

Microbiological and chemical characterization of Cabacinha Cheese marketed in three municipalities in Vale do Jequitinhonha

Caracterização microbiológica e química do Queijo Cabacinha comercializado em três municípios do Vale do Jequitinhonha

Caracterización microbiológica y química del queso Cabacinha comercializado en tres municipios del Vale de Jequitinhonha

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Adair da Silva Santos Filho

ORCID: <https://orcid.org/0000-0003-0499-6784>

Universidade Federal de Minas Gerais, Brasil

E-mail: adairof@gmail.com

Christiano Vieira Pires

ORCID: <https://orcid.org/0000-0002-4182-0772>

Universidade Federal de São João del Rei, Brasil

E-mail: christiano@ufsj.edu.br

Andreia Marçal da Silva

ORCID: <https://orcid.org/0000-0003-3116-5070>

Universidade Federal de São João del Rei, Brasil

E-mail: amsilva@ufsj.edu.br

Luana Sousa Silva

ORCID: <https://orcid.org/0000-0002-9518-5911>

Universidade Federal de São João del Rei, Brasil

E-mail: luana.sousa@ufsj.edu.br

Maximiliano Soares Pinto

ORCID: <https://orcid.org/0000-0001-8933-491X>

Universidade Federal de Minas Gerais, Brasil

E-mail: maxonze@yahoo.com.br

Gustavo Leal Teixeira

ORCID: <https://orcid.org/0000-0001-7293-0790>

Universidade Federal de Minas Gerais, Brasil

E-mail: lealtex@gmail.com

Neide Judith Faria de Oliveira

ORCID: <https://orcid.org/0000-0003-0854-892X>

Universidade Federal de Minas Gerais, Brasil

E-mail: neideufmg@gmail.com

Abstract

Cabacinha cheese from Vale do Jequitinhonha is similar mozzarella, but in this milk is crude, being the product is stored at ambient without packaging. Besides it contributes to local income, customers may be food-poisoned. The objective of this study was to verify the physical-chemical and microbiological characteristics of samples of Cabacinha cheese produced and marketed in Vale do Jequitinhonha-MG. Samples were bought in tents (n=25), restaurants (n=4) and bakeries (n=2) located by BR 251 and BR 116 highways in the towns of Medina, Cachoeira de Pajeú and Pedra Azul. Cheeses from 17 marketplaces were purchased from the first town, 10 from the second and 4 from the third, respectively. The coliforms at 35°C, *Escherichia coli*, coagulase positive *Staphylococcus*, lactic acid bacteria, filamentous fungi and yeasts were 1.8×10^3 ; 1×10^1 ; 4.6×10^3 ; 6.3×10^7 and 4.9×10^6 Colony Forming Units per gram, respectively, and *Salmonella* spp. are absent. The chemical characteristics mean was 26.47% of protein, 27.69% of fat, 4.34% of minerals, 36.23% of moisture, 843.66 mg/100g of sodium and pH of 5.14. This is the first paper that describes microbiological and chemical characteristics of Cabacinha cheese from Vale do Jequitinhonha. The absence of regulations for microbiological parameters may put the health of consumers at risk.

Keywords: Artisanal cheese; Popular trade; Nutritional composition; Stirre-curd cheese.

Resumo

O queijo cabacinha do Vale do Jequitinhonha é parecido com a mussarela, porém é produzido a partir de leite cru, sendo o produto armazenado em temperatura ambiente. Esse derivado lácteo pode contribuir para a elevação da renda da população local, principalmente dos moradores das margens das rodovias, em função do grande fluxo de veículos e possíveis compradores. Estes podem adquirir doenças de origem alimentar ao ingerirem alimentos contaminados por causa das condições higiênico-sanitárias insatisfatórias. O objetivo deste estudo foi verificar as características físico-químicas e microbiológicas de amostras de queijo Cabacinha produzidos e comercializados no Vale do Jequitinhonha-MG. As amostras foram adquiridas em barracas (n = 25), restaurantes (n = 4) e padarias (n = 2) localizadas nas rodovias BR 251 e BR 116 nos municípios de Medina, Cachoeira de Pajeú e Pedra Azul. As

