Scientific Papers. Series D. Animal Science. Vol. LXI, Number 2, 2018
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE IMPLICATIONS OF GENETIC MATERIAL ON THE PARAMETERS OF RAW MILK OBTAINED UNDER IDENTICAL GROWTH CONDITIONS FROM ROMANIAN BLACK SPOTTED AND HOLSTEIN-FRIESIAN COWS

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Abstract

Romanian Black Spotted and Holstein-Friesian cows are breeds that are frequently found on the dairy farms in Romania. The aim of the study was to evaluate the main sensory, physical-chemical and microbiological parameters of the milk coming from these cows grown under identical conditions of housing, microclimate and nutrition. In terms of most sensorial parameters (appearance, colour, smell, density, taste) the recorded values did not differ significantly from one breed to the other. For the total number of germs and the number of somatic cells the values varied quite a lot, higher values being recorded by Romanian Black Spotted cows' milk, but without exceeding the legal limits. Significant differences were recorded for some physical-chemical parameters for which the milk samples were analyzed. Thus, the amount of milk harvested from Holstein-Friesian cows was up to 35% higher than from Romanian Black Spotted, milk to which the dry substance was in larger quantity (up to 14%) due to higher protein content (4%) and fat (2-5%). At the same time, values for acidity, density and freezing point were close for the two types of milk analyzed.

Key words: *Holstein-Friesian cows, Romanian Black Spotted cows, milk composition, milk quality.*

INTRODUCTION

Cow milk represents a system with a yield and chemical composition that may be affected by various factors, including here the genetic and the environmental ones.

Some authors claim that the mammary diseases (clinical mastitis) represents the main cause of losses on milk yield production, losses that are mainly due to the growth of the total number of germs and the number of somatic cells in milk, accompanied by a decrease of chemical components values in the milk yield. Other authors believe that low milk production is due to unfavorable environmental conditions, which do not allow full expression of the genetic potential of the cows (Neijenhuis, 2008; Timms, 2004).

From the nutritional point of view, milk is a valuable food, because it contains most of the nutrients needed by the body, in a balanced proportion and which are well assimilated by the organism (Arghiriade et al., 2013). From a chemical point of view, milk is mostly formed from a dispersed medium – water (89.7 – 86%), in which the other components are dispersed which forms the dry substance (10.3 – 14%; the average dry substance is 12.5%) (Tăpăloagă, 2014).

The dry substance consists of main components: proteins, fats, carbohydrates and small components: mineral salts, vitamins, enzymes, gases and pigments. Fat varies between very wide limits, between 2.5 and 7.5% and is represented by triglycerides, complex lipids and free fatty acids. Proteins are in proportion 3.4%, contain about 22 essential amino acids, giving to the proteins a high biological value. Lactose varies widely, between 2.84 – 7.46%, with an average of 4.55%, is and its the main milk sugar (Tudor, 2009).

In addition to the important source of calcium, phosphorus and B complex vitamins, milk contains large quantities of potassium but low sodium, which is manifested by increased diuresis. Also in milk there are low amounts of essential fatty acids, iron and vitamins A and D. Milk pigments are mainly carotene, lactochrome and lipocrom.

The diversity of microorganisms present in milk can be explained by multiple contamination sources: mammary contamination,

unhygienic milking or external factors that act after milk (contact with the outside or cooling and storage temperature) (Kalac, 2011; Lembeye, 2016). So, somatic cells count can be viewed as an indicator of udder health status and milking hygiene (Ilie, 2011). Human nutrition is the basis of its construction. Wellbeing, balance and health of each human being are in close touch with food. Developing appropriate feeding brings together with other correct behaviour items a healthier life for everyone (Tăpăloagă, 2017).

MATERIALS AND METHODS

The study was conducted on two groups of bovine breeds, Romanian Black Spotted and Holstein-Friesian (20 cows of each breed), grown under identical conditions of housing, microclimate and nutrition. The milk collected from them has been evaluated in terms of sensorial parameters (appearance, colour, smell, consistency, taste), of some physical-chemical parameters (fat, protein, dry matter, acidity, density, freezing point) and hygienic parameters (the total number of germs and the number of somatic cells). The samples were collected and analyzed during 2017, a number of 724 samples, making statistical comparative evaluations between the average values obtained by the two batches of cows. Concerning the data collected for this survey, there were used the results of the control of cow milking, determined during test milking. The methods of analysis used were those mentioned and described in the specific normative acts (Reg. (EC) No. 853/2004; Reg. (EC) No. 854/2004; Reg. (EC) No. 882/2004; AOAC, 2012), the samples being harvested twice a day in the morning and evening meals.

