

## RESEARCHES REGARDING THE DEGREE OF RELATEDNES AND KINSHIP OF GREY STEPPE BREED FROM SCDCB DANCU

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### Abstract

*Steppe Grey is an ancient breed of cattle that can be found on the present territory of our country since ancient times. In our country Steppe Grey is a breed of cattle considered at risk of extinction (having fewer than 1000 head), in danger of reach the critical limit of less than 100 animals, according to risk categories used by FAO. This paper has proposed calculating the degree of mating and inbreeding between female Gray cattle from SCDCB Dancu, in number of 48 heads and between bulls used at Ia and these, only 26.61 % of the female have between them relationship of relatednes and kinship ranging between 0.33 % for relatednes and kinship coefficient of 0.0156 / 0.0078 and 0.08 % for a factor of relatednes and kinship of 0.6125 / 0.30625.*

**Key words:** Steppe Grey, relatedness, kinship

### INTRODUCTION

Gray cattle breed is in the attention of specialists with different studies regarding its evolution in time, now being considered an endangered species.

In 1935 the gray cattle had a proportion of about 57,3 % of the total number of bulls and only 0,6 % in 1977 [1].

At present, gray cattle are found here and there in the north-eastern part of Moldavia, in Neamț and Iași counties and in the Danube Delta, in rural farms, more as half-breed and fully gray cattle can be found at the Station of Research-Development for Bovine Breeding of Dancu - Iași, TCE 3 Brazi Piatra Neamț, U.S.AMV Cluj and Roua-Grup from Ialomița county and in some individual farms from Neamț and Tulcea counties.

The aim of this paper intends the quantification of the degree of relatedness and kinship of the number of gray cattle breed from S.C.D.C.B. Dancu.

### MATERIAL AND METHOD

Researches were carried out on 48 cows from S.C.D.C.B. Dancu, Iași.

The statistical interpretation and processing of obtained data was carried out with the aid of the program SPSS 19 referring to the position and variation estimators (arithmetic mean  $\bar{X}$ , standard deviation of the mean  $\pm s$ , standard deviation  $s$ , variation factor  $V\%$ ) for the studied features.

The determination of the degree of relatedness as measurable value of the relatedness factor between the reproductive bulls and their bloodline, as well as within the bloodline, shows us the degree in which a population is uniform from a genetic point of view. A high degree of relatedness between individuals is somehow beneficial, as it establishes within the population certain genes that determine a constancy of the value of features and at the same time the genetic drift risks to appear. Also, a low degree of relatedness within a population involves a higher genetic diversity, but also higher differences concerning the phenotypic manifestation of features.

The relatedness between cows was analyzed, which express the probability to have identical genes in gene pool. This means that related individuals have a common part of the gene pool, expressed through a relatedness factor, marked down with  $R_{xy}$ , which can have values between 0 and 1.

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In 1921 *Wright* established the general calculus formula for the relatedness factor:

$$R_{XY} = \sum (0.5)^{n_{xy}}$$

$R_{XY}$  = relatedness factor between X and Y;  
 0.5 = the weight factor with which an ascendant participates at the hereditary base of descendants;

$\Sigma$  = the sign which shows the sum of weight factors of genes transmitted on more than 2 ways at the two related individuals;

$n_{XY}$  = the number of generations that separate the 2 individuals related on direct line.

The degree of kinship was also analyzed, fact which shows the probability for two genes situated at the same locus to be identical (that is to be in homozygotism for that locus) to an individual from related coupling.

The kinship factor is expressed with  $F$ . Taking into consideration all the loci of a genotype, this represents the proportion of loci which became homozygotes after applying related coupling.

The general calculus formula for the kinship factor is:

$$F_x = 0.5 \sum (0.5)^n$$

$n$  = the number of generations that separates the parents from individual X, through the common ascendant [2].

**RESULTS AND DISCUSSIONS**

The analysis of the relatedness factor between bulls used for reproduction (through

m.s.c.) and the population of gray cattle from SCDCB Dancu shows different variations:

- a value of 0.5 of the relatedness factor for 3 bulls (79004, gray cattle Fort I, gray cattle Fort II) which report each with a daughter in bloodline.
- a value of 0.45 of the relatedness factor, with limits of variation comprised between 0.25-0.75 for the reproducer 79006 for those 11 own bloodlines.
- a value of 0.43 of the relatedness factor, with limits of variation comprised between 0.25-0.5 for the reproducer 79008, which register 25 daughters in bloodline.
- a value of 0.375 of the relatedness factor for the reproducers 86002 (with 4 daughters) and 79009 (with 12 daughters).