contagens médias de coliformes a 35 °C, *Escherichia coli*, *Staphylococcus* coagulase positivo, bactérias ácido-lácticas, fungos filamentosos e leveduras foram 1,8 x 10³; 1 x 10¹; 4,6 x 10³; 6,3 x 10⁷ e 4,9 x 10⁶ UFC/g, respectivamente, sendo ausente *Salmonella* spp. Os valores médios referentes às características químicas foram 26,47% de proteína, 27,69% de gordura, 4,34% de minerais, 36,23% de umidade, 843,66 mg/100g de sódio e 5,14 de pH. O estudo demonstrou a precariedade das estruturas físicas e conseqüentemente a falta de condições higiênico-sanitárias adequadas. Apesar desses problemas houve baixa contagem de coliformes a 35 °C e E. coli, quanto a *Staphylococcus coagulase* positivo, 80,64% dos queijos resultaram em contagens aceitas para a comercialização de Mussarela. O percentual de 48,38%, das amostras de Queijo Cabacinha, foi classificado como semigordo e de baixa umidade, o restante como gordo e média umidade.

Palavras-chave: Artesanal; Comercialização; Composição nutricional; Massa filada.

Resumen

O queijo Cabacinha de Vale do Jequitinhonha es similar a la mozzarella, sin embargo, se produce a partir de leche cruda y el producto se almacena a temperatura ambiente. Este derivado lácteo puede contribuir a incrementar los ingresos de la población local, especialmente de los vecinos de los márgenes de las carreteras, debido al gran flujo de vehículos y posibles compradores. Pueden contraer enfermedades transmitidas por los alimentos al ingerir alimentos contaminados debido a condiciones higiénico-sanitarias insatisfactorias. El objetivo de este estudio fue verificar las características físicas, químicas y microbiológicas del queso Cabacinha producidas y comercializadas en Vale do Jequitinhonha-MG. Las muestras se adquirieron en carpas (n = 25), restaurantes (n = 4) y panaderías (n = 2) ubicadas en las carreteras BR 251 y BR 116 en los municipios de Medina, Cachoeira de Pajeú y Pedra Azul. Los recuentos promedio de coliformes a 35 °C, *Escherichia coli*, *Staphylococcus* coagulasa positiva, bacterias del ácido láctico, hongos filamentosos y levaduras fueron 1.8 x 10³; 1 x 10¹; 4,6 x 10³; 6,3 x 10⁷ y 4,9 x 10⁶ UFC / g, respectivamente, con *Salmonella* spp. Los valores medios de las características químicas fueron 26,47% de proteína, 27,69% de grasa, 4,34% de minerales, 36,23% de el humedad, 843,66 mg / 100 g de sodio y 5,14 de pH. . El estudio demostró la precariedad de las estructuras físicas y, en consecuencia, la falta de condiciones higiénico-sanitarias adecuadas. A pesar de estos problemas, hubo un recuento bajo de coliformes a 35 °C y E. coli, en cuanto a *Staphylococcus* coagulasa positivo, el 80,64% de los quesos resultó en recuentos aceptados para la comercialización de Mozzarella. El porcentaje de 48,38% de las muestras de queso

Cabacinha se clasificó como semigraso y de baja humedad, el resto como graso y de humedad media.

Palabra clave: Artesanal; Comercialización; Composición nutricional; Pastelería filamento.

1. Introduction

The top three most produced cheeses in Brazil are Prato, Mozzarella and Minas, all manufactured in dairy product industries or by small rural producers. These often make use of unpasteurized milk and have inappropriate manufacturing practices that can bring contamination from deterioration and pathogen micro-organisms (Rezende et al., 2010; Fernandes et al., 2011; Apolinário et al., 2014).

