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Research Article

Coffee cupcake added to chia flour: Enrichment and physicochemical characterization

Borges Josileide Goncalves*, Mariano Raiara Dias, Da Silva, Batista Famela, De Sa, Almeida, Gabriela Gomes, Aureni, Queiroz & Pinheiro Joao Victor Rodrigues

Department of Pharmacy, Federal University of Sao Francisco Valley (UNIVASF), Av. Jose of Sa Manicoba, S/N, 56.304-205, Petrolina, Pernambuco, Brazil, Tel: +5587216862

E-mail: josileide.borges@univasf.edu.br

Abstract

Cupcake was developed to bring health benefits due to presence of chia seed (*Salvia Hispanica L.*), which contains high nutritional value due to presence of calcium, potassium, antioxidants, essential amino acids, fiber, omega 3. Aim of this study was to develop cupcake with partial replacement of wheat flour by chia flour, to evaluate its physicochemical composition. Centesimal composition of formulations, chias flour was evaluated according to official methodology. Chia-enriched cupcakes showed nutritional improvement compared to standard cupcakes with increased protein content (6.99%), ash (2.02%), unsaturated fatty acids (24.08%), nutritional fiber (8.74%). Showing that chia can really be incorporated into foods making them healthier, helping in preventing chronic diseases.

Keywords: Cupcake, Chia flour, Nutritional value, Physicochemical analysis

INTRODUCTION

Cupcakes are known as cakes sold in individual portions. They are obtained from a combination of flour(s) or starch(s), plus other ingredients, fermented and baked (Vieira et al., 2017) that are part of the diet of many people. With the growing search for healthy eating and prevention of diseases such as obesity and diabetes, there was a significant increase in the enrichment of various foods seeking to increase the fiber content, due to the proven health benefit.

Adequate nutrition is capable of promoting the health of the body, reducing stress, anxiety and irritability, in addition to facilitating weight and mood control. It also helps in the fight against various diseases, makes its treatment more effective and favors a faster recovery for the patient. Likewise, it can promote an improvement in the performance of athletes, enhance the physical and cognitive development of children and adolescents, contribute to a full, healthy pregnancy and offer conditions to deal with the natural changes of aging.

Chia (*Salvia hispanica L.*) is an herbaceous plant that belongs to the Lamiaceae family, in which the plants are often aromatic herbs used in cooking such as mint, basil, sage, oregano and thyme. It is a plant with little tolerance to cold climates, coming from southern Mexico and northern Guatemala, being cultivated in tropical and subtropical regions. However, its cultivation can be adapted to greenhouse systems in other climates such as Europe (Ixtaina et al., 2010). Chia is commercially grown in Mexico, Bolivia, Argentina, Ecuador and Guatemala (Huerta et al., 2016).

The chia seed (*Salvia Hispanica L.*) has been introduced in the diet, being considered a functional food due to its high content of soluble and insoluble fibers, antioxidant potential due to the presence of polyphenols. Its nutritional properties include: essential amino acids, proteins, polyunsaturated fatty acids (PUFA), mainly omega 3, α -linolenic acid and considerable calcium, iron and potassium. The chia seed acts against constipation, increases immunity, prevents osteoporosis, reduces triglyceride levels and helps to lose

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weight Frequent consumption of foods rich in omega 3 reduces cholesterol, triglyceride levels in the blood, also reduces blood pressure, being associated with lower rates of cardiovascular disease and also helps to treat and prevent arthritis, cancer, depression, Alzheimer's disease, among others (Jin et al.2021) indicated that the consumption of 25 g of chia seed per day for 7 weeks increases the plasma levels of α -linolenic acid and eicosapentaenoic acid in postmenopausal women by 138% and 30%, respectively. Investigating the benefits of chia ingestion on dyslipidemias and insulin resistance induced by the consumption of a sucrose-rich diet (62.5%) on rats for three weeks, demonstrated that chia seed prevented the onset of dyslipidemia and insulin resistance, with no change in blood glucose. Furthermore, during the last two months of the rats' feeding period, he observed a reduction in adiposity.

