PHYSICAL AND CHEMICAL ANALYSIS OF THE "MARAJOARA" CHEESE ELABORATED WITH MILK OF WATER BUFFALO AND CATTLE

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ABSTRACT

It was analyzed four types of cheese, two from water buffalo milk and two from cattle. For each animal species, it was studied two methods of cheese making, one handmade and he other using proper technology. The handmade cheese was obtained from local farm, and the other ones from the Laboratory of Technology of Embrapa Eastern Amazon, in Belem, Para State, Brazil, using water buffalo and cattle milk. For each animal species, the cheese was obtained from local farms and from the Laboratory of Technology, where the physical and chemical analyses were accomplished. The cheese was conserved under refrigeration 12°C, considering that is the storing conditions more likely to be found in the area. Later on, the cheeses were conserved in cryovac packing, for four weeks. The laboratories analyses began one day after its production at intervals of seven days, during approximately one month, in five replications. The following determinations were made: fat, protein, humidity, ashes, sodium chloride, pH, calcium, phosphorus and magnesium.

Key words: Amazon, cheese, food technology, nutritive value.

INTRODUCTION

The "marajoara" cheese is one of the dairy products more commonly produced in the Marajo island, having great acceptance and being commercialized in the local market. It is handmade, in inadequate conditions, using mainly water buffalo (*Bubalus bubalis*) milk and, in smaller scale, milk from crossbred cattle (*Bos indicus* vs. *Bos taurus*). There is very little research concerning the physical and chemical characteristics of dairy products from cattle and water buffalo in the Brazilian Amazon (5, 6, 7, 8, 17). The aim of this work was to determine the physical and chemical analysis of the "marajoara" cheese made from water buffalo and cattle milk.

MATERIAL AND METHODS

Four types of cheese were analyzed, two elaborated with water buffalo milk and two with cattle milk. A cheese of each animal species was handmade, in a local farm, and the others made using appropriate technology, in the Laboratory of Technology of Embrapa Eastern Amazon, in Belem, Para State, Brazil, where the analyses were accomplished. The cheeses were conserved under refrigeration the about 12°C, considering that is the storing conditions more likely to be found in the area. Later on, the cheeses were conserved in cryovac packing, for four weeks. The laboratories analyses began one day after its production at intervals of seven days, during approximately one month, in five replications. The following determinations were made: fat, protein, humidity, ashes, chloride of sodium, pH, calcium, phosphorus and magnesium (1, 9).

RESULTS AND DISCUSSION

Humidity

The humidity levels were more elevated in the cheeses of cattle milk and they are researched in other works (2, 13, 15). The humidity of cattle milk cheese (57,10% to 60.97%, with technology, and 46.99% to 52.0%, without technology) and of water buffalo milk (47.15% to 52.20%, with

technology, and 38.15% to 42.11%, without technology) was similar to that found for several cheese types by literature (11). These authors affirm that the cheese of the northern region contains about 48% of humidity, the same value reported by the Laboratory of Quality Control CEPE/ILCT, for a slicing cheese. The creamy cheese, according to literature (18), contains about 57.6% of humidity. On the other hand, (3), when analyzing the physical and chemical characteristics of the cheese from the northern region, verified large variations in the composition of those dairy products, which humidity varied from 45% to 57%.

Fat

The levels of fat of cheese from water buffalo milk are superior to that from cattle milk. These results are confirmed by studies accomplished by literature (11, 13, 15). However, it is observed that the "marajoara" cheese, so much of cattle milk as of water buffalo milk, when elaborated without technology, present high level, probably due to the lack of control of the content of cream, during the elaboration. The fat levels of cheese derived of cattle milk (4.53% to 6.69%, with technology, and 16.59% to 17.04%, without technology) and of water buffalo milk (10.52% to 15.79%, with technology, and 29.60% to 30.16%, without technology), are similar to the of several types of cheese studied by literature (11), which affirm that those dairy products from the northern region contains about 36.5% of fat, while the Laboratory of Quality Control of CEPE/ILCT reports that the slicing cheese has 31.75% of fat, approximately. The creamy cheese, according to literature (18), contains 28.5% of fat.

Protein

The levels of protein of the cheese from water buffalo milk are a little larger than those found for cattle milk. Comparing the mean protein levels of the samples of cheese from cattle milk (24.39% to 26.39%, with technology, and 18.74% to 21.69%, without technology) and from water buffalo (24.99% to 26.61%, with technology, and 18.9% to 24.6%, without technology), it can be observed that the values are similar to those found in the literature, between 23% to 27% (12), for marajoara cheese. Other work (11) found 22.64% of protein for the cheese from the northeastern region and (3), from 26% to 36%, in similar cheese. There were observed negative correlation among protein vs. ashes (-0.6115) and positive correlation among protein vs. calcium (0.5476).