The production of raw-milk-handmade cheese is associated to the Slow Food Movement that is supported by National Institute of Brazilian Historical Heritage (*IPHAN*) with Minas Gerais being its main producing state in the country. Minas Gerais Institute of Agriculture (*IMA*), has identified the areas of Serro, Araxá, Alto Paranaíba, Canastra, Cerrado, Campo das Vertentes, Triângulo Mineiro, Serra do Salitre, Alagoa, Vale do Suaçui and Vale do Jequitinhonha as the most important cheese producers in the state (Minas Gerais, 2012, 2014). All these zones are defined as Minas Artisanal Cheese producers, except Alagoa, Vale do Suaçui and Vale do Jequitinhonha that produce Cabacinha (Calabash) cheese (Fernandes et al., 2011). Cabacinha has as manufacturing steps milk filtration, rennet coagulation addition, cutting, mixing and heating mass, stirring the curd, determination of stirring point, serum discard, curd fermentation until stretching point, curd stretching, hand molding, salting in brine and drying (Minas Gerais, 2012).

Local artisanal direct marketing of cheese positively increases the income of small farmers, although it is impossible to point the exact monetary impact from official statistics. It's marketing however is more significant for producers who cannot sell it to the dairy industry (Silva et al., 2011). Cabacinha cheese from Vale do Jequitinhonha is generally sold outdoors as vendors hung them unpacked on strings that are strapped to tents that don't fully protect them from heat or sunlight, usually by highways. Such factors may enable access of vectors of contamination which can compromise the sanitary quality of the product (Santos Filho et al., 2016).

As a consequence of the lack of hygiene that is associated to the market of Cabacinha cheese that is sold by highways (Santos Filho et al., 2016), food-poisoning is likely to happen to travelers from some regions of the country. To avoid food-poisoning outbreaks and/or food

infection, IMA in one of its ordinances determines that raw-milk cheese maturation should take at least 60 days (Minas Gerais, 2013), even though the reduced dimensions of this type of cheese are incompatible with maturation for this long (Fernandes et al., 2011). As there is a scarce number of researches related to Cabacinha cheese and an absence of official regulations for its microbiological parameters, the aim of this study is to analyze microbiological and chemical characteristics of the Cabacinha cheese that is marketed in Vale do Jequitinhonha.

2. Material and methods

The research was based on guidance from Pereira et al. (2018).

In January 2016, in Médio Jequitinhonha that is located around the central part of Vale do Jequitinhonha, Minas Gerais, Brazil, Cabacinha cheese marketplaces were prospected. After identifying each marketplace in the whole area, the ones chosen for analysis were those from the municipalities of Medina (n=17), Cachoeira de Pajeú (n=10) and Pedra Azul (n=4), totalizing 31 marketplaces. Cabacinha cheeses were collected from 25 tents, 4 restaurants and 2 bakeries. From the ones exposed to sale, a couple of cheeses were randomly chosen and bought to be analyzed - that was the research's sampling unit.

The purchased cheeses were put in unused Poly Nylon plastic containers, packed in isothermal boxes filled with recyclable ice and then transported to the Microbiological food-analysis laboratory of UFMG, Campus Montes Claros and to the food-analysis laboratory from the department of food engineering of UFSJ - both from the state of Minas Gerais, Brazil.

For each sample, Coliforms at 35°C and *Escherichia coli* counting was performed by the PetrifilmTM(EC) method. The positive coagulase *Staphylococcus*, lactic acid bacteria, filamentous fungi, yeasts counts and the presence of *Salmonella* spp. were verified according the methodologies described by Silva et al. (2010). Chemical analyzes of protein, fat, minerals, moisture, sodium and pH were also performed (Zenebon et al., 2008) and data was processed with Microsoft Excel[®] (2007).

3. Results and Discussion

The major counts of Coliforms at 35°C occurred in cheeses from Medina and Pedra Azul (Tab. 1) as 58,82% of samples with lesser index value than 10 CFU/g were found in

Medina and 75.00% in Pedra Azul. Those samples reduced index average and collaborated for the lowest variation coefficient. Cabacinha cheeses from these municipalities are the most homogeneous of all, even if considered high variation in weighted average. This evidence characterizes unstandardized manufacturing as all of them were not produced neither in industries, nor by the same family group or person.

