

PRESERVATION AND UTILITY OF THE GENETIC FUND OF THE ROMANIAN GREY STEPPE BREED

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Abstract

Researches were effectuated on 30 Romanian Grey Steppe cows raised semi-intensively, tied-up stalling, at S.C.D.C.B. Dancu, Iași. The milk quantity per lactation ranged between 1589.64 kg (1st lactation) and 2535.43 kg in the 5th lactation also representing the maximum lactation. Starting from the 6th lactation, the milk quantity decreases and in the 8th lactation it reaches 1078.5 kg. At the same time, we identified the alleles identified for the six loci codifying the six types of major milk proteins (α S1-cz; β -cz; K-cz; β -lg; α -la; α S2-cz). A new allele a α_{S1} -CN, called \hat{F}^{SM} , discovered in the Grey Steppe, the Moldavian variety, was fully characterized (SM index represents the Moldavian Grey Steppe).

Studies of quantitative genetics on the characteristics of milk yield of members of the Bovidae family show that both the protein content (0.63%) and the type of casein or seric proteins have a strong genetic determinism and their variants may positively or negatively influence the total protein content of milk. The main lactoprotein from milk, kappa - casein (K-cz), characterized in the specialized literature as a feature having a high degree of hereditary transmission, behaves as such in the nucleus of Romanian Grey Steppe from Dancu Iasi, Romania, a value also confirmed by the heritability coefficient ($h^2 = 0.57\%$).

Key words: breed, Grey Steppe, conservation, genetic fund

INTRODUCTION

The Grey Steppe has been raised and perpetuated on the territory of our country since times immemorial representing a basic source for the Romanian peasant who has been always preoccupied by the field labour and animal growing.

At present, the spreading area for this breed in Romania has disappeared and there are only several individuals left in some households from Moldavia and the Danube Delta and we still have a nucleus of 62 heads at Dancu farm of S.C.D.C.B. – Dancu Iași and SC TCE 3 Brazi SRL farm of Neamț [6].

Starting from this reality, our team intended to preserve the genetic fund of the Romanian Grey Steppe whose finalization should materialize in a management programme of the genetic resources for this breed and the harmonization of our programme with the framework programme at international level, under the aegis of

FAO, for the preservation of the animal genetic resources.

MATERIAL AND METHOD

Researches were effectuated on 30 Romanian Grey Steppe cows on which we studied: the indices of milk production by successive lactations; the genetic determinism for the characters under study and the main lactoprotein systems and the improvement value of the breeding stock. The data were taken from direct observations and determinations on the farm and from the primary data bank of the farm and O.A.R.Z. Iași (Office for Improvement and Reproduction in Animal Science, Iași). All data were statistically processed \bar{X} , $\pm s \bar{x}$, s , $V\%$ and synthesized in tables and figures. To estimate the genetic parameters, we used R.E.M.L. (Restricted Maximum Likelihood) method [7, 9, 10, 13].

The study of polymorphism of milk proteins [6, 14] for the Grey Steppe individuals was made by PCR-RFLP technique, and for the study of polymorphism of all bovine lactoproteins we also used the isoelectric focalization technique (IEF).

RESULTS AND DISCUSSIONS

The milk quantity per lactation ranged between 1589.64 kg (the 1st lactation) to 2535.43 Kg in the 5th lactation also representing the maximum lactation. Starting from the 6th lactation, the milk quantity decreases and in the 8th lactation the quantity is 1078.5 kg. The first lactation represents 62.69 % from the maximum lactation, a value highlighting the tardiness of Romanian Grey Steppe breed in terms of milk yield. We must mention that in the nucleus under study there were individuals with a maximum yield of 3087 kg or 4080 kg of milk by lactation.

As for the qualitative features of milk, the fat percentage reaches its maximum value in the 5th lactation, namely 4.73% and the protein percentage has the same evolution reaching 3.71% in the 5th lactation. The variability for the mentioned indicators is intermediate to high (V = 6.09 – 12.06 %) [6, 11].

The cows from the nucleus under study had a large size of 122.28 cm and a body weight of 542.86 kg, values that highlight some good body massiveness. For this character we registered plus variants reaching the weight of 710.00 kg.

