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Antioxidant activity of dried açaí extract: is it a functional food?

Atividade antioxidante do extrato seco de açaí: um alimento funcional?

Actividad antioxidante del extracto seco de açaí: ¿es un alimento funcional?

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ABSTRACT
Açaí is a native Amazonian plant rich in antioxidant compounds such as polyphenols, anthocyanins and phenolic compounds, substances capable of neutralizing oxidative stress and helping to prevent various diseases. As a result, there has been much discussion about its use as a functional food. One alternative for the industry is the commercialization of dried extracts from plants. To this end, the aim of this study was to evaluate the antioxidant action of powdered açaí extract, in order to assess the composition of phenolics and DPPH present in a dry extract of açaí. The extracts evaluated were called samples A and B. In both tests, Sample A obtained lower values than Sample B for both phenolic compounds (6.42 ± 0.12) and DPPH antioxidant capacity (20.69 ± 0.16). In this context, it is necessary to investigate more rigorously the composition and efficacy of extracts made from açaí pulp and sold on the market, in order to provide consumers with a safer guarantee of the bioactive compounds present in the food.

Keywords: antioxidant action, bioactive compounds, functional nutrition.

RESUMO
Açaí é uma planta nativa amazônica rica em compostos antioxidantes como polifenóis, antocianinas e compostos fenólicos, substâncias capazes de neutralizar o estresse oxidativo e ajudar a prevenir várias doenças. Como resultado, tem havido muita discussão sobre o seu uso como alimento funcional. Uma alternativa para a indústria é a comercialização de extratos secos de plantas. Para isso, o objetivo deste estudo foi avaliar a ação antioxidante do extrato de açaí em pó, a fim de avaliar a composição de fenólicos e DPPH presentes em um extrato seco de açaí. Os extratos avaliados foram denominados amostras A e B. Em ambos os testes, a Amostra A obteve valores menores que a Amostra B para ambos os compostos fenólicos (6,42 ± 0,12) e capacidade antioxidante DPPH (20,69 ± 0,16). Nesse contexto, é necessário investigar mais rigorosamente a composição e a eficácia de extratos feitos de polpa de açaí e vendidos no mercado, a fim de dar aos consumidores uma garantia mais segura dos compostos bioativos presentes nos alimentos.

Palavras-chave: ação antioxidante, compostos bioativos, nutrição funcional.

RESUMEN
Açaí es una planta nativa amazónica rica en compuestos antioxidantes como polifenoles, antocianinas y compuestos fenólicos, sustancias capaces de neutralizar el estrés oxidativo y ayudar a prevenir diversas enfermedades. Como resultado, ha habido mucha discusión sobre su uso como alimento funcional. Una alternativa para la industria es la comercialización de extractos secos de plantas. Con este fin, el objetivo de este estudio fue evaluar la acción antioxidante del extracto de açaí en polvo, con el fin de evaluar la composición de fenólicos y DPPH presentes en un extracto seco de açaí. Los extractos evaluados se denominaron muestras A y B. En ambos ensayos, la muestra A obtuvo valores más bajos que la muestra B para ambos compuestos fenólicos

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(6,42 ± 0,12) y capacidad antioxidante DPPH (20,69 ± 0,16). En este contexto, es necesario investigar más rigurosamente la composición y eficacia de los extractos elaborados a partir de pulpa de azaí y vendidos en el mercado, con el fin de proporcionar a los consumidores una garantía más segura de los compuestos bioactivos presentes en los alimentos.

Palabras clave: acción antioxidante, compuestos bioactivos, nutrición funcional.

1 INTRODUCTION

Oxidative stress results from a metabolic imbalance that leads to the overproduction of reactive oxygen species (ROS) during the oxidation process. This can cause damage to the molecular structure of lipids, proteins, and DNA, which in turn can harm cells. The harmful impact of free radicals arises when they are present in excessive amounts, leading to an inability to neutralize these compounds. Therefore, it is essential to consume dietary sources of antioxidants, which are vital for maintaining the quality of life and longevity of individuals (LAMARÃO et al., 2020).