RESULTS AND DISCUSSIONS

From the point of view of sensorial parameters, the recorded values did not differ significantly from one race to the other, the samples being of colour white-yellow or even yellowish fat for fatty milk; the smell was normal with a weak flavour of fresh protein; normal taste is sweet due to lactose; the opacity being higher as the milk is fatter.

It is well known that the smell of raw milk is typical for each ruminant species, which is considered dependent on some quantitative differences in the volatile profile and on the presence of specific compounds associated with each type of milk (Toso, 2002).

Table 1. Milk yield and composition of milk values

Cow's groups	Milk yield (kg x 100 l)	Fat (%)	Protein (%)
Holstein-Friesian	5.77	5.16	4.0
Romanian Black Spotted	4.28	4.02	3.4

For parameters that characterize the hygienic quality of milk, the total number of germs and the number of somatic cells, the values varied quite a lot, higher values being recorded by cow's milk Romanian Black Spotted (NTG = 83,000 cell/ml and respectively SCC = 365,000 cell/ml), but without exceeding the legal limits (NTG = 100,000 cell/ml and CCS = 400,000 cell/ml).

Table 2. NTG and CSS values of milk samples

Cow's groups	NTG (cell x 10.000ml)	CSS (cell x 100.000ml)
Holstein-Friesian	6.7	3.12
Romanian Black Spotted	8.3	3.65

The significant differences were recorded for some physical-chemical parameters for which the milk samples were analyzed. Thus, the amount of milk harvested daily from the Holstein-Friesian cow's (average value 577 kg of milk/day/20 cows) has been with up to 35% was greater than to Romanian Black Spotted cow's (average value 428 kg of milk/day/20 cows).

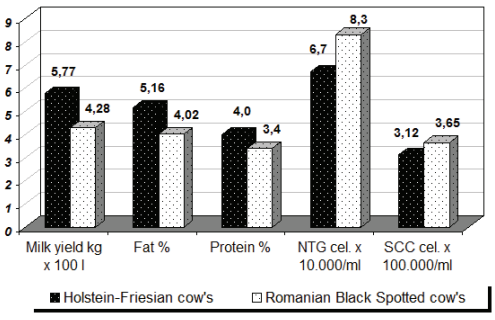

Figure 1. Values of milk yield, composition of milk, NTG and SCC

For milk samples from the Holstein-Friesian cows the dry substance was in greater quantity (up to 14%) due to higher protein content (4%) and fat (2-5%).

The researches concerning this thematic (cow productivity, content of somatic cells) performed by other scientific teams, demonstrated a highly significant effect of the herd on the count of somatic cells, while others presented no significant effect of the first factor on the other parameter.

At the same time, values for acidity, density and freezing point were close for the two types of milk analyzed and did not exceed the maximum admissible limits provided by the legislation.

The stage of lactation and animal health play an important role in the balance which must exist between milk components (Tăpăloagă, 2014).

Among sensory characteristics of milk, flavor is one of the most important attributes for acceptability and preference by consumers (Kim, 1996).

CONCLUSIONS

The values of the chemical compounds present in milk depend primarily on the genetic potential of the cows. Secondly, expressing the maximum productive potential of cows is dependent on microclimate conditions. Without a superior genetic potential, excellent microclimate conditions will generate good parameters, but not extraordinary for milk. The genetic potential also influences the hygienic quality of milk, an increased immunity will make the rate of mammary affection low, so rare cases with increasing number of somatic cells.

For establishing the productive performance is mandatory, additionally to the conditions of housing, microclimate and nutrition, the quality of the genetic material, which will increase the feed conversion rate in higher quantities of animal food, compared to similar costs. In addition, although the amount of milk is higher, its quality is clearly superior, giving a higher value to the use of this food of a population category of various ages, without having associated food problems.

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NUTRITION