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The factors importance to economization produced cheese mozzarella from cow's milk

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SUMMARY: *Milk used for cheese making is normally standardized and heat treated. In some case, milk is homogenized. An acid – producing starter culture is then added.*
The standardization of milk has become necessary to ensure that the milk obtained from several producers or dairies is of a "standard" composition and condition throughout the year. This is critical in cheese making because the legal standards of various cheeses specify certain fat-to-protein rations. Though there are numerous cheese varieties, the manufacturing processes of most of them share several common steps. Variations at one or more steps during manufacture produce cheese of different textures and flavors.
This study is done to research the examinations for production of mozzarella cheese, after research and analyses of physical-chemical peculiar feature of milk. We have followed the processes from drying of cheese until preparing it for market, physical-chemical peculiar feature. We carried out three experiments for each milk-kind. For every experiment, we took three patterns and analyzed. Production of this sort of cheese, the application of producing technology and the supply of Kosova's trade market with mozzarella cheese produced from cow's milk is the objective of this presentation work research.

KEYWORDS: *Cow, milk, coagulum, cheese, whey, mozzarella*

I. INTRODUCTION

Milk is the only food for mammals, the baby in the first period to give milk containing lifetime. Material energy and building materials needed for the baby's growth. Contains antibodies that protect the baby from infections mammal. Milk is a complete food and cheaper to man - SAMPURNA AHAAR (complete feed). Milk contains many vitamins. Vitamins are organic substances that are found in very small concentrations in plants in the classroom. Among the most popular are: A and D, soluble in fat or fatty solvents and B_1, B_2, C soluble in water. The role of milk in nature is to nourish and provide immunological protection for the mammalian young (Maxhuni, 2013).

Few people are aware that raw milk is actually used as a medicine in the early last century. That's right. Milk directly from breasts was used as medicine to treat, and often cure some serious chronic diseases. From the time of Hippocrates until just after World War II, this "white blood" nourished and has recovered millions of people and cures (Dairy processing handbook, Lund, Sweden.Cheese is one of the first and most popular manufactured food products. What perhaps started out as an accidental curdling of milk has been further defined into cheese making. Over several thousand years, cheese making has advanced from an art to near science. Cheese varieties have proliferated to suit varied conditions and requirements, especially during the last decade or so. It is estimated that more than 2000 varieties exist (Olson, 1995), and the list may be growing.

Legend has it that mozzarella was first made when cheese curds accidentally fell into a pail of hot water in a cheese factory near Naples and soon thereafter the first pizza was made! Actually, new cheeses are often formulated when mistakes happen, so there well may be truth in the tale**.** This study is done to research the examinations for production of mozzarella cheese, after research and analyses of physical-chemical peculiar feature of milk.

In Italy, recently legislation has been introduced to restrict use of term "Mozzarella" only to those products exclusively made from buffalo milk (Cheese Rheology and Texture, M.Mehmet Ak. P.cm.@2003).
Cheese production has three steps: curd formation, curd treatment and curd ripening.
1. Curd important product of fermentative lactic acid bacteria. (Mozzarella di Bufala.org, 2006).
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.
Most buffalo milk mozzarella sold here is imported from Italy and SouthAmerica (Wikipedia®).

Mozzarella can be smoked, either in a smoking chamber with intense smoke or by "painting" with a liquid smoke. The curds can be mixed with fresh herbs or chili peppers before forming to flavor the mozzarella.

The possibilities and variations are endless (India Diry;Mozzarella di Bufala.org , Italian version Copyright 2006).
The perish ability of fresh mozzarella varies according to packaging. Vacuum sealing extends the shelf life dramatically, (Mozzarella Dallas Texas).

Work Material -Milk

For the production of Mozzarella Cheese we have used milk of the following breeds: autochthon Bufallo's in the dairy of the region of Fushë Kosova, in milk industry "Bylmeti". We carried out three experiments for each milk-kind. For every experiment, we took three patterns and analyzed the physical – chemical. The calculation was appraised statistically. We have followed the processes from drying of cheese until preparing it for market, physical-chemical peculiar feature.

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The calculation was appraised statistically. In fact, the best area to produce Mozzarella cheese Buffalo's non-standardized milk.

