

Development of functional cake with probiotics and prebiotics for insertion in the diet of elderly institutionalized elderly

Sara Vitória da Silva Souza¹, Rosângela dos Santos Souza¹, Victória Luiza Lima da Silva¹, Ramon Silva de Oliveira¹, Victor Novais Costa¹, Flávia Teresa de Oliveira Castedo¹, Marijara Vilas Boas Silva¹, Anny Carolinny Tigre Almeida Chaves², Juçara Alvarindo Brito Soledade^{1,*}

¹ Nutrition Collegiate, Salvador University, Feira de Santana, Brazil.

² Pharmacy Collegiate, Salvador University, Feira de Santana, Brazil.

*Corresponding author: jucarasoledade@yahoo.br

Abstract— Studies have been performed by aiming at the identification of new bioactive compounds and the establishment of scientific bases to prove the pleadings of functional properties of foods. This study had as the goal to develop a functional cake with probiotics and prebiotics for insertion in the diet of elderly institutionalized residents. This is a descriptive cross-sectional study conducted with elderly people residents in a Long Stay Institution (LSI) in Feira de Santana-BA. Two analyzes were performed, being one sensory of the attributes: aroma, taste, color, texture and overall impression, and other one of acceptability. Chemical composition analysis was also performed by considering the following determinations: moisture (greenhouse at 105 ° C) and ash (muffle 550 ° C). Therefore, it was observed that the two formulations offered had a satisfactory acceptance, demonstrating the viability and excellent nutritional value, both formulations had a satisfactory acceptance, demonstrating the viability, and especially for their excellent nutritional value. Besides that, the chemical composition analysis in both formulations presented moisture content considered high, possibly due to the large amount of fibers present in its formulation. The ash contents were slightly different but not very discordant. It is concluded that the possibility of using green banana biomass and kefir fermented in cake formulations demonstrated potential for market acceptance and purchase, including with the replacement of wheat flour, for presenting important nutritional and functional values to the health of the consumers, especially in elderly people.

Keywords— functional foods; old man; antioxidant; dysbiosis.

I. INTRODUCTION

Aging is defined as a progressive process in what biological, functional and psychological changes occur. In this context, the so-called functional foods take place, with emphasis on prebiotics, probiotics and symbiotics. Thinking about the insertion of these foods in elderly patients, it is essential that there is a constancy in their use in order to minimize possible pathological conditions resulting from the natural process of aging (TAVARES, 2012; CONRADO et al., 2018).

With aging, changes that occur in the gut, as reduction of the mucosal surface and villi, change motility, allowing bacterial hyperproliferation. With these changes, there may be a propitious medium for the appearance of gastrointestinal tract diseases, as the intestinal dysbiosis.

Possible causes of dysbiosis are: poor diet, advanced age, stress, availability of fermentable material, poor digestion, intestinal transit time, intestinal pH and host immune status. Other factors may include the indiscriminate use of medicines and excessive consumption of processed foods (ALMEIDA et al., 2009; CAVALLI et al., 2011).

It is noteworthy that numerous researches have been realized by aiming at the identification of new bioactive compounds and the establishment of scientific bases to prove the claims of functional properties of foods. Functional foods are worthy as those ones that produce physiological or metabolic effects through the performance of some nutrient in maintaining the functions of the human organism. Concerning to these foods, it is important to remember that they do not cure diseases, they only prevent

their appearance, helping the body to fight them in a more effective way (SALES et al., 2008; VIDAL et al., 2012).

functional prebiotic foods, because they have resistant starch, what is by great interest for food industry because it has important nutrients for human health, given that it might be used on the elaboration of products with reduced lipid and sugar content, besides helping in the control of blood glucose, cholesterol and helps on the treatment of intestinal disorders (TOPPING; FUKUSHIMA; BIRD, 2011; FREITAS; TAVARES, 2005).

This way, functional nutrition is an alternative for the treatment, prevention and control of intestinal dysbiosis, using the importance of gastrointestinal tract functionality as a basic principle, followed by the biochemical specificity, patient-oriented therapy and not on pathology, nutritional stability, nutrient bioavailability and the intervention of external factors to the organic health (ALMEIDA et al., 2009; TEIXEIRA, 2010; MAHAN et al., 2011; GAVANSKI; BARATTO; GATTI, 2015).

Given the above, this study has the goal of developing a functional food product with probiotics and prebiotics for insertion in the diet of institutionalized elderly residents.

II. MATERIAL AND METHODS

This study was part of a larger project entitled "Characterization and analysis of the health conditions of elderly residents in a long-term care institution in the city of Feira de Santana Bahia", what was approved by the Ethics Committee on Research with Human Beings, by means of Consubstantiated Opinion of the Zip Code No. 3,190,475. This is a descriptive cross-sectional study conducted with elderly people living in a long-term facility care (LFC) in Feira de Santana-BA.

The study included individuals of both sexes, aged sixty and over, residents in the Asilar Institution - Feirense Social Welfare Association of Feira de Santana (FSWA), who agreed to participate in the study after signing the Free Consent Form and Clarified (FCFC).

The study did not include individuals that for some reason were unable to answer the questions, as well as elderly people with some gastrointestinal tract pathology such as chronic diarrhea or enteral, parenteral and diet-specific conditions medical procedure. Data were collected by the multidisciplinary team, composed by undergraduate students in Nutrition and Physiotherapy, being all these ones properly trained. The procedures for obtaining the data were standardized as a measure of quality control and consistency of information.

The development of the formulations was performed in the teaching kitchen of UNIFACS, in what was used green banana biomass, kefir ferment, rice flour, brown sugar,

Among functional foods, bananas, especially when cooked and green, are included on the group of cinnamon, egg, rolled oats, corn flour and kefir fermented to the three different formulations. The ingredients used to produce the cake were purchased at the local trade fair of Feira de Santana-BA, observing the expiration date and quality of the packaging of each product. The green banana, a key ingredient of the experiment was selected to meet the required criteria for recipe functionality.

