SENSORY EVALUATION OF REQUEIJÃO CREMOSO WITH THE ADDITION OF GREEN BANANA BIOMASS AS A PARTIAL FAT SUBSTITUTE

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RESUMEN - Este estudio evaluó los efectos de la adición de *Lactobacillus acidophilus* encapsulado y biomasa de plátano verde sobre las características sensoriales de requeijão cremoso. Los quesos elaborados, requeijões cremosos procesados incluyeron la adición de *Lactobacillus acidophilus* encapsulado como fuente probiótica y biomasa de plátano verde como sustituto parcial de grasa, en un total de cinco tratamientos. La coloración blanca amarillenta de las formulaciones se modificó en función de la composición, así como de los parámetros de textura, los tratamientos F1 y F3 presentaron los mayores cambios.

ABSTRACT - This study evaluated the effects of the addition of encapsulated *Lactobacillus acidophilus* and green banana biomass on the sensory characteristics of requeijão cremoso. The elaborated requeijões cremosos, processed cheeses included addition of encapsulated *Lactobacillus acidophilus* as probiotic source, and green banana biomass as partial fat substitute, in a total of five treatments. The yellowish white coloration of the formulations was altered as a function of the composition as well as the texture parameters, F1 and F3 treatments presented the greatest changes.

PALABRAS-CLAVE: alimentos funcionales, reducción de grasas, derivados lácteos

KEYWORDS: functional foods, fat reduction, dairy derivative.

1. INTRODUCTION

The recent decade has witnessed a huge increase in consumer demand for food products with functional properties, in addition to being a source of essential nutrients and energy, food products are nowadays fortified with additives to improve human health (Colín-Cruz et al., 2019).

Various foods have made considerable progress in the market, and in the area of dairy products, cheese is one of the most versatile, produced throughout the world, it has a diversity of flavors, textures and shapes, is pleasing to the palate of many people and suitable for any age group (Weschenfelder et al., 2018).

According to the Technical Regulation for Identification and Quality of Requeijão: requeijão cremoso is a processed cheese obtained from the fusion of curd mass, cooked or uncooked, desorbed and washed, obtained by acid and/or enzymatic coagulation of the milk, optionally added of milk cream and/or butter and/or anhydrous

milk fat or butter oil. The product may be added with condiments, spices and other food substances (Brazil, 1997). Due to its versatility, this processed cheese has become one of the focus in researches on the production of functional and differentiated products (Vieira et al., 2014).

Consumption of green banana products is growing because it's nutritional and physiological benefits to human health (Riquette et al., 2019). Green banana is rich in starch resistant which is recognized for having positive effects on colon health (Moongngarm et al., 2014).

Consequently, many studies are being developed to evaluate its technological properties as a functional ingredient (Bezerra et al., 2013). In addition, it would also be a way to reduce the waste impacts of the fruits that are suitable for consumption, but are out of commercial standards.

Green banana biomass, cooked and processed green bananas, are tasteless and odourless, appear as an option to be used as thickeners, improving nutritional value and assuming the flavour and aroma of foods prepared with this substance (Oi, Tambourgi and Moraes Jr, 2012). It can be used in the elaboration of products with reduced lipid and sugar contents (Freitas and Tavares, 2012).

Due to these trends in food products, this study, in general, aims at the development of functional creamy curd cheese with low fat content, partially replacing it with green banana biomass and with the addition of encapsulated *Lactobacillus acidophilus*. In addition, we also study consumer acceptance of this new product.

2. MATERIAL AND METHODS

2.1 Encapsulation probiotic microorganism

The encapsulation of the probiotic microorganism *Lactobacillus acidophilus* was performed using the extrusion technique, following the methodology described by Krasaekoop et al. (2004).

2.2 Production of the processed cheese (requeijao)

For the elaboration of the processed cheese, first, the process of obtaining the base mass (curd) was carried out using the enzymatic milk coagulation method, according to the methodology described by Rodrigues (2006). Subsequently, the ingredients were weighed according to the five formulations described in Table 1, which were defined by preliminary tests performed with the product. The cheese was then processed according to Van Dender (2014).

Table 1 – Composition of processed cheese formulations.

