

## **Elaboration of an unfermented dairy beverage from sheep's milk whey**

### **Elaboração de uma bebida láctea não fermentada a partir de soro de leite de ovelha**

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#### **ABSTRACT**

Sheep whey is a by-product of cheese production, rich in compounds with high added value, such as proteins and free amino-acids. Sheep's milk and, consequently, its whey, have higher levels of solids, such as proteins, being nutritionally richer than cow's milk.

The objective of this paper is to develop a drink composed of passion fruit juice and sheep milk whey, with the purpose of being a sweet drink with outstanding nutritional properties, in addition to adding value to the by-product of sheep cheese factories, which so far does not have industrial use. The formulation was developed with passion fruit juice and sheep milk whey. The microbiological and physicochemical results of the sample were satisfactory. The formulation pleased the consumer and showed positive results, highlighting the flavor (7.02 and viscosity (7.18). The global assessment, this formulation had an average of 7.46 and buy intention of 3.82. The results obtained in this study may help sheep milk producers as well as dairy industries, as an alternative to use sheep milk whey that is currently utilized for animal feed.

**Keywords:** Whey, Sheep, Sustainability, Use of by-products.

## RESUMO

O soro de leite de ovelha é um subproduto da produção de queijo, rico em compostos de alto valor acrescentado, tais como proteínas e amino-ácidos livres. O leite de ovelha e, conseqüentemente, o seu soro de leite, têm níveis mais elevados de sólidos, tais como proteínas, sendo nutricionalmente mais ricos do que o leite de vaca. O objectivo deste artigo é desenvolver uma bebida composta por sumo de maracujá e soro de leite de ovelha, com o propósito de ser uma bebida doce com propriedades nutricionais excepcionais, além de acrescentar valor ao subproduto das fábricas de queijo de ovelha, que até agora não tem uso industrial. A formulação foi desenvolvida com sumo de maracujá e soro de leite de ovelha. Os resultados microbiológicos e físico-químicos da amostra foram satisfatórios. A formulação agradou ao consumidor e mostrou resultados positivos, destacando o sabor (7,02 e viscosidade (7,18). A avaliação global, esta formulação teve uma média de 7,46 e a intenção de compra de 3,82. Os resultados obtidos neste estudo podem ajudar os produtores de leite de ovelha, bem como as indústrias leiteiras, como alternativa à utilização do soro de leite de ovelha que é actualmente utilizado para a alimentação animal.

**Palavras-chave:** Soro de leite, Ovinos, Sustentabilidade, Utilização de subprodutos.

## 1 INTRODUCTION

The first sheep with dairy aptitude were brought to Brazil in 1992. The first breed introduced was the Lacaune, originally from France, which is currently well adapted to the climate and feeding conditions of southern Brazil. A female can produce 4.5 liters of milk/day at the peak of lactation, which occurs around 30 days postpartum, with the lactation period lasting approximately 150 days (BRITO, 2006). Sheep's milk differs from other species especially for the richness of its constituents. This has higher levels of fat, proteins and minerals, especially calcium, compared to cow or goat milk, which gives it better industrial yield, reaching 20-25%, requiring only 4-5 liters of milk. Sheep for the production of 1 kg of cheese (PELLEGRINI, 2012). These contents may vary depending on the animal's diet, breed, health and season.

Whey is generated in the production of cheese, which is the main by-product of the dairy industry, also has great polluting potential due to the high content of organic matter present (VILAR, 2009). Medium and small dairy products industries consider sheep whey a waste, and usually incorporated in effluent treatment plants, discarded into watercourses or destined for animal feed (LEIDENS, 2013). Improper disposal of whey is a serious problem, because it can pollute waterways and cause negative damage to the environment (DA SILVA; DE SIQUEIRA; NOGUEIRA, 2018).

Thus, there is a need to seek an alternative to use the sheep whey. Currently, cow's whey has several applications, such as the production of dairy drink, ricotta, whey powder, whey protein concentrate, among others (BERNARDI, 2020), but few alternatives have been presented for the sheep whey.