Table 1. Microbiological parameters of Cabacinha cheese marketed in different municipalities of Vale do Jequitinhonha.

Microbiological Parameters	Town	Average	** V. C.	Minimum	Maximum
Coliforms at 35 °C (UFC/g*)	Medina	2.9 x 10 ³	225.50	<1.0 x 10 ¹	2.0 x 10 ⁴
	C. de Pajeú	1.3 x 10 ²	217.28	<1.0 x 10 ¹	9.3 x 10 ²
	P. Azul	1.4 x 10 ³	198.55	<1.0 x 10 ¹	5.5 x 10 ³
Average		1.8 x 10 ³	276.31	<1.0 x 10 ¹	2.0 x 10 ⁴
<i>Escherichia coli</i> (CFU/g*)	Medina	1.0 x 10 ¹	0	<1.0 x 10 ¹	1.0 x 10 ¹
	C. de Pajeú	1.0 x 10 ¹	0	<1.0 x 10 ¹	<1.0 x 10 ¹
	P. Azul	1.0 x 10 ¹	0	<1.0 x 10 ¹	<1.0 x 10 ¹
Average		1.0 x 10 ¹	0	<1.0 x 10 ¹	1.0 x 10 ¹
Coagulase positive <i>Staphylococcus</i> (CFU/g*)	Medina	3.3 x 10 ³	292.44	<1.0 x 10 ¹	4.0 x 10 ⁴
	C. de Pajeú	8.9 x 10 ²	243.75	<1.0 x 10 ¹	7.0 x 10 ³
	P. Azul	1.9 x 10 ⁴	199.62	<1.0 x 10 ¹	7.8 x 10 ⁴
Average		4.6 x 10 ³	333.97	<1.0 x 10 ¹	7.8 x 10 ⁴
Lactic Acid Bacteria (CFU/g*)	Medina	7.0 X 10 ⁷	125.62	5.5 X 10 ⁵	>2.5 X 10 ⁸
	C. de Pajeú	3.7 X 10 ⁷	202.83	2.5 X 10 ⁵	>2.5 X 10 ⁸
	P. Azul	9.7 X 10 ⁷	112.11	9.9 X 10 ⁶	2.4 X 10 ⁸
Average		6.3 X 10 ⁷	136.93	2.5 X 10 ⁵	>2.5 X 10 ⁸
Filamentous Fungi (CFU/g*)	Medina	2.2 x 10 ⁶	37.58	1.2 x 10 ⁵	>2.5 x 10 ⁶
	C. de Pajeú	6.8 X 10 ⁶	147.2	1.0 X 10 ⁵	>2.5 X 10 ⁷
	P. Azul	1.1 X 10 ⁷	96.77	2.0 X 10 ⁶	>2.5 X 10 ⁷
Average		4.9 X 10 ⁶	151.71	1.0 X 10 ⁵	>2.5 X 10 ⁷
<i>Salmonella</i> spp. (25g)	Medina				
	C. de Pajeú				
	P. Azul			Absent	

Note: * CFU/g - Colony Forming Units per gram from sample. C. de Pajeú – Cachoeira de Pajeú ** V.C.- Variation Coefficient
 Fonte: Autores.

