

## QUANTITATIVE GENETICS RESEARCHES ON THE B.N.R. POPULATION REARED IN THE PRIVATE FARMS FROM THE NORTH-EASTERN AREA OF ROMANIA

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### Abstract

The research has been conducted in terms of household and semiintensive operating Black and White Romanian cows from Moldova region. The primary data came from a database of OARZ: Iasi, Bacau, Botosani, Suceava, Vaslui and Vrancea, obtained by control of production, supplemented by direct observations of some personal holdings taken in research. The heritability for milk quantity varies between 0.21 and 0.37 for the Black and White Romanian cows from Bacau and Vrancea. The fat quantity has a medium value, between 0,27 și 0,38 %. The percentaj of fat and protein from milk is strongly genetically determinated and in our case the coeficient of heritability has value between 0.57 for the Black and White Romanian cows from Iasi and 0.83 for the Black and White Romanian cows from Vaslui. The quantity of milk is strongly and positively correlated with the quantity of fat ( $r = 0.99$ ) and the quantity of protein from milk ( $r = 0.85$ ). Between the quantity of milk and other characters for milk quality and reproduction indices the correlations were negative and had low value for: fat content in milk  $r = -0.24$ , protein content of milk  $r = -0.23$ , dry period  $r = -0.35$  etc.

**Key words:** Cows, Black And White Romanian, Milk, Heritability, Correlation

### MATERIAL AND METHOD

The research was conducted in conditions of household system and semiintensiv system dairy cows, Black and White Romanian (BNR), reared in Moldova. The primary data came from OARZ database of Iași, Bacău, Botoșani, Suceava, Vaslui și Vrancea, obtained by official control of production, supplemented by direct personal observations made in research holdings. The herds of cows in this area were raised, fed, maintained and exploited in some private households which were differentiated in terms of fodder and provision of food, management of technological factors of production, the degree of technical equipment, manpower and method of production capitalization.

Complexity of the issues imposed the use of a varied methodology of work according to the pursued aspects, using and respecting the methodology of investigation specific for research in animal husbandry recommended

by literature. When estimating genetic parameters the used method was REML (Restricted Maximum Likelihood).

This method is based on an iterative process of a function maximization. Calculation techniques vary according to the chosen optimization algorithm, but they all require BLUP solutions for different effects of the model in every iterative cycle. Also, a large number of iterative processes are made until convergence is reached.

### RESULTS AND DISCUSSIONS

For all studied characters, respectively, length of first total lactation, the quantity of milk in first normal lactation, fat content, amount of fat, protein content, protein quantity, age at first calving, interval between birth to first fecund insemination (SP1), dry period between first and second lactation (RM2) and the interval between first and second birth (CI2), heritability coefficients

were estimated (Table 1) and comparison was made between characters and between regions for the same character.

Thus, it may be noted that for the length of the first lactation, the lowest coefficient was recorded in the group of Black and White Romanian cows from Bacau and Vaslui ( $h^2 = 0.12$ ) and the highest in Vrancea ( $h^2 = 0.38$ ). For this character, all values are in compliance with those of literature, showing that this character is medium to low heritable.

The heritability coefficient for the quantity of milk ranged between 0.21 and 0.37, values recorded in populations of dairy cows in Bacau and Vrancea.

It may be concluded that the results from this research includes the character of milk quantity in the category of those medium heritable. The fat and protein quantity are included in the same group of characters with medium heritability .

For fat, the average values are between 0.27 and 0.38 (Bacau, Vrancea and Vaslui, respectively). For the protein, the heritability coefficient had values between 0.25 (Bacau) and 0.36 (Vaslui).

Fat and protein in milk have a strong hereditary transmission ( $h^2 > 0.4$ ), considering that these are quantitative characters which influence the milk quality. Values between 0.57 (the population of dairy cows in Iasi) and 0.83 (the population of BNR dairy cows Vaslui) have emerged from the sorted and processed raw data in these investigations. The values for protein heritability coefficient ranged between 0.46 and 0.80 set out in Bacau and Vaslui.

By comparison between the coefficients of heritability established for the dairy cow populations used in the 6 regions for age at first calving, it can be noted that the lowest value was found in Iasi, 0.21, and the highest, 0.37, in Vrancea. All estimated heritability coefficients are in accordance with the literature.

The interval between birth to first fecund insemination (SP1)- this being another character considered in the research- had a heritability coefficient between 0.14 and 0.29, extremes found Bacau and Vrancea, which makes them medium to low heritable characters.