The tests for the acceptability analyzes were performed in a room previously prepared for this purpose, at Salvador University - UNIFACS Campus 3 - at Feira de Santana. The analyzes were performed in triplicates, considering each cake a replicate. The target audience consisted by students from Health School, professors and employees of UNIFACS by self-interest on participating in the study.

Three samples were prepared with approximately 30g each one. The samples were evaluated according to the preference and acceptability of the participants, considering the attributes, aroma, flavor, color, texture and overall impression. Among the tasting of the three samples, each taster was instructed to ingest approximately 50 mL of water so that sensory interference do not occur between the two samples during the test. It was used the sensorial tests from the Hedonic Scale of nine points varying from 9 - "very much liked" to 1 - "very much disliked" for the requirements: appearance, texture, aroma, taste, color. It was still performed the test of attitude order of purchasing varying from 1 - "would certainly not buy" to 5 - "would certainly buy".

The tests for the acceptability analyzes with the elderly were performed in the outhouses of the institution under study. Acceptability analyzes were performed in triplicates, considering each cake a replicate. The target audience were elderly people from the nursing home, of both sexes, aged sixty years and over, with their own interest in participating on the study.

Two samples were prepared, with approximately 30g each one, according to the preference and acceptability of the participants, considering the attributes, I LIKED, YES and NO. Each taster was instructed to ingest approximately 50 ml of water so that there is no sensory interference between the two samples during the test.

The chemical composition analysis was performed by collecting the samples of the cake formulations in triplicate, considering the following determinations: moisture (in an oven at 105 ° C) and ashes (in muffle 550 ° C) according to the methods described by Adolfo Lutz Institute (ZENEBON, PASCUET; TIGLEA, 2008). The analyzes of the formulations were performed at the Chemistry Laboratory of the University of Salvador -

UNIFACS. The determination of the quality control of two functional cakes, one made with rice flour and the other one with corn flour, was performed at the Biochemistry Laboratory of the University of Salvador, in Feira de Santana - Ba.

The data from the analyzes were charted in Microsoft Office Excel 2009 and presented in tables and graphs.

III. RESULTS AND DISCUSSION

The results of the acceptability and purchase intention tests of the cake formulations are presented on Figures 1,2,3,4, 5 and 6. Among 90 judges, 67 were female and 23 male, with a predominant age group from 17 to 25 years old, because it is a place frequented by undergraduate students. The Figure 1 shows the percent acceptability appearance of the developed cake formulations.