The results from these cheese analyses were different from those related by Silva et al. (2012), as the minimum coliforms count of at 35°C in Cabacinha cheeses were lower than 10 CFU/g and at maximum 2×10^4 CFU/g (Tab. 1). With Coalho cheese which is prepared with raw milk in the Northeast region of Brazil, the lowest value was 2.82×10^2 and the highest 1.09×10^3 Most Probable Number per gram (MPN/g). The percentage of Cabacinha cheeses with counts that reached less than 1×10^3 CFU/g corresponded to 87.10% - a substantial figure if compared to Apolinário et al. (2014) research that showed that 22.58% of samples from Minas Frescal cheese produced by dairy industries from Minas Gerais possessed this characteristic. Similar results those from the Cabacinha cheeses analyzed were presented by Buzi et al. (2009), as 84.00% of Mozzarella cheeses produced with buffalo milk were within this standard. From all samples analyzed, only one showed a count of *E. coli* equals to 1×10^1 CFU/g, being the other less than 10 CFU/g. This minimal contamination level may have been influenced by curd stretching, as water with a temperature that is higher than 85°C is used for about 15 minutes to facilitate the shaping of raw material into the form of a calabash. Similar results were described by Spano et al. (2003), as a consequence of curd stretching of mozzarella cheese at 80°C for five minutes - this process was effective in controlling the development and emergence of *E. coli* strains. The lower countings from Medina, Cachoeira de Pajeú and Pedra Azul (Tab. 1), were analogous to the results presented by Seixas et al. (2014) with the Marajó Tipo Creme cheese, that presents *E. coli* counting lower than 1×10^1 CFU/g in 100,00% of the samples obtained during rainy season. According to Raimundo et al. (2013) the exposure of cheese curd to temperatures above 80°C makes small contamination by *E. coli* possible. In Minas Frescal cheese analysis Santos & Hoffmann (2010) identified *E. coli* averages from 6.6×10^1 and 5.8×10^1 CFU/g, respectively soon after fabrication and five days after that date, possibly because it is manufactured with unheated curd.

For coagulase-positive *Staphylococcus*, 80% of cheeses presented less than 1×10^3 CFU/g (Tab. 1). The binomial time and temperature may have contributed to this low count considering the precarious hygienic-sanitary conditions of the marketplaces described by Santos Filho et al. (2016). As there are still no regulations for Cabacinha cheese market, comparisons were made according the requirements for Mozzarella cheese as a result of similarities of production. The percentage of cheeses with coagulase positive *Staphylococcus* counting lower than 1×10^3 CFU/g in Vale do Jequitinhonha was comparable to the 81,80% identified by Seixas et al. (2014) in Marajó Tipo Creme cheese during rainy season. This outcome probably occurred because in both cases, curd was inserted into hot water. Rezende

et al. (2010) found coagulase positive higher than 1×10^3 CFU/g in 23 Minas Artisanal cheeses from traditional markets of Uberlândia, Minas Gerais. The absence of curd stretching in cheeses can provide contamination by this micro-organism.

Cabacinha cheese analysis resulted in high counts of lactic acid bacteria (Tab. 1), as all results were above 1×10^5 CFU/g e 67.74% and concentrations above 1×10^7 CFU/g. Heat treatment of milk interferes in development of these micro-organisms after pasteurization as Marques et al. (2011) added some cultures to milk and obtained cheeses with lactic acid bacteria counts between 1×10^7 and 1×10^8 CFU/g.

Levels of filamentous fungi and yeasts above 1×10^6 CFU/g in Cabacinha cheese from Vale do Jequitinhonha were considered high (Tab. 1). According to Lara et al. (2016) contamination happened possibly by virtue of outdoor exposure. With grated Parmesan cheese Trombete et al. (2012) reported the maximum count of 3.0×10^5 CFU/g, as 16.70% of the samples were inappropriate to consumption. According to Sá (2012), Parmesan cheese contamination may have occurred as a result of unsuitable handling and packaging, resulting in possible production of toxins.

These are the first results of microbiological analysis of Cabacinha cheese described in the literature. Despite *E. coli* low contamination, there is a need for regulation to avoid potential risks to consumers as contamination by coagulase positive *Staphylococcus*, filamentous fungi and yeasts was found in several samples.

