EXFOLIATING SOAP BASED ON TUCUMÃ FIBER (*ASTROCARYUM VULGARE*)

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ABSTRACT

The beauty market is constantly growing and always looking to innovate. To be able to meet consumer demands, industries are always looking for new raw materials that offer greater benefits in beauty care. Known for its exuberant flora, the Amazon has had its fruits increasingly investigated in order to understand their bioactives, as existing research shows that they have enormous potential for the pharmaceutical, beauty and health markets. Thus, among the thousands of fruit trees, the tucumã stands out, which is currently very widespread both in the food sector, where it is part of the gastronomic culture of the Amazonians, and in the cosmetics industry, where the butter and oil have enormous added value, as they are rich in numerous components such as antioxidants, phenolic compounds, carotenoids, fatty acids and many others that are important for the skin care sector. Once the oil and butter have been obtained, the surplus residue, which is generally discarded, still has considerable value in terms of these components. With this in mind, in an effort to add value to this once worthless residue, this work aimed to formulate an exfoliating soap with tucumã fiber, in order to generate value for the residue.

Keywords: Amazônia. Tucumã. Waste. Cosmetic. Soap

1 INTRODUCTION

The cosmetics industry is one of the fastest-growing segments in the world, because the search for products that have properties that promote greater benefits for the skin, such as rejuvenation, deep hydration and many other benefits, is increasing. The beauty market is increasingly looking for products that have a sustainable matrix, mainly because over the years the concept of vegan products has managed to occupy a good place within the beauty segment. So whenever a product is launched that has components of sustainable origin in its composition, it is well accepted by the public.

Therefore, in order to find sources of raw materials that have the characteristics of interest to the cosmetics industry, research into the potential of various fruits has increased surprisingly over the years. Known for its exuberant biodiversity of both flora and fauna, the Amazon has a wealth of fruits that have local economic potential (Braga *et al*., 2010). Among this variety of fruit species, the Tucumã stands out (*Astrocaryum aculeatum Meyer* and *Astrocaryum vulgare Mart*.) Both are palms belonging to the *Arecaceae* family, with a wide distribution in South America (Oliveira *et al.,* 2018).

The fruits and seeds of tucumã have been used in animal (Xavier *et al.* 2019) and human (Araújo *et al*., 2021) feed, where it is appreciated by the population in the most diverse forms such as in natura, drinks, wines, ice cream and others. The pulp is widely consumed due to its nutritional properties and contains substances of high caloric potential such as fatty acids, especially oleic acid, linoleic acid, among others (Nascimento *et al.,* 2021; Pardauil *et al.,* 2017). In addition to these components, tucumã is rich in carotenoids (Sagrillo *et al*., 2015), which are rich in pigments and antioxidants that help minimize the effect of free radicals in the body. Phenolic compounds (Jobim *et al*., 2014) which have a high antioxidant potential and also phytosterols (Santos *et al*., 2013). The fruit is also rich in omega-3, which is an important aid in reducing inflammation in the body and improves blood circulation, as well as vitamin C.

Given all these and many other characteristics, tucumã has come to be used on a larger scale, both in the food industry and in the cosmetics industry, where oil and butter are extracted and included in the most diverse formulations of beauty and care products. The bioactives present contribute to slowing down ageing, help with collagen synthesis and prevent the appearance of wrinkles (Globo Rural, 2024). As a result, production of the fruit has increased considerably so that it can meet all the demand from cosmetics companies. After the process of extracting the butter and oil, there is a large volume of waste produced, including the remains of the kernel and fiber, which, despite having been pressed, still have a high fat content and are generally not properly disposed of at the end of processing.

The aim of this work was to formulate an exfoliating soap from vegetable oils and tucumã fiber, given that the post-extraction fiber residue still contains a considerable amount of oil and other components that provide excellent results for skin care. In this way, waste that would once have been discarded without any application can gain added value within the cosmetics industry.

2 MATERIAL & METHODS

2.1 Biomass preparation

The tucumã fiber waste was donated by the food engineering faculty. When it arrived at the laboratory, the residue was ground up in an industrial processor and then placed in packages which were stored in a refrigerator until the analysis was carried out.

2.2 Centesimal analysis

The centesimal composition of the tucumã fiber residue was carried out according to the official AOAC methods (1997), the moisture content was determined in a drying oven with air circulation at 105ºC (AOAC method nº925.10), ash was determined by incineration in a muffle furnace at 550ºC (AOAC method no. 923.03), protein content was determined by total nitrogen analysis by Kjeldahl (NTK method) (AOAC method no. 920.87), the lipid fraction was determined by the Bligh & Dyer method (1959). The total fiber content was analyzed using the gravimetric-enzymatic method established by AOAC, adapted by Embrapa Agroindústria de Alimentos (AOAC method no. 985.29) (Freitas *et al.,* 2011).