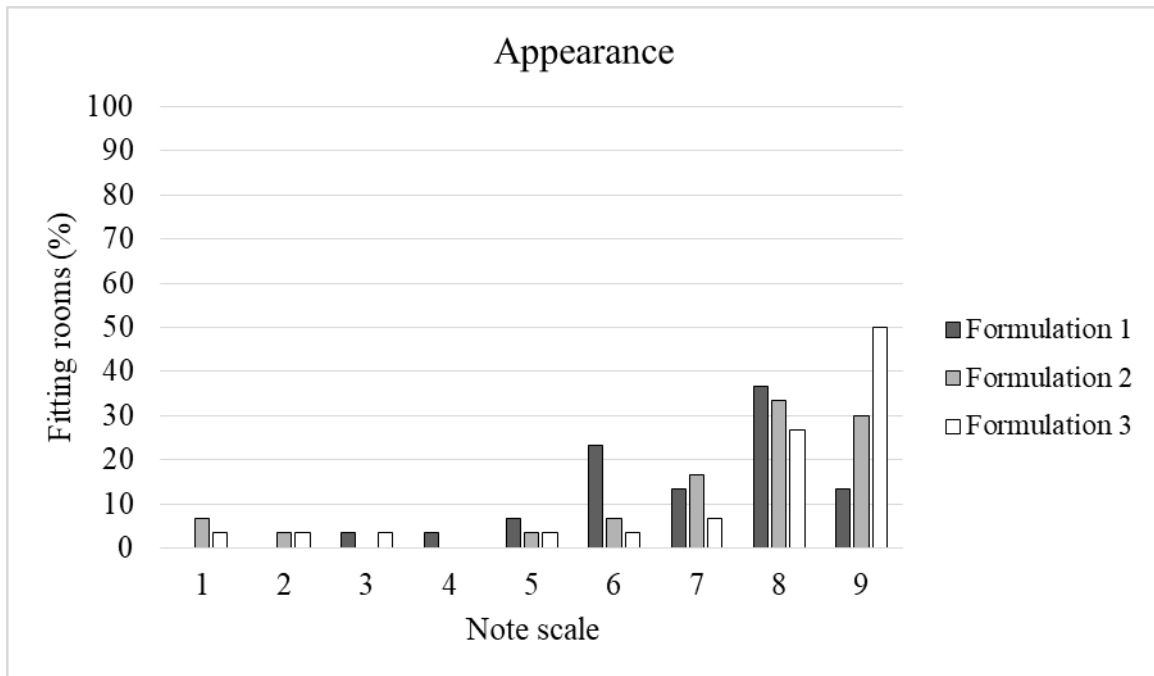


Fig.1. Acceptability of appearance

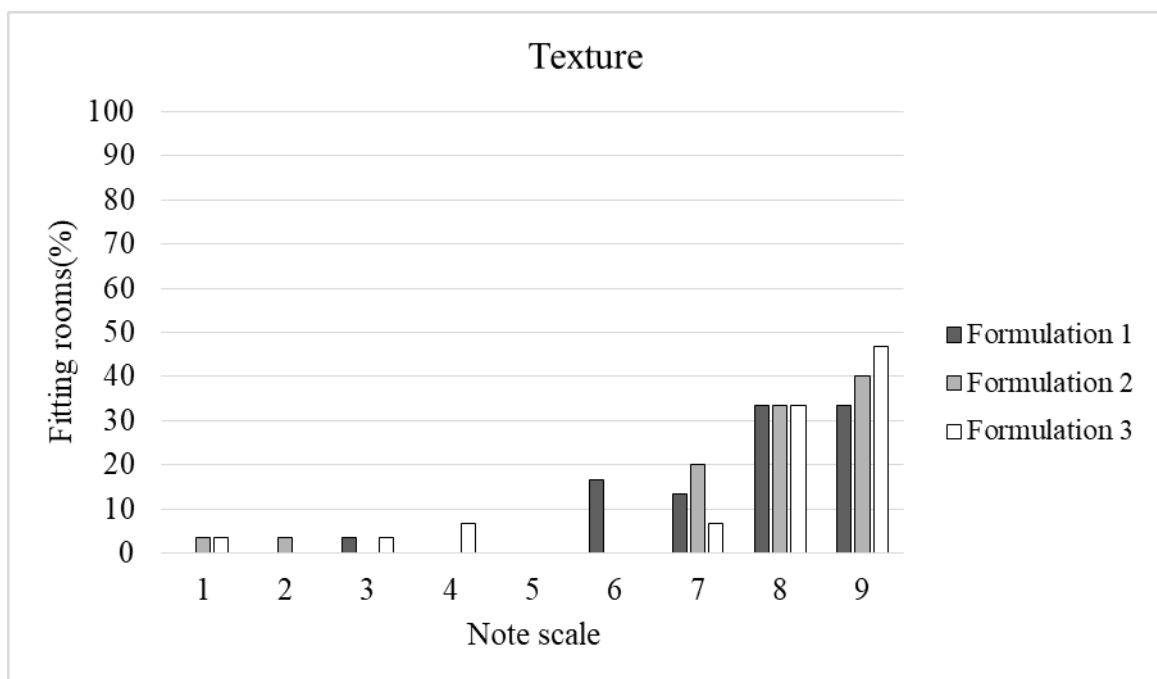


Fig.2. Acceptability of texture attribute

As for the appearance attribute, the formulation 3 reached a higher acceptability percentage (50%), obtaining (grade 9), proving that the appearance attribute of the formulation developed with the replacement of corn flour obtained better acceptance. In the study of Silva (2018), he proves that the substitution of ingredients in the formulation for containing cornflour and banana biomass, the fibers present contribute so that the product shows a rougher and apparently less silky surface than the traditional, favoring greater acceptability.

The Figure 2 shows the acceptability percentage of the texture attribute of the cake formulations developed.

With respect to the texture attribute, the formulation 3 reached a percentage of 49% (grade 9). Similar results were found in the study by Leon (2010) about elaboration and acceptability of corn cake with green banana biomass, whereupon 74% of the interviewed considered it very good, noting that, despite the corn cake has a heavy texture, the author, used banana biomass, favoring to confer lightness, without interference in the flavor.

The Figure 3 shows the percentage of aroma attribute of the developed cake formulations.

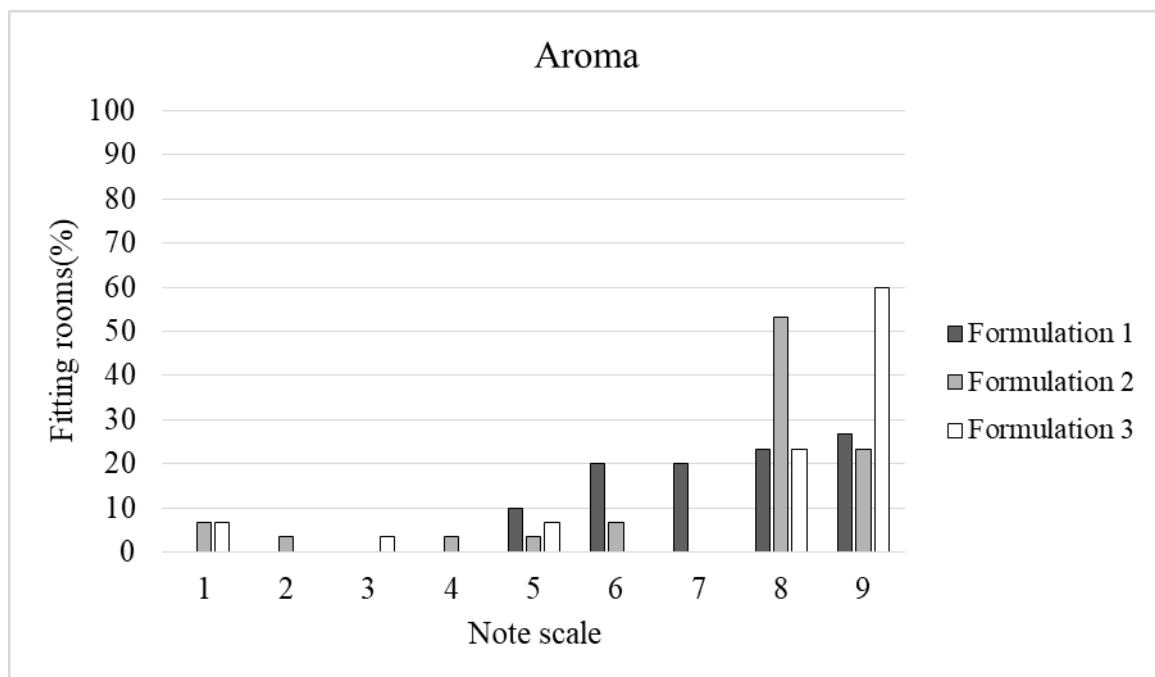


Fig.3. Acceptability of aroma attribute

With respect to the aroma attribute, the formulation 2 reached 50% (grade 8) and the formulation 3 with 60% (grade 9). Similar results were found in the study by Marques and Lemos (2016), in what they developed muffins containing green banana biomass, totaling 77% of acceptance regarding to the aroma. In the work by Amorim et al. (2016), the aroma of the cake developed with chocolate and green banana biomass, the preparation had a good acceptability index, and 56.66% said they liked it a lot.

The Figure 4 shows the percentage of the flavor attribute of the cake formulations developed.