To minimize or neutralize ROS and any resulting imbalance, it is necessary to consume fruits, vegetables, and other foods that contain active antioxidant compounds(KESSIN et al., 2018). Açaí is known for its antioxidant action due to its composition of dietary fibers and polyphenols, which are important and promising bioactive compounds in preventing various pathologies. Açaí has been extensively studied for its potential therapeutic functionality against oxidative stress and as a possible alternative for preventing various clinical conditions. However, it is important to maintain objectivity and avoid making subjective evaluations.

Dehydration of plant extracts has been proven to be an effective solution for preserving bioactive compounds, as fruits are highly perishable foods. Given the current trend of increasing demand for high-quality, nutritious foods, this method is particularly relevant. To preserve the quality and availability of the bioactive compounds of açaí, the food industry can consider some alternatives. The spray drying technique is one of the most used methods for reducing water content through a dehydration process (IBIAPINA et al., 2019). Currently, there

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are several methods available for evaluating antioxidant compounds. It is crucial to select techniques that are widely accepted and validated to ensure the efficacy and consistency of results, as well as the correct processing steps for the plant extract. In scientific circles, there is a correlation between the total phenolic content and antioxidant activity of plant extracts. The total phenolic content is measured by the Folin-Ciocalteu method, while antioxidant activity is assessed by the DPPH free radical scavenging method. These methods are efficient means of establishing an analysis for the antioxidant evaluation of plant extracts (HUANG; BOXIN; PRIOR, 2005).

When analyzing dried açaí extract as a potential functional food, it is important to question the reliability and efficacy of the products being sold on the market. Flaws in the processing of the dried extract can interfere with the drying, grinding, and storage characteristics of the product. This investigation aims to determine whether these foods can produce the desired effects when consumed. Therefore, this study aims to compare the antioxidant activity of two commercially supplied dried açaí extracts and discuss the role of açaí as a functional food in its different presentations.

2 MATERIALS AND METHODS

This study assessed the antioxidant activity of two commercially available dried extracts of açaí by examining their phenolic compound composition and DPPH test results. Both samples were extracted using the Spray Drying technique.

To obtain the aqueous extract, the sample was dissolved in distilled water and stirred at 100 rpm for 1 hour at 25°C in the absence of light. The resulting mixture was then centrifuged at 17,000 x g for 10 minutes at 5°C, and the supernatant was collected to determine the total phenolic compound content and antioxidant activity.

The total phenolic compound (TPC) content was estimated using the Folin-Ciocalteu colorimetric method(WATERHOUSE, 2002). To 25 µL of the sample (2 mg/mL), 25 µL of Folin-Ciocalteau solution (50% v/v) and 200 µL of sodium

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carbonate (5% m/v) were added. After 20 minutes of incubation at 40°C in the absence of light, the absorbance was determined at 760 nm using a Spectra Max M3 microplate reader (Molecular Devices, LLC, Sunnyvale, CA, USA). The amount of phenolic compounds was expressed as milligrams of gallic acid equivalents (GAE) per gram of sample (mg GAE/g) and micromoles of GAE per gram of sample (µmol GAE/g).

The methodology described by Rasera et al.(BOSCARIOL RASERA et al., 2019) was followed to determine the antioxidant activity by scavenging the DPPH free radical in a microplate. Each well of the microplate was filled with 66 µL of the samples (2 mg/mL), blank (distilled water), or standard solution (Trolox), and 134 µL of ethanolic DPPH solution (150 µmol/mL). After 45 minutes in the absence of light, the reading was taken at 517 nm and the antioxidant activity was expressed as µmol of Trolox equivalents per gram of sample (µmol TE g-1).

3 RESULTS AND DISCUSSION

The search for pharmacological research on natural products to treat various diseases has significantly increased in recent decades. Açaí is a fruit of great interest for health due to its nutritional value and is considered a 'superfruit' along with pomegranate, blueberry, and blackberry (J et al., 2018). The beneficial effect of this substance is attributed to its composition, which includes high levels of fatty acids, carbohydrates, fiber, vitamins, proteins, minerals, and antioxidant compounds (NERI-NUMA et al., 2018)

The analysis of the antioxidant capacity of the two dried açaí extracts revealed variations among the components studied. Sample B exhibited higher antioxidant activity in terms of phenolic compound content (PCC) (refer to Table 1). The categorization of PCC levels is based on its polyphenol content. It is considered low when the content is below 5 mg GAE/g DW, intermediate when it varies between 5 and 25 mg GAE/1g DW, and high when it exceeds 25 mg GAE/100 g DW(PAZ et al., 2015a).

