

The Production of Mozzarella Cheese from Goat Curd

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Abstract

The quality of curd is of crucial importance when it comes to cheese production because it directly affects the quality of the final product. This research paper analyzes the financial benefits of producing curd from non-standardized goat milk with 4.44% fat. The Chemical examinations of the used curds adhered to international standards and methods. A total of three experiments were conducted in which for each individual experiment, 500 L of goat milk was used to produce curd that served as a base for the production of mozzarella cheese. Out of these experiments, 48 samples were taken from the milk that was used and another 48 samples were taken from the curd that was produced in order to further analyze and compare their chemical composition. We concluded that it is more financially profitable to use standardized milk with 3.2% fat for curd and cheese production, than using non-standardized milk with 4.44% fat for the same purpose.

Keywords: Milk, goat, curd-coagulum, non standardization, mozzarella

Introduction

Goat cheese is made the same way other cheeses are made by acidifying the milk with lactobacilli and rennet (or another acidifying agent) to form the curd. The curd is “cut” into smaller curds, warmed to contract them, then drained of the whey. The result after it is formed is called cheese. Different cheeses have different handling and bacteria added to form their distinctive flavors, textures, and shapes (Rosie Griffeth, Literary Writer, 2018).

Curd as in “curds and whey” is an early stage of the cheese-making process. We add lactobacillus culture to the milk to acidify it and leave it to set it into curds. Then we cut the curds. How small we cut them depends on the cheese we are making. Indeed, everything from the temperature of the milk to the strain of bacteria we add determines what the end result will be. Generally speaking, more bacteria (acidifying agents) plus time means firmer curds (Rosie Griffeth, Literary Writer, 2018).

Goat curd is a fresh lively goat's cheese. It has a mild, light and tangy flavor with a smooth, creamy finish that is nearly fluffy. Spread its fresh bread, use it in tarts or top on your favorite pasta dish; it is the perfect partner to both sweet and savory flavors (Cheese & Dairy Produce Results, 2008 and Sydney Royal Cheese & Dairy Produce Competition, 2008).

How to manufacture goat curd to produce mozzarella cheese

Processing steps of the curd's manufacturing:

1. Preparation of milk

The goat milk is heated up or pasteurized and placed in stainless steel vat, in which the other ingredients are mixed in 72°C / 15 sec.

The amount of culture or whey used in the processing of goat milk curd is much lower than that used for buffalo milk, which requires stronger acidification. The dose of freeze-dried culture is usually specified by the manufacturer; on the contrary, in case you use the whey culture you must add a suitable amount, generally not exceeding 1%, to get an optimal ripening time of the curd within 4 or 5 hours (Maxhuni, Shukri, 2012, Possibility of obtaining of the cheese: Mozzarella Cheese produced from cows, buffalo, and goats milk).



Fresh curd.

2. Coagulation process

First, you need to heat the milk up to 36-38 ° C and then you can add the rennet to it, making sure to mix it thoroughly in the mass. The dose of rennet must be suitable to obtain a compact curd approximately in 1 hr. Generally, with a rennet of title 1:10.000, the proportion may vary from 25 to 35 ml/hl according to the quality of the milk (milk culture castaway 4gr/100l milk (Firma CHR-Ansen-Type of culter FRC-75 Bacterie Mezofile 70% Lactobacillus Bulgaricus 50 U(Junit) 500 l milk and 30% Bac.Thermophylus(Lactococcus(Streptococcus) Thermophylus), Milk pH=6.4 ((Maxhuni, Shukri, 2012, Possibility of obtaining of the cheese: Mozzarella Cheese produced from cows, buffalo and goats milk).

The milk is incubated with a whey starter containing thermophilic bacteria. Then rennet is added to form the curds. The curds are heated in water or whey until they form strings (hence the term "string cheese") and become elastic in texture. The curds are stretched, kneaded until smooth, and then formed into round balls to make fresh mozzarella cheese (Maxhuni, Shukri, 2012, Possibility of obtaining of the cheese: Mozzarella Cheese produced from cows, buffalo and goats milk).

Curd to produce cheese starts 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 (Louisa Kamps, "Cheese Curds," NY Times, October 17, 2004.)

