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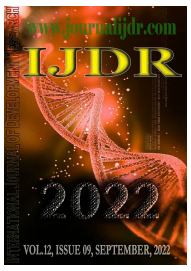

RESEARCH ARTICLE OPEN ACCESS

NUTRITIONAL CHARACTERIZATION OF GREEN LICURI ALMOND

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ABSTRACT

The licuri, Syagrus coronata is a palm tree native of Brazil. It is distributed in the states of Alagoas, Bahia, Minas Gerais, Pernambuco and Sergipe, but little is known about the nutritional value of licuri almonds, especially in the green stages. Thus, the aim of this work was to carry out the bromatological characterization of the green licuri almond in natura and cooked green in order to expand its sustainable consumption in human food, valuing a native plant of the caatinga. The physical chemical analyzes performed were: Total Carbohydrates, Total Proteins, Total Fat, Moisture, Ash and Crude Fiber. In natura green and cooked green licuri almonds presented total carbohydrates 3.67% and 2.82%, total proteins 5.18% and 5.04%, total fats 21.5 g/100g and 23.02 g/100g , moisture 41.23 g/100g and 43.76 g/100g, ash 1.02% and 0.95%, crude fiber 29.59 % and 27.23%, respectively. The results indicate that in natura green and cooked green licuri almonds are important sources of protein, fat and fiber.

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INTRODUCTION

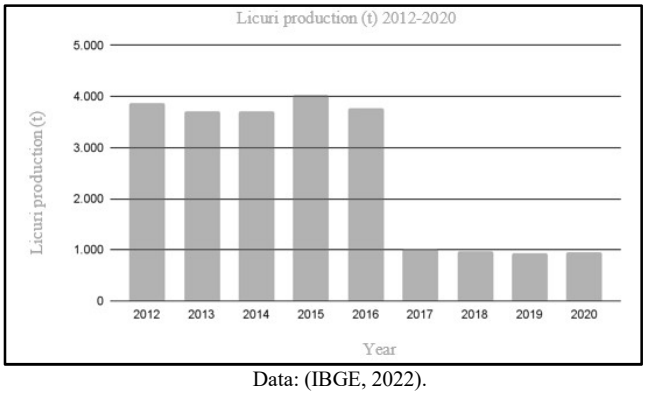
The licuri, Syagrus coronata (Mart.) Becc of the Arecaceae family, commonly known as licuri, ouricuri or licurizeiro, among other popular names (DRUMOND, 2007), is a palm tree native of Brazil (SOARES, 2022), It is distributed in the states of Alagoas, Bahia, Minas Gerais, Pernambuco and Sergipe as shown in Figure 1 and it is one of the few palm trees in the caatinga (CORADIN; CAMILLO; PAREYN, 2018). It can reach 13 m in height, having a solitary stem, leaves arranged in a perfect spiral around the stem and an androgynous inflorescence. Its staminate flowers have a cream to yellowish color and the pistillate flowers from green to brown. The fruits are ovoid or elliptical with a color variation according to the stages of maturation, becoming orange to light yellow when ripe (CORADIN; CAMILLO; PAREYN, 2018), (CREPALDI *et al*., 2001), (SOARES, 2020). Licurizeiro leaves are widely used in cattle feeding, rural construction and the manufacture of objects such as hats, bags, ropes, baskets and others. The fruits, both green and ripe, are used in human and animal food, from which the edible almonds and raw material for obtaining oil are also removed. (BONDAR, 1942). It is in human food that licuri stands out, especially in the traditional food of the sertanejo, who consumes it in natura, cooked, pasty sweets, coconut sweet, vegetable milk, among others, as well with the development of new products such as flour (SALLES *et al*., 2006), cookies (FOLEGATTI *et al*., 2006), beer (ARESOL, 2021) and juices (ANJOS; DRUMOND, 2010). There are even patented products such as licuri ice cream and popsicle (JESUS; DUARTE, 2007), coated licuri almonds (JESUS, 2006) and preserved licuri almonds (JESUS, 2006). According to Belviso *et al*. (2013) the processing of licuri uses firewood as a source of heat. Currently around the world there are more than 3 billion people who depend on firewood to develop domestic activities, mainly cooking food (GIODA, 2019). In Brazil, about 33 million individuals use firewood for cooking with 605 kg of annual consumption per capita. Every day the Caatinga biome has its vegetation suppressed in order to serve as an energy source for cooking food. This volume of daily firewood removal does not allow the natural recovery of this biome, exposing it to degrading processes, such as: erosion, loss of soil nutrients, reduction of biodiversity, water scarcity, microclimate changes and even the process of desertification.