Regarding the evaluated samples, both were found to have an intermediate level of polyphenol content. This is consistent with the classification

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of açaí pulp in a study by Paz et al.(PAZ et al., 2015b). Notably, there is a variation in the compounds found in the two samples, with sample B (10.20 ± 0.38) having a higher value. Although both samples were processed in the same way, any differences found in the results may be associated with physiological factors in the plant, storage, or flaws in the extract processing. Table 1 displays these differences.

Table 1. Antioxidant capacity determined using the DPPH assay.

Acai Powder	Antioxidant activity (µmol TE g-1)
Sample A	20,69 ± 0,16
Sample B	100,54 ± 10,52

Source: the authors, 2024.

To ensure the appropriate benefits of plant compounds, it is necessary to optimize food processing to increase their bioavailability. Neglecting these factors can result in the loss of these compounds, ultimately reducing the quality of the final product. During processing, food may be exposed to various factors that can affect its structure and nutritional composition, leading to the degradation of labile nutrients and biologically active compounds (SALGAÇO; SACRAMENTO, 2019).

Thus, the decrease in the levels of these bioactive compounds in the evaluated extracts may indicate a decrease in their expected antioxidant effects, as phenolic compounds are directly linked to the ability to scavenge free radicals (NEVES et al., 2015).

Regarding the DPPH radical, sample B (100.54 ± 10.52) exhibited significantly higher antioxidant activity than sample A (20.69 ± 0.16). Rufino's(RUFINO et al., 2011) study reported an antioxidant activity of 133.4 µmol TE/g of freeze-dried pulp for the fruits of E. oleracea, a value similar to that of sample B (100.54 ± 10.52) as shown in Table 2. Kang(KANG et al., 2012) found that açaí had the highest antioxidant power among the spray-dried extracts, while black mulberry had the lowest, demonstrating the strong antioxidant activity of the Amazonian plant. Although DPPH is not strongly correlated with physiological responses, it is a widely reported method for indicating the antioxidant capacity of foods and beverages(CÖMERT; GÖKMEN, 2018).

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Table 2. Total phenolic compound content (mg GAE/g).

Acai Powder	Total phenolics (mg AGE g^{-1})
Sample A	6,42 ± 0,12
Sample B	10,20 ± 0,38

Source: the authors, 2024.

Sample B appears to be a better alternative for ensuring antioxidant compounds and could be a viable way to consume açaí extract. It is important to note that quantifying the antioxidant activity of a fruit is a complex process that requires the assessment of several factors beyond antioxidant capacity. When analyzing factors at the biological level, it is important to consider the synergistic action of the active constituents, their absorption by the gastrointestinal system, potential collateral toxic activities, speed of metabolization and excretion, and dose-response(OLIVEIRA et al., 2019).

To ensure compliance with legislation, it is necessary to conduct rigorous tests on pharmaceutical products without compromising the quantity of bioactive compounds. This preserves the antioxidant properties of the product. Careful consideration should also be given to the selection of raw materials and appropriate processing methods.

In this context, it is important to investigate the main factors that affect the physiological conditions of bioavailability and digestion of this compound. This will clarify the conditions under which the properties of açaí are best utilized, whether in its natural form or by dehydrating the fruit. Standardization is necessary for greater alignment with the food and pharmaceutical industry. This will lead to a more detailed understanding of the preservation of the therapeutic action of açaí and the appropriate doses needed to guarantee the desired effect for the population. So, it will be possible to formulate supplements and nutraceuticals that offer the therapeutic properties of açaí while retaining the bioactive compounds.

4 CONCLUSION

Based on our observations of the results and differences found among the commercialized extracts, it is necessary to investigate the quality of these

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compounds sold on the market. Factors such as storage time, processing methods, and the origin of the fruit can significantly alter the bioactive compounds present. Therefore, it is important to conduct further research in this area.

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