The protein percentage average of 26.47% in Cabacinha Cheese (Tab. 2) exceeded the 21.00% level found in Corradini et al. (2013) in mozzarella cheese made from dairy-cow's milk by cows that were fed with three different diets. It also exceeded the level of 20.00% displayed by Seixas et al. (2014) with Marajó cream cheese. The high protein levels of Cabacinha cheese may have occurred due to the specific conditions of its' outdoor exposure, as verified by Santos Filho et al. (2016). These factors may facilitate loss of moisture and concentration of other constituents. According Ribas et al. (2015) there is little variation in milk protein concentration. Another influence on protein levels could be the time span between manufacturing and marketing which facilitates water loss to the environment - as a close value to Cabacinha Cheese was appearing in Silva et al. (2011) in Minas Artisanal Canastra matured cheese - 23.90%. Seixas et al. (2015) also identified an average of 25.17% of protein in Marajó tipo manteiga cheese. This type of cheese presented the closest protein average to Cabacinha cheese, but according to the authors it is produced with buffalo milk, which has higher protein content and cooked curd, resulting in nutrients concentration.

Table 2. Chemical parameters of Cabacinha cheese marketed in different municipalities of Vale do Jequitinhonha

Chemical parameters	Town	Average	** V. C.	Minimum	Maximum
Protein (%)	Medina	24.23	18.88	18.49	33.61
	C. de Pajeú	28.34	7.90	25.04	32.74
	P. Azul	31.27	11.50	26.31	33.03
Average		26.47	17.33	18.49	33.03
Fat (%)	Medina	28.06	11.33	20.75	33.50
	C. de Pajeú	27.42	19.93	15.00	33.30
	P. Azul	26.81	16.28	20.75	30.00
Average		27.69	14.65	15.00	33.50
Minerals (%)	Medina	4.44	14.51	3.10	5.74
	C. de Pajeú	4.02	24.58	2.79	6.26
	P. Azul	4.70	14.28	3.98	5.44
Average		4.34	18.11	2.79	6.26
Moisture (%)	Medina	35.55	12.18	27.24	43.16
	C. de Pajeú	37.37	12.52	26.17	42.25
	P. Azul	36.25	8.47	32.19	39.45
Average		36.23	11.78	26.17	43.16
Sodium (mg/100g)	Medina	910.66	28.03	590.96	1580.00
	C. de Pajeú	759.83	65.36	431.21	2100.24
	P. Azul	768.52	52.21	430.39	1343.90
Average		843.66	42.82	430.39	2100.24
pH	Medina	5.13	7.14	4.56	5.83
	C. de Pajeú	5.16	3.74	4.87	5.44
	P. Azul	5.13	1.94	5.02	5.26
Average		5.14	5.64	4.56	5.83

Note: C. de Pajeú – Cachoeira de Pajeú ** V.C.- Variation Coefficient
 Fonte: Autores.

The 27.69% of fats (Tab. 2) found in Cabacinha cheese from Vale do Jequitinhonha surpassed the results of 22.33% and 25.00% from Marajó Tipo Manteiga and mozzarella presented by Seixas et al. (2015) and Corradini et al. (2013), respectively. The higher fat

content of Cabacinha cheese analyzed can possibly be related to the season it was made as Ribas et al. (2015), states that dairy cows usually consume better-quality forage during summer. These hypothesis is reinforced by Seixas et al. (2014) as it is stated that during the rainy season fat concentration of Marajó Tipo Creme cheese was 38.05%, while in dry season the value observed was 33.98%. Another possibility for the high amount of fat in Cabacinha cheese is its extended shelf life, as Silva et al. (2011) spotted 28.15% with Minas Artisanal Canastra matured cheese.

The mineral average of 4.34% (Tab. 2) of Medina, Cachoeira de Pajeú and Pedra Azul Cabacinha cheeses exceeded the 1.60; 2.53 and 3.00% identified in Marajó Tipo Creme cheese, Marajó Tipo Manteiga cheese and Mozzarella described by Seixas et al. (2014), Seixas et al. (2015) and Corradini et al. (2013), respectively. Mineral concentration levels that were closer to those from Cabacinha were found by Chiesa et al. (2011), 3.81 in low-fat Mozzarella. Possibly the greater amount of minerals found in Cabacinha cheeses is a consequence of nutrients' concentration as a result of the loss of moisture, as it is not packed and has a high sodium content according to Silva & Ferreira (2010).