In addition to the impacts on the natural ecosystem, deforestation promotes social and economic impacts, such as respiratory problems arising from the inhalation of smoke during cooking with firewood and the non-collection of dividends with environmental services that only exist with the forest standing.

Source: (SOARES, 2022).

Figure 1. Geographic distribution of Syagrus coronata

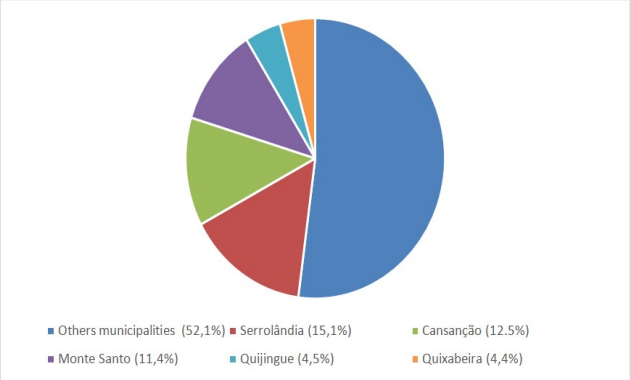
Licurizeiro is a palm tree with good productivity rates, which can under optimal conditions, produce 12-16 bunches per year (BONDAR, 1942) with 1357 licuris in each bunch (CREPALDI *et al*., 2001). According to the IBGE (2022), Bahia is the largest producer of licuri with 958 tons, only in 2020. Serrolândia, Cansanção, Monte Santo, Quijingue and Quixabeira are the five municipalities in Bahia that produced the most (Figure 3). However, it is noted that there have been significant reductions over the years as shown in Figure 1. The reduction in productivity is associated with increasing deforestation for cattle raising and extensive monocultures.



Data: (IBGE, 2022).

Figure 2. Historical series of licuri production in the State of Bahia in ton

Knowledge of the nutritional composition of foods is essential for a better use of these in a balanced di*et al*though licuri is already widely used in the diet of the population living in the semi-arid region of Bahia. Little is known about the nutritional value of licuri almonds, especially in the green stages. Thus, the aim of this work was to carry out the chemical characterization of the green licuri almond in natura and cooked green in order to expand its sustainable consumption in human food, valuing a native plant of the caatinga.

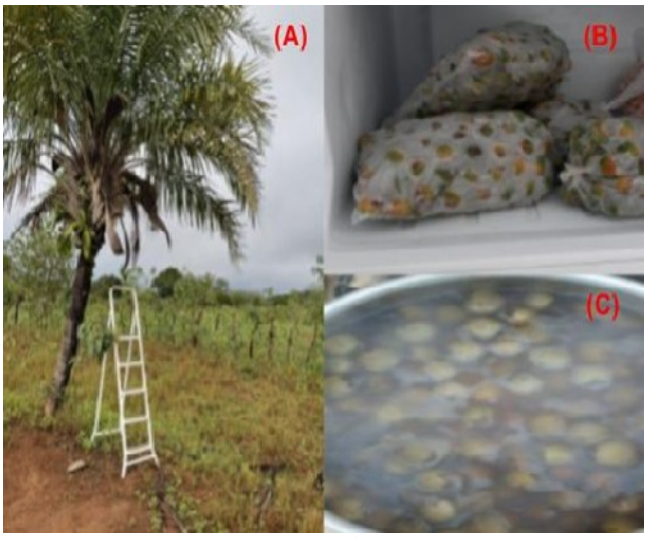


Data: (IBGE, 2022).

