CONTRIBUTIONS REGARDING THE STUDY OF PRECOCITY AND PRODUCTIVE LONGEVITY OF A BNR POPULATION FROM AN ELITE FARM IN MOLDOVA

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Abstract

The study regarding precocity and longevity was conducted at Dancu cattle farm of Research and Development Station Iaşi, on BNR primiparous and adult animals which was exploited during 1990-2008. The obtained results enlightened the following. The age at first calving, as main precocity indicator, was of 827.74 days (27 moths and 18 days), with limits between 782.92 and 896 days, which show a good precocity. Milk production on normal lactation increased from 4485.52 kg realised by the primiparous of 1995 generation up to 6300.58 kg for 2006 generation. Dates enlightened a genetic gain of 1815.06 kg of milk on a 12 years period or a yearly genetic gain of 151.25 kg of milk. Average fat content increased from 3.85% at generation 1995, up to 4.30% for generation 2003. Milk quality was improved also under the aspect of protein content from 3.08% for primiparous of generation 2001 to 3.35% for generation 2008, with an average of 3.24%. Average milk production on productive life was of 23031.09 kg of milk, with limits between 2640 kg and 66162 kg of milk. The duration of productive life was, in average, 1188.81 days (3.89 normal lactations), with limits between 218 days and 3272 days (10.72 lactations). Index of usage in production was 69.62%. Mean values of milk production and reproduction indexes for primiparous show a good genetic value for the analysed herd.

Key words: productive longevity, Romanian Black Pied (BNR), primiparous

INTRODUCTION

The genetic selection and amelioration programs implemented in the dairy cattle farms have the purpose of obtaining generations with high genetic productive potential, good precocity and length of productive life, facts that trigger economical and profit in breeding dairy cattle [1, 2, 4, 9, 12].

The literature underlines more and more persistently the importance of fitness traits, mainly precocity and longevity, as essential elements in genetic selection and amelioration of cattle populations [1, 3, 4, 5, 8, 9, 11, 12].

The references concerning the fitness traits revealed that all research together with genetic and economical implications in exploiting dairy cows is, still, scanty/poor in the literature hence the theme under consideration is well motivated/justified and actual [2, 5, 8, 9, 10, 12].

MATERIAL AND METHODS

Longevity research was carried out on the BNR livestock in the Dancu Farm, i.e. 999 cows that ended their productive life during 1995-2008 and precocity for all the cows that entered the livestock during 2000-2008. There should be pointed out that Dancu Farm holds the most valuable biological material of the BNR in the Moldavian region, here being introduced the first Friesian nucleus, imported from Denmark in 1967 which, in time, gave a big number of reproduction animals, heifers and calves all over the country and Basarabia.

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The manuscript was received: 18.04.2012
Accepted for publication: 22.06.2012

A great number of home-bred and imported bulls activated in the studied population using frozen semen, the most valuable genetic line of the Friesian breed.

The primary databank belonging to the official production control, completed with documents of selection work in this farm from its very beginning and observations and personal determinations within the existing livestock of the farm were used in this paper.

First the primary data were arranged, years, lactations, genetic groups of paternal half sisters and whole/total population. The arranged data were statistically processed, using the literature methodology for zoo-technical research [6, 7].

RESULTS AND DISCUSSIONS

In order to appreciate the productive performances of the BNR in the Dancu Farm, Iaşi, we have processed the concretion of the milk production on total and normal lactation, on successive lactations and total population results are shown in table 1.

Table 1 Mean values and milk production variability, on total lactation, of BNR cows at Dancu Farm

Sample statistics	Period of total lactation, days	Milk kg	Fat %	Fat kg	Protein %	Protein kg
n	3388	3388	3388	3388	2016	2016
$\overline{X}$	350.64	6983.78	4.09	285.69	3.15	220.11
$\pm s_{\bar{x}}$	1.75	38.80	0.01	1.61	0.13	2.42
s	102.29	2258.52	0.21	93.99	5.96	108.73
V%	29.17	32.34	5.34	32.89	17.25	49.40
Min	53	772	3.28	35	2.38	25
Max	972	22929	5.09	976	3.71	380

Period of total lactation recorded an average of 350±1.75 days, with limits of extreme variability, between 53 days and 972 days.

During the lactation period its length has an obvious tendency to be close to a normal one, with the exception of the 9th one which recorded an average of 365.50 days.

The variability of this index was big, the standard deviation taking values between s=157.69 days and 14.84 days, and the variation coefficient between V=56.31% and V=4.16%.

Logically the period of total lactation influenced the milk production on productive life.

The mean production on total lactation, on the 10 successive ones, was 6983.78±38.80 kg milk, with very large limits between 772 kg and 22929 kg milk.

This parameter variability was very big, as there can be noticed from the value of dispersion indexes (s=2258.52 kg and V%=32.34).

In table 2 there are shown the mean values and variability of productive longevity of the BNR population in the Dancu Farm.