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 (Peggy Trowbridge Filippone, Fresh Mozzarella Cheese, 2019).

3. The breakage of the curd

The following steps are the breakage of the curd, which needs to continue until obtaining little lumps of hazelnut size, and then a resting phase of approx. 30 minutes to allow the curd to settle and to consolidate on the bottom of the vat.

4. Ripening of the curd

First, you need to remove the whey that lies on the curd. Later you must cut the curd into blocks with a side of approx. 30 cm and leave it to ripen immersed in the whey that still flows out of the mass. It is important that you make sure that its temperature does not drop below 32-34° C in order to avoid the slowdown of the bacterial activity.

The ripening of the curd must be kept under control through various pH measurements until reaching a pH value of 5.0 to 5.2 (pH of stretching), and / or performing the stretching test (Xochitl Garcia, March 4, 2016, Get Cheesy: Make Curds and Mozzarella, Science Friday).

Curd can be made in both traditional and industrial forms. Traditionally 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. Traditionally curd (buffalo curd is thicker and tastier and has a higher fat content than cow curd) is made from filtered and boiled buffalo milk. 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 (Louisa Kamps, "Cheese Curds," NY Times, October 17, 2004).

The curds can be mixed with fresh herbs or chili peppers before forming to flavor the mozzarella. The possibilities and variations are endless. The perishability of fresh mozzarella varies according to packaging. Vacuum sealing extends the shelf life dramatically (Xochitl Garcia, March 4, 2016, Get Cheesy: Make Curds and Mozzarella, Science Friday).

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 melded 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 (Gunasekaran Sundaram, M.Memet Ak. 2003, P.cm. Cheese Rheology and Texture).

Work Material Goat Milk

To production Curd for Mozzarella Cheese, we have used goat's no standardized milk with 4.44% fat in the dairy region of Fushë Kosova, in the 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 the market, physical-chemical peculiar feature.

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Work methods

For analyzing physical-chemical kinds of milk and cheese are used these international standard methods.

