Elaboration, nutritional and sensory analysis of peanut butter plus milk chocolate

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ABSTRACT

This work has as its theme the elaboration, nutritional and sensory analysis of peanut butter plus milk chocolate, since peanut butter plus chocolate is very nutritious, bringing several benefits, as chocolate is a source of proteins, fats, calcium, magnesium, iron, zinc, vitamins E, B1, B2, B3, B6, B12 and C, in addition to being rich in carbohydrates and bioactive compounds. Five formulations of peanut pastes were elaborated using the concentrations of 0%, 10%, 20%, 30% and 40% of milk chocolate, respectively. It was observed that the greater the amount of milk chocolate added to peanut butter, the less energetic the product is made. Due to the data obtained through this study, it is concluded that the elaboration of peanut butter with the addition of 40% milk chocolate presented satisfactory results in relation to the characteristics of appearance, color, texture, flavor and global acceptance, obtaining averages greater than 7 (seven), and also pointed out acceptable responses in the microbiological and nutritional analyses. In addition, it proved to have a great capacity to be marketed, since it reached an index of 80% in terms of purchase intention.

Keywords: Peanuts, Milk chocolate, Peanut butter, Nutritional analysis, Sensory analysis.

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INTRODUCTION

Peanuts are an important food that, when ingested prudently due to their energy value, can establish a good source of vitamins, minerals and phytochemicals with antioxidant and anti-inflammatory properties in the human diet (ARYA et al., 2016). Thus, its composition comprises more than 20 amino acids, polyphenols, antioxidants, vitamins and minerals (SANDEFUR, 2017). The fats found in peanuts are mainly unsaturated fats (mono and polyunsaturated), constituting a great alternative to animal fats, which help reduce LDL – low-density lipoprotein, the well-known "bad cholesterol". One of the products derived from peanuts is peanut butter, which can be consumed naturally, added with additives or incorporated into various food formulations (TIMBABADIYA et al., 2017).

Peanut butter is a product obtained from crushed peanuts, which has been gaining renown among physical activity practitioners to the detriment of its beneficial properties, such as fatty acids and proteins. In addition to presenting vitamins, minerals and bioactive compounds, such as resveratrol, which collaborate with the reduction of the risk of cardiovascular diseases (LUU et al., 2015). In the process of developing peanut butter, the integument, film or skin, is removed and discarded, representing a waste of material, which if not disposed of properly, can cause environmental problems (CISNEROS et al., 2018). This film contains phenolic compounds and especially the flavonoid class, which are antioxidants, considered bioactive substances, providing color attribute to foods (VASCONCELOS, 2014).

Chocolate intake provides several functional health benefits, both in the cardiovascular system and in dermal health (DE OLIVEIRA RIBAS et al., 2018). Thus, it is necessary to implement chocolate and its sources in a balanced diet, however, it is important to point out that its consumption should originate from healthy sources without the addition of high sugars and preservatives, since products that have high levels of sugars and additives have low concentrations of chocolate, resulting in an increase in body weight.

Chocolate is a nutritional source, which has pleasant sensory characteristics, acting as a source of proteins, fats, calcium, magnesium, iron, zinc, vitamins E, B1, B2, B3, B6, B12 and C, which if ingested in moderation, add health benefits (DALLABRIDA, 2018). In addition, they are rich in carbohydrates and bioactive compounds, and can be consumed by people of all ages (ARUNKUMAR et al., 2019). Chocolate has a high content of flavonoids and polyphenols, which confer antioxidant, antimutagenic, and antidiabetic activities (BATISTA et al., 2016; FAKHARI et al., 2021). In addition, they also have a source of magnesium and potassium, which configure a cardioprotective effect. For Magrone et al. (2017), what provides a decrease in blood pressure in consumers of cocoa products is the fact that after consumption, nitric oxide is released and also angiotensin-converting enzyme inhibited, through flavonoids or theobromine. And with the addition

of chocolate in peanut butter, it will provide a more palatable flavor, be more nutritious, bringing much more benefits to the consumer.

In view of this theme, this work legitimizes the elaboration of peanut butter added to milk chocolate, and to evaluate sensory acceptance, purchase intention, acceptability index, as well as its nutritional composition.

MATERIAL AND METHODS

The experiment was carried out at the Bakery Laboratory of the Federal Institute of Education, Science and Technology of Maranhão – São Luís/Maracanã Campus.

MATERIALS

Whole, roasted and film-free peanuts, milk chocolate and soybean oil were used.

PREPARATION OF PEANUT BUTTER

The peanut butter was prepared in the bakery laboratory of the Federal Institute of Maranhão (IFMA), using the methodology described by LIMA et al. (2009), with some modifications, using roasted peanuts, milk chocolate and soybean oil.

