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Production of Curd, the Importance Indicator for Compared Buffalo's Milk Standardization with non - Standardized

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Abstract

For quality cheese production, the quality of the curd production is of special importance. In order to discover the economic importance of the production of curd from buffalo standardized milk which contains 3,2% fat and the non- standardized buffalo milk, we have used curd pulp for the production of cheese mozzarella from the non-standardized milk which contains 7,95% fat. We have compared the non-standardized and the standardized buffalo milk in economic terms taking into account the percentage of fat, in the retail Dairy "Bylmeti" in Fushë Kosovë. Physical and chemical analyses of the milk and cheese were made according to international standard methods. Analyses were made for setting the exact percentage of fat in the curd dough acquired from standardized milk and the non- standardized and the calculation of the profit was made based on the percentage of fat in the curd dough. We made three experiments with 500 l of milk from each production of curds. We got from three samples for analyzing the physical and chemical properties. We took 48 samples of milk and 48 samples of curds, where we analyzed the physical and chemical properties of the all 96 samples. From the profit viewpoint of our results, we concluded that, from the economic aspect the standardization of milk at 3,2% fat should be done by all means because: curd pulp which is made by non-standardized milk gives excessive whey during its long process of production, which is not the case when it is produced from standardized milk.

Keywords: Milk; buffalo; curd; whey; standardization; non standardization.

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1. Introduction

Milk production is the main product of livestock according to human food value and economic value for farms which cultivate dairy cows [1]. Milk is considered as a complete and ideal food and it contains most of the proximate values of a well balanced diet. Milk of various mammals is used for food but cow's milk is being used throughout out the world for feeding infants and as a supplement to the diets of the children and adults [2 , 21]. The main dairy ingredients: water, fat, protein, lactose, minerals, vitamins [5 , 1]. Buffalo milk is a totally natural product that can be consumed like any other milk. Participants in tasting trials prefer buffalo milk when compared to cows, goats and artificially manufactured milks because it tastes smoother and is more pleasing to the palate. Buffalo milk is very white, significantly less in cholesterol and higher in calcium than cows, sheep's or goat's milk. In addition to the significant cholesterol and calcium benefits buffalo milk is also a rich source of iron, phosphorous, vitamin A and protein. Although buffalo milk lacks the yellow pigment, buffalos convert carotene in their diet to vitamin A. Buffalo milk is totally free from additives and chemicals used to produce non dairy milk such as soya and rice milks [9 , 10 , 11 , 12]. Fermentation of milk is a form of anaerobic respiration which does not use oxygen as the final electron acceptor. An organic molecule, usually an intermediary of the process, accepts the electrons [31]. The aims of food industry today, as in the past, are fourfold:

1. To extend the period during which a food remains wholesome (the shelf life) by preservation techniques which inhibit microbiological or biochemical changes and thus allow time for distribution, sales and home storage.

2. To increase variety in the diet by providing a range of attractive flavors, colors, aromas and textures in food.

3. To provide the nutrients required for health (termed nutritional quality of a food).

4. To generate income for the manufacturing company.

Each of these aims exists to a greater or lesser extent in all food production, but the processing of a given product may emphasis some more than others [18].

Cheese production has three steps: curd formation, curd treatment and curd ripening [3].

1. Curd important product of fermentative lactic acid bacteria.

2. Curd treatment consists of condensing and squeezing to form dense, hard curd.

It is then molded into the desired shape, salted and mixed with different types of secondary micro flora.

3. Secondary micro flora ripens the cheese and will determine the final texture and aroma of each type of cheese [3 , 6 , 7 , 9 , 10 , 11].

Curd to produce cheese start off with fresh milk, obtained by coagulating milk in a process called curdling.