Work methods IT'S used fresh milk to produce cheeps of mozzarella-unpasteurized cows, buffalo's and goat's with these parameters. For physical-chemical peculiar feature of milk and mozzarella samples were used these methods:
1. For definition of pH value were used the ph-meter ISOLAB pH -111,
2. Soxhelt-Henkels method were used to define sour taste,
3. For Physical – chemical is utilized LACTOSCAN – D -90,
4**.** For definition of Nitrogen (N) were used the Kelda's method,
5. For definition of fat percentage % were use 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).
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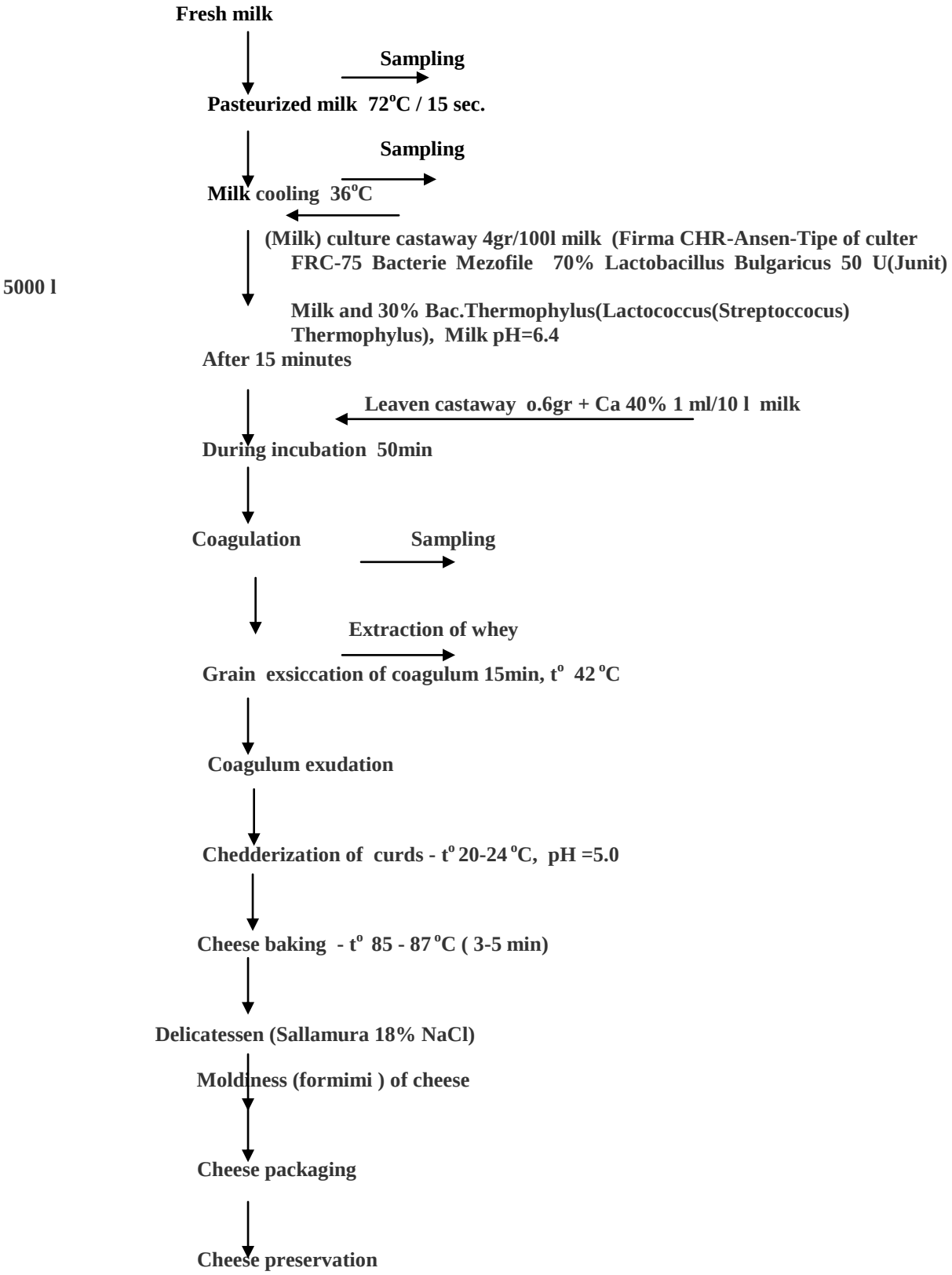
Table.1. Physico chemical analisys from cow milk non standardezed

pH	6.44
Acidities ^{o}SH	7.0
Temp. Sample	18.3
Fat %	4.10
SNF %	8.54
Density	1.02600
Protein%	3.48
Lactose%	4.51
Added Water%	0.41
Solids %	0.71
Freezing Point	- 0.540
Conductometria -mS/cm	4.57