Figure 3. Participation of the five municipalities that produce the most licuri in the State of Bahia in 2020

METHODOLOGY

To obtain the fresh and cooked green licuri almonds, the licuri were harvested directly from the licuri trees located in the villages Caboré 10º34'17.6"S, 38º44'29.4"W and Pai João 10°33'28.7"S, 39°03' 22.2"W in Euclides da Cunha - Bahia (Figure 4A), selected (discarding the damaged fruits), sanitized in running water and sanitized in a sodium hypochlorite solution at a concentration of 200 ppm, To obtain the almonds in natura 10.336 kg of licuri were used, which were later bagged with plastic bags and frozen for 12-24 hours. After the freezing period (Figure 4B), the plastic bags were thawed at room temperature and broken, so the frozen almonds were removed for conservation and sent to carry out the characterization analysis of the green almond in natura. In order to obtain the cooked green licuri almonds, 722 licuris were used cooked over firewood in an aluminum cauldron with a capacity of 6 liters for 3 hours (Figure 4C). After cooling to room temperature, the cooked almonds were broken and removed and stored in the freezer for analysis. Licuris, when green, get their almonds stuck in the endocarp, which are difficult to detach. In this case, a thermal treatment either by cooling or heating is needed. Figure 4 presents the flowchart of the three steps mentioned above.



Source: Authors

Figure 4. (A) collection of licuri fruits, (B) freezing, (C) cooking

The physical chemical analyzes carried out with in natura green and cooked green licuri almonds were: Total Carbohydrates, Total Proteins, Total Fat, Moisture, Ash and Crude Fiber, following the methodology of Instituto Adolfo Lutz (2008).

Table 1. Physical chemical analysis of in natura green licuri almond and cooked green licuri

Determination	In natura green Licuri			Cooked green Licuri		
	Means	Standard Deviation	CV (%)	Means	Standard Deviation	CV (%)
Total Carboydrates (%weight)	3,67	0,05	1,42%	2,82	0,49	17,20%
Total Proteínes (%weight)	5,18	0,01	0,22%	5,04	0,86	17,08%
Total Fat (g/100g)	21,5	0,17	0,81%	23,02	19,08	82,89%
Moisture (g/100g)	41,23	7,23	17,53%	43,76	11,18	25,55%
Ash (%weight)	1,02	0,02	2,26%	0,95	0,10	10,42%
Crude Fiber(%)	29,59	0,28	0,95%	27,23	3,36	12,34%

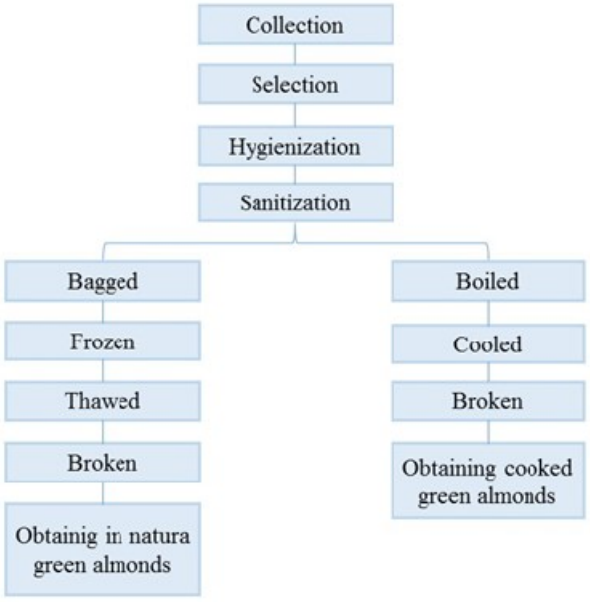
Table 2. Characterization of in natura green and cooked green licuri almonds compared to the literature

