

The Use of the Industrial and Artisanal cashew apple bagasses in Culinary Preparations

Natália Sucupira¹, Paulo Sousa^{1,2}, Leopoldo Gondim Neto², Sandro Gouveia², Raimundo Figueiredo¹, Geraldo Maia¹

¹Departamento de Tecnologia de Alimentos, Universidade Federal do Ceara, phenriquemachado@gmail.com

²Curso de Gastronomia, Instituto de Cultura e Arte, Universidade Federal do Ceara

Key words: fiber, sensory evaluation, cashew apple ball.

INTRODUCTION

The world production of the main tropical fruits reached 62 million tons in 2010 (FAO, 2013). Brazil has a large number of native and exotic fruit species that are underexploited. These fruits represent an opportunity for local producers to gain access to special markets where consumers put emphasis on the exotic character and the presence of nutrients that could prevent degenerative diseases (Alves et al., 2008).

In Brazil, it is worth considering the immense potential of the cashew crop (*Anacardium occidentale* L.) because of its nutritional and functional components. This fruit has one of the most expressive productions in Brazil; however, <20% of its production is used by the fruit juice industry. This is commonly caused by the concentration of the harvesting season being in 3 month time period, showing the importance of the agro-industry to add value to the final products (Sousa et al., 2010). The stalk has a very fragile skin, which makes it sensitive to mechanical damage during transportation, being a highly perishable fruit that for the great part is wasted (Queiroz et al., 2011). New food products are prepared in order to satisfy consumer demands for taste, appearance, value and convenience. The production of foods with beneficial health effects are recognized more and more for their role in the prevention and treatment of diseases. This has been the proposal of institutions and companies that are very focused and involved in the production of functional foods (Mazza, 2000).

There is a need to develop processes and products from fruits due to the high domestic production of tropical fruits and their high perishability. This goes along with the difficulty in storing the fruits during the months of peak industrial processing /crop that contribute to a higher loss of fruits, mostly tropical ones.

The objective of this work was to develop two culinary dishes from bagasses of the cashew apple obtained by artisanal and industrial processes: paçoca cashew apple and cashew apple ball.

MATERIAL AND METHODS

Obtaining the cashew apple bagasses

Two kinds of cashew apple bagasses, industrial and artisan, that are common in commercial juice production in Brazil, were used in this study. The cashew apples (*Anacardium occidentale* L.) used in this work were provided by producing companies located at Pacajus-Brazil, in 2011 in a randomized complete block design with three replications, during the harvesting season (October / November). The bagasse was stored in the dark at 4° C until analysis and processing.

The industrial cashew apple bagasse was processed by a commercial juice company and the artisanal bagasse was produced manually in the experimental kitchen at the Federal University of Ceará, Brazil, with the difference in amount of juice adhered to the bagasse. In obtaining the cashew apple bagasse, of the 20 kg received, three batches of cashew apple bagasse were taken randomly. Bagasses were taken to obtain different sections similar to those generated in the industry. Whole red and yellow cashew apples were selected from the conveyor belt and washed by immersion in chlorinated water (100 mg L⁻¹). Soon after, the cashew apples were crushed and pulped to remove the juice, and then properly pulped and pressed again in fine-mesh screens to obtain the cashew apple bagasse. In order to obtain the artisanal cashew apple bagasse, intact cashew apples, red and yellow in color, were hand-picked and washed by immersion in chlorinated water. Then, the nut was removed from the cashew apples, and the juice was extracted with the aid of a Brazilian Philips Walita RI 1861 centrifugal juicer, then it was finely shredded by hand and squeezed through a household sieve. All of the analysis was performed in triplicate for the three separate batches of cashew apple bagasse.

The cashew apple bagasses obtained were packed in polyethylene bags, vacuum sealed and properly stored in a freezer until the time of analysis.

Elaboration of culinary preparations using cashew apple bagasse
Cashew apple ball were prepared twice, one for each bagasse type (artisanal and industrial). The quantities of the ingredients used in the development and drafting of the cashew apple ball are described in Table 1.