Regarding the flavor attribute, the formulation 2 reached 70% and the formulation 3 69%, being attributed (grade 9). The flavor was one of the attributes that was highlighted in the formulations 2 and 3. Although the taste causes influence on the sensory properties of the food products

one of the attributes that was highlighted in formulations added with frequently unused ingredients (ALAMANOU et al., 1996), it can be stated that, in this study, the addition of rice flour and cornflour was considered a positive factor.

The Figure 5 shows the percentage of the flavor attribute of the developed cake formulations.

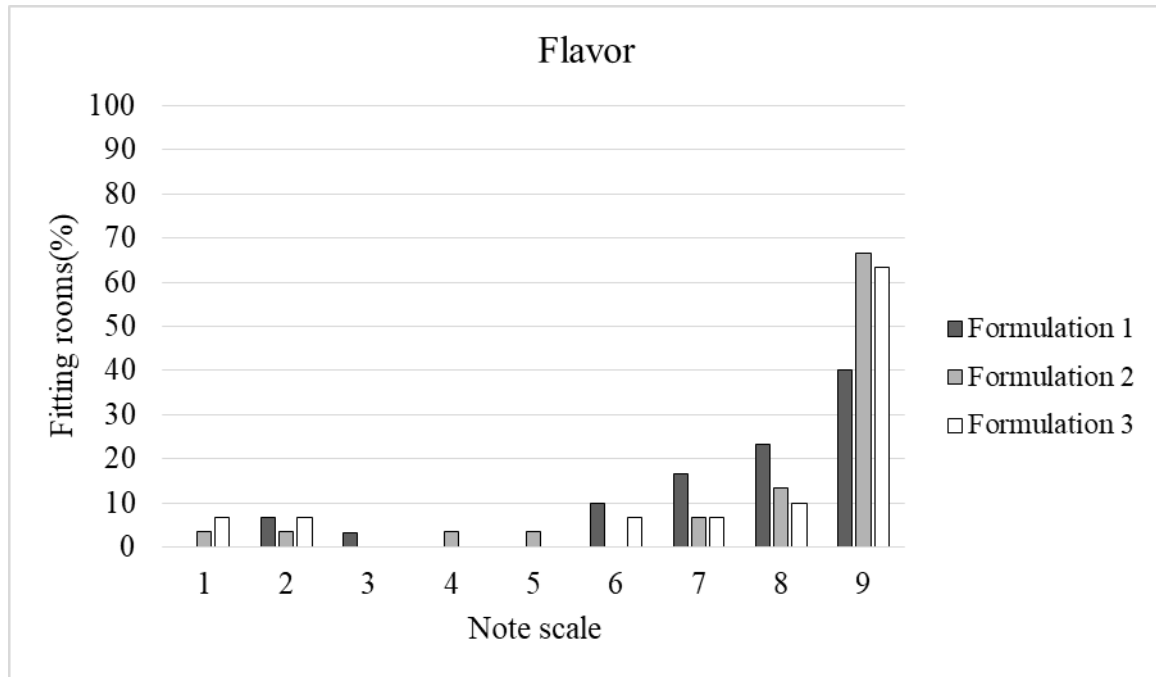


Fig.4. Acceptability of the flavor attribute.

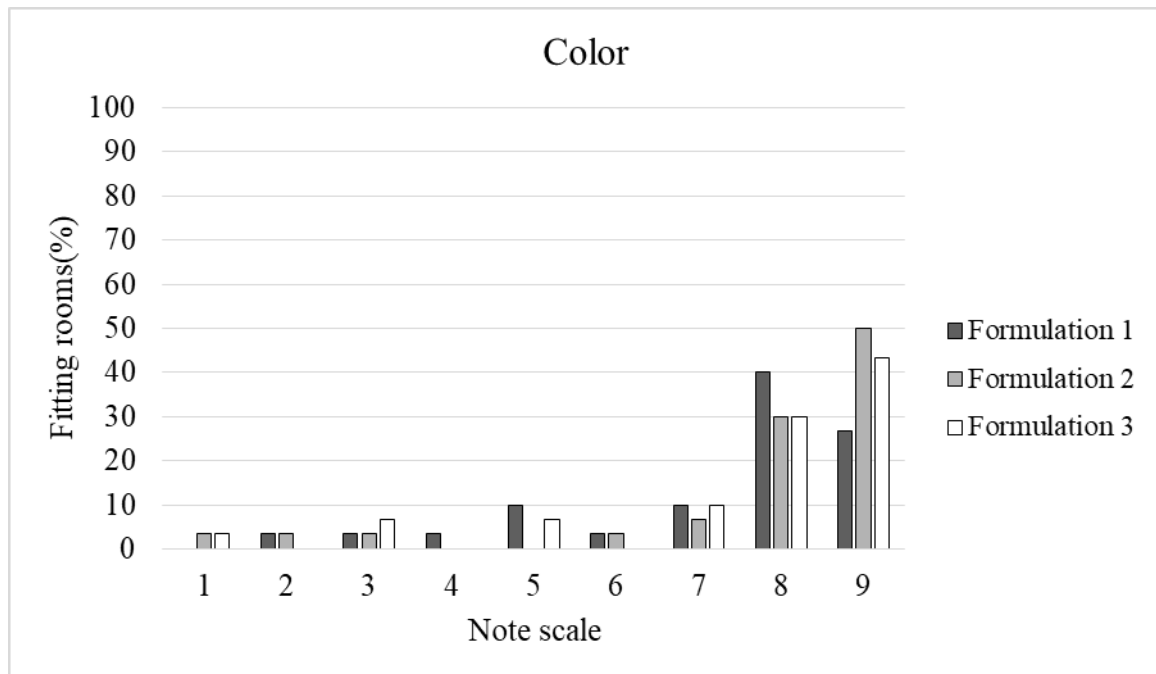


Fig.5. Acceptability of color attribute

Regarding to the color attribute, the formulation 1 reached 40% for formulation 1 (grade 8), 50% for formulation 2 (grade 9) and 40% for formulation 3 (grade 9). According to Ribeiro and Seravalli (2004) bananas, while green, have a large amount of tannins, what leads to astringency of the

fruit. The tannins have a yellowish to dark brown color, therefore it contributes so that the formulations have a brownish tone.