The milk is pasteurized, much like in the process of creating cheese. During this process, rennet is added to clot the milk. The coagulation can be caused by adding rennet or any edible acidic substance such as lemon juice or vinegar, and then allowing it to sit. The increased acidity causes the milk proteins (casein) to tangle into solid masses, or *curds*. Milk that has been left to sour (raw milk alone or pasteurized milk with added lactic acid bacteria) will also naturally produce curds, and sour milk cheeses are produced this way. Producing cheese curds is one of the first steps in cheese making [31,32 ,32]. Buffalo curd is obtained by bacterial fermentation of buffalo milk. In this process lactose in buffalo milk is converted into lactic acid using several micro-organisms. The species involved in the fermentation include *Lactococcus lactis*, *Streptococcus diacetylactis*, *Streptococcus cremoris*, *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus*. Buffalo curd can be made in both traditional and industrial forms. Traditionally buffalo milk is filtered and boiled, the scum is removed and it is cooled to room temperature. A few spoonfuls of a previous batch of curd are added and it is then mixed well and poured into clay pots. These are sealed by wrapping a piece of paper over the pot and allowing it to stand for 12 hours [30]. Traditionally buffalo curd (it's thicker and tastier and has a higher fat content than cow's curd) is made from filtered and boiled buffalo milk [25]. The milk (usually from cows or water buffalo) is warmed and curdled and allowed to rest for an hour before the curds are cut into small pieces and the whey is drained off. The curds are allowed to rest for a number of hours [20]. The curds can be mixed with fresh herbs or chili peppers before forming to flavor the mozzarella. The possibilities and variations are endless. The perish ability of fresh mozzarella varies according to packaging. Vacuum sealing extends the shelf life dramatically [28].

2. Experiment

The study included three experiments with 500 l of Buffalo's standardized and non standardized unpasteurized milk. We made three experiments with 500 l of milk from each production of curds. We got from it three samples for analyzing the physical and chemical properties. We took 48 samples of milk and 48 samples of curds, where we analyzed the physical and chemical properties of all 96 samples. The calculation was presented statistically. We followed the processes from drying of curds until preparing it for making cheese mozzarella.

2.1. Materials and Methods

For the production curd of cheese, we have had used milk of the following breeds: autochthon Buffalo's in the dairy of Kosova, in milk industry "Bylmeti" in Fushë Kosova.

For physical-chemical peculiar features of milk and curd samples were used these methods:

1. For definition of pH value was used the ph-meter ISOLAB pH -111,
2. Soxhelt-Henkels method was used to define sour taste,
3. For Physical – chemical was utilized LACTOSCAN – D -90,
4. For definition of Nitrogen (N) was used the Kelda's method,
5. For definition of fat percentage % was used the method of Gerber,
6. For definition of dry matters until drying up of constant mass,

7. Dry quantity of mass without fat has been done in calculated way,
8. Percentage of fat at dry mass has been done in calculated way,
9. Water quantity has been done in calculated way,
10. For definition of saline's (NaCl),
11. Ash%, {IDF Standard 17 A, 1972].
12. (IDF Standard 17 A, 1972) [8 , 15 , 16 , 17 , 1 9].

Table 1: Physic - chemical analysis from buffalos milk standardized with 3.2 % of fat

pH	5.1
^{o}SH	7.6
Temp Sample	14 ^{0} C
Fat %	3.2
Dry matter %	11.58
Density g/cm^{3}	1.03078
Protein %	3.45
Lactose %	4.21
Added Water %	0.00
Solids %	0.72
Freezing Point	-0.590 ^{0} C
Conductometry mS/cm	4.56
Water %	88.42

Table 2: Physic - chemical analysis from buffalo milk non standardized with 7.95 % of fat

pH	5.2
^{o}SH	7.4 ^{0} SH
Temp Sample	16 ^{0} C
Fat %	7.95
Dry matter %	17.71
Density g/cm^{3}	1.03097
Protein %	3.98
Lactose %	4.99
Added Water %	0.00
Solids %	0.79
Freezing Point	- 0.610 ^{0} C
Conductometry mS/cm	4.58
Water %	82.29