Period of productive life of the 999 cows that ended their productive career during 1995-2008 was of 1188.81±18.11 days, with limits between 218 and 3272 days (table 2), so a very strong variability (s=11.385 kg and V%=49.43). The cows of this farm were exploited, on average, 3.89 normal lactations (305 days), without exerting their maximum productive potential during their life.

Taking into consideration age at first calving, 813.89 days, it means that the duration of life was 2002.7 days, namely 6.56 lactations, and the utilization index 59.36%.

Table 2 Productive longevity of the BNR population in the Dancu Farm

Specification		n	$\overline{X} \pm s_{\overline{x}}$	s	V%	Min	Max
Period of lactation, days		999	1188.81±18.11	572.53	48.16	218	3272
Milk, kg		999	23031.09±360.21	11385.15	49.43	2640	77566
Fat, %		999	4.20±0.22	6.99	50.40	3.68	4.42
Fat, kg		999	968.89±15.89	502.45	51.85	110	2927
Protein, %		881	3.17±0.32	9.75	124.76	2.88	3.71
Protein, kg		881	730.08±10.08	299.42	59.91	47	2259
Period of life, days		999	2002.7				
Amount on day of productive life	Milk, kg	999	19.37				
	Fat, kg	999	0.81				
	Protein, kg	881	0.61				
Amount on day of life	Milk, kg	999	11.50				
	Fat, kg	999	0.48				
	Protein, kg	881	0.36				
Utilization index, %		999	59.36				

The average milk production on productive life was 23.031±360.21 kg milk, with limits between 2640 kg and 77.566 kg milk.

The maximum milk production on productive life was 77.566 kg milk and 2927.49 kg fat and the utilization index 70.16%, obtained by the cow with serial number 930078 daughter of the bull Code 50704, followed by the cow with serial number 890228 with a production of 72847 kg milk and 2772 kg fat and the third was the cow with serial number 960004 with a production of 71256 kg milk and 2899 kg fat.

By analyzing the range of variation for the milk quantity on productive life we find that 232 cows (16.28%) realized bellow 10000 kg milk, the period of exploitation being thus very short/small.

Most of the animals (802 heads), namely 56.29% realized between 10000 kg and 30000 kg milk and 348 cows (24.42%) between 30000 kg and 50000 kg milk.

In the studied livestock, there were a number of 42 cows (2.94) with performances over 50000 kg milk on productive life, among which three cows with over 70000 kg milk.

The cow serial number 800108, the daughter of the bull Code 50819 realized the most of lactations on productive life (12 lactations) and a total production of 57012 kg milk and 2168.18 kg fat, being a champion from this point of view.

If we take into consideration the paternal origin of the cows with the greatest milk production on duration of productive life it is observed that most of them come from imported bulls which justifies using import genetics to ameliorate the Romanian Black Pied Breed.

The results found show that the most valuable imported bulls that gave a greater number of daughters were: Code 50387, 50834, 50426, 50518, 50558, 50618, 50704, 50889. These bulls come, most of them, from American and Canadian genetic lines acknowledged all over the world which were imported in Romania too, and the benefice effects started to become obvious in well organized farms.

At the same time we notice the existence of plus variants with good longevity having native bulls at their origin. Among these the bulls: Code 4344, 5179, 5923, 6841, 9012, 9649, 10398, 11397, 13470, 17864, 18059, 19165 whose daughters gave over 40000 kg milk on productive life.

Taking into consideration these data we selected the best families from both imported

and native bulls with superior genetic value concerning the productive longevity which will further contribute to the multiplication and consolidation of this fitness trait in the studied population.

Regarding the productive and reproduction precocity there was analyzed age at first calving, primiparous milk production and its evolution on successive lactations, maximum lactation in life and first lactation share/weight out of the total lactation.

Age at first calving was in average 813.89±2.70 days with limits between 548 and 1523 days. There was found that the studied livestock has a good reproductive precocity (27 months and 4 days), therefore this reproduction parameter variability is very strong with variability amplitude of 977 days.

These values with individual limits excessively big prove some negligence or management flaws/mistakes as calving at one and a half year old means very early artificial insemination (bellow one year) which is as unacceptable as calving at four years old that means inappropriate breeding of reproductive female youth and bad management as well.

Interval between calving, on all productive life exceeded 400 days, for the first seven calving it was of 420-430 days, afterwards it has the tendency to decrease getting close to 400 days,

Resting breast is the reproduction index which recorded values close to normal ones for all studied lactations. The mean values were between 72 and 83 days, slightly above optimum values but in correlation with the milk production performances of the analyzed livestock.

Service period exceeded the optimum values for this indicator of the reproductive function, the cows being inseminated and getting pregnant after the 4-5th heat cycle.

Precocity of milk production is closely related to the reproduction traits, first with the age at heifers' introduction to artificial insemination and age at first calving, but it can also be appreciated taking into consideration the evolution of milk production in life and maximum production as well as the weight of the first lactation in comparison to the maximum lactation (tab.3).