Replacing less nutritious ingredients with others of greater nutritional value, without altering the taste of food, is a routine practice in the food industry and contributes to a healthier diet. Developed wholegrain bread added with soy (10%), chia (5%), flaxseed (5%) and folic acid in order to obtain products with higher nutritional value and better functional characteristics. Some studies have been carried out to increase the amount of insoluble fiber in baked goods, biscuits and cereal bars with the addition of fibers from cereals, fruits, vegetables and powdered cellulose In addition, breads, cookies, pastas and snacks appear to be excellent carriers of dietary fiber; they are well-accepted products, consumed by all age groups, and reach mainly the elderly and children This work aimed to develop a coffee cupcake enriched with chia and carry out its physical-chemical characterization.

MATERIALS AND METHODS

Cupcake formulation

From a cupcake base formulation, two cupcake formulations were developed: a control formulation without added chia (F1=0%) and a formulation with added chia (F2=19%). Formulations were prepared individually, with the proportions of the ingredients prepare the cupcakes in an ordinary mixer, margarine and refined sugar were added until a whitish cream was obtained, then the eggs were added one by one with the mixer on.

Other ingredients were added until obtaining a homogeneous mass. Chemical yeast was manually mixed and the mass was distributed in paper molds positioned on top of the aluminum ones and placed in a preheated oven at 210°C for 25 minutes.

Physical-chemical analysis of chia flour and coffee cupcakes

Physical-chemical analyzes were performed in triplicate at the Laboratory of General and Analytical Chemistry at

the Federal University of Vale de São Francisco (UNIVASF), according to the methodology of the Association of Official Analytical Chemistry (2012) and Institute.

The moisture contents (oven drying at 105°C/ 24 hours), ash (muffle 550°C / 4 hours) were determined by the gravimetric method, method nº 920151 and nº 920.153, respectively. Protein content was determined by the Kjeldahl method (method 928.08), which is based on the determination of nitrogen, using the 6.25 factor for the conversion of total nitrogen into total protein and total lipids by (Bligh & Dyer (1959). Dietary fiber was evaluated by the theoretical calculation of the formulations using the Brazilian Table of Food Composition (UNICAMP, 2011). Non-fibrous carbohydrates were calculated by the difference from the following formula Carbohydrates = 100 – (moisture + protein + fiber + total lipids + ash). Total energy value (VET) was calculated according to the energy value of macronutrients considering the Atawer conversion factors of 4 kcal/g of protein, carbohydrate and 9 kcal/g of lipids, according to Resolution - RDC ANVISA/MS nº 360, of December 23, 2003.

Statistical analysis

Data from the physicochemical analysis were evaluated using analysis of variance (ANOVA) and Tukey's test to compare means with a significance level of 5%, using STATISTICA 7.0 program.

RESULTS AND DISCUSSION

Centesimal composition

Moisture:

Increasingly, food industry has included legume flours in the development of bakery products to increase their nutritional value.

Chia seed has a large amount of mucilage, which is a secretion rich in polysaccharides, responsible for water retention by the seeds, contributing to their increase in volume when inserted in an aqueous medium forming a transparent gel, rich in fibers and soluble with capacity emulsifier. This mucilage allows the chia the ability to absorb up to 12 times its water weight hence the high amount of moisture. Part of this moisture content remains in the chia flour although producers are careful to apply some method of reduction of moisture.

The chia flour used in this study had a moisture content of 10.62%. There is no individual regulation for each flour produced, but normative instruction N°. 8 of the MAPA "Technical regulation for cereal, starch, flour and bran products" recommends that the maximum moisture content for these products should be 15%, (100 g), therefore, both the flour and the cupcakes are within the current laws.

When evaluating banana peel cupcakes with the addition of banana flour, in the proportions of 2.50% and 7.00%, found moisture contents of 19.50% to 21.07%, higher results than those found in this work. ANVISA recommends that the maximum moisture content for wheat flour should be 15.26% which indicates that the cupcakes developed in this research are in accordance with current legislation. When analyzing the moisture content of a cupcake enriched with baru flour, found moisture contents of 19.86% for the standard cupcake and 20.05% when 12.00% of the baru flour was added. Values found in this study for the standard (13.42%) and the enriched cupcake (13.78%) is within the Brazilian legislation.

