ASSESSMENT OF THE POTENTIAL OF MELON RIND (CUCUMIS MELO 'SANTA CLAUS') FOR PRODUCTION OF BIOACTIVE COMPOUNDS

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ABSTRACT

The surge in interest surrounding antioxidants and bioactive compounds, such as flavonoids, stems from their remarkable capacity to counteract free radicals and mitigate oxidative harm. This study delves into the antioxidant potential of Melon Rind (Cucumis melo 'Santa Claus') by employing flour subjected to ethanol extraction under varied conditions to extract flavonoids. The maximum concentration of flavonoids (688.6 µg/100g) was obtained with 50% solvent, a mass/volume ratio of 1:20, and a 60-minute extraction time. Melon rind flour emerges as a promising natural source of bioactive compounds, offering significant contributions to future research and potential applications in the food and pharmaceutical industries, promoting both public health and environmental sustainability.

Keywords: Flavonoids. Antioxidants. Circular economy. Sustainability. Waste management.

1 INTRODUCTION

In recent years, there has been a growing interest and recognition of the importance of antioxidants and bioactive compounds for human health. This trend is driven by an increasing understanding of the harmful effects of oxidative stress on the human body and the search for