Diagram for production for mozzarella curds

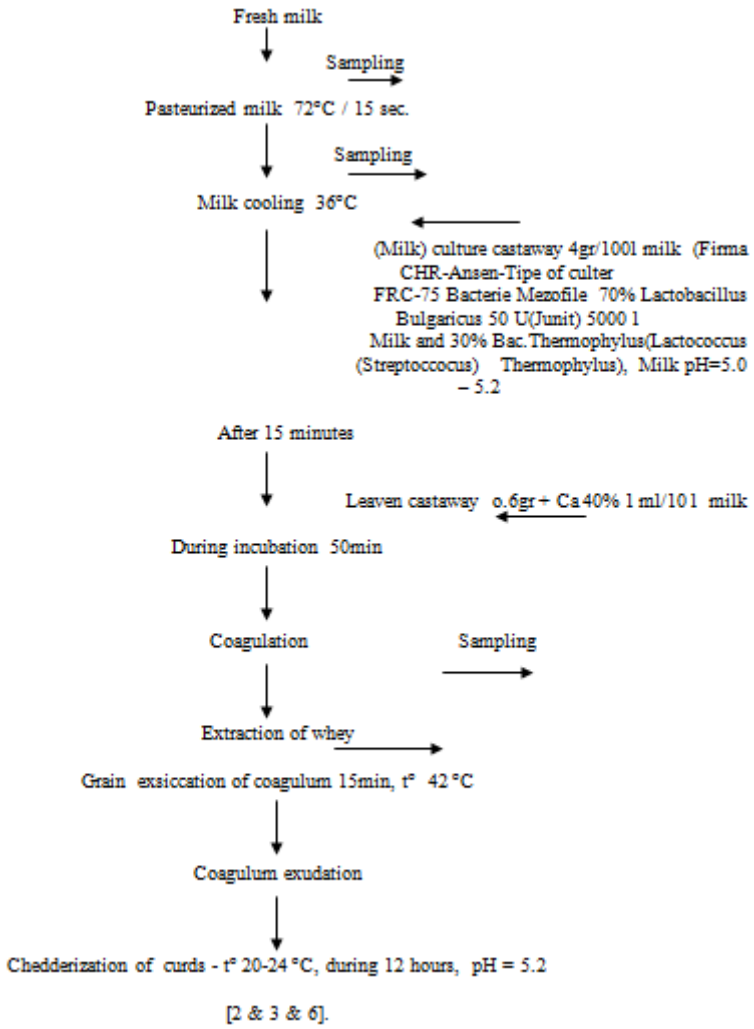

Figure 1

3. Results and discussion

For the production of curd and the mozzarella cheese we used in our experiment standardized buffalo milk which contains 3.2% fat and compared it with the non-standardized buffalo milk which contains 7.95% fat and with milks pasteurized at 72^{o}C / 15 sec. Then we analyzed the physical and chemical properties of all 96 samples of milks and curds from standardized and non standardized buffalo's milk. The process of production curd milk begins when the heat reaches the temperature of 500 l up to 36^{o}C. Then we dismiss at Castaway culture 4gr milk / milk 100l - CHR-Ansen-Firma Type of culter FRC-75 Bacteri Mesophile 70% Lactobacillus bulgaricus 50 U (Junit) 5000 l Milk and 30% Bac.Thermophylus Lactococcus - Streptoccocus Thermophylus. Milk had pH = 6.4. After 15 minutes we dismiss o.6gr Castaway leaven + Ca 40% 1 ml / 10 l milk. Then we made exsiccation of coagulum Grain 15min, to

42 ° C. Chedderization of curds - to 20-24 ° C, pH = 5.2 - 5.3

This method for producing curds is used with both types of milk from three experiments and three samples for

each experiment, where each sample was analyzed for chemical and physical curds settings. From buffalo milk standardized to 3.2% fat and we have gained Curd context the one day and have the following results: pH = 5:20; ^{O}SH = 21.91; Fat% = 20.75; Protein% = 18.70; Solids% = 1:48; General N% = 4:25; General protein% = 26.48; SNF% = 24.43; Dry matter% = 43.81; % Fat in SNF = 47.36; Water% = 56.19. From buffalo milk with standardized fat we have gained 37.95% Curd and have a context the day and have the following results: pH = 5:17; ^{O}SH = 23:45; Fat% = 22:01; Protein% = 21:06; Solids% = 1:49; General N% = 4:45; General protein% = 27.00**;** SNF% = 26.98; Dry matter% = 48.99; % Fat in SNF = 44.92; Water% = 51.01.