	Treatments/Formulations				
Ingredients (%)	**F1**	**F2**	**F3**	**F4**	**F5**
Mass (curd)	60	60	60	60	60
Pasteurized cream	10	10	5	5	20
Green banana biomass *	10	5	10	5	
Salt	1	1	1	1	1
Molten salt	2	2	2	2	2
Water	20	20	20	20	20

Encapsulated *Lactobacillus acidophilus*	10	10	10	10	10

* for each gram of green banana biomass, 1 mL of water was added to each formulation. The salt and molten salt were calculated on the amount of curd mass and encapsulated *Lactobacillus acidophilus* were calculated on the final weight of the ready product.

The formulations were cooled until 40 °C under aseptic conditions for the addition of encapsulated *Lactobacillus acidophilus*. The products were then packed in plastic pots with a lid and stored under refrigeration at a temperature of 5 ± 1 °C.

2.3 Sensory analyses

For the sensory analysis, 50 untrained tasters, consumers of processed cheese participated. Acceptance test was performed for the attributes of colour, aroma, flavour, texture and global acceptance, using a structured hedonic scale of 7 points according to Lawless and Heymann (2010). The test of purchase intention was performed with a scale of 5 points. The research was approved by the Ethics and Research Committee of the Federal University of Santa Maria, under protocol no. 56769116.9.0000.5346.

2.4 Statistical analyses

A completely randomized experimental design with factorial 2^2 was used to evaluate the effect of the different components used to prepare the processed cheese on the characteristics of the same, with two independent variables and control treatment, totalling five treatments and three replicates. The independent variables were the amount pasteurized cream (fat) and green banana biomass.
The results were analysed through analysis of variance (ANOVA), and test for differentiation at the 5% level of significance using BioEstat 5.0 software.

3. RESULTS AND DISCUSSION

The mean values for sensory analysis of the elaborated processed cheese are presented in table 2.
The points attributed to the global appearance, colour, aroma, flavour and texture varied from 4.12 (indifferent) to 5.98 (liked), with the lowest and highest value being verified in the colour attribute. In this sense, the elaborated processed cheeses were considered accepted, since the grades were outside the rejection region, from 1 to 3 points. Colour is the first characteristic perceived by consumers and therefore often influences consumer preference (Mani-Lopez et al., 2014). It can be observed, in general, that the different concentrations of green banana biomass and fat did not provide great in the acceptance of the product when compared to the control. Speranza et al. (2018) in their study developed fresh functional cream cheese and also observed that the addition of a probiotic microorganism and prebiotic ingredient did not negatively affect the product´s sensory acceptability.

Table 2 - Average results of the sensory evaluation regarding the acceptance test of the elaborated processed cheese.

Sample	Colour	Aroma	Flavour	Texture	Global appearance
F1	4.62[b]	4.98[a]	5.24[ab]	5.22[a]	5.28[ab]
F2	5.1[b]	4.68[a]	4.66[b]	4.12[b]	4.56[c]
F3	4.92[b]	4.88[a]	5.14[ab]	5.34[a]	5.04[bc]
F4	5.12[b]	4.96[a]	4.9[b]	4.74[ab]	4.94[bc]
F5	5.98[a]	5.12[a]	5.64[a]	5.42[a]	5.84[a]

Means in the same column with the same overwritten did not differ significantly ($p < 0.05$) by Tukey test (ANOVA). 1: I disliked very much, 2: I disliked much, 3: disliked, 4: indifferent, 5: I liked it, 6: I liked it much and 7: I liked it very much.

F1 (10% pasteurized cream and 10% green banana biomass); F2 (10% pasteurized cream 5% green banana biomass); F3 (5% pasteurized cream and 10% green banana biomass) F4 (5% pasteurized cream and 5% green banana biomass); F5 (control).

In relation to the purchase intention it can be affirmed that the processed cheeses had a good acceptance of purchase, because the greater percentages correspond to the term "would probably buy" in the majority of the formulations. The best purchase intention indices were observed in the formulations F2, F4 and F5.

4. CONCLUSION

The sensory analysis showed that the F1 formulation was better accepted, equating to the control. The best purchase intention indices were observed in the formulations F2, F4 and F5.
Therefore, our findings indicate that green banana biomass and encapsulated probiotic microorganisms may be a potential option as ingredients to be used in the formulation of processed cheese for dairies, adding a functional value to this product.

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