Study Regarding the Influence of Activity Period of Cows on Milk Production Indices in the Romanian Black and White Breed

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Abstract
The aim of the study was to assess if there are significant differences of milk production between the Romanian Black and White cow populations activating in different periods of time in Timiş and Caraş-Severin. Studies were carried out on 3764 lactations, of which 1290 lactations from active cows after year 2007 and 2474 lactations from cows that ended their productive life before year 2007. In Timiş County, the milk production per normal lactation of active cows was 4676.4 kg milk, with 183.83 kg butterfat and 150.46 kg protein, being significantly higher than the milk production of previous population by 6-7% ($p<0.05$). Per total lactation the milk production of active population was 5130.6 kg milk, with 201.87 kg butterfat and 165.70 kg protein, being significantly higher than milk production of the previous population by 4-5% ($p<0.05$). In Caraş-Severin County, the milk production per normal lactation of active population was 4312.1 kg milk with 170.40 kg butterfat and 145.50 kg protein, while the production per total lactation was 4731.9 kg milk with 188.23 kg butterfat and 159.74 kg protein. These values were not significantly different ($p>0.05$) compared with the productions of previous population. It was concluded that the rearing conditions in the two counties had an effect on phenotypic expression of milk production.

Keywords: active population, cows, milk production, previous population, Romanian Black and White

1. Introduction

Genetic improvement of the cattle breeds represents a priority in the cattle production systems and is based on selection work and controlled reproduction by using artificial inseminations and embryo-transfer [1].
Genetic improvement is based on a complex of applied systems and methods that modify the genetic structure of the cattle population in successive generations, improving the economic traits genetic potential. Only the populations that are reared in optimal environments could be improved genetically [2].
There are three steps to obtain the genetic improvement of the cattle production traits [2]. In the first step, the production genetic potential of the new cattle generation is set up after applying selection, gene migration and controlled mating. This step is the true genetic improvement. In the second step, the phenotypic potential for production is accomplished by optimizing calf and heifers rearing. In the third step, the improved production is obtained by providing the optimal environment for animals to perform.
The breeding objectives of each herd should be unique to the economic conditions faced by that herd [3]. Herd breeding goals must accurately

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reflect the sources of income appropriate for each specific herd.
In order to assess the genetic progress of cattle population, the evaluation of current and previous levels of production of this population is needed. The difference on milk production between the two counties in the South-Western Romania was presented previously [4], as well as the variation in milk production from lactation to lactation in Timiş County [5]. Recently [6] it was shown that the longevity traits of Romanian Black and White cows raised in South-western Romania were satisfactory, while the lifetime milk production was lower in Caraş-Severin County. The economic efficiency of milk production was higher in Timiş County.
The objectives of this paper is to provide evidence for the differences in phenotypic production of the current active and previous active Romanian Black and White cow population bred in the Timiş and Caraş-Severin counties.

2. Materials and methods

Data regarding the milk production was collected from the official production control in Timiş and Caraş-Severin counties.
Researches were carried out on 2474 lactations obtained from the previous population, out of which 2263 lactations in Timiş County and 211 in Caraş-Severin County. The previous population was defined as the cows that ended their productive life before January 1, 2007. In Timiş County the previous population of cows performed between years 1997 and 2006. In Caraş-Severin County, cows from previous population produced milk between years 2000 and 2006.
The active population of cows was made of the existing cows after January 1, 2007. These cows were born between years 1994 and 2004 in Timiş County and between years 1991 and 2003 in Caraş-Severin County. A number of 1290 lactations were studied from the active population out of which 988 lactations in Timiş County and 302 lactations in Caraş-Severin County.
Milk production traits per total lactation and normal lactation were calculated: days in milk, milk yield, butterfat yield, protein yield, butterfat percentage and protein percentage.
Averages and dispersion indices were computed for each county and each population, and differences among averages were tested using the t test.

3. Results and discussion

Milk production traits in previous and active populations from Timiş County are presented in Tables 1 and 2.
For normal lactation (Table 1) the active population produced by 286.7 kg milk ($p<0.001$), 10.65 kg butterfat ($p<0.05$), 20.97 kg protein ($p<0.001$), and 0.211 percentage points ($p<0.001$), more than the previous population. The butterfat percentage remained unchanged from the previous to the active Romanian Black and White cow populations ($p>0.05$). This increase from one generation of cows to another was about 6% for milk yield, butterfat yield and protein percentage and about 16% for protein yield.
Per total lactation (Table 2) the milk production of the active population was significantly higher ($p<0.001$) than the milk production of the previous population, except for the butterfat percentage that did not changed over the cow generations ($p>0.05$). Cows from the active population of Romanian Black and White breed raised in Timiş County had, on average, longer total lactation by 17.8 days ($p<0.001$).
The milk production of the two cow populations from Caraş-Severin County is presented in Tables 3 and 4.
In Caraş-Severin County (Table 3), cows in the active population had similar milk production per normal lactation as cows from previous population, differences were very low 1-2% and did not reached the significance level ($p>0.05$).