Table.2. Physico chemical analisys from cow milk standardized

pH	6.42
^{o}SH	7.13 ^{0}SH
Temp Samlle	17 ^{0}C
Fat %	3.16
SNF %	9.50
Density	1.02919
Mate. Sec. %	10.11
Added Water %	0.00
Solids %	0.75
Freezing Point	-0.596 ^{0}C
Conduc. mS/cm	4.49

Diagram for production for mozzarella cheese



Percentage of Buffalo Cheese produced from standardized milk with 3.2% of fat
Table.3.

pH	**4.95**
°SH	**50.66**
Fat %	**19.36**
Materie such %	**68.53**
General N %	**2.17**
General proteine %	**39.37**
Solids (NaCl) %	**5.03**
SNF %	**29.81**
% Fat in SNF*	**10.41**
Water %	**31.47**

Table.4. Percentage of Buffalo Cheese produced from non standardized milk 30 days

pH	5.58
°SH	22.6
Fat %	22.00
Materie such %	53.50
General N %	2.72
General proteine %	26.21
Solids %	1.49
Ash %	2.11
SNF %	34.84
% Fat in SNF	41.10
Water %	46.49

*SNF (Solids – not – fat) = proteins, lactose, minerals, acids, enzymes, vitamins

Results and Discusion

Cheese made from buffalo milk displays typical body and textural characteristics. More specifically, where chewing and stringing properties are specially desired as in the case of Mozzarella cheese, buffalo milk is technologically preferable over cow milk. In Italy, recently legislation has been introduced to restrict use of term "Mozzarella" only to those products exclusively made from buffalo milk (without admixture with cow milk). Certain traditional cheese varieties, such as *pannier* in India or pickled cheeses from the Middle-East countries, are best made from buffalo milk.

Buffalo, a fresh, stringy textured cheese with porcelain-white color, it has an extremely thin rind and delicate taste. When cut, it produces a white watery fluid with the aroma of milk enzymes. Apart from its typical round shape, it is also produced in small bite-sized shapes and plaits. Unlike cow's milk there is no need to homogenize goat's milk. While the fat globules in cow's milk tend to separate to the surface. When individuals have sensitivity to cow's milk.

Cow' Cheese Vs. Buffalo's Cheese

More proteins: Animal bioassays have shown the Protein Efficiency Ratio (PER) value of buffalo milk proteins to be 2.74 and that of cow milk as 2.49. It will be seen that buffalo milk has about 11.42 per cent higher protein than cow milk. More important minerals: Buffalo milk is also superior to cow milk in terms of important minerals per cent respectively than those present in cow milk. More viable commercially: Buffalo milk is commercially more viable than cow milk for the manufacture of fat-based and SNF-based milk products, such as butter, ghee and milk powders because of its lower water content and higher fat content. Most significantly, the lower cholesterol value should make it more popular in the health conscious market. By the virtue of greater opacity of casein micelles, coupled with higher levels of colloidal proteins, calcium and phosphorus, buffalo milk is more densely white and has superior whitening properties as compared to cow milk. Therefore, unlike the cow milk (which is pale - creams yellow in color) and cow milk fat (which is golden yellow in color), buffalo milk is distinctively whiter. UHT- processed buffalo milk and cream are intrinsically whiter and more viscous than their cow milk counterparts, because of conversion of greater levels of calcium and phosphorus into the colloidal form. Buffalo milk is, therefore, more aptly suitable for the production of tea and coffee whiteners than cow milk. Higher innate levels of proteins and fat render buffalo milk a more economical alternative to cow milk for the production of casein, caseinates, whey protein concentrates and a wide range of the fat-rich dairy products

