 (11,57)	10 (19,99)	14 (9,08)	9,34
Roso SL 2000	35 (36)	2 (7,2)	3 (8,00)	1,73	28 (23,25)	5 (14,48)	7 (19,00)	2,08	19 (11,12)	13 (19,88)	12 (8,55)	1,94

*Theoretically expected number

The presence of two alleles in analyzed populations lead to differentiation of hens on the basis of the types of transferrin with three genotypes. Homozygous Tf^{CC} genotype – 28 and 29 (70% and 72,5%) individuals was the most frequent in all tested groups. 5 individuals (12,5%) in all populations possessed heterozygous genotypes.

The populations of hens of the investigated crosses on ceruloplasmine types

were differentiated on the basis of three genotypes – AA, AB and BB. The largest number were homozygous genotypes AA of Albo -70 and crosses – 19 (47,5%) individuals, homozygous genotypes BB – 17 individuals (42,5%).

Loci of blood albumens are used while studing the genetic similarities between populations. The genetic similarity between crosses is shown in table 3.

Table 3.
 Coefficients of genetic similarity between investigated crosses

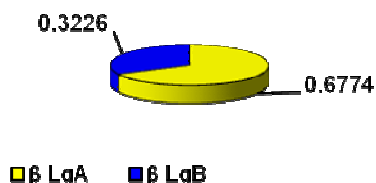
Specification	r	mr
Roso SL 2000 – Roso SL 93	0,9601	0,0010
Roso SL 2000 – Albo 70	0,9366	0,0016
Roso SL 93 – Albo 70	0,9325	0,0017

Roso SL 2000 – Roso SL 93 crosses, which were obtained by crossing lines of hens Rhode-Island, are very similar and the quantity r is the largest - $0,9601 \pm 0,0010$, that proves their common origin.

Among sheep the greatest interest takes milk albumen β Lg, which is connected with indices of milk productivity of animals. In our investigations 2 alleles were revealed in

the locus - β Lg^A и β Lg^B, with higher frequency for type β Lg^A – 0,6774 (picture 1).

With the aim of possible use the locus as a marker, we analyzed individuals of different genotypes of β Lg according to their milk productivity. The obtained results are given in the table.



Picture 1. The frequency of alleles of β Lg in milk of sheep Karakul

Table 4
 The characteristics sheep's Karakul of of different genotypes β Lg according to their milk productivity

Index	β -Lg AA(n=15)		β -Lg AB(n=12)		β -Lg BB(n=4)	
	X \pm Sx	C _v , \pm Scv %	X \pm Sx	C _v , \pm Scv %	X \pm Sx	C _v , \pm Scv %
Productivity, l	11,61 \pm 0,552	37,5 \pm 3,42	10,24 \pm 0,5	50 \pm 5,1	9,09 \pm 0,75	40 \pm 7,07
Fat, %	8,07 \pm 1,041	17,6 \pm 1,61	7,94 \pm 1,14	17,76 \pm 1,8	8,55 \pm 2,14	16,96 \pm 2,3
Dry substance %	18,93 \pm 2,44	10,51 \pm 0,96	18,69 \pm 2,7	11,23 \pm 1,14	19,48 \pm 4,87	11,24 \pm 1,99
Protein, %	4,66 \pm 0,6	21,03 \pm 1,92	4,82 \pm 0,7	18,26 \pm 1,87	4,37 \pm 1,1	22,88 \pm 4,04
Casein, %	3,7 \pm 0,48	21,62 \pm 1,97	3,73 \pm 0,54	18,23 \pm ,86	3,45 \pm 0,86	23,48 \pm 4,15

According to the results of the table the following conclusions can be drawn:

1. The sheep with β Lg AA genotype have higher productivity 11,611.
2. The sheep with β Lg BB genotype have the highest per cent of fat 8,55%. It points out the fact that milk from these individuals exceeds average index of butter-fat for this breed 0,4%.
3. In sheep milk with β Lg AB genotype the concentration of protein and casein was the highest – 4,82% and – 3,73% accordingly.

CONCLUSION

From the presented dates, we infer the following conclusions:

1. There were 2 alleles discovered in loci that define the systems of blood albumen that belong to hens of investigated crosses. In such a way, the observed polymorphism allows to reveal the most important genotypes in order to diagnose useful qualities of hens.
2. The most genetically similar crosses are Roso SL 2000 and Roso 93.
3. As a result of defining of the influence of locus β Lg on the productive qualities of sheep it became clear that AA genotype influences milk productivity, the individuals with such a genotype produce more milk compared to other genotypes. What concerns fat, the priority of β Lg BB genotype was pointed out, and in case of common albumen and casein – heterozygote

AB. That's why we suggest using locus β Lg as a genetic marker in selection of sheep according to milk productivity.

4. Analyzed populations were in genetic balance of loci according to Hardy Weinberg law.

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