Lipids:

Formulations F1 and F2 had total lipid contents of 18.09% and 24.08%, respectively. Noting a higher lipid content in the chia-enriched cupcake. This result was already expected since chia is an oilseed and both flour and seeds were used. These results do not preclude the consumption of the product since chia is a source of polyunsaturated fatty acids (PUFA) with a protective effect on the heart.

Vieira et al. (2017) when comparing two of the five cupcake formulations tested, as follows: F1 control (0%) and F5 incorporated with 20% mouthwash, found lipid values of 7.57% (standard) and 11.93% for the enriched cupcake although the lipid content in the bocaiuva flour was 13.15%. In this study, the same pattern was observed in which the cupcakes had lower lipid values than the reference product. When developing three cupcake formulations partially replacing wheat flour with cashew flour in different proportions (F1 = 0%; F2 = 5%; F3 = 12%) found lipid values of 13.44% (F1 and F2), 14.34% (F3). It is noteworthy that in this study the cashew pulp was used and these values would have been higher if the nut had been used.

Protein:

Protein values of the enriched cupcake (6.99%) were expressive, it can be seen that the incorporation of chia flour contributes to the increase in the protein content when compared to the standard (Borges et al., 2019). When analyzing fruit peel flours, found that the protein content in this food is small (1.70%). It can be seen in this study that oilseed flours have much higher protein content when compared to the peel of some fruits. However, to maintain health an adult needs to consume 0.8 g protein/kg/weight/day based on a 2000 calorie diet.

when preparing five cupcake formulations substituting wheat flour partially with watermelon rind flour (FCM) in different proportions, being: standard F1 (0% FCM addition) and the others added 6% (F2), 8% (F3), 10% (F4) and 12% (F5) of FCM and comparing the standard formulation (F1)

with F4 found protein contents of 5.87% for standard and 5.03 % for F4 formulation, indicating that the replacement of wheat flour by 10% of bocaiuva flour does not contribute to calories (Kcal. 100⁻¹) improvement of this parameter.

Ashes:

In the chia flour, ash contents of 4.66% were found, 1.56% in the standard cupcake and 2.02% in the enriched cupcake. The ash content present in chia flour demonstrates the high concentration of minerals, mainly calcium, iron and potassium. In this way, its incorporation into food contributes to its nutritional improvement. Similar mineral contents were found in several cupcakes enriched with different types of flours such as: 2.52% with melon flour (Vieira et al., 2017), 1.38% with baru flour 1.56% with bocaiuva flour (Vieira et al., 2017b) and 1.16% using cashew flour. Therefore, the ash values found in this study are compatible with other flours used in food preparations.

Raw fiber:

The incorporation of chia flour contributes to a considerable increase in fiber content, increasing from 2.13% in the standard cupcake to 8.74% in the enriched cupcake. According to the Brazilian Legislation a product is considered as a source of dietary fiber when it presents at least 3% and with a high content of at least 6% in fiber. Soon this cupcake could be considered an excellent source of fiber (Capitani et al., 2022).

Other authors have achieved an increase in fiber content by partially replacing wheat flour with another food flour (Chicco et al. 2009), when using watermelon flour (FM) in their cupcakes, managed to increase the fiber content from 0.46% (Standard) to 7.67% using 10.00% of FM. when preparing cakes using 75% of the shell flour (FCA), pumpkin seed (FSA), achieved an increase from 0.84 (standard) to 1.44% and 1.68% using seed flour.

Developed a new bakery product by replacing wheat flour with 5% chia seeds and 5% whole chia flour and concluded that chia seeds or their flour can be used as an ingredient in the preparation of baked products to increase the nutritional value and quality of the product, and bread added with chia seed was more accepted by consumers compared to bread added with chia flour. These results of increased fiber content, such as those found in this work, show that it is possible to develop healthy foods with a higher nutritional value, which can be an adjuvant in the prevention and treatment of diseases such as obesity, diabetes, cardiovascular diseases and metabolic syndrome. Chia seeds are an important raw material for obtaining functional foods due to their special characteristics, offering advantages over other available sources (Coates, 1996). Chia is ideal for enriching a number of products such as baby foods, baked goods, cereal bars, yogurts and sauces).