The Figure 6 shows the percentage of purchase intention of the developed cake formulations.

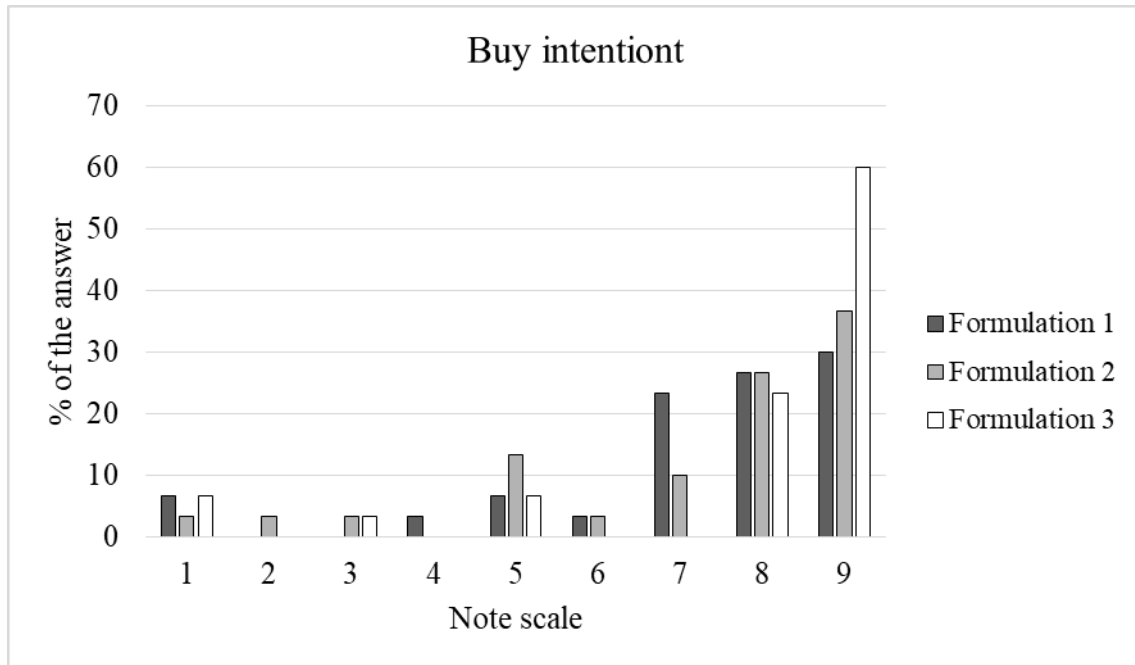


Fig.6. Purchase intention of the formulations developed.

The intention-to-buy test of both cake formulations obtained the highest percentage, 50% (formulation 1) grade 4 “Probably would buy”. Higher purchase intention was observed 60% (formulation 3), given grade 5 "would certainly buy". Similar results were found in the study by Freitas and Camargos (2002) in what 75% of tasters said they would "certainly buy" the product if it was available for sale.

Overall, it was observed that the grades assigned to the three formulations were above 6, indicating a positive assessment for acceptability. Likewise, De Carvalho et al. (2012), when developing cupcake formulations, added with banana peel flour, found that the products were well accepted by tasters, as occurred in the present study.

After evaluating the nutritional and functional benefits in the three formulations, it is found that one of the benefits of wheat flour replacement is the difference in refined carbohydrate for having high glycemic index, while oatmeal, corn and rice have a concentrate value of fiber with beneficial health effects

The results of the acceptability tests performed with the elderly people, from the formulations developed with cornmeal and rice flour, are shown in the Figure 7.

The result of the analysis of the acceptability test with the elderly people demonstrates better acceptance for the cake developed with cornmeal being 29 (87.9%) liked; 4 (12.1%) did not like it, and the cake made with rice flour 26 (78.8%) liked it and 7 (21.2%) did not like it.

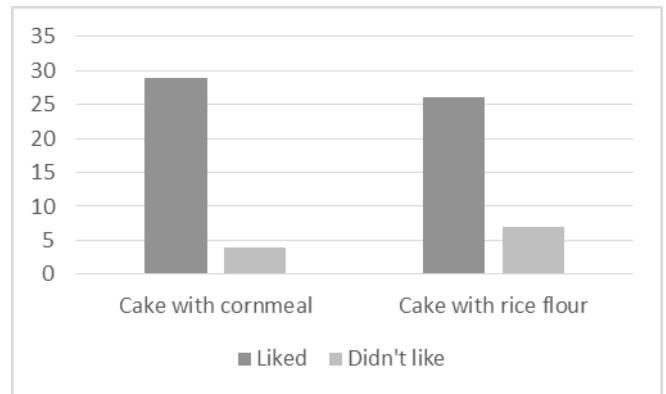


Fig.7. Acceptability tests performed with the elderly people

In the study by Leon (2010), the preparation of corn cake with green banana biomass obtained a good acceptability index and many of the academics commented that the biomass did not interfere with the taste of the elaborations. Already from the work by Maia et al. (2018), the corn cake formulation presented good acceptability, receiving hedonic values of global acceptance and taste acceptance corresponding to “moderately liked”, and hedonic value for appearance corresponding to “liked very much”.

In the study by Ramos; Piemolini-Barreto and Sandri (2012) the addition of rice flour in the proportions tested on the formulations did not affect the acceptance of cakes, that presented a minimum acceptability index (70%) and among them, any significant difference was observed, representing a great consumption alternative for people with celiac disease or for the ones who are adherents of a gluten-free diet.

For Silva and Lima (2015), the products developed with gluten-free flour do not have the same sensory characteristics as those ones developed with gluten, compromising the taste of these foods. The study by Urala and Lahteenmaki (2004) the authors report that the acceptance of functional foods is related to the information that these consumers receive about these products and the perception of benefits promoted by that food.