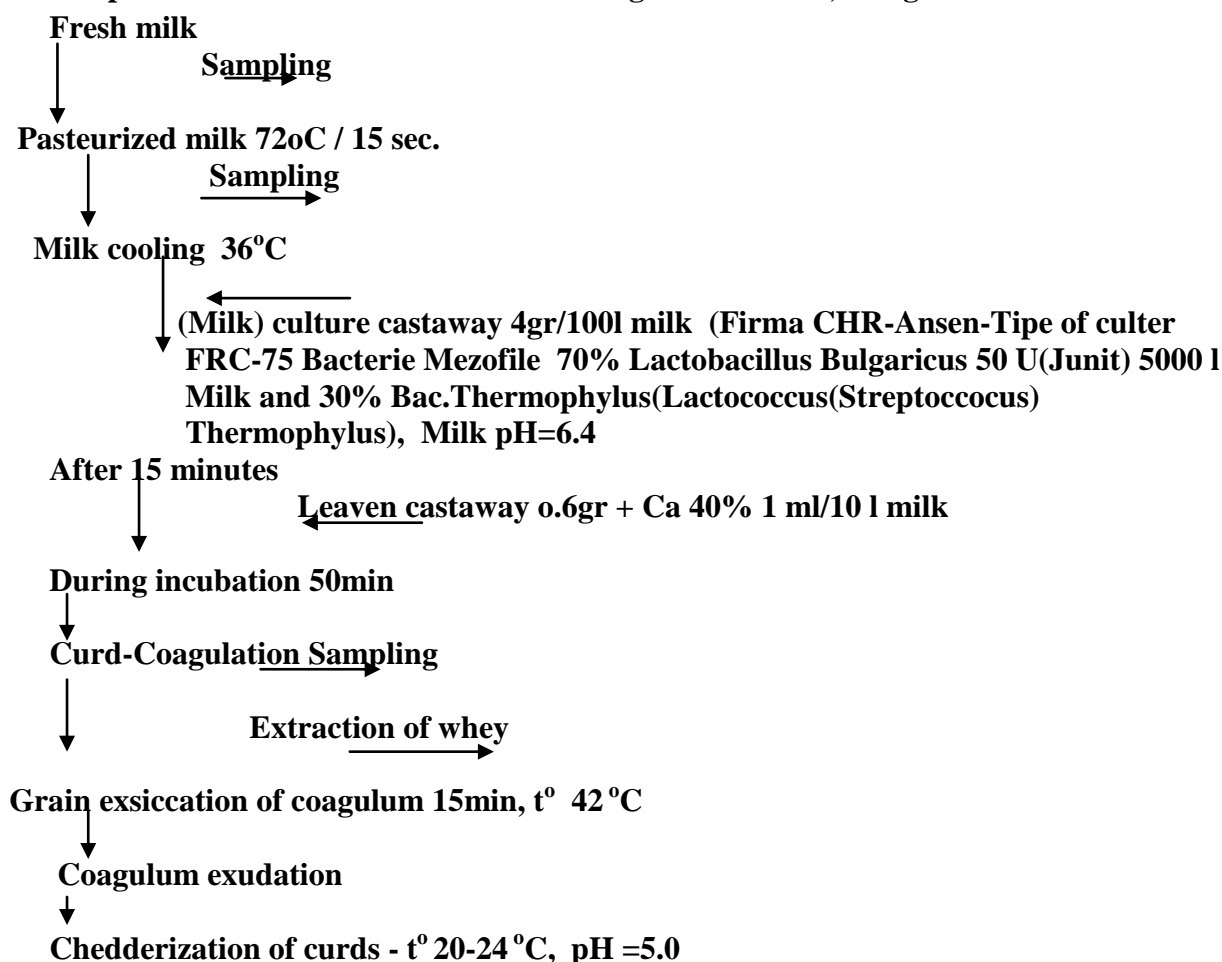
1. For the definition of pH value were used the pH-meter ISOLAB pH -111,
2. Soxhelt-Henkels method was used to define sour taste,
3. For Physical-chemicals utilized LACTOSCAN-D -90,
4. For the definition of Nitrogen (N) were used the Kelda's method,
5. For the definition of fat percentage % were using the method of Gerber,
6. for the definition of dry matters until drying up of constant mass,
7. Dry quantity of mass without fat has been done in a calculated way,
8. Percentage of fat at dry mass has been done in a calculated way,
9. Water quantity has been done in a calculated way,
10. for the definition of saline's (NaCl),
11. Ash%, (IDF Standard 17 A, 1972 & Manual of Methods of Analysis of Foods, Milk and milk products, 2005).

Average percentage from goats non standardized Milk

Table.1.

Parameters	ts Milk
	6.21
Acidities °SH	7.2 °SH
Temp. Sample	18.3 °C
Fat %	4.44 %
SNF %	8.54%
Density	1.02847
Protein%	3.47%
Lactose%	4.39 %
Added Water %	0.41 %
Solids %	0.69%
Freezing Point	- 0.515° C
Cond. mS/cm	5.58
Color in milk	Less Creamy
Texture in milk	Less smooth -
Taste in milk	Salty

Processing diagram of the production of mozzarella cheese from goat milk curd, using the Traditional method



(Maxhuni, Shukri, 2012, Possibility of obtaining of the cheese:

Mozzarella Cheese produced from cows, buffalo and goats

Average Goat's Curd-coagulum from non standardized milk

Table.2.

pH	6.17
°SH	18.43
Fat %	21.18
Materie such %	52.22
General N %	2.39
General protein %	25.27
Ash%	2.12
Solids %	1.43
SNF%	31.04
% Fat in SNF	41.06
Water %	47.78

Results and Discussion

Without quality curds, you cannot make a good cheese. While making your cheese curds, try to answer the following questions:

*How do differences in milk composition (fat, protein, and sugar) affect cheese curd formation?

*What components of milk end up in the cheese curds?

To test how milk composition affects curd formation, you could use milk from different animals, although it's sometimes hard to find a variety of animal milk types at the grocery store.

The fat content of milk affects curd formation. While fat plays a big role in the taste and consistency of the cheese, proteins also play a crucial role in cheese making. Both the curds and the whey contain proteins. In dairy milk, **casein** is a family of proteins that coagulate around lactose and fat in the milk and solidifies to form the cheese curds. So, why does casein solidify and produce curds while other proteins don't?