Table 1

The heritability ( $h^2$ ) of the morphoproductive characters of the B.N.R. population from NE areas of the country

Specification	Total number of BNR Iași (1005)	Total number of BNR Bacău (881)	Total number of BNR Botoșani (493)	Total number of BNR Suceava (80)	Total number of BNR Vaslui (103)	Total number of BNR Vrancea (687)	Total number of BNR Moldova (3249)
Length of first normal lactation	0,14	0,12	0,30	0,30	0,12	0,38	0,29
Milk quantity (305 days)	0,24	0,21	0,23	0,25	0,24	0,37	0,27
Fat content	0,57	0,58	0,62	0,61	0,83	0,74	0,75
Fat quantity	0,32	0,27	0,35	0,32	0,38	0,38	0,30
Protein content	0,50	0,46	0,51	0,54	0,80	0,65	0,64
Protein quantity	0,30	0,25	0,34	0,29	0,36	0,30	0,28
Age at first birth	0,21	0,35	0,27	0,31	0,26	0,37	0,26
SP 1	0,22	0,14	0,21	0,22	0,27	0,29	0,20
RM 2	0,24	0,18	0,17	0,22	0,21	0,24	0,08
CI 2	0,34	0,17	0,28	0,36	0,32	0,39	0,18

The heritability coefficient for the dry period between first and second lactation (RM2) was between 0.17 and 0.24, calculated on the basis of the data from Botosani, Iasi and Vrancea, respectively. For

the whole population of Black and White Romanian cows, the heritability coefficient is 0.08; this result was obtained due to the very large number of individuals.

The hereditary transmission for the interval between the first and second parturition (CI2) had values between 0.17 and 0.36 for populations of dairy cows in Bacău, Suceava respectively.

According to data from literature, the interval between birth to first fecund insemination (SP1), the dry period between the first and second lactation (RM2) and the interval between the first and second parturition, as well (CI2) are low heritable characters.

In addition to heritability for populations of cows analyzed in Moldova (BNR), repeatability has also been estimated (tab.2.) for the same characters: length for first total lactation, the quantity of milk in first normal lactation, fat content, fat quantity, protein content, protein quantity, age at first calving, length from birth to first fecund insemination (SP1), dry period between lactation I and II (RM2) and the interval between births I and II (CI2).

The coefficients of repeatability found in this research have the following limits: 0.15 - 0.32, for the length of the first normal lactation, 0.22 and 0.30 for the quantity of milk on normal lactation at first lactation, varies between 0.60 and 0.74 for the fat content, between 0.29 and 0.40 for quantity of fat, between 0.53 and 0.69 for protein content and between 0.27 - 0.33 for the quantity of protein (Table 2). All these values are close to those in the literature for each character.

Regarding repeatability for the reproduction characters it can be stated that repeatability had the lowest value for the population of cows from Bacău (0.18) for the service period (SP1) and the greatest for the population of cows in Suceava and Vrancea (0.24); for the dry period (RM2), the lowest repeatability was for the population from Bacău (0.16) and the largest for the population in Suceava and Vaslui (0, 20).

Table 2  
 The repeatability of the morphoproductive characters of the B.N.R. population from NE areas of the country

Specification	Total number of BNR Iași (1005)	Total number of BNR Bacău (881)	Total number of BNR Botoșani (493)	Total number of BNR Suceava (80)	Total number of BNR Vaslui (103)	Total number of BNR Vrancea (687)	Total number of BNR Moldova (3249)
Length of first normal lactation	0,21	0,20	0,32	0,29	0,15	0,32	0,26
Milk quantity (305 days)	0,28	0,24	0,25	0,26	0,22	0,30	0,28
Fat content	0,60	0,61	0,70	0,72	0,74	0,69	0,72
Fat quantity	0,30	0,29	0,40	0,30	0,32	0,34	0,31
Protein content	0,53	0,53	0,61	0,61	0,69	0,62	0,60
Protein quantity	0,29	0,27	0,33	0,28	0,29	0,28	0,30
SP 1	0,20	0,18	0,20	0,24	0,23	0,24	0,17
RM 2	0,17	0,16	0,19	0,20	0,20	0,17	0,10
CI 2	0,31	0,25	0,34	0,35	0,30	0,33	0,20

Table 3

The correlations between some of the morphproductive and reproduction features for the first normal lactation of the B.N.R. population from NE areas of the country