Table 3: Physic chemical analysis of Buffalo curd produced from standardized milk with 3.2% of fat one (1) day

pH	5.20
^{o}SH	21.91
Fat %	20.75
Protein %	18.70
Solids %	1.48
General N %	4.25
General protein %	26.48
SNF %	24.43
Dry matter %	43.81
% Fat in SNF	47.36
Water %	56.19

Table 4: Physic chemical analysis of Buffalo curd produced from non standardized milk 7.95 one (1) days

pH	5.17
^{o}SH	23.45
Fat %	22.01
Protein %	21.06
Solids %	1.49
General N %	4.45
General protein %	27.00
SNF %	26.98
Dry matter %	48.99
% Fat in SNF	44.92
Water %	51.01

4. Statistical analysis

Statistical analyses were made to: % of general protein, % of SNF (soli – non –fat), % of Dry matter, % of fat in dry matter, % of water.

5. Conclusions

The main factor of the economic aspect for the manufacture of curds to produced mozzarella cheese is the standardization of milk with 3.2% fat.

Based on exploratory data for production of curds for Mozzarella cheese from standardized and non-standardized milk from buffalo's milk we can conclude that:

1.

- Buffalo milk is commercially viable for the manufacture of fat-based and SNF-based milk products, such as curds, cheese, butter, ghee and milk powders because of its lower water content and higher fat content and other components.
- Color in buffalo's milk is pure white and lacks the yellow pigment carotene.
- The smooth creamy texture of buffalo milk makes it ideal for many types of dairy product. The high levels of solids make processing very much more cost effective.
- Fresh milk mast is in the standard as regards to the number of microorganisms.
- For the maturity of the curd coagulant the pH must have the value 5.0 – 5.2.
- Fat percentage differentiation in between the non-standardized and standardized milk is big.
- The Fat in the non-standardized buffalo's milk is 7.95 % and in the standardized is 3.2 %.
- 3.2% fat = 100%;
- 7.95% fat = 100%;
- 7.95 % - 3.2 % = 4.75 % i.e. = 148.43 % of fat is more invested to produced curd for cheese mozzarella.

2.

- For the maturity of the curd coagulant the pH must have the value 5.1 – 5.17.
- Flavor of curds is mild, but can differ in taste depending on the process in which it was made. It has about the same firmness and density as cheese, but with a springy or rubbery texture.
- Fresh curds against the teeth when bitten into, a defining characteristic due to air trapped inside the porous material.
- After 12 hours, even under room temperature 20-24 ^{o}C can we preserve, cheese curds lose much of

their "fresh" characteristic, particularly the cheese mozzarella.

- The curds have a mild flavor and are sometimes somewhat salty, are naturally uncolored. The curds are usually yellow or orange, but it does not require the artificial coloring.
- Quality of the curd totally depends on the starter culture.
- Fermentation also develops the characteristic flavor and color of the product.
- In general stocking rates of curds from buffalo milk can be 10-20% higher than another milks.
- Buffalo curd produced from non-standardized milk with 7.95 % fat, has a higher nutritional value of: fat, proteins, minerals, dry matter.

- So the results of this particular examination are quite good.

3.

- With standardized milk 3.2 % of fat, we have had produced curd for mozzarella cheese with 20.75 % of fat.
- With non-standardized milk 7.95 % of fat, we have had produced curd for mozzarella cheese with 22.01 % fat.

- i.e. by 3.2% we have: 20.75% = 100 **%**
- i.e. by 7.95% we have: 22.01 % = 100 %
- Difference between the cheese is: 22.01 % - 20.75 % = 1.26 % of fat
- 148.43 % investment more % of fat from non-standardized milk and we have had curd with 6.07% more fat than from standardized milk.

4.

148.43 % : 6.07% = 24.45 times we have had invested more % of fat in mile, than we have produced curd with less % of fat.

5.

- It is not economic to produce curd for cheese mozzarella with non standardized milk.
- Because, we lose 148.43 % of fat, to produced 1kg of curd for produced cheese mozzarella.
- The amount of fat which cannot absorb curds, whey passes.

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