We suspected the presence of some ancestral alleles undiscovered so far for the loci codifying the milk proteins due to the lack of an improvement programme, what made Romanian Grey Steppe breed keep a high variability for a long time. Unfortunately, the drastic reduction of the number of individuals and the replacement of this breed with other more productive breeds has led to the loss of this variability and this is why the breed has been introduced in a preservation programme of the animal genetic resources from Romania.

In figure 1 we may see the alleles identified for the six loci codifying the six

types of major proteins of milk (α S1-cz; β -cz; K-cz; β -lg; α -la; α S2-cz).

The analysis of the electrophoretic profiles highlighted the presence of some common alleles for the 6 loci codifying the 6 types of major milk proteins, and also of some more rare alleles difficult to identify by PCR.

Following the interpretation of the electrophoretic profiles, in the 6 loci under analysis we identified alleles encountered in other breeds, too. For locus α S1-CN we identified both common alleles B and C. Moreover, we noticed a possibly new genetic variant in two individuals. This appears under the form of a major strip having the isoelectric point situated between alleles B and C, closer to that of allele C. The experiment was repeated for 3 times, and after migration we obtained the same electrophoretic profile (fig. 2).

This possibly new allele was identified in heterozygote state in two individuals and it was called α S1-CN I^{RV} [1,2,3,6]. The name of I was given according to the nomenclature used in the denomination of the genetic variants of major milk proteins. According to this, for the denomination of a new genetic variant one must use the alphabet letters, the latest genetic variant discovered in the members of the Bovidae family being variant H [12, 8]; RV index of this allele was used to underline the fact that this genetic variant belongs to an autochthonous breed, RV representing the Romanian Variety [1,2,3,6].

Following the characterization of the main breeds of members of the Bovidae family from Romania for locus α S1-CN carried out in our researches, we noticed that this genetic variant is specific to the Grey Steppe breed, the Moldavian variety, that is why it has been renamed α S1-CN ISM (SM index representing the Moldavian Grey Steppe).

For locus α S1-CN we found out 4 genotypes resulted from the combination of the 3 identified alleles.

Out of all 24 genotyped samples, we identified 14 genotypes BB, 8 genotypes BC, 1 genotype BISM and 1 genotype CISM for locus α S1-CN.

The presence of this new allele was identified only in the individuals considered as a pure breed from S.C.D.C.B. Dancu, therefore its belonging to the Grey Steppe is indisputable.

The highest frequency was noticed in case of genotype BB, genotype BC had an

average frequency and the genotypes carrying the new allele (BI^{SM} , CI^{SM}) registered a low frequency. The frequency of allele B is the highest, allele C has an average frequency and allele I^{SM} has a low one. The low frequency of allele I^{SM} is due to the small number of cows in lactation.

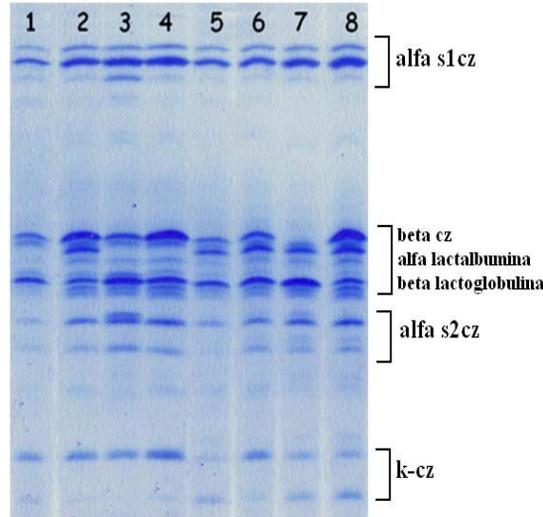


Fig. 1 IEF Profile belonging to some individuals from Romanian Grey Steppe breed highlighting alleles of milk major proteins