Total carbohydrates and caloric value:

In the analysis of total carbohydrates there was a decrease in this variable with the partial replacement of wheat flour by chia flour from 63.20% (standard cupcake) to 44.39% (cupcake with chia). This result was already expected since wheat flour has lower carbohydrate content than wheat flour. However, there was no reduction in the caloric value of the cupcake with the addition of chia flour due to its rich constitution in proteins and lipids. Future studies could look for a way to enrich baked goods like cupcake while trying to reduce the caloric value that is desired by people who diet and seek to reduce weight for health reasons (Horwitz et al., 1995).

CONCLUSION

Work demonstrated that the addition of chia flour improves the nutritional properties of the coffee cupcake, as observed in the increase in the content of proteins, minerals and unsaturated lipids and fibers, making it a functional food that can be consumed to aid and prevent diseases chronicles. The data confirm that it is possible to formulate foods consumed by general population, however with greater nutritional value, thus contributing to the consumption of a greater supply of nutritional constituents and prevention of non-contagious diseases such as those caused by mineral, protein and vitamin deficiencies, obesity cardiovascular diseases. Cupcake's high fiber content contributes to delayed gastric emptying, satiety, intestinal mobility and facilitates colonization of the colon by beneficial bacteria (Eckert et al., 2014).

REFERENCES

Bligh EG, Dyer WJ (1959). A rapid method of total lipid extraction and purification. *Can J Biochem Physiol.* 37: 911-917.

- Borges JG, da Silva Almeida JRG, Pinheiro JV, de Sa JAR, Bezerra KSP, Leal IL (2019). Nutritional and Phytochemical Composition of Fruit Bioproducts. *J Agric Sci.* 7: 252-263.
- Capitani MEA, Spotorno V, Nolasco SM, Tomas MC (2012). Physicochemical and functional characterization of by-products from chia (*Salvia hispanica* L.) seeds of Argentina. *Lwt lwt-food sci technol.* 45: 94-102.
- Chicco AG, DAlessandro ME, Hein GJ, Oliva ME, Lombardo YB (2009). Dietary Chia Seed (*Salvia hispânica* L.) Rich in α -linolenic acid improves adiposity and normalises hypertriglycerolaemia and Insulin Resistance in Dyslipaemic Rats. *Br J Nutr.* 101: 41-50.
- Coates W (1996). Production potential of chia in northwestern Argentina. *Ind Crops Prod.* 5: 229-233.
- Coelho MS, Salas-Mellado MM (2014). Chemical Characterization of Chia (*Salvia hispanica* L.) for Use in Food Products. *J Food Nutr Res.* 2: 263-269.
- Eckert RG, de Oliveira Almeida PG. (2014). Análise centesimal e dosagem de ω 3 em semente de chia (salvia hispanica) e semente de linhaça (linum usitatissimum). *Varia Scientia Agrárias.* 4: 49-64.
- Horwitz W, chichilo P, Reynolds H (1955). Official methods of analysis of the Association of Official Analytical Chemists.
- Huerta KM, Alves JS, Da Silva AFC, Kubota EH, Da Rosa CS (2016). Sensory response and physical characteristics of glúten-free and gun-free Bread with chia flour. *Food Sci Technol.* 36: 15-18.
- Ixtaina VY, Vega A, Nolasco SM, Tomas MC, Gimeno M, Bárzana E, Tecante A (2010). Supercritical carbon dioxide extraction of oil from Mexican chia seed (*Salvia hispanica* L.): Characterization and process optimization. *J Supercrit Fluids.* 55: 192-199.
- Jin F, Nieman DC, Sha W, Xie G, Qiu Y, Jia W (2021). Supplementation of milled Chia seeds increases plasma ALA and EPA ins postmenopausal women. *Plant Foods Hum Nutr.* 67: 105-110.
- Vieira RFF, Carvalho CLS, Carvalho IRA, Candido CJ, Dos Santos EF, Novello D (2017). Addition of melon peel flour to cupcakes alters the physicochemical composition and acceptability among children. *science connection.* 12 (2): 22-30.