Table 1. Ingredients of cashew apple paçoca and cashew apple ball

Ingredients	Cashew Apple Ball
Cashew apple bagasse (g)	470
Cassava flour, sifted (g)	-
Purple onion (g)	92
Ghee, bottled butter fat (ml)	-
Chopped garlic (g)	15
Broth in tablet (g)	10,8
Paprika (g)	7
Salt (g)	5
Parsley (g)	5
Black pepper, freshly ground (g)	3
Slices of crust less toast bread (g)	183
Eggs (unity)	2
Cherry pepper (g)	12
Soy oil (ml)	540

In the development of the cashew apple ball, cashew apple bagasse was first added to broth, and then drained. In a large bowl, the bagasse was added and then the sliced bread cut into pieces, onion, garlic, hot peppers cut into small slices, chopped parsley, paprika, salt and black pepper were added. Then the eggs were placed in order to provide homogeneity to the mix. The ingredients were mixed well and then were modeled with hands, weighing at 50g each, they were then taken to the frying pan in hot oil for about 5 minutes (Figure 1). In the last step, the cashew apple balls were placed on paper towels and taken for sensory analysis.

Sensorial Evaluation

The cashew apple balls were evaluated individually using a sensory sheet for samples evaluated. The overall acceptance of the product was performed two hours after the making of the product, by untrained panelists (n=60), who judged the level of acceptance of the following attributes: aroma, appearance, flavor and overall impression.

The project followed the legal ethical aspects and was approved by National Counsel of Scientific and Technological Development - (registration number No. 261/11). The formulations were submitted to sensory tests to determine their acceptance by potential consumers. One session was conducted to verify the acceptance of the four formulations. The tests were applied in individual booths, under white light, 30 g of samples were served alone, in a glass dish codified with three digit numbers. The order of the presentation was balanced according to the design proposed by MacFie et al. (1989). The sensory evaluation, carried out with sixty untrained panelists, was enlisted as suggested by Meilgaard et al. (1999). In this laboratory test, consisting of acceptance tests for overall appearance, aroma, flavor and overall acceptance, nine-point structured hedonic scales were used (1: 'extremely disliked' to 9: 'extremely liked'); and with the purchase intent test, a five-point structured scale was used (1: 'definitely would not buy' to 5: 'definitely would buy').

The experiment was carried out using the split plot design, with two bagasses (artisanal and industrial) in the plots and four subplots in treatments in a completely randomized factorial with three repetitions of the experiments. The data was statistically treated by the one-way analysis of variance (ANOVA) using tukey's test. Differences were considered to be significant at $P \leq 0.05$, using the SAS statistical program software version 9.4 (SAS Institute, Cary, NC, 2014).

RESULTS AND DISCUSSION

For sensory analysis of cashew meatballs, there was no significant difference ($P > 0.05$) between the sensory attributes evaluated, showing that the cashew apple balls (artisanal and industrial bagasses) are statistically the same (Table 1).

This similarity can be attributed to the addition of these ingredients in equal amounts in the two preparations, with variation in the formulations just for the cashew bagasse, suggesting that the different raw materials used did not influence the sensory evaluation for this cashew product.

The results shown in Table 1 reveal that the attributes analyzed were all located in the middle of the acceptance area of the hedonic scale, noting that the two cashew apple balls were well accepted by the judges.

It was observed that the sample cashew apple ball was accepted better in relation to appearance. The highest percentages are in grades 7 and 8, which correspond to "liked moderately" and "liked."

In a study by Lima et al. (2008), the appearance of the cashew hamburger was observed with an average value of 6.2, which was smaller than that found in this study.

For the aroma and flavor of the cashew apple balls, most of the notes received stood in the region indicative of approval for products.

Pinho et al. (2011) studied by adding different percentages of cashew residue in products like the cashew hamburger, they observed mean values of 3.5 and 3.7 for flavor and taste, respectively, hamburgers had a 14.27% residual percentage, below the results found in this analysis. Yilmaz (2004) replaced fat with rye bran in meatballs, in the concentrations of 10% and 20%, and found mean values in the acceptance area of the scale.