The average of 36.23% in moisture concentration of Cabacinha cheese (Tab. 2) was lower than the 48.00% obtained with commercial low-fat Mozzarella (Chiesa et al., 2011), 50.00% in Marajó Tipo Manteiga cheese (Seixas et al., 2015) and 45.00% with Mozzarella (Corradini et al., 2013). From the analyzed data, the types of cheese with the closest amount of moisture to Cabacinha were Minas Artisanal Canastra matured cheese with 43.63% (Silva et al., 2011) and Marajó Tipo Creme cheese at the dry season, with 41.00% (Seixas et al., 2014). The low levels of humidity from samples Cabacinha cheese collected are probably due to the absence of packaging and its exposure to high environmental temperatures, according to Silva et al. (2011).

The estimated amount of sodium - 843.66 mg in 100 g in Cabacinha cheese (Tab. 2) was superior to that from studies carried out by Silva and Ferreira (2010) which identified 289.00 mg/100g in Minas Frescal cheese, 277.00 mg/100g in fat reduced Minas Frescal cheese and 246.00 mg/100g in Ricotta cheese. This value was however, lower than 1281.50 mg/100g from Marajó Tipo Creme Cheese quantified by Figueiredo et al. (2011). Probably, Cabacinha cheese has a high amount of sodium as a consequence of the lack of standardization of portions of salt added, what does not happen in the dairy industry according to Silva & Ferreira (2010). Standardization is not a common practice when it comes to homemade products (Figueiredo et al., 2011), besides, Rodrigues et al. (2014) have found a high sodium value, 630.00 mg/100g, in Mozzarella cheese from dairy industries.

The 5.14 pH value of Cabacinha cheese (Tab. 2) was lower than 5.27 and 5.59 from Marajó Tipo Manteiga cheese (Seixas et al., 2015) in rainy and dry seasons, respectively, and 5.54 to 5.62 in Mozzarella presented by Coelho et al. (2014). However, it was greater than 4.90 from grated Parmesan cheese (Trombete et al., 2012) and 4.89 in Marajó Tipo Creme cheese (Seixas et al., 2014). The analyzed Cabacinha cheese pH was lower than the results found by Seixas et al. (2015) and Coelho et al. (2014), possibly because it contains a higher quantity of micro-organisms that are capable to convert lactose into lactic acid, as described by Marques et al. (2011) with samples from other types of cheeses.

Cabacinha cheese showed low counts of coliforms at 35°C and *E. coli*. what indicates the possible elimination of certain micro-organisms during the process of curd stretching. Coagulase positive *Staphylococcus* have resulted in scores that are acceptable for the marketing of mozzarella in 80.64% of the samples. High amounts of lactic acid bacteria, fungi and yeasts were found possibly related to the absence of packaging and marketing conditions. In no sample *Salmonella* spp was present.

4. Final Considerations

Due to of contamination by coagulase positive *Staphylococcus*, filamentous fungi and yeasts in several samples, regulation is mandatory to avoid potential risks to consumers.

Based on its chemical composition, 48.38% of Cabacinha cheeses were classified as medium fat and the rest of them as fat. Regarding classification by moisture, 48.38% of these cheeses were considered of low humidity, while the others of medium moisture.

This is the first paper that describes microbiological and chemical characteristics of Cabacinha cheeses from Vale do Jequitinhonha and the absence of official regulations for its microbiological parameters can be a risk to consumers.

Further studies are suggested in order to monitor Cabacinha cheeses.

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Percentage of contribution of each author in the manuscript

Adair da Silva Santos Filho - 30%

Christiano Vieira Pires - 15 %

Andreia Marçal da Silva - 8 %

Luana Sousa Silva - 11 %

Maximiliano Soares Pinto - 8 %

Gustavo Leal Teixeira - 8 %

Neide Judith Faria de Oliveira - 20 %