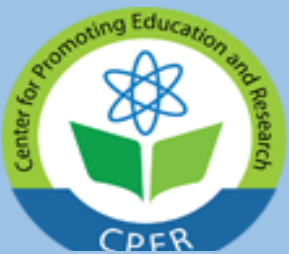
The process of starting production Curd milk begins to heat at a temperature 36°C for 500 l milk. Then we dismiss at Castaway culture 4gr milk / milk 100l-CHR-Ansen-Firma Type of culter FRC-75 Bacteri Mesophile 70% Lactobacillus bulgaricus 50 U (Junit) 5000 l Milk and 30% Bac.Thermophylus Lactococcus - Streptococcus Thermophylus. Milk had pH = 6.21. After 15 minutes we dismiss 0.6gr Castaway leaven + Ca 40% 1 ml / 10 l milk. Then we made exsiccation of coagulum Grain 15 min, to 42 ° C. Cheddarization of curds-to 20-24 ° C, with pH = 5.2 - 5.3.

This method for producing curds is used goat's milk from three experiments and three samples for each experiment, where each sample was analyzed chemical curds physical settings. From goats's milk unstandardized to 4.44% fat and we have gained Curd context the one day and have the following results: pH = 6,17; °SH = 18,43; Fat% = 21.18; Dry matter% = 52.22; General N% = 2,39; General protein% = 25.27; Ash=2.12%; SNF% = 31.04; Fat in SNF = 41.06; Water% = 47.78.

Conclusions:

* Goat curd is a fresh lively goat's cheese. It has a mild, light and tangy flavor with a smooth, creamy finish that is nearly fluffy.

* Curds are the solid bits you get when you separate the curds from the whey in milk (either through a souring process, and/or with rennet). It doesn't matter if the milk is from a goat, or a cow, or a sheep. The curds can be eaten as fresh cheese, or they can be processed further into other kinds of cheeses. The kind of cheese the curds eventually become depends on the processing (e.g., addition of bacteria, pressing, salting, etc.), and sometimes on the species of animal the milk came.



- * 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 und room temperature 20-24 °C can we preserve, cheese curds lose much of their "fresh" characteristic, particularly the mozzarella cheese.
- * Quality of the curd totally depends on the starter culture.
- * Fermentation also develops the characteristic flavor and color of the product.
- * So the results of this particular examination are quite good.
- * Though the results of this particular examination are quite good, we would recommend a temperature raise of 2°C, from 85 °C to 87 °C for a 2-3 minutes period of the pasteurization of the curd coagulant.

REFERENCES

1. Cheese & Dairy Produce Results, 2008 and Sydney Royal Cheese & Dairy Produce Competition, 2008.
2. Gunasekaran Sundaram, M. Mehmet Ak. 2003, P.cm. Cheese Rheology and Texture, ISBN 1-58716-02-8 (alk.paper), I.Ak.M. Mehmet. II. Title. Library of Congress Card Number 2002034861, @by CRC Press LLC.
3. IDF Standard 17 A, 1972.
4. Louisa Kamps, "Cheese Curds," NY Times, October 17, 2004.
5. Maxhuni I, Shukri, 2012, Possibility of obtaining of the cheese:
Mozzarella Cheese produced from cows, buffalo and goats milk.
Publisher: LAP Lambert Academic Publishing.
6. Maxhuni I, Shukri, Enkeleda Lamçe, Arber Sh. Maxhuni, Production of Curd, the Importance Indicator for Compared Buffalo's Milk Standardization with non – Standardized, *International Journal of Sciences: Basic and Applied Research (IJSBAR)* (2017) Volume 33, No 3, pp 164-173, ISSN 2307-4531(Print & Online), <http://gssrr.org/index.php?journal=JournalOfBasicAndApplied>.
7. Manual of Methods of Analysis of Foods (Milk and milk Products) (2050).
8. [Peggy Trowbridge Filippone](#), Fresh Mozzarella Cheese, **2019**.
9. [Rosie Griffeth](#), Literary Writer, **2018**.
10. Seraj, Shykh. "Buffalo Curd: Heritage of Bhola". The Daily Star. Retrieved 29 May 2015.
11. Xochitl Garcia, March 4, 2016, Get Cheesy: Make Curds and Mozzarella, Science Friday.