For the overall impression, the cashew apple balls had averages between 6 ("slightly liked") and 7 ("moderately liked"), being higher than the results found by Lima (2008), who found an average of 5.9 for burgers made with the cashew apple bagasse.

It was found that the percentage of responses for the purchase intention of cashew apple balls fell in the range of acceptance of the hedonic scale used.

In this study observed that 35% of the panelists revealed that they were very fond for the cashew apple ball obtained by the artisanal bagasse, and a lower percentage was observed for the cashew balls made with industrialized cashew apple bagasse, 23.3%.

The two cashew apple balls prepared with different cashew bagasse had the means to purchase intent, ranging from "maybe buy / maybe not buy" to "possibly buy" (Table 1), and showing that the cashew apple balls may have a good market acceptance if they were for sale.

Fig. 1. Cashew apple meat ball makes with artisanal cashew apple bagasse



Table 2. Average scores of the acceptance tests and purchase intent of the artisanal and industrialized cashew apples balls

Process	Sensorial attributes				
	Appearance	Aroma	Flavour	Overall acceptance	Purchase intent
Artisanal	7.20 ^a	6.80 ^a	6.68 ^a	6.71 ^a	3.60 ^a
Industrialized	7.10 ^a	6.93 ^a	6.93 ^a	6.86 ^a	3.65 ^a

CONCLUSIONS

The two developed preparations, artisanal and industrialized cashew apple ball, were all located in the middle of the scale's acceptance zone, indicating a positive evaluation of these new recipes, which could be an alternative to the consumer market.

ACKNOWLEDGMENTS

Thanks to CNPq (National Counsel of Technological and Scientific Development) for the financial support and Jandaia for supplying the raw materials.

REFERENCES

- Alves, R.E., Brito, E.A., Rufino, M.S.M., Sampaio, C.G. Antioxidant activity measurement in tropical fruits: A case study with acerola. *Acta Hort.* 773, 299-305, 2008.
- FAO. Faostat: statistics division online databases. Disponível em: <<http://faostat.fao.org/>>. Acesso em: 15 dez. 2013.
- Lima, J.R. Caracterização físico-química e sensorial de hambúrguer vegetal elaborado à base de caju. *Cienc. Agrotec.* 32, 191-195, 2008.
- MacFIE, H.J., Bratchell, N., Greehoff, K., Vallis, L.V. Designs to balance the effect of order of presentation and first-order carry-over effects in hall tests. *J. Sens. Stud.* 4, 129-148, 1989.
- Mazza, G. Alimentos funcionales: aspectos bioquímicos y de procesado. first ed. Acribia, Zaragoza, 2000.
- Meilgaard, M., Civille, G.V., Carr, B.T. Sensory Evaluation Techniques. second ed. CRC Press: Florida, 1999.
- Pinho, L.X., Afonso, M.R.A., Carioca, J.O.B., Costa, J.M.C., Ramos, A.M. The use of cashew apple residue as source of fiber in low fat hamburgers. *Cienc. Tecnol. Aliment.* 31, 941-945, 2011.
- Queiroz, C., Lopes, M.L.M., Fialho, E., Valente-Mesquita, V.L. Changes in bioactive compounds and antioxidant capacity of fresh-cut cashew apple. *Food Res. Int.* 44, 1459-1462, 2011.
- SAS Institute Inc., version 9.4. Cary, NC, USA, 2014.
- Sousa, P.H.M., Ramos, A.M., Maia, G.A., Brito, E.S., Garruti, D.S., Fonseca, A.V.V. Adição de extratos de Ginkgo biloba e Panax ginseng em néctares mistos de frutas tropicais. *Cienc. Tecnol. Aliment.* 30, 463-470, 2010.
- Yilmaz, I. Effects of rye bran addition on fatty acid composition and quality characteristics of low-fat meatballs. *Meat Sci.* 67, 245-249, 2004.