Sheep dairies generate a large amount of whey, which can be sweet or sour. Sweet whey can be used to make a dairy drink, but acid whey has not been reused in the food industry so far. Justifying its potential use in the development of new products. The use of whey is a way to increase the profitability and competitiveness of dairy products, adding value to the by-product, enabling the generation of profits (GOMES; PENNA, 2009).

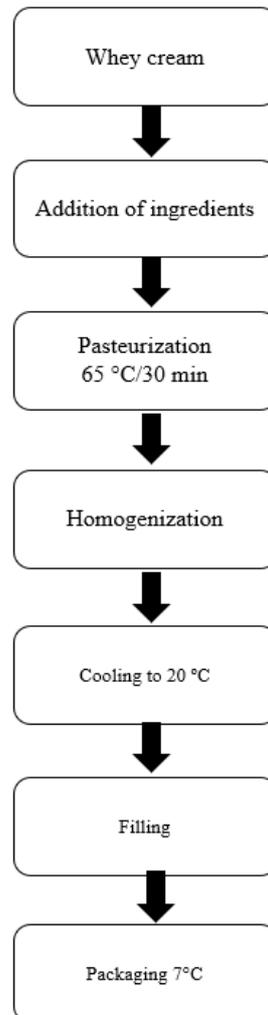
Cheese whey is defined as a by-product obtained in the manufacture of cheese, this by-product contains 5–9% dry matter which represents an average of 43–50% of the solids present in milk, almost all lactose, 20% of proteins and high concentrations of essential amino acids, minerals and vitamins (TRIBST et al., 2020). One possible use of whey is the preparation of fermented and non-fermented beverages and associated with them the addition of fruit juice, which are widely used in the manufacture of beverages today. The objective of the paper is to develop a passion fruit flavored sheep whey drink, in order to present an application for the acid sheep whey that so far is not used in the food industry.

These aspects relate to the goals of Objectives 2 and 9 of the UN 2030 Agenda. Goal 2, which is to end hunger, achieve food security and improve nutrition, and promote sustainable agriculture, has the goal related to this study to ensure sustainable food production systems. Goal 9, which is to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation, it has two goals related to this study: facilitating the development of sustainable infrastructure in developing countries, strengthening scientific research and improving the technological capabilities of industrial sectors in all countries, particularly in developing countries (AGENDA 2030).

## 2 MATERIAL AND METHODS

The acid whey from Lacaune sheep cheese was obtained in a small farm after the production of Pecorino cheese and processed as shown in Figure 1.

Figure 1. Stages of the process of elaboration of the passion fruit flavored sheep's cheese whey drink.



The acid cheese whey with pH 4.2 was initially heated to 36 °C for the creaming process. Whole and skimmed whey were characterized as to their fat and protein contents. After skimming, the product together with the ingredients was placed in the equipment (cooking pan) for slow pasteurization at a temperature of 65 °C for 30 minutes.

The developed formulation had as ingredients: sheep cheese acid whey, passion fruit aroma, concentrated passion fruit juice, stabilizer LAC 8083-1 and sucrose. After pasteurization, the product was filtered through a sieve and cooled to 20 °C for the

addition of potassium sorbate preservative. The drink was bottled and cooled to 7 °C for after consumption.

The beverage based on sheep cheese acid whey, was characterized in duplicate as to its physicochemical parameters, the protein and fat analyzes were evaluated by direct measurement through the infrared equipment (Combiscope filter 200/400). The acidity analysis was performed by titration, carbohydrates by oxidation-reduction, protein by the Lowry method, total dry extract (EST) and ash was determined by gravimetry, based on the methodology of Adolfo Lutz (2008). The microbiological analyzes of total coliforms, thermotolerants, molds and yeasts and mesophiles were determined by the methodology AOAC OMA 990.12 21st ed, 2019. After physical, chemical and microbiological characterization, the product was submitted to sensory analysis.