Correlated characters		n	r <sub>g</sub>	r <sub>p</sub>
Milk quantity (305 days)	Length of first normal lactation	3249	0,57	0,76
	Fat content	3249	-0,22	-0,24
	Fat quantity	3249	0,99	0,99
	Protein content	2977	-0,20	-0,23
	Protein quantity	2977	0,73	0,85
	Age at first calving	3249	-0,10	-0,14
	SP 2	2194	-0,35	-0,37
	RM 2	2194	-0,22	-0,35
	CI 2	2194	-0,36	-0,41
Length of first normal lactation	Fat content	3249	0,90	0,97
	Fat quantity	3249	0,89	0,93
	Protein content	2977	0,95	0,98
	Protein quantity	2977	0,91	0,94
	Age at first parturition	3249	-0,19	-0,17
Fat content	Fat quantity	3249	0,96	0,98
	Protein content	2977	0,99	0,97
	Protein quantity	2977	0,92	0,95
	Age at first parturition	3249	-0,21	-0,17
Fat quantity	Protein content	2977	0,89	0,90
	Protein quantity	2977	0,99	0,98
	Age at first parturition	3249	-0,12	-0,13
Protein content	Protein quantity	2977	0,98	0,99
	Age at first parturition	3249	-0,20	-0,22
VP	SP 2	2194	0,15	0,16
	RM 2	2194	0,11	0,15
	CI 2	2194	0,18	0,17
SP 2	RM 2	2194	0,67	0,51
	CI 2	2194	0,83	0,69
RM 2	CI 2	2194	0,71	0,60

The lowest value for the repeatability of the calving interval (CI2) (0.25) was also found in Bacău and the highest value (0.35) in Suceava. And in these cases, the values of the repeatability coefficient are close to those in the literature for each character. The estimated genetic parameters for the analyzed population include correlations (tab. 3.) between the main morpho-productive characters.

Thus, it may find that between the quantity of milk from first lactation, assessed for normal lactation and other characters are both positively and negatively correlated for the BNR population of cows. The quantity of milk is strongly positively correlated with length of lactation (0.76), with the quantity of milk fat (0.99) and the amount of milk protein (0.85). Between the quantity of milk and the other characters the correlations are negative and the quantity of milk and the fat content of milk (-0.24), the quantity of milk and the protein content of milk (-0.23), the

quantity of milk and service-period (-0.37), the quantity of milk and the dry period (-0.35), the quantity of milk and calving interval (-0.41) are medium correlated.

Between length of the first lactation and content of milk fat, the quantity of milk fat, content and quantity of milk protein there are strong positive correlations (0.97, 0.93, 0.98, and 0.94). The length of the first lactation is low and negatively correlated with age at first calving (-0.17).

The content of milk fat is strongly positively correlated with the amount of milk fat (+0.98) with the milk protein content (+0.97) and the amount of milk protein. A low negative correlation is established between the fat content of milk and age at first calving (-0.17).

Between the quantity of milk fat and protein content of milk there is a strong positive correlation (+0.90), as well as between the quantity of milk fat and the

quantity of milk protein (+0.98). Between the quantity of milk fat and age at first calving, the correlation is low negative (-0.13).

The milk protein content is strongly positively correlated with the quantity of milk protein (+0.99) and medium negatively correlated with the age at first calving (-0.22).

The reproduction characters considered for the study are positively correlated, ie. the age at first calving is low positively correlated with the service period (+0.16), the dry period (+0.15) and the calving interval (+0.17); the service period is strongly positively correlated with the dry period (+0.51) and the calving interval (+0.69) and the dry period is also strongly positively correlated with the calving interval (+0.60).

## CONCLUSIONS

Following the study we can conclude the following:

The quantity of milk is a character for which the heritability coefficient ranged between 0.21 and 0.37, values recorded in populations of dairy cows in Bacau and Vrancea. It may be said that the results from this research includes the character milk quantity in the category of those medium heritable. The quantity of fat and protein can be included in the same group of characters with medium heritability. For fat, the average values are between 0.27 and 0.38 (Bacau, Vrancea and Vaslui respectively). For the quantity of protein, the coefficient of heritability had values between 0.25 (Bacau) and 0.36 (Vaslui). Fat content values are between 0.57 (at the population of dairy cows in Iasi) and 0.83 (the population of BNR cows of Vaslui).

The coefficients of repeatability found in this research have the following limits: 0.15 - 0.32, for the length of the first normal lactation, 0.22 and 0.30 for the quantity of milk on normal lactation at first lactation,

varies between 0.60 and 0.74 for the fat content, between 0.29 and 0.40 for quantity of fat, between 0.53 and 0.69 for protein content and between 0.27 - 0.33 for the quantity of protein (Table 6.4, Fig. 6.19-6.21). All these values are close to those in the literature for each character.

The quantity of milk is strongly positively correlated with length of lactation (0.76), the quantity of milk fat (0.99) and the quantity of milk protein (0.85). Between the quantity of milk and the other characters correlations are negative; the quantity of milk and quantity of milk fat (-0.24), the quantity of milk and the protein content of milk (-0.23), the quantity of milk and service-period (-0.37), the quantity of milk and the dry period (-0.35); the quantity of milk and calving interval (-0.41) are medium correlated.

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