Ash

The ash levels of samples of cheese from cattle milk (1.74% to 2.80%, with technology, and 6.15% to 6.40%, without technology) and of water buffalo (2.50% to 2.98%, with technology, and 1.55% to 3.13%, without technology), are similar to those reported in the research works made with several cheese types by literature (11), which affirm that the cheese from the northeastern region contains about 2.33% of ashes, while the creamy cheese, according to literature (18), contains 1.97% of ashes. It was observed that the cheese samples from cattle milk without technology present elevated levels of ashes, which is related mainly to the high content of chloride of sodium added during the manufacturing. The same conclusion was obtained by literature (10), which observed variations in the ash levels directly related to the different proportions of chloride of sodium added in the elaboration process of the cheeses, which is accomplished without any control or pattern.

pH

The pH values of the samples of cheese from cattle milk (5.19% to 5.39%, with technology, and 5.26% to 5.44%, without technology) and from water buffalo (5.71% to 5.82%, with technology, and 5.26% to 5.41%, without technology) are similar to the mentioned by literature (14), from analyzes carried out with cheese from the northeaster region, pH of 5,5. The creamy cheese, according to (18), presents pH of 5,8, while the Laboratory of Quality Control of CEPE/ILCT reports that the slicing cheese has pH around 5,7.

Sodium Chloride

The levels of Sodium chloride of cheese from cattle milk (0.26% to 0.57%, with technology, and 3.79% to 5.71%, without technology) and from water buffalo milk (0.23% to 0.88%, with technology, and 0.77% to 0.96%, without technology), are inferior (except the one of cattle milk without technology) to the determined in other work (14), which affirms that the cheese from the northeastern region contains about 1.26% of fat, while the Laboratory of Quality Control CEPE/ILCT the slicing cheese has 1.19% approximately. The creamy cheese (18), contains 1.1% of fat. As it was expected, a positive correlation was observed among Sodium chloride vs. ashes (0,9450). Among protein vs. sodium chloride was observed a negative correlation (0,6113), considering that high amounts of salt can denature the proteins.

Phosphorum

The levels of phosphorus of cheese from cattle milk (0.12% to 0.17%, with technology, and 0.11% to 0.16%, without technology) and from water buffalo milk (0.16% to 0.17%, with technology, and 0.09% to 0.12%, without technology) of this work are inferior to those obtained in other research (15), which observed levels of that mineral in the cheese mozzarella of water buffalo milk (1.43%), compared to cheese from cattle milk (1.05%). It was observed negative correlation for phosphorus vs. fat (- 0.61) and positive for calcium vs. phosphorus (0.68).

Calcium

There is no registration in the literature with respect to the pattern of calcium in regional cheese. In this work, the levels of calcium of the cheese elaborated with technology were higher than that produced without technology. A positive correlation was observed among the levels of calcium vs. protein (0,5476). Phosphorus levels for cheese from cattle milk (0.18% to 0.23%, with technology, and 0.14% to 0.18%, without technology) and from water buffalo milk (0.29% to 0.50%, with technology, and 0.13% to 0.16%, without technology), are inferior to those of the works mentioned in the literature (15, 16), which found elevated values for calcium in cheese mozzarella from water buffalo milk (2.35%), when it compared it with that produced from with cattle milk (2.10%).

Magnesium

As well as for calcium, there is no registration in the literature with respect to the pattern of magnesium levels in cheese from milk, and the mean values found were around 0.07%, about the same for cheeses from cattle and water buffalo milk. A positive correlation for magnesium vs. phosphorus was observed. (0.57). The levels of magnesium of cheese from cattle milk (0.04% to 0.10%, with technology, and 0.06% to 0.09%, without technology) and of water buffalo milk (0.04% to 0.09%, with technology, and 0.01% to 0.07%, without technology), are similar to those observed in other work (15), which affirm that the mozzarella from cattle and water buffalo milk contains levels of 0.06%.

The lack of standardization patterns for the quality of the product marketed in the State of Para, due to the absence of a proper legislation or economic factors, results in the offer of very low-quality products. Same results was obtained (4), with relation to the quality of the "Minas" cheese produced manually. In Para State, the diversity in the processes of making cheese from cattle milk, among which is the marajoara cheese, requires the application of proper technologies, being necessary the establishment of standard specifications or the quality control for the products. The humidity contents, protein, fat, ashes, phosphorus, calcium, magnesium and sodium chloride presented a great variability mainly among the samples the cheeses elaborated without technology, indicating the lack of standardization patterns of these products.

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