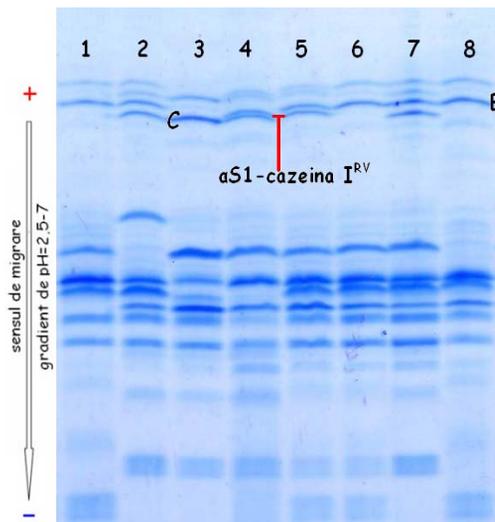


Fig. 2 IEF profile for some individuals of Romanian Grey Steppe from SCDCB Dancu, Iasi county (lanes 1, 4, 5, 6, 8), and Romanian Spotted cattle of Simmental type (lanes 2, 3, 7) Genotypes identified for locus $\alpha S1-CN$ are: 1- BB; 2- BC; 3- CC; 4- CI^{SM} , 5- BI^{SM} , 6- BB; 7- BC; 8- BB

Table 1 Heritability coefficient for the main features and milk protean systems for the Grey Steppe

Character	Heritability	Variance due to additive genes	"Intralot" variance	Total variance
Length of normal lactation by days	0.24	1799.0387	4628.2904	6427.3292
Milk Kg	0.26	46247.036	340772.72	387019.76
Fat %	0.71	0.9212	0.6745	1.5957
Fat Kg.	0.29	166.5806	614.5592	781.1397
Protein %	0.63	0.9084	0.7005	1.7089
Protein kg	0.27	203.1983	479.9655	683.1637
K-cz %	0.57	0.204	0.3	0.504
β -cz %	0.21	0.048	0.8	0.848
β -lg %	0.19	0.132	0.3	0.168
α S1- cz %	0.29	0.696	1.8	1.104

Studies of quantitative genetics on the characteristics of milk yield of members of the Bovidae family show that both the protein content and the type of casein or seric proteins have a strong genetic determinism and their variants may positively or negatively influence the total protein content of milk [11, 6].

After having initially established the phenotypic values and total variance of the main milk proteins for the Romanian Grey Steppe breed, we started to determine the genetic variance and heritability coefficients for each feature and lactoprotein separately (tab. 1).

Analyzing the value of the heritability coefficient for kappa-casein (K_cz), this has a stronger level of hereditary determination and a guarantee that the phenotypic values established largely correspond to the potentiality of component genotypes. The environment, in case of this feature, participates with a lower share in determining the total variance, a fact triggering different orientations, methods and managerial systems in the genetic improvement process as against the lactoproteins with a poor hereditary transmission.

The high "intralot" variance of β -casein (β -cz) and β lactoglobulin (β -lg) and the lower one due to the additive genes determined smaller values of genetic variance and, implicitly, of heritability coefficients for these lactoproteins [11, 6]. The low genetic determination rate of these lactoproteins reflects the high variability of the female

material from where we took off the milk samples and the low genetic variance of the male breeding stock. The influence of environment on the determination of variance of these features is so high, a situation classifying these lactoproteins in the category of those having a poor hereditary transmission. An intermediate situation is that of α S₁ casein (α S1- cz) having a medium hereditary transmission coefficient ($h^2 = 0.29\%$).

By examining the hereditary transmission indices of the main milk protean systems for Romanian Grey Steppe breed, we confirm the observation made on the basis of phenotypic data according to which this population is made of more homogenous or heterogeneous genotypes with a higher or less genetic variability, with features more or less hereditarily fixed [11,6].

The main milk lactoprotein, kappa-casein (K_cz), characterized in the specialized literature as a feature having a high level of hereditary transmission, for Romanian Grey Steppe nucleus from Dancu farm, Iași, Romania, behaves as such, a value also confirmed by the heritability coefficient ($h^2=0.57\%$).

On the basis of the heritability coefficient values of the main features and milk lactoproteins of Romanian Grey Steppe cows, we may affirm the favorable effect of selection in accordance with the improvement and genetic preservation objectives of this nucleus having a patrimony genetic value for Romania.

CONCLUSIONS

If from the productive viewpoint, this breed no longer meets the current requirements, it may play a historical, tourist and genetic role in the future (as a reservoir of valuable genes), all these being a serious argument for the application of a preservation programme. The Romanian Grey Steppe might become of high interest in time due to some characters such as: high content of fat and protein of milk, hardiness, adaptability, resistance to diseases and bad weather.

The Romanian Grey Steppe may play a major role in the traditional production systems economically important on the marginal lands, which are the most sustainable systems.

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