METHODS

Five formulations of peanut butter added with milk chocolate were elaborated, one of them being standard, that is, without the addition of milk chocolate and the others with additions of 10%, 20%, 30% and 40% of milk chocolate, respectively.

For the preparation of the peanut butter, roasted and unfilmed peanuts, soybean oil and milk chocolate were weighed on an analytical scale in the proportions of 10%, 20%, 30% and 40%.

Then, the peanuts were crushed in a blender until all the beans are uniform in powder form. After this step, the soybean oil was added to the peanuts, beating them in a blender until the peanut butter was obtained (figure 3). Soon after, the peanut butter was removed from the blender, and the contents were weighed, separating it into portions, adding the chocolate respectively in the percentages of 10%, 20%, 30% and 40% (figures 4 and 5).

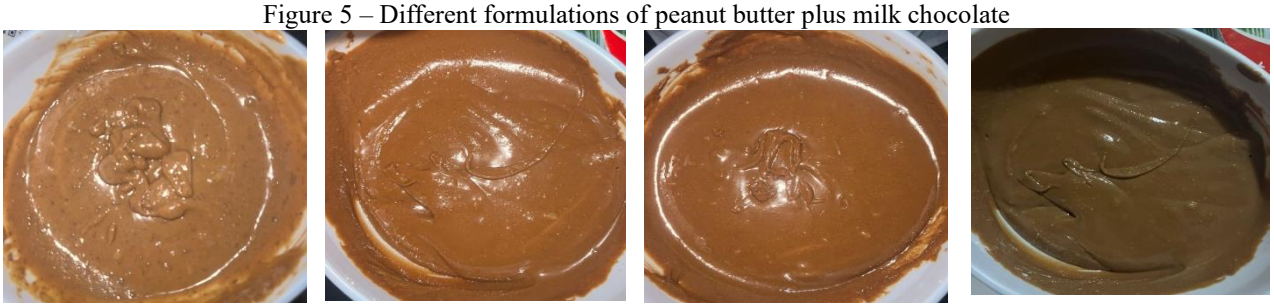
Figure 3 – Preparation of peanut butter

Source: Author, 2023

Figure 4 – Addition of milk chocolate to peanut butter

Source: Author, 2023

Figure 5 – Different formulations of peanut butter plus milk chocolate



Source: Author, 2023

NUTRITIONAL ANALYSIS

To carry out the nutritional composition analysis, the determinations established by the National Health Surveillance Agency – ANVISA were followed, through the Resolution of the Collegiate Board – RDC No. 429 of October 8, 2020, which provides for the nutritional labeling of packaged foods and the Normative Instruction – IN No. 75 of October 8, 2020, which establishes the technical requirements for the declaration of nutritional labeling on packaged foods and the Brazilian Food Composition Table – TACO 4th Edition (BRASIL, 2020) was also used.

MICROBIOLOGICAL ANALYSIS

Microbiological analysis is indicated for peanut butter and similar (BRASIL, 2001). The multi-tube technique for the determination of thermotolerant coliforms was performed at the Microbiology Laboratory of the Federal Institute of Education, Science and Technology of Maranhão – São Luís/Maracanã Campus (ARAÚJO et al., 2016).

SENSORY ANALYSIS

The sensory analysis was carried out based on the methodology recommended by Lopes (2012), using a 9-point Hedonic Scale, being 9 = very much liked, 8 = very much liked, 7 = moderately liked, 6 = slightly liked, 5 = indifferent, 4 = slightly disliked, 3 = moderately disliked, 2 = disliked a lot and 1 = disliked extremely. The following characteristics were evaluated: appearance, color, texture, flavor and global acceptance.

To evaluate the purchase intention, a Purchase Intention Form was used by a 5-point attitude scale, as follows: 1 = I would certainly buy this sample, 2 = I would probably buy this sample, 3 = I have doubts about whether I would buy this sample, 4 = I probably would not buy this sample and 5 = I certainly would not buy this sample.

The sensory evaluation was carried out at the Federal Institute of Maranhão IFMA – São Luís/Maracanã Campus, on October 16, 2023, with the cooperation of 56 untrained evaluators, male and female servers and students, where all signed the Informed Consent Form (ICF). Everyone made the evaluation individually and was properly instructed to observe the characteristics of the product and mark the answer sheets.

STATISTICAL ANALYSIS

The data were evaluated using the *Excel* version 2019 program (*Microsoft Corporation*).

RESULTS AND DISCUSSION

FORMULATION OF PEANUT BUTTERS

The formulations of the peanut butter samples were presented in Table 2.