Table 1. Milk production indices per normal lactation of the Romanian Black and White cows from Timiş County

Indices	Active population		Previous population		Difference and significance
	n	$\bar{X}\pm S_x$	n	$\bar{X}\pm S_x$	
Milk yield (kg)	988	4676.4±52.52	2263	4389.7±27.26	286.7***
Butterfat yield (kg)	988	183.83±2.134	2263	173.18±1.081	10.65*
Butterfat percentage (%)	988	3.924±0.0088	2263	3.950±0.0067	-0.026 ^{ns}
Protein yield (kg)	984	150.46±1.718	2128	129.49±0.891	20.97***
Protein percentage (%)	984	3.224±0.0085	2128	3.013±0.0113	0.211***

Table 2. Milk production indices per total lactation of the Romanian Black and White cows from Timiş County

Indices	Active population		Previous population		Difference and significance
	n	$\bar{X}\pm S_x$	n	$\bar{X}\pm S_x$	
Days in milk	988	371.9±3.24	2263	354.1±2.28	17.8***
Milk yield (kg)	988	5130.6±67.97	2263	4894.8±37.99	235.8***
Butterfat yield (kg)	988	201.87±2.740	2263	194.20±1.534	7.67***
Butterfat percentage (%)	988	3.932±0.0101	2263	3.984±0.0056	-0.061 ns
Protein yield (kg)	984	165.70±2.229	2128	144.59±1.221	21.11***
Protein percentage (%)	984	3.239±0.0052	2128	3.029±0.0106	0.210***

Table 3. Milk production indices per normal lactation of the Romanian Black and White cows from Caraş-Severin County

Indices	Active population		Previous population		Difference and significance
	n	$\bar{X}\pm S_x$	n	$\bar{X}\pm S_x$	
Milk yield (kg)	302	4312.1±61.52	211	4274.3±65.68	37.8 ns
Butterfat yield (kg)	302	170.40±2.620	211	166.73±2.927	3.67 ns
Butterfat percentage (%)	302	3.937±0.0124	211	3.879±0.0162	0.058 ns
Protein yield (kg)	288	145.50±2.016	180	149.04±2.248	-3.54 ns
Protein percentage (%)	288	3.327±0.0097	180	3.351±0.0135	-0.024 ns

Table 4. Milk production indices per total lactation of the Romanian Black and White cows from Caraş-Severin County

Indices	Active population		Previous population		Difference and significance
	n	$\bar{X}\pm S_x$	n	$\bar{X}\pm S_x$	
Days in milk	302	341.8±4.070	211	347.6±5.812	-5.8 ns
Milk yield (kg)	302	4731.9±77.69	211	4738.4±92.02	-6.5 ns
Butterfat yield (kg)	302	188.23±3.391	211	189.58±3.967	-1.35 ns
Butterfat percentage (%)	302	3.963±0.0207	211	3.894±0.0160	0.069 ns
Protein yield (kg)	288	159.74±2.547	180	164.23±3.281	-4.49 ns
Protein percentage (%)	288	3.333±0.0093	180	3.358±0.0131	-0.025 ns

Per total lactation (Table 4) milk production traits of the active population in Caraş-Severin County were not differed statistically from the milk production traits of previous population ($p>0.05$).
The rearing conditions in Caraş-Severin County did not changed over the years, even though the genetic improvement of the Romanian Black and White cow population improved, cows being raised in small, household farms. Compared to this situation, in Timiş County rearing cows of this breed moved to the larger farms that apply new breeding technologies.

4. Conclusions

Genetic improvement programs of the breeds should be backed by improvements in rearing technologies and methods in order to obtain better milk production indices and increase the economics of the farms. This happened in Timiş County where dairy farms improved their rearing methods together with using high value semen, and milk production improved over the years by 6 to 16%. In Caraş-Severin County, the rearing methods remained the same, thus the genetic improvement induced by the high genetic merit semen was not observed in the milk production of cows.

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