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### Surveillance in Low-Fat Cheese Processing

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**Abstract:** Seventy samples of various types of low-fat cheeses were submitted to physical-chemical analyses to determine the total dry extract, fat and the fat contained in the dry extract. Significant differences were found for all the parameters analysed for fresh minas-type cheese, prato-type cheese and ricotta ( $p < 0.05$ ), except for the fat (F) and the fat contained in the total dry extract (F/TDE) of the standard minas cheese, which did not show such behaviour ( $p > 0.05$ ). The 100% of the labels failed to conform with respect to the fat content, the cheeses presenting values 40-60% above those declared on the label. The results obtained in the present study suggest a lack of uniformity in the composition of these products, indicating the need for more constant inspection by the Sanitary Surveillance to guarantee the identity of these products, such that the correct information is provided and the consumers can acquire products that truly attend their expectations.

**Key words:** Low-fat cheese, surveillance, processing

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### INTRODUCTION

The dairy products sector is one of the most important in the Brazilian agroindustrial complex, involving about 10 billion dollars per year and employing 3 million workers (Silva and Furlaneto, 2005). In the particular case of cheeses, approximately 400 thousand tons are annually produced in Brazil, of which 240 thousand tons are inspected by state, federal or municipal authorities. The majority of this production, about 95%, is considered to be for popular consumption, the most prominent types being prato, parmesan, fresh minas and mozzarella cheeses (Silva and Fernandez, 2003).

Recently a worldwide tendency for the consumption of low-fat foods has been observed in a variety of countries, due to public concern about the excess ingestion of calories and fats, leading to an increase in the consumption of diet and light foods (Oliveira and Assumpção, 2000). According to the Brazilian Association of Diet Food Industries, the supply of these products into the retail market registered an increase of up to 425% in the period from 1990 and 1997. More than 180 diet and light products are annually launched onto the Brazilian market, resulting in an 870% increase in such products in the last decade (Fadine, 2005).

Dairy processors have also taken noted of this tendency, which it reflects in development of and sensorial evaluation of several low/reduced fat cheeses (Nelson and Barbano, 2004; Koca and Mustafa, 2004; Madadlou *et al.*, 2005; Kilcawley *et al.*, 2007). In 1998, low-fat cheeses represented approximately 20% of the cheeses sold in supermarkets in the USA and in Switzerland, the

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consumption of such cheeses doubled over a three-year period (Mistry, 2001). With respect to Brazil, there are no specific registers on the production and consumption of low-fat cheeses, although the number of brands available in supermarkets is constantly increasing. Additionally, few researches relate their identity and quality worldwide. In this context, this research aimed to check the quality of Brazilian low fat cheeses marketed in Rio de Janeiro to determine if the products are complying with the norms determined by the legislation.

## MATERIALS AND METHODS

Seventy samples of diet and light cheeses from 12 different brands were analysed, distributed as follows: ricotta (20 samples, 2 commercial brands), minas frescal cheese (20 samples, 4 commercial brands), prato cheese (20 samples, 4 commercial brands) and minas padrão cheese (10 samples, 2 commercial brands). The products were collected by a random process, the choice of the types of cheese being related to the offer of the different types in the commercial establishments at the time of the study.

The analyses for fat, Total Dry Extract (TDE) and fat contained in the total dry extract (F/TDE) were carried out according to the Normative Instruction N°22 of April 14th 2003, which brought the Official Physical-Chemical Analytical Methods for the Control of Milk and Dairy Products in Brazil (Brasil, 2003) into force. The Total Dry Extract (TDE) was determined by quantifying the loss of moisture and volatiles by desiccation and weighing the residue obtained. The fat content (F) was determined by the Gerber butyrometric method. The fat content in the dry extract (F/TDE) was obtained by dividing the values obtained for fat by the values obtained for total dry extract.

The information contained on the labels of the products was compared with the results obtained in the physical-chemical analyses according to the legislation in force for the nutritional labelling of food and of food with special objectives, which includes diet and light foods (Brasil, 1998a, b).