Table 2 – Formulations of peanut butter samples

PEANUT BUTTER SAMPLE FORMULATIONS					
INGREDIENTS	SAMPLE 1 (STANDARD - 0%)	SAMPLE 2 (10%)	SAMPLE 3 (20%)	SAMPLE 4 (30%)	SAMPLE 5 (40%)
Peanut (g)	83	77	71	66	62
Soybean oil (g)	16,6	15,4	14,2	13,2	12,4
Milk chocolate (g)		7,7	14,2	19,8	24,8

Source: Author, 2023

NUTRITIONAL ANALYSIS

Using the nutritional values that make up each ingredient, and having the Brazilian Food Composition Table (TACO) as a reference, table 3 was elaborated. Table 3 presents the nutritional values of the peanut butters elaborated.

Table 3 – Nutritional table of peanut butters added to milk chocolate in the proportions of 0%, 10%, 20%, 30% and 40% of milk chocolate, respectively.

NUTRITIONAL TABLE PEANUT BUTTER (each 100 g)						
INGREDIENTS		Sample 1 Standard (0%)	Sample 2 10%	Sample 3 20%	Sample 4 30%	Sample 5 40%
MOISTURE (%)		1,41	5,15	8,3	10,22	13,45
ENERGY	Kcal	649,72	613,29	575,23	543,76	519,30
	Kj	2.716,59	2.565,86	2.386,75	2.275,21	2.172,97
PROTEIN (g)		18,67	17,36	16,05	14,96	14,09
LIPIDS (g)		61,42	58,13	54,67	51,81	49,60
COLESTEROL (mg)		ON	1,77	3,26	4,55	5,70
CARBOHYDRATE (g)		15,52	15,54	15,4	15,31	15,31
DIETARY FIBER (g)		6,47	6,04	5,61	5,25	4,97
ASH(g)		2,65	2,76	2,76	2,90	2,97
CALCIUM (mg)		32,37	44,58	54,52	63,16	71,05
MAGNESIUM (mg)		131,97	122,43	121,83	117,41	114,20
TOTAL FATS (g)		58,1	54,52	50,85	47,80	45,40
SATURATED FATS (g)		10,95	10,68	10,33	10,05	9,86
GORDURAS TRANS (g)		0,08	0,07	0,07	0,06	0,06
SODIUM (mg)		14,11	13,09	12,07	11,22	10,54
POTASSIUM (mg)		538,67	528,37	513,61	501,99	494,63
IRON (mg)		1,58	1,65	1,69	1,73	1,77
VITAMINA B6 (mg)		0,41	0,38	0,35	0,33	0,31

Source: Author, 2023

Analyzing the nutritional values of the five samples of peanut butters, it can be observed that the nutrient content changed according to the formulation used, however all formulations were presented as a source of proteins and vitamins, in addition to having a high content of carbohydrates, calories, potassium and minerals. It was observed that the greater the amount of milk chocolate added, the less energetic the peanut butter is. This is due to the fact that standard peanut butter contains more lipids than peanut butter plus milk chocolate.

MICROBIOLOGICAL ANALYSIS

Table 4 shows the values obtained through microbiological analyses.

Table 4 – Results of microbiological analyses

Peanut butter	Coliforms totais	Thermotolerant coliforms	*Salmonella spp.*
Sample 1 (default 0%)	< 3,0	< 3,0	Absent
Aexhibition 2 (10%)	< 3,0	< 3,0	Absent
Sample 3 (20%)	< 3.0	< 3.0	Absent
Sample 4 (30%)	< 3.0	< 3.0	Absent
Sample 5 (40%)	< 3.0	< 3.0	Absent

Source: Author, 2023

Analyzing the data obtained through the microbiological analysis for the peanut butter samples at their concentrations of 0%, 10%, 20%, 30% and 40% of milk chocolate addition, the absence of Salmonella *spp.* and that the concentration of total and thermotolerant coliforms was relatively low, certifying the microbiological quality of the peanut butter, since the results meet the

provisions of Normative Instruction No. 60, of December 23, 2019.

SENSORY ANALYSIS

Table 5 shows the mean values and standard deviations of the samples of peanut butter plus milk chocolate obtained through sensory analysis.