In general, the reconstitution behavior of dried milk products made from buffalo milk is indistinguishable from those made from cow milk. Cheese made from buffalo milk displays typical body and textural characteristics. More specifically, where chewing and stringing properties are specially desired as in the case of Mozzarella cheese, buffalo milk is technologically preferable over cow milk. In general stocking rates for buffalo milk can be 10-20% higher than for cattle. The richness of buffalo milk makes it highly suitable for processing. To produce 1 kg of cheese, a cheese maker requires 8.5 kg of cow's milk but only 5 kg of buffalo milk. To produce 1 kg of butter requires 14 kg of cow's milk but only 10 kg of buffalo milk. Because of these high yields, processors appreciate the value of buffalo milk. Buffalo cheese is pure white. Milk none standardized utilized for produced cheese: Buffalo's milk with average 7.32% fat, we have gained Buffalo's cheese mozzarella with average 24.5% fat. But by cow's milk with average 4.10 % fat, we have gained Cow's cheese mozzarella with average 22.0 % fat.

CONCLUSION

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

- Fresh milk mast is in the standard with number of microorganisms.
- For the maturity of the curd coagulant the pH must have the value 5.0 – 5.2.
- Color in buffalo's milk is pure white lacks the yellow pigment carotene, precursor for vitamin A, and it's whiteness is frequently used to differentiate it from cow's and goat's milk in the market. Despite the absence of carotene, the vitamin A content in buffalo milk is almost as high as that of cow's and goat's milk.

Buffalo prefer to graze a shorter sward to cattle and goat's, nearer to that for sheep, but in cow's and goat's milk the color is creamy.

- 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 when compared to cows and goat's milk. Color of milk is a blend of individual effects produced by:
- Colloidal calcium casein ate/phosphate particles and dispersed/emulsified fat globules, both of which scatter light.
- Carotene (to some extent xanthophylls), which imparts a yellowish color.
  The greater intake of green feed, results in deeper yellow color of cow milk.
- Larger fat globules and higher fat percentage also results in increased intensity of yellow color. Upon heating whiteness increases due to increased reflection of light by coagulate. Skim milk has a bluish and whey a greenish yellow color (due to presence of riboflavin), riboflavin (vitamin B_2) and potassium.
- Fat percentage differentiation in between the non-standardized and standardized milk is big.
- The Fat in buffalo's milk non standardized is 4.10 % and by standardized is 3.16 %.
- 3.16% fat = 100%;
- 4.10 % - 3.16 % = 0.94 % i.e. = 31 % of fat is more invested to produced mozzarella.

- With non standardized milk 4.10 % of fat, we have had produced cheese with 22.0 % fat.
- With standardized milk 3.16 % of fat, we have had produced cheese with 19.36 % of fat.
- Difference between the cheese is: 22.0 % - 19.36 % = 2.64 % of fat **So:**
- i.e. 19.36% = 100 **%**

22.0 % = 100
2.64 % = x

X = 264 : 22.0 = 12.0 %

- 31 % of fat we have more invested to produced cheese, and we have had produced cheese with 22.0 more fat i.e. 31 – 22 = 9.0 %
- We have had lose of fat: 111.67 %/kg.

- As is un economically to produced cheese with non standardized milk.
- Because, we lose 111.67 %/kg of fat, to produced 1kg of cheese mozzarella.

Based on exploratory data for production of Mozzarella cheese from un-standardized milk of three kinds of animals by this we can conclude that:

1.1. Fat percentage differentiation in between the non-standardized sort's milk is big, notably, the buffalo's comparing with cow's milk. Buffalo's fat percentage is double higher than the cow's milk. Normally the Fat in buffalo's milk (7.32 %) is higher than that of cows (4.10 %) milk.

The SNF - (Solids – not – fat = proteins, lactose, minerals) in buffalo's milk (9.50 %) is higher than that of cow's (8.54%) milk. Protein in buffalo milk (3.79%) is higher than that of cows (3.48%).

The Lactose in buffalo's milk (4.92 %) is higher than that of cow's (4.51 %) milk.

The Solids in buffalo's milk is higher than that of cows. The ^{o}SH in buffalo's milk is higher ($7.2^{o}SH$) than that of cow's is milk- *7.0* ^{o}SH.

The pH in cow's milk is higher (pH = 6.44 – 6.45) than that of buffalo's milk pH *6.21*.

Color in buffalo's milk is pure white lacks the yellow pigment carotene, precursor for vitamin A, and it's whiteness is frequently used to differentiate it from cow's milk in the market. Despite the absence of carotene, the vitamin A content in buffalo milk is almost as high as that of cow's milk.