Values of the relatedness factor of 0.309 also presents the bull 87027 for those 20 bloodlines, with wide limits of variation comprised between 0.0625 and 0.5.

The reproducer 79005 shows average values of 0.291 of the relatedness factor, with limits of variation of 0.125-0.5, reported to those 12 daughters in its bloodline.

The lowest value of the relatedness factor is registered at the bull 8003, respectively 0.229, reported to its 6 daughters, with a high variability factor of 63.76%.

The research carried out proves a high degree of relatedness between the bulls used at reproduction and their bloodline, wherefrom results that these were repeatedly used for reproduction in the succession of generations (figure 1).

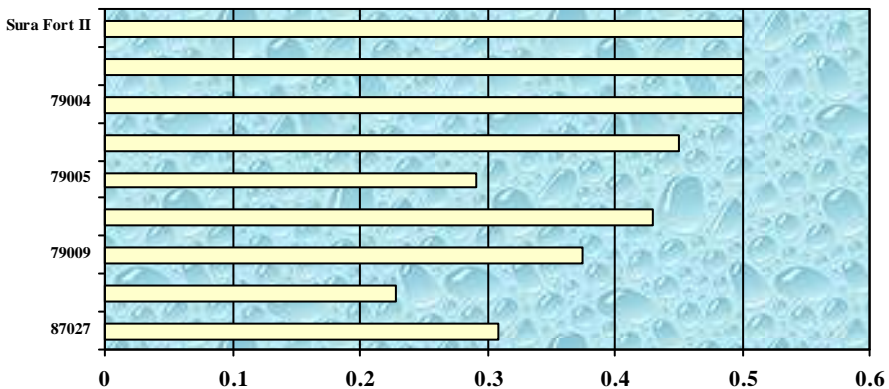


Fig. 1 The relatedness factor between bulls used for reproduction and the population of gray cattle from SCDCB Dancu

From the total of cows from S.C.D.C.B. Dancu, only 26.61% present relatedness reports, with an average of 0.17 of the relatedness factor.

The highest value of the relatedness factor in the analyzed population is of 0.61, representing 0.31% of the total of related animals (0.08% from the total of the population).

Values of 0.56 of the relatedness factor are registered at 0.15% of the total of related animals (0.04% of the total of the population). Most of the animals show a relatedness factor of 0.25 (29.42% of the total of related animals) and 0.125 (30.98% of the total of related animals). The smallest relatedness factor, of 0.015, is present at 1.25% of the related animals (table 1).

Table 1 The relatedness factor reported of total animal of gray cattle from SCDCB Dancu

Nr. Crt.	relatedness factor	% of total animal	% of total animal relatedness
1	0.015625	1.251956	0.333195
2	0.03125	6.416275	1.707622
3	0.0625	14.3975	3.831737
4	0.070313	0.156495	0.041649
5	0.078125	0.782473	0.208247
6	0.125	30.98592	8.246564
7	0.132813	0.312989	0.083299
8	0.140625	1.408451	0.374844
9	0.15625	2.660407	0.708038
10	0.25	29.42097	7.830071
11	0.265625	0.312989	0.083299
12	0.265625	0.938967	0.249896
13	0.28125	2.973396	0.791337
14	0.3125	6.103286	1.624323
15	0.328125	0.156495	0.041649
16	0.375	0.625978	0.166597
17	0.40625	0.156495	0.041649
18	0.5	0.469484	0.124948
19	0.5625	0.156495	0.041649
20	0.6125	0.312989	0.083299
<b>MEAN</b>	<b>0.170678</b>	<b>100</b>	<b>26.61391</b>

The kinship factor analyzed at those 48 gray cattle from S.C.D.C.B. Dancu registers an average value of 0.08.

The lowest value of the kinship factor of 0.007 is registered at 2.08% from the population. Maximum values of the kinship factor of 0.14 and 0.12 are registered in the population of animals with the same percentage, respectively 2.08% (1 animal).

Values of 0.09 of the factor are present at 27.08% of the population (13 animals), while 25% of the population show values of the

factor of 0.1 (12.5%, 6 animals) and 0.06 (12.5%, 6 animals).