Fifty untrained people using a hedonic scale performed sensory analysis of acceptability and buy intention. The samples of the elaborated product were kept at a temperature of  $7 \pm 1$  °C until the moment of analysis. Approximately 25 mL of each sample was served to consumers in disposable plastic containers encoded with random three-digit numbers. The acceptability of the beverage samples was evaluated in terms of flavor, viscosity and global assessment attributes using a structured nine-point scale, anchored in the extremes of (1) disliked a lot and (9) liked a lot. To assess buy intention, a five-point scale anchored at the extremes was used (1) would certainly not buy and (5) would certainly buy. Data were analyzed in Excel version 2010, using the variance test (ANOVA), with a significance level of 5%.

### 3 RESULTS AND DISCUSSION

The acid whey of pecorino cheese obtained from Lacaune sheep's milk had 1.46% protein. Protein values of 0.67% have already been described for cow's whey (ANGELINO, G.M.; DINNIES, R.; SALEM, S., 2017). In comparison with published data for cow's whey, the richness of proteins present in sheep's whey stands out, highlighting the nutritional appeal of using this by-product. As whole sheep whey still had a high percentage of fat (2.38%), undesirable for the product that was under development, the whey skimming process was used, considerably reducing the percentage of fat, going to 0.28 % in skim whey. It is also noteworthy that the skimming process was efficient in reducing fat, without changing the percentage of whey protein, as expected. Table 1 shows the results of the physicochemical analyzes carried out on the beverage made up of passion fruit juice and sheep cheese acid whey.

Table 1. Physical chemical parameters of unfermented beverage added with sheep whey and passion fruit.

Analyze	(%)
Acidity	0,46±0,2
carbohydrates	4,59±0,1
Ashes	0,57±0,4
Total dry extract	7,54±0,2
Protein	1,25±0,1
Fat	0,26±0,3
pH	4,2±0,0

Values are presented by mean and standard deviation.

According to Table 1, we can see that the sheep's cheese acid whey drink is acidic with a pH of 4.2. Trumpet (2008), obtained as a result in his study a pH value equal to 4.2, demonstrating the development of an acidic product. Almeida et. al. (2001) carried out a study where a non-fermented milk drink with 50% whey was evaluated, the milk drink had a pH of 4.61, fat 1.59, protein 1.94 and total dry extract 7.86. Composite drink had a pH of 4.2, 0.26 fat, 1.25 protein, and 7.54 total dry extract. The difference in fat content is due to the skimming of the whey used to prepare the beverage made up of whey. The other results were very similar, highlighting that the drink composed of whey has physicochemical characteristics identical to those of the dairy drink. Microbiological analyzes showed satisfactory results, being suitable for consumption.

Through sensory analysis, it was noticed a favorable acceptance of the product, as shown in Figure 2 in relation to the acceptability of the consumer to the developed product.

Figura 2. Avaliação sensorial da bebida de soro ácido de queijo de ovelha adicionada de maracujá.



The results showed that the formulation pleased the consumer because the global assessment of the product had an average of 7.46, and an average buy intention of 3.82. In addition, standing out in flavor (7.02) and viscosity (7.18) presented by the product. Dude et al. (2010) produced a milk drink from sheep's whey with different proportions of whey (25%, 35% and 45%) and through sensory analysis found there was no significant difference in terms of taste. Samples with higher whey content obtained higher marks in the buy intention.

According to the physicochemical, microbiological and sensory parameters, the product becomes an alternative to add value to sheep's cheese whey, yet, it is noteworthy that in the literature there are few studies on the production of non-fermented beverage with sheep whey.

#### **4 CONCLUSION**

The development of a product with cheese acid whey provides industries with a viable and profitable alternative for using this by-product, reducing the amount of waste resulting from the processing of dairy products, in addition to adding commercial value. Furthermore, whey is a great source of nutrients, like proteins, so the products produced can add a high nutritional value, becoming healthy consumption alternatives. However, it is clear that this research area has a vast field to be explored, studies and applications of cheese acid whey are still very little carried out when compared to the amount of this by-product generated daily in dairy products. Because of this, further studies and applications of this by-product are needed, adding value and increasing the competitiveness of the industry, making them more and more sustainable, optimizing their waste.