## RESULTS AND DISCUSSION

Table 1 shows the results of the physical-chemical parameters determined for the seventy samples of low fat cheeses analysed. Significant differences were found for all the parameters analysed for all cheeses ( $p < 0.05$ ), being the fat (F) presents and the fat and the dry extract (F/TDE) of in minas frescal cheese and minas padrão cheese and the total dry extract content of minas frescal cheese the most relevant ones ( $p > 0.05$ ). Except for ricotta, all the others products are typical cheeses consumed by all the Brazilian People.

The mean values obtained for the TDE of minas frescal, prato, ricotta and padrão minas cheeses were: 30.29, 37.41, 32.23 and 34.14%, respectively. According to the Brazilian regulation for cheese quality identity (Brasil, 1996), the minas frescal, ricotta and minas padrão cheeses would be classified as low moisture content cheeses-maximum TDE of 35.9%-whilst the prato cheese would be classified as a medium moisture content cheese-TDE varying from 36.0 to 45.9%. These variations in the values for TDE are related to the techniques used to improve the organoleptic characteristics of low-fat

Table 1: Physical-chemical parameters of low fat cheeses

Cheese	Sampling	TDE (%)	F (%)	F/TDE (%)
Minas frescal	20	30.29 <sup>b</sup> (2.30)	12.97 <sup>b</sup> (1.45)	39.24 <sup>a</sup> (1.21)
Prato	20	37.41 <sup>a</sup> (2.10)	17.01 <sup>a</sup> (1.89)	46.23 <sup>a</sup> (1.90)
Ricota	20	32.23 <sup>a</sup> (2.02)	16.09 <sup>a</sup> (1.23)	48.35 <sup>a</sup> (1.78)
Minas padrão	10	34.12 <sup>a</sup> (2.78)	18.23 <sup>a</sup> (1.97)	54.12 <sup>a</sup> (1.56)

The results are the mean values of analysis carried out in triplicate, with SD between brackets. TDE: Total Dry Extract; F: Fat; F/TDE: Fat contained in the dry extract. Small lower case letters denote significant statistical difference ( $p < 0.05$ ) between the various commercial brands for the parameter under analysis

cheeses. During processing, some ingredients are added, which can be based on proteins, carbohydrates or synthetic materials that present fat-similar characteristics and act by increasing moisture retention.

The mean values registered for fat were: 12.97, 17.01, 16.09 and 18.23% for the minas frescal, prato, ricotta and minas padrão cheeses, respectively, suggesting moderate variation between the products. It is important to mention that significant differences were not found between the different commercial brands for the parameters analysed (data not shown,  $p > 0.05$ ), suggesting that for the same type of cheese, the physical-chemical analyses of the parameters determined gave homogenous results.

These variations in the values found for fat content (12.97-18.23% w/w) can be explained on the basis of deficiencies in the milk standardisation stage, different nutritional handling of the herds and the addition of whole and/or skimmed milk to improve the texture and yield of the cheeses. Another factor that could explain such oscillations in the fat content is the skimming step, which is the step when the fat is removed, when operational problems during the procedure can contribute to variations in the content of this component. The fat contributes to the physical characteristics and is a determinant factor in the texture and flavour of cheeses. Thus how to totally or partially remove the fat from cheeses without changing its sensory features, represents an enormous challenge to the cheese industry. Similar results were obtained in evaluation of light cheeses commercialised in the city of São Paulo. The authors reported values more than 40.0% higher than the value declared on the label for fat content and differences of more than 60% for the cholesterol content (Duarte *et al.*, 2005).

With respect to the values for F/TDE, the prato, ricotta and standard minas cheeses presented mean values of 46.23, 48.35 and 54.12%, respectively, being classified as fatty cheeses (45.0-59.9%). The fresh minas cheeses presented a mean value of 39.24%, being classified as semi-fat according to the technical regulation for cheese quality and identity, which establishes a range of from 25.0-44.9% for this classification (Brasil, 1996).