It was also observed that the two formulations offered had a satisfactory acceptance, demonstrating the viability, and especially for their excellent nutritional value. During the sensory analysis it was observed that none of the elderly people knew to identify how the formulations were made of, what becomes extremely relevant to their constant distribution in the institution, favoring of this way the health of the elderly people.

Average results of the composition of the two bolus formulations are shown in Table 1, expressed in g / 3g.

Table 1. Centesimal composition of functional cakes, produced in the biochemistry laboratory of the Salvador University of Feira de Santana – BA, 2019.

Formulations	Moisture	Ashes
A	37.66%	1.41%
B	36.87%	2.11%
C	25.30%	1.0%

* Formulation: A- corn functional cake; B - functional rice cake; C reference value according (USDA, 2001).

According to the analysis of the centesimal composition, both the corn and rice functional cake presented moisture content between 36.87% and 37.66%, values considered high, according to the literature. In the same way, Carneiro et.al. (2015) observed moisture content of (24.45%; 24.59%; 24.32%) in oatmeal, quinoa and flaxseed cake formulations. In the study by Souza et. al. (2013), with cakes developed with rice flour and manioc peel, the authors found moisture of: 11.5% and 12.8%.

Borges et al. (2011) state that the high values of moisture content may be attributed to the amount of fibers present in the product, directly favoring the increase of water absorption, mainly due to the large number of hydroxyl groups present in the structure of food fibers.

Rodrigues et al. (2011), in their study show that moisture analysis is important to indicate signs of microorganisms proliferation, that once present in food in inadequate quantity may damage to the quality of the same one, and moreover, if it presents significantly low value, it may indicate a decrease in nutritional value.

The ash contents were slightly different: sample 1 (1.41%) and sample 2 (2.11%), but not very different from those

ones obtained experimentally. In the study by Carneiro et al. (2015), in what three types of cake were produced with partial replacement of wheat flour by oats, quinoa and flaxseed in different proportions. The proportions used were: F1 = 30% oatmeal, 10% quinoa flour and 10% flaxseed; F2 = 15% oatmeal, 5% quinoa flour and 5% flaxseed flour; F3 = 7% oatmeal, 3% quinoa flour and 3% flaxseed flour.

It was not observed any significantly statistic difference in the ash contents of formulations F1 (1.33%) and F2 (1.29%), but differed significantly from formulation F3 (1.10%). These differences in ash content may be associated with the insertion of quinoa and flaxseed, since they contribute to the mineral input when added to food (BORGES et al., 2006) justifying the increase in ash content in samples 1 and 2. which presented a higher proportion of these ingredients. Lopes et al. (2009) and Lamacchia et al. (2010) found in the composition of quinoa flour minerals such as calcium, zinc, potassium and iron, and furthermore, obtained ash concentrations approximately seven and four times higher from that one present in rice and wheat flour, respectively.

The determination of ashes aims to quantify the total minerals present in the food (RODRIGUES et al., 2011). Among the functions that minerals perform in the body, it is noteworthy that they act as ions dissolved in body fluids, regulating the activities of many enzymes, besides keeping acid-base balance and osmotic pressure (CECCHI, 2003).

Based on the study by Celestino (2011) that lays down the rules, standards, and applicability methodologies for food drying principles, as well as the ash results obtained from scientific studies the two types of functional cakes presented here are according to specifications, and fit for consumption.

The results of the ash fraction analysis, the corn functional cake obtained a concentration of 1.41% of ash for each 3g of the sample, while the rice fraction obtained 2.11% of ash for each 3g of the sample. , which correlates with the reference value established by the United States National Bureau of Agricultural Statistics (2001), where it establishes 1.0% of ashes, did not show significant variation (USDA, 2001).

According to Silva and Moreira – Araújo (2019), the "ash" fraction represents the inorganic substances present in the food. When a food is burned the organic matter is transformed remaining only the minerals present in the food. Already the study of Ozores; Storck and Fogaça (2015) formulated a cake enriched with okra flour obtained an ash content of 1.82%, a result similar to this study where the ash content was 1.79%. Pereira (2014) evaluated the centesimal composition of gluten-free chocolate cake

and lactose fortified with melon seed flour, it was observed that the ash content was 1.32%. In another study Silva et al. (2015), the ash content was around 3.80% for the biscuit produced with pumpkin seed flour.