Determination	In natura green Licuri	Cooked green Licuri	Dry Licuri *	*Syagrus cearensis***	*Butia capitata****	*Cocos nucifera L*****
Total Carboydrates	3,67 (%)	2,82 (%)	34,87 (%)	43,93 (g/100g)	-	10,4 (g/100g)
Total Proteines	5,18 (%)	5,04 (%)	10,95 (%)	9,95 (g/100g)	11,6 (%)	3,7 (g/100g)
Total Fat	21,5 (g/100g)	23,02 (g/100g)	48,39 (%)	38,22 (g/100g)	53,6 (%)	42,0 (g/100g)
Moisture	41,23 (g/100g)	43,76 (g/100g)	4,74 (%)	6,51 (g/100g)	9,9 (%)	43,0 (%)
Ashes	1,02 (%)	0,95 (%)	1,05 (%)	1,39 (g/100g)	-	1,0 (g/100g)
Crude Fiber	29,59 (%)	27,23 (%)	33,7 (%)	-	-	5,4 (g/100g)

*(DAMÁSIO, 2014) **(MEIRELES *et al*., 2020) ***(FARIA *et al*., 2008) ****(NEPA, 2011)

RESULTS

The total carbohydrate values found for in natura green and cooked green licuri almonds were 3.67% and 2.82%, respectively, lower than the dried and cooked licuri fruit analyzed by Damásio (2014) and in dried catolé coconut almonds. (Syagrus cearensis), (MEIRELES *et al*., 2020). Total proteins showed values of 5.18% for in natura green almond and 5.04% for cooked green almond. It was found a similar value in cooked licuri and lower than the dry licuri detected by Damásio (2014), but higher than coconut (Cocos nucifera L) (NEPA, 2011).



Source: Authors

Figure 5. Flowchart for obtaining in natura green and cooked green licuri almonds

Total fat contents ranged from 21.5 g/100g (in natura green almonds) to 23.02 g/100g (cooked green almonds), values close to those found by Damásio (2014) in cooked licuri almonds, but lower than that identified in sour coconut almond (Butia capitata), catolé coconut and dried licuri itself (FARIA *et al*., 2008); (MEIRELES *et al*., 2020); (DAMASIO, 2014). The moisture indexes were: 41.23 g/100g and 43.76 g/100g for fresh and cooked green almonds, respectively, similar to coconut moisture reported in the Brazilian Food Composition Table, NEPA (2011) and lower than that found in cooked licuri (DAMASIO, 2014). As for ash, the values presented for in natura green and cooked green almonds were:1.02% and 0.95% in the proper order, both values showed similarity to dried and cooked licuri, catolé coconut and coconut (), (DAMASIO, 2014); (MEIRELES *et al*., 2020); (NEPA, 2011). The crude fiber indexes obtained were 29.59% for in natura green almond and 27.23% for cooked green almond, higher than the cooked licuri fruit and lower than the dried licuri fruit obtained by Damásio (2014). When comparing the physical chemical analyzes of in natura and cooked green licuri almonds in the literature, differences in the results are seen due to the many published works that used dried licuri almonds in their analysis. This is in agreement with the work of Miranda (2011), who noticed variations in the results between the genotypes and a significant difference between the two maturation stages, when analyzing physicochemically licuri almonds in two maturation stages and with thirty licuri genotypes. The most advanced stage of maturation showed higher values of proteins, lipids, among other determinations.

FINAL CONSIDERATIONS

In natura and cooked green licuri almonds showed similar values in the physical chemical analyses, but differed in some determinations found in the literature. The results indicate that in natura green and cooked green licuri almonds are important sources of protein, fat and fiber. Regarding the use of firewood for heat generation in licuri processing, it is important to diversify using renewable and clean energy sources to reduce pressure on ecosystems and damage to the health of the population.

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