Table 5 – Results of sensory analyses

Feature	Sample 1 (default 0%)	Aexhibition 2 (10%)	Amostra 3 (20%)	Aexhibition 4 (30%)	Amostra 5 (40%)
Appearance	5.63 ± 2.19	6.63 ± 1.78	6.64 ± 1.71	6.96 ± 1.75	7.79 ± 1.33
Colour	5.80 ± 2.19	6.32 ± 1.69	6.77 ± 1.56	6.80 ± 1.92	7.54 ± 1.50
Texture	5.79 ± 2.15	6.59 ± 1.71	6.91 ± 1.65	6.89 ± 1.65	7.70 ± 1.53
Flavor	3.93 ± 1.94	5.73 ± 2.20	6.52 ± 1.72	6.80 ± 1.76	7.93 ± 1.36
Global acceptance	4.86 ± 2.07	6.39 ± 1.88	6.86 ± 1.55	6.84 ± 1.97	7.93 ± 1.25

Source: Author, 2023

Regarding the appearance characteristic, sample 5 with the addition of 40% milk chocolate had 7.79, with the highest score by the evaluators, while sample 1, standard containing 0% milk chocolate, had the lowest score of 5.63. Samples 2 and 3, with the addition of 10% and 20% of milk chocolate, respectively, remained with relatively equal values of 6.63 and 6.64, respectively, while sample 4 with 30% milk chocolate obtained a score of 6.96.

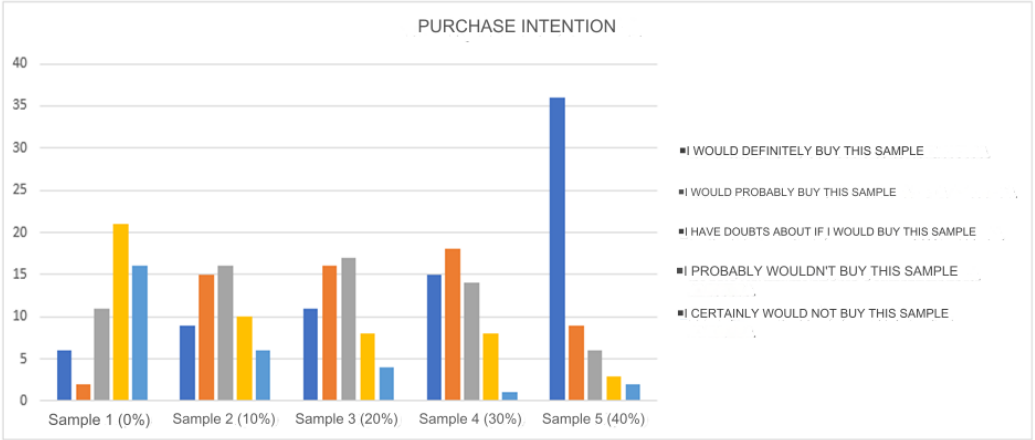
Regarding the color attribute, sample 5 had the highest score of 7.54, followed by samples 4, 3, 2 and 1, which obtained scores of 6.80, 6.77, 6.32 and 5.80, respectively. Regarding texture, sample 5 obtained the highest score among the evaluators 7.70, followed by sample 3 which obtained a score of 6.91, while samples 4, 2 and 1 obtained scores of 6.89, 6.59 and 5.79, in that order.

In the flavor requirement, sample 5 also obtained the highest score, achieving an average of 7.93. Sample 1 received the lowest score of 3.93 and samples 2, 3 and 4 received averages of 5.73, 6.52 and 6.80, in that order.

Global acceptance showed that samples 3, 4 and 5 received the highest scores of 6.86, 6.84 and 7.93, respectively. Samples 1 and 2 obtained the lowest acceptance scores from the evaluators, 4.86 and 6.39.

Sensory evaluation is an extremely important characteristic, as it involves the interaction between food and the tissues of the mouth (BURITI et al., 2008). Thus, among the five samples, the one that obtained the highest sensory acceptance was sample 5, which reached values above the average.

Figure 6 – Purchase intention



Source: Author, 2023

Regarding the purchase intention test based on the results obtained, sample 5 of peanut butter with the addition of 40% milk chocolate presented the best purchase intention score. The percentage of the sum of the items "I would certainly buy" and "I would probably buy" pointed to the result of 80%. Samples 1, 2, 3 and 4 presented the percentages of 14%, 43%, 48% and 59%, respectively.

According to Carmo et al. (2017), regarding the acceptability index, the product that reaches at least 70% acceptance is considered accepted. Therefore, sample 5 containing 40% milk chocolate is acceptable, thus having great conditions to be placed for commercialization.

CONCLUSION

It was observed that the greater the amount of milk chocolate added to peanut butter, the less energetic the product is made. Due to the data obtained through this study, it is concluded that the elaboration of peanut butter with the addition of 40% milk chocolate presented satisfactory results in relation to the characteristics of appearance, color, texture, flavor and global acceptance, obtaining averages greater than 7 (seven), and also pointed out acceptable responses in the microbiological and nutritional analyses. In addition, it proved to have a great capacity to be marketed, since it reached an index of 80% in terms of purchase intention.

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