REFERENCES

- [1] ALAMANOU, Silvana et al. Influence of protein isolate from lupin seeds (*Lupinus albus* ssp. *Graecus*) on processing and quality characteristics of frankfurters. *Meat science*, v. 42, n. 1, p. 79-93, 1996.
- [2] ALMEIDA, Luciana Barros, et al., Disbiose intestinal. *Revista Brasileira de Nutrição Clínica*. v. 24, n. 1, p. 58-65. 2009.
- [3] AMORIM, Mirelly dos Santos, et al. Aspectos físico-químicos, grau de aceitabilidade e efeitos funcionais do bolo de chocolate sem glúten e lactose com biomassa da banana verde à saúde humana. 2016.
- [4] Association of Official Analytical Chemists - AOAC. HORWITZ, W. Official methods of analysis of the Association Analytical Chemists. 17 ed Arlington: AOAC Inc., v.1 ev. 2, 2000.
- [5] Associação Brasileira das Indústrias de Biscoitos – (ABIMAPI). Massas Alimentícias, Pães e Bolos Industrializados. Anuário ABIMAPI, 78 p, 2015.
- [6] BORGES, João Tomaz Da Silva et al. Caracterização físico-química e sensorial de pão de sal enriquecido com farinha integral de linhaça. *Boletim do Centro de Pesquisa de Processamento de Alimentos*, v. 29, n. 1, 2011.
- [7] BORGES, João Tomaz da Silva, et al. Utilização de farinha mista de aveia e trigo na elaboração de bolos. *Boletim do Centro de Pesquisa de Processamento de Alimentos*, Curitiba, v. 24, n. 1, p. 145-162, jan./jun. 2006.
- [8] BRASIL. Companhia Nacional de Abastecimento-CONAB. Acompanhamento da safra brasileira de grãos, Safra 2010/2011: décimo levantamento. 2011. Disponível em: <http://www.conab.gov.br/OlalaCMS/uploads/arquivos/11_07_15_11_03_18_boletim_julho_-_2011.pdf>. Acesso em: 10 set. 2019.
- [9] BRASIL. Gerência Geral de Toxicologia. Agência Nacional de Vigilância Sanitária (ANVISA). Programa de Análise de Resíduos de Agrotóxicos em Alimentos (PARA), Relatório de Atividades de 2010. 2011.
- [10] BRASIL. Empresa Brasileira de Pesquisa Agropecuária- (EMBRAPA). Ministério da Agricultura, Pecuária e Abastecimento. **Sistema de produção da bananeira irrigada**. Versão Eletrônica, Jul., 2009.
- [11] BRASIL. Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA). Embrapa Milho e Sargo. Cultivo do Milho. Versão Eletrônica, Set., 2010. Disponível em: <https://ainfo.cnptia.embrapa.br/digital/bitstream/item/27037/1/Plantio.pdf>. Acesso em: 15 de Out. 2019.
- [12] BRASIL. Empresa Brasileira de Pesquisa Agropecuária - (EMBRAPA) Cultivos: Banana.jun,2014. Disponível em: <<https://www.embrapa.br/mandioca-e-fruticultura/cultivos/banana>>. Acesso em:18 de out.2019.
- [13] CARNEIRO, Geila Silva et al. Caracterização físico-química de bolos com substituição parcial da farinha de trigo por aveia, quinoa e linhaça. *Enciclopédia biosfera*, v. 11, n. 21, p. 33-48, 2015.
- [14] CAVALLI, Adriana Schüler; CAVALLI, Marcelo Oliveira. O Brasil fica velho antes de ficar rico: o planejamento prognóstico como premissa para um envelhecimento saudável. **Trabalhando com a terceira idade: práticas interdisciplinares**. Pelotas: Editora e Gráfica Universitária, 13-37.2011.
- [15] CECCHI, Heloísa Máscia. **Fundamentos teóricos e práticos em análise de alimentos**. Editora da UNICAMP, 2003.
- [16] CELESTINO, Sonia Maria Costa. Princípios de secagem de alimentos. Embrapa, Cerrados-Documents (INFOTECA-E), 2010.
- [17] CONRADO, Bruna Ágata, et al. Disbiose Intestinal em idosos e aplicabilidade dos probióticos e prebióticos. *Cadernos UniFOA*, 13.36: 71-78. 2018.
- [18] CONAB – Companhia Nacional de Abastecimento. Acompanhamento da safra brasileira de grãos, Safra 2010/2011: décimo levantamento. 2011. Disponível em: <http://www.conab.gov.br/OlalaCMS/uploads/arquivos/11_07_15_11_03_18_boletim_julho_-_2011.pdf>. Acesso em: 10 set. 2019.
- [19] DE CARVALHO, Kennyara Henriqueta et al. Development of the cupcake added flour banana peel: sensory and chemical characteristics/Desenvolvimento de cupcake adicionado de farinha da casca de banana: características sensoriais e químicas. *Alimentos e Nutricao (Brazilian Journal of Food and Nutrition)*, v. 23, n. 3, p. 475-482, 2012.
- [20] FREITAS, Valle Heloisa de;CAMARGOS, Marcia. **Yes, nós temos bananas: histórias e receitas com biomassa de banana verde**. Editora Senac São Paulo, p.256. 2002.
- [21] Food and Agriculture Organization of the United Nations, World Health Organization (FAO/WHO). Evaluation of health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria. Córdoba, 34p 2001.
- [22] FREITAS, M. C. J.; TAVARES, D.de Q. Caracterização do grânulo de amido de bananas (AAA-nanicão e AAB-terra) musa musa. **Ciência e Tecnologia de Alimentos**, v. 25, n.02, p. 217-222, 2005.
- [23] GAVANSKI, Daniella Souza; BARATTO, Indiomara; GATTI, Raquel Rosalva. Avaliação do hábito intestinal e ingestão de fibras alimentares em uma população de idosos. **Revista brasileira de obesidade, nutrição e emagrecimento, São Paulo**. v.9. n.49. p.3-11, 2015.
- [24] LAMACCHIA, Carmela, et al. Amaranth, quinoa and oat doughs: Mechanical and rheological behaviour, polymeric protein size distribution and extractability. **Journal of Food Engineering**, v.96, n.1, p.97-106, 2010.
- [25] LEON, Tiane Machado de. Elaboração e aceitabilidade de receitas com biomassa de banana verde. 2010.
- [26] LIMA, Thiago da Silva. Desenvolvimento e análise de biscoito sem glúten com farinha de inhame enriquecido