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The greater intake of green feed, results in deeper yellow color of cow milk. Larger fat globules and higher fat percentage also results in increased intensity of yellow color. Upon heating whiteness increases due to increased reflection of light by coagulate. Skim milk has a bluish and whey a greenish yellow color (due to presence of riboflavin), riboflavin (vitamin B2) and potassium.

This can testify that *pH* has no any big alteration in between the coagulation and cheese of three sorts of milk, whilst acidity has an alteration from *2 – 3* ^{o}SH at the milk sorts. General N, Ash, Solids, has not any emphatic alteration. Total alteration of *SNF* is from *0 – 3%*. But it has alterations in between the sorts of milk that was produced coagulant and cheese.

In high restriction should be respected the *pH* of coagulation for production of Mozzarella cheese, the *pH* should be *5.0* (maximum *5.2*). This should be formerly designed with analyses at the laboratory, a part of coagulant should be tested at a dish with temperature according to given diagram for reaching maturity of coagulation of three milk sorts.

Furthermore the percentage alteration of dry matters and water are small (from *1-3%)* of cheese coagulation, because of daily produced cheese is fresh and could not have opportunity for cheese maturity. But there is alteration between sorts of milk for production of Mozzarella cheese, in between coagulation and cheese *1-3%* these difference is notably at sorts of buffalo milk.

For the maturity of the curd coagulant the pH must have the value 5.0.

The temperature must be raised with $2^{o}C$ more in order to fully ensure the pasteurization of the curd coagulan.

Fat percentage alteration in dry matter in between coagulation and cheese from three sorts of milk is not of great alteration (from *0 – 1 %*) that is as result of a daily production of fresh milk but this percentage differs between milk sorts (up to *1-3%*) on the favor of buffalo milk sorts.

Percentage alteration of casein in total between the coagulation and cheese is not any great alteration (*0, 5 – 1.5*), but there is changes in between the production of coagulation and cheese from different sorts of milk, notably between those of buffalos and cows is *3%* in the favor of buffalos milk.

Ash percentage has a change of *0.20%* between different sorts of milk that was cheese produced, but the percentage difference of coagulation and cheese approximately is *0.15%*.

Furthermore percentage alteration of solid between coagulation and cheese is up to *0.15%* and also between sorts of milk products is *0.23%* in favor of buffalo cheese.

Fat percentage in *SNF* it is not in big change *1.36%* between coagulation and cheese at the all sorts of milk, in between production of milk sorts is higher at buffalos *0.8%* in favor of the buffalo's milk products.

Counsel for practice- For the maturity

It is of greater importance that there is not of economic profitability to produce Mozzarella cheese from un-standardized milk.

It is of greater importance that we have not of economic profitability to produce cheese from un-standardized milk.
If we wish to produce cheese from Cow's milk with *4.1%* of fat, we will have cheese with *22%* of fat in cheese.
a). If we wish to produce cheese from Cow's milk with *3.2%* of fat, we will have cheese with *21%* of fat.
b). Percentage alteration of fat in cheese at un-standardized Cow's milk (*22%*) and standardized milk (*21%*) is *1%* more.
c). Percentage of un-standardized fat 22 %: 4.1% = 5.36 % more.
d). Standardized per centered of fat 21% : 3.2% = 6.56 % more.
e). Alteration between 6.56 : 5.36= 1.22 times more.
f). Standardized Cow's milk is 1.22 % more profitable then un-standardized milk
g). we have *1.22* % more percentage loss of fat in cheese with un-standardized milk.

Percentage loss of fat in whey of un-standardized cow's milk during the production process of mozzarella is 1.22*%.*

Meanwhile, percentage of fat in whey depends from standardized kind of milk which is from *0.50 – 75%* of fat. Though the results of this particular examination are quite good, we would recommend a temeprature raise of 2^{o}C, from 85 ^{o}C to 87 ^{o}C for a 2-3 minutes period of the pasteurization of the curd coagulant.

During the production of the mozzarella cheese we had at disposal the proper conditions, but the conditions in Kosova in general are not favorable for the production of this type of cheese with regard to the registered microbiological indicators of the fresh milk.

It is crucial that the Kosova government takes measures for enacting laws and drafting administrative regulations and instructions for creating good conditions for the farmers so that the milk has fewer microorganisms and meets the European standards.

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