## REFERÊNCIAS

ANGELINO, G. M.; DINNIES, R.; SALEM, S. Desenvolvimento de bebida fermentada, à base de soro de leite, adicionada de colágeno. In: 2017, Anais... [s.l: s.n.]. Disponível em: <[https://siseve.apps.uepg.br/storage/eaic2017/10\\_Gislaine\\_de\\_Mello\\_Angelino-150533672627087.pdf](https://siseve.apps.uepg.br/storage/eaic2017/10_Gislaine_de_Mello_Angelino-150533672627087.pdf)>. Acesso em: 6 mar. 2021.

AGENDA 2030. Disponível em: <http://www.agenda2030.com.br/>. Acesso em 06 mar. 2021.

ALMEIDA, K. E.; BONASSI, I. A.; ROÇA, R. O. Características físicas e químicas de bebidas lácteas fermentadas e preparadas com soro de queijo minas frescal. *Ciênc. Tecnol. Aliment.*, v.21, p.187-192, 2001.

BRITO, et al, Composição do sangue e do leite em ovinos leiteiros do sul do Brasil: variações na gestação e na lactação. *Ciência Rural*, v.36, n.3, p.942-948, mai-jun, Santa Maria, 2006.

BERNARDI, F. Soro de leite- alternativas para o processamento do subproduto. 2020. Universidade Regional Integrada Do Alto Uruguai, Erechim, 2020.

DA SILVA, R. R.; DE SIQUEIRA, E. Q.; NOGUEIRA, I. de S. Environmental impacts of dairy effluent on waterway in the pomba river basin. *Engenharia Sanitaria e Ambiental*, [s. l.], v. 23, n. 2, p. 217–228, 2018. Disponível em: <[http://www.scielo.br/scielo.php?script=sci\\_arttext&pid=S1413-41522018000200217&lng=en&nrm=iso&tlng=pt](http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-41522018000200217&lng=en&nrm=iso&tlng=pt)>. Acesso em: 6 mar. 2021.

GAJO, A. A.; CARVALHO, M. S.; ABREU, L. R.; P. S. M. Avaliação da composição química e características sensoriais de bebidas lácteas fermentadas elaboradas com leite de ovelha. *Revista do Instituto de Laticínios Cândido Tostes, Juiz de Fora*, v. 65, n. 374, p. 59-65, 2010.

GOMES, R. G.; PENNA, A. L. B. Características reológicas e sensoriais de bebidas lácteas funcionais. *Semina: Ciências Agrárias*, v. 30, p. 629-646, 2009.

INSTITUTO ADOLFO LUTZ- IAL. Métodos físico-químicos para análises de alimentos. Instituto Adolfo Lutz, São Paulo. 2008.

LEIDENS, N. Concentração das proteínas do soro de leite de ovelha por ultrafiltração e determinação das proteínas funcionais dos concentrados proteicos. 2013. Universidade Federal do Rio Grande do Sul, [s. l.], 2013.

PELEGRINE, L.G.; CASSANEGO, D.B.; GUSSO, A.P.; MATTANNA, P.; SILVA, S.V. Características físico-químicas de leite bovino, caprino e ovino. *Synergismus scientifica*, UTFPR, Pato Branco, 2012.

TRIBST, A. A. L. et al. Manufacture of a fermented dairy product using whey from sheep's milk cheese: An alternative to using the main by-product of sheep's milk cheese production in small farms. *International Dairy Journal*, [s. l.], v. 111, p. 104833, 2020.

TROMBETE, F., CARVALHO, G., CARDOSO, M., Sorinho – mistura ternária de frutas e soro de leite Fortificada com ferro. I Jornada Científica e VI FIPA do CEFET Bambuí, Centro Federal de Educação Tecnológica de Bambuí – MG, 2008.

VILAR, A. C. Utilização da flotação em coluna para o tratamento de efluente na indústria láctea. Dissertação (Mestrado em Desenvolvimento de Processos Ambientais), Universidade Católica de Pernambuco, Pernambuco, 2009.