- com farinha de semente de uva [trabalho de conclusão de curso]. João Pessoa: Universidade Federal da Paraíba, Curso de Tecnologia de Alimentos; 2015.
- [27] LOPES, Cristiane de Oliveira, et al. Aproveitamento, composição nutricional e antinutricional da farinha de quinoa (*Chenopodium quinoa*). **Alimentos e Nutrição**, v.20, n.4, p.669-675, 2009.
- [28] MAIA, Silvana Mara Prado Cysne, et al. Farinha de maracujá na elaboração de bolo de milho. **Revista Verde de Agroecologia e Desenvolvimento Sustentável**, 13.3: 328-336, 2018.
- [29] MAHAN .L Kathleen, et al. Krause: alimentos, nutrição e dietoterapia. In: PETER L; BEYER M. S. **Tratamento Médico Nutricional para Doenças do Trato Gastrointestinal Inferior**. 12º ed. Rio de Janeiro: Editora Elsevier, p. 696, 2011.
- [30] MARQUES, Gisela Silvana Pereira; LEMOS, Adriane Cristina Garcia. Desenvolvimento, análise sensorial e intenção de compra de muffins funcional elaborado com a biomassa de banana verde, 2016.
- [31] OZORES, Bruna; STORCK, Cátia Regina; FOGAÇA, Aline Oliveira de. Aceitabilidade e características tecnológicas de bolo enriquecido com farinha de maracujá. **Revista Ciências da Saúde**, 16(1): 61-69, 2015.
- [32] PEREIRA, Hellen Luciane Silva. Aceitabilidade e composição centesimal de bolo de chocolate (tipo mãe benta) isento de glúten e lactose fortificado com farinha de sementes de melão (*Cucumis melo*). Monografia (Bacharelado em Nutrição) - Universidade Federal do Maranhão, São Luís, 51p, 2014.
- [33] RAMOS, Naiara Cansi; PIEMOLINI-BARRETO, Luciani Tatsch; SANDRI, Ivana Greice. Elaboração de Pré-Mistura para bolo sem glúten .Preparation pré mix to cake free-gluten. **Alimentos e Nutrição Araraquara**, v. 23, n. 1, p. 33-38, 2012.
- [34] REIS, Jairo César dos; MORAIS, Mauro Batista de; FAGUNDES-NETO, Ulysses. Teste do H2 no ar expirado na avaliação de absorção de lactose e sobre crescimento bacteriano no intestino delgado de escolares. **Arq. Gastroenterol**, v. 36, p.169- 176, 1999.
- [35] RIBEIRO, Eliana Paula; SERAVALLI, Elisena AG. Química de alimentos. 2. ed. São Paulo: Blucher Editora Blucher, 88-109p, 2007.
- [36] ROBERFROID, Marcel B. Prebiotics: preferential substrates for specific germs. **The American journal of clinical nutrition**, v. 73, n. 2, p. 406s-409s, 2001.
- [37] ROBERFROID, Marcel. Functional food concept and its application to prebiotics. **Digestive and Liver Disease**, v. 34, p. S105-S110, 2002.
- [38] RODRIGUES, Mariéli Lira et al. Controle de qualidade e análise centesimal de uma barra de cereal, comercializada na cidade de Cascavel, PR. **Cultivando o Saber**, v. 4, n. 1, p. 36-44, 2011.
- [39] SILVA, Mara Reis et al. Composição química de pratos à base de milho: comparação entre dados laboratoriais e de tabelas. **Revista do Instituto Adolfo Lutz, São Paulo**, v. 63, n. 2, p. 193-199, 2004.
- [40] SILVA, Vitória Bezerra da. **Elaboração de bolos tipo muffins sem glúten com substituição parcial da gordura por biomassa de banana verde**. Trabalho de Conclusão de Curso. Brasil, 2018.
- [41] SILVA, Joyce, Gouveia Nunes da. Diabetes mellitus tipo 1, doença celíaca e sua associação: estudo comparativo do estado nutricional, consumo alimentar e qualidade de vida em indivíduos com duas doenças crônicas. 2015a, 95f. Dissertação (Mestrado em Ciências) – Universidade de São Paulo, São Paulo, 2015a.
- [42] SILVA, Cláudia Nunes da; SILVA, Débora Thaís Sampaio da; MOREIRA-ARAÚJO, Regilda Saraiva dos Reis. Desenvolvimento de bolo funcional isento de lactose e sacarose. **Revista Eletrônica Acervo Saúde**, v. 11, n. 14, p. e897, 7 out. 2019.
- [43] SILVA, Juliana Bergonsi, et al, et al. Biscoitos Enriquecidos com Farinha de Semente de Abóbora como Fonte de Fibra Alimentar. **Revista Destaques Acadêmicos**, 7(4): 174-184. 26, 2015.
- [44] SOUZA, Thaísa Anders Carvalho et al. Bolos sem glúten a base de arroz quebrado e
- [45] casca de mandioca. Semina: **Ciências Agrárias**, v. 34, n. 2, p. 717-727, 2013.
- [46] STATISTICS Krea. **Food grain consumption in 2011**, 2012. Disponível em: <http://kostat.go.kr/portal/korea/kor_nw/2/1/index.board?bmode14>. Acesso em: 14 de agosto de 2019.
- [47] TAVARES, Keila Okuda, et al. Envelhecer, adoecer e tornar-se dependente: a visão do idoso. **Revista Kairós: Gerontologia**, 15.2: 105-118, 2012.
- [48] TEIXEIRA, Rejane Teixeira. Nutrição: um guia completo de alimentação, práticas de higiene, cardápios, doenças, dietas e gestão. 1º ed. São Paulo: Editora Rideel, 2010.
- [49] TOPPING, David L.; FUKUSHIMA, Michihiro; BIRD, Anthony R.. Resistant starch as a prebiotic and symbiotic: state of the art. **Proc of the Nutr Soc, Edinburg**, v. 62, n. 01, p. 171-176, 2011.
- [50] UNITED STATE DEPARTMENT OF AGRICULTURE (USDA). Nutrient Database for Standard Reference, Release 14. Washington: USDA; Jul 2001.
- [51] URALA, Nina; LÄHTEENMÄKI, Liisa. Attitudes behind consumers' willingness to use functional foods. **Food quality and preference**, 15.7-8: 793-803, 2004.
- [52] VIDAL, Andressa Meirelles et al. A ingestão de alimentos funcionais e sua contribuição para a diminuição da incidência de doenças. **Caderno de Graduação - Ciências Biológicas e da Saúde - UNIT**, [S.l.], v. 1, n. 1, p. 43-52, out. 2012.
- [53] World Health Organization (WHO). Global strategy on diet, physical activity and health: fifty-seventh World Health Assembly Wha 57.17, 21 p, 2004.
- [54] ZENEBO, Odair; PASCUET, Sadocco, Neus; TIGLEA, Paulo. Métodos físico- químicos para análise de alimentos. (4 ed.). São Paulo: Instituto Adolfo Lutz, 2008.