Table 3 Evolution of milk production on successive lactation, BNR cows from Dancu Farm

Lactation	Total lactation		Normal lactation	
	Kg	%	Kg	%
I	6850.77	92.54	5791.90	88.81
II	7403.30	100.00	6521.18	100.00
III	7124.66	96.23	6440.64	98.76
IV	6924.64	93.52	6362.05	97.55
V	6777.68	91.54	6412.55	98.33
VI	5779.90	78.07	6035.06	92.54
VII	5887.08	79.51	5966.17	91.48
VIII	5758.15	77.77	5472.19	83.91
IX	5080.00	68.61	5347.25	81.99
X	4031.33	54.45	4056.00	62.19

The index analysis of milk production on successive lactation there can be observed that the studied population accomplished productive performances over 5000 kg milk, with the exception of the last lactation when it was only obtained 4031.33 kg milk.

Following the evolution of the milk production in life we find performances of over 6000 kg in the first five lactations, over 7000kg milk in lactations two and three, the maximum production being realized in the second lactation 7403.30 kg milk.

Comparing the mean values of the productive performances to those recorded by the BNR in livestock all over the country controlled in 2007/2008 that was of 5293 kg milk, we can draw the conclusion the Dancu Farm population constitutes a valuable genetic nucleus with an average 6983.78 kg, 1500 kg milk more than the national production.

Considering the milk production evolution, it is noticed a 7.96% increase in the second lactation, which is the maximum lactation, then the production maintains at high levels (over 90%) to the fifth lactation and finally a slow decrease in the following three lactation (lactations VI-VIII) and a stronger decrease in the last lactation (54.45% of the maximum lactation).

These data point out good longevity and precocity of BNR breed of the Dancu Farm, the lactation homogeneity and persistence in life, being determined both genetically and applying technological exploitation but also an adequate management of technological factors.

In order to better underline/highlight milk production precocity we analyzed the evolution of productive performances of the selected primiparous, between 1995-2008, whose mean values are shown in table 4.

Table 4 Evolution of milk production at RBP primiparous in the Dancu Farm

Generation (year)	Total lactation kg	Normal lactation kg
1995	5856.71	4485.52
1996	7066.62	5186.77
1997	6845.48	5460.19
1998	7665.92	5826.46
1999	6895.53	5311.20
2000	7296.00	5476.00
2001	7469.58	5734.00
2002	7923.11	5797.78
2003	7370.55	5720.14
2004	8870.89	5836.42
2005	6633.69	5830.62
2006	8705.42	6300.58
2007	7239.75	5423.19
2008	8182.33	5890.92
Average 1995-2008	7323.62	5520.35

These productive performances underline the genetic value of the selected primiparous in the analyzed period of time, performances that can easily be compared to those obtained in countries that share a tradition in growing the Friesian breed.

Table 5 Mean values and variability of age at first calving of BNR primiparous between 1999-2008

Anul	n	$\overline{X} \pm s_{\overline{X}}$		s	V%	Min	Max
1999	15	800.60	14.56	56.41	7.04	727	939
2000	7	896.00	53.62	141.87	15.83	761	1174
2001	12	833.75	24.75	85.75	10.28	724	998
2002	9	854.78	28.33	84.99	9.94	755	1028
2003	29	851.48	29.65	159.71	18.75	648	1265
2004	19	847.89	16.46	71.74	8.46	735	1020
2005	13	822.08	20.58	74.23	9.03	730	987
2006	12	849.25	63.98	221.65	26.10	630	1525
2007	16	811.00	22.35	89.40	11.20	669	965
2008	12	815.83	24.27	84.08	10.30	705	1009
Mean 1999-2008	144	836.29	9.83	118.01	14.11	630	1525

The data shown in table 5 shows that age at first calving was between 800.6 days in 1999 and 896 days in 2000, with an average of 836.29 days, namely 27 months and 26 days, which indicates a good reproductive precocity. The results show a decrease tendency of age at first calving, i.e. a precociousness tendency through the action

of genetic factors as well as technological factors management.

CONCLUSIONS

The research regarding the precocity and productive longevity of the cattle population, with its genetic and economical implications in exploiting dairy cows is still poor in the literature, mostly for our country breeds, hence the necessity for such studies and research.

The analyses of the milk production indexes and their variability on successive lactations ascertained/proved that the studied population realized productive performances over 5000 kg milk which certified its high genetic potential.

Age at firs calving shows a medium degree of productive precocity, being influenced by exogenous exploitation and management factors.

Length of productive life was, in average, 3.89 normal lactations (305) days and the utilization index 59.35%.

The average milk production on productive life was 23031.09 kg with a maximum 77560 kg.

A detailed analysis of the reform causes points out firstly the alteration of the reproductive function followed by that of the udder and legs.

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