In the total of cows from SCDCB Dancu 10.41% of the population of gray cattle show values of the kinship factor of 0.07, and 8.33% of the population registered a factor of 0.05.

The analysis of the kinship factor at the population of gray cattle show a value of 0.11 at 6.25% of the population of bulls, and a value of 0.04 at 4.16% of the population (fig. 2).

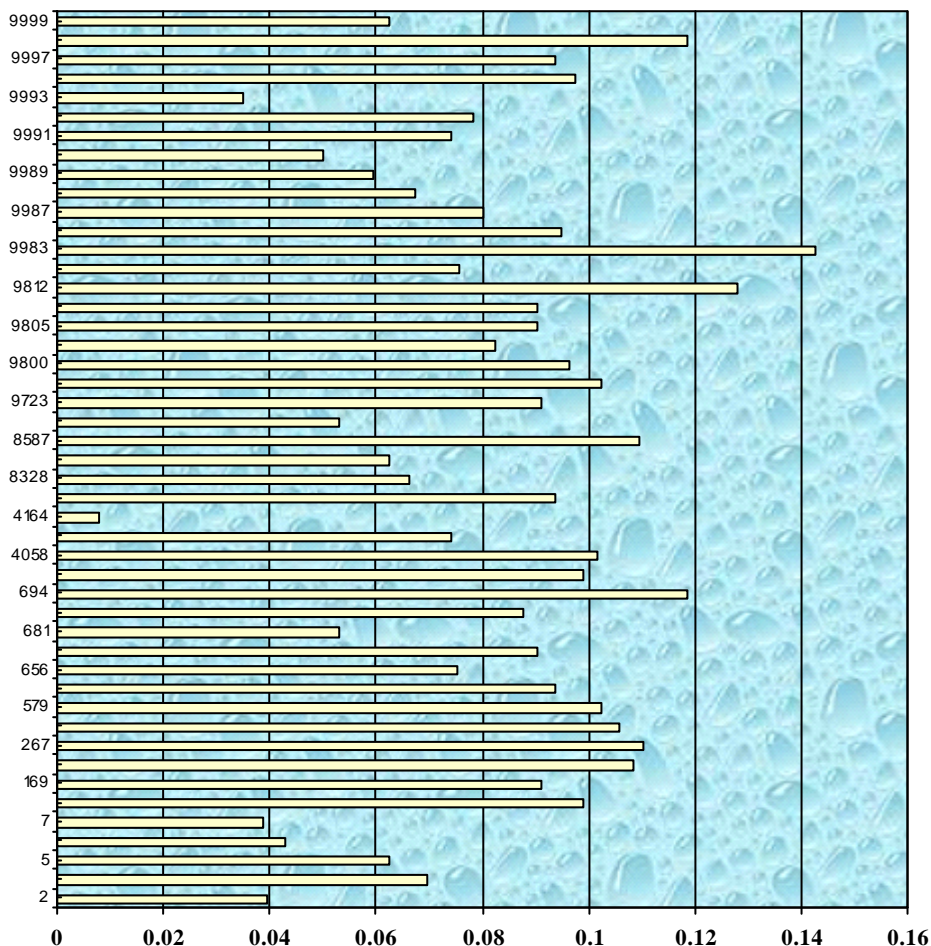


Fig. 2 The kinship factor at gray cattle from S.C.D.C.B. Dancu

Analyzing the frequency of the values of kinship factors within the studied population, it was determined that 22.91% of the population show values of over 0.1, these being a value of reference in the conservation of endangered breeds, in order to avoid the negative effects of kinship.

**CONCLUSIONS**

1. The research carried out proves a high degree of relatedness between the bulls used at reproduction and their bloodline, wherefrom results that these were repeatedly used for reproduction in the succession of generations
2. From the total of cows from S.C.D.C.B. Dancu, only 26.61% present

relatedness reports, with an average of 0.17 of the relatedness factor.

Analyzing the frequency of the values of kinship factors within the studied population, it was determined that 22.91% of the population show values of over 0.1.

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**REFERENCES**

[1] Creangă Ș., Maciuc V., 2010: Gray cattle from Romania, ALFA Publishing House, Iași.  
 [2] Ivancia M., 2007: *Improving animals*, ALFA Publishing House, Iași.