2.3 Exfoliating soap

The method used was the Cold Process, where the components were mixed (base mixture + essences), all the components were weighed based on the amount of soap to be obtained at the end and these mathematical operations were done on the Mendrulandia calculator. Initially, the base mixture of water and caustic soda was prepared, where the soda was added to the water little by little to avoid an exothermic reaction. This stage took place at a temperature of approximately 45ºC on a hot plate and using magnetic bars to help homogenize it. When the base mixture cooled, glycerol, orange essence and coconut, chia and sunflower oils were added, followed by the crushed tucumã fiber. They were then homogenized in a mixer where they remained until they reached the ideal point, which is comparable to mayonnaise, and then poured into two silicone moulds. They were left at room temperature for 45 days and then unmolded.

2.4 Texture analysis

To evaluate this characteristic of the soaps, 0.2 mm of the soap was removed and placed in the texturometer to see how resistant the soap was to force. A commercial soap was used as a standard, from which 0.2 mm was removed and submitted to the equipment.

2.5 Foaming analysis

In order to find out the foaming potential of the soaps, 1 g of each soap (Tucumã and commercial) was taken and macerated with water, then each one was placed in a beaker and homogenized with a mix. Homogenization was carried out for a few minutes until it was observed that foam had formed, then using the volume markings on the beaker itself, the amount of foam each had was recorded. The two experiments (formulation with tucumã (1), commercial soap (2)) were left to stand for 1 hour and it was again noted how much foam each had left.

2.6 pH analysis

For this analysis, 2 g of each of the soaps (tucumã and commercial) were used, each placed in a beaker with 20 ml of distilled water, and taken to a magnetic stirrer for 1 hour. The pH of each was then measured.

3 RESULTS & DISCUSSION

3.1 Centesimal analysis

After grinding the biomass, the centesimal analysis was carried out, and excellent results were observed for a waste product that normally has no application. Table 1 shows the values obtained.

Table 1 - Percentage of centesimal analyses

	Composition				
Biomass	Protein (%)	Lipids (%)	Ash (%)	Humidity (%)	Fibers + Carbohydrates (%)
Tucumã fiber	18.60	33.15	2.13	6.08	40.04

These results show that tucumã fiber, even after being pressed to remove the products of interest, still has a satisfactory fat content.

3.2 Exfoliating soap

At the end of the ripening period, the soaps, which had been placed in two different types of molds, were uninformed and presented an excellent firmness and appearance, as well as an excellent aroma.

The soaps obtained showed that it is possible to use the tucumã fiber residue as an exfoliant. Although it has been through stages to remove components, it still contains interesting components that can be used in beauty products. The lipids present in the exfoliating soap can guarantee excellent benefits for the skin, while other components that still remain in the fiber contribute to optimal skin care.

Figure 1 - Exfoliating soaps

3.3 Texture analysis

A good texture is one of the criteria that the market wants in soap bars, because there's no point in having a super fragrant and moisturizing soap if it dissolves in a short time when it comes into contact with water. The exfoliating soap had an excellent texture and firmness when compared to the commercial standard used, making it suitable for market insertion.

3.4 Foaming analysis

Another requirement for a soap to be appreciated by customers is that it lathers well. The tucumã fiber soap showed satisfactory results compared to the commercial soap. But the commercial one kept the foam for longer, which is due to the fact that it has stabilizers, which ensure that the foam remains for a longer period of time. Based on this, it was concluded that by adding some components such as stabilizers to the exfoliating soap, it could be very well marketed.

3.5 pH analysis

The pH values of the soaps are shown in Table 2.

Table 2 - pH values

Soap	Commercial	Fiber scrub
pH	10.9	10.5

The pH value of the soap was satisfactory, as it is close to the pH of commercial soap. Brazilian legislation establishes that the pH of bar soaps should be around 10.4 and 11.5, so the soap is within acceptable parameters and can be applied on the market.

4 CONCLUSION

The conclusion is that the work was extremely successful, demonstrating that it is possible to formulate a product from agro-industrial waste that is generally discarded. The exfoliating soap containing tucumã fiber showed good results in terms of texture, foam formation and pH value, when compared to commercial soaps, which are extremely important to be accepted by consumers and also by regulatory standards. In this way, waste that once had little added value can now also be included in the cosmetics industry.

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