In the evaluation of the physical-chemical characteristics of light minas frescal cheese commercialised in the city of Belo Horizonte, a research obtained similar results for the TDE and fat contents to those obtained in the present study, showing mean values of 31.04 and 11.02%, respectively and mean values of 32.61% for F/TDE (De Souza *et al.*, 2002). With respect to ricotta, similar values were registered by the same authors obtained for samples commercialised in Belo Horizonte, obtaining values of 14.72% for fat content, 31.17% for TDE and 47.69% for F/TDE (Rangel *et al.*, 2002).

Cruz and Gomes (2001) evaluated the lipid content of various ricotta samples marketed in Botucatu, Brazil, obtaining a mean value for the fat content in the range from 6.7 to 17.4%, results similar to those obtained in the present experiment. There are no requirements for the physical-chemical parameters in the technical regulation for the identity and quality of ricotta and standard *minas* cheeses, making it difficult to monitor these parameters in the manufacture of these products. Esper *et al.* (2007) found excessive variation in the various constituents of ricotta samples commercialised in the city of Campinas, Brazil, with values varying from 59.4 to 77.3% for the total dry extract, from 24.2 to 58.7% for the fat content contained in the dry extract, acidity varying from 0.15 to 0.82% and pH from 4.7 to 6.5. The results obtained by these authors showed that 100% of these samples could be classified as high moisture content cheeses, that is TDE > 55 and 90% of the samples could be classified as semi-fat or fatty cheeses.

The analysis of the labels showed that the fat contents of 100% of the samples did not conform with what was written on the labels, presenting from 40-60% more fat than the value specified on the label, which is above the tolerance limit of 20.0% specified by the Brazilian legislation for the physical-chemical analyses (Brasil, 1998a).

In addition these products could not be classified as light or diet. According to the Brazilian legislation, the term diet can be used for two types of food, the first constituting foods produced for individuals with physical demands and/or the second, for those suffering from specific diseases such

as diabetes. Diet foods can include foods produced for diets with restrictions of the following nutrients: fats, carbohydrates, sodium and proteins; foods produced exclusively for weight control and foods for diets with controlled sugar consumption. In the case of foods for diets with restricted fat intake, the food should contain a maximum of 0.5 g of fat per 100 g of final product. The term light, on the other hand, can be used for foods in which the composition has been changed to reduce by at least 25% one of the following: calories, sugars, total fat, saturated fat, cholesterol or sodium, as compared to the traditional product or a similar product of another brand (Brasil, 1998b). The discrepancy found in the values for fat content was reflected in the caloric value of the products, such that this parameter was also sub-estimated, since 1 g of fat releases 9 Kcal.

Another relevant aspect is that high fat contents result in the true values for cholesterol and saturated fat being unknown, which is an additional concern considering the relationship between these components and heart diseases.

Esper *et al.* (2007) found similar results when they analysed the labels of ricottas commercialised in Campinas, Brazil. Only 60% of the brands analysed presented values for the fat content determined analytically varying a maximum of 20% from the values specified on the label. With respect to protein content, 60% of the brands presented values below those declared on the label, with variations between 20 and 60%. For the total energy value, 50 of the brands presented variations greater than 20%, 40% being above the specified value and 10% below.

The quality control of food products labelled with the status of diet or light is important for the food industry, since the failures shown in the analysis of the parameters evaluated can not to identify the product and cheat the consumer, who may be purchasing a product that does not attend his needs. The results obtained are worrying since they suggest that the products do not attend the needs of a special public searching for healthier foods and could represent a frustration for the consumer who is looking for a differentiated product with a healthier appeal.

Few studies have reported the physical-chemical aspects of low-fat cheeses, making further research necessary to amplify the data, which could confer greater complexity on future studies with more informative discussion in order to obtain a wider range of patterns for evaluation and finally acquire official specifications.

## CONCLUSION

The results obtained in the present study suggest products lacking uniformity of composition and demonstrating a great need for orientation of cheese producers and distributors. In addition they suggest the need for more constant inspection by the official organs in order to guarantee the identity of these foods, such that the correct information is divulged, allowing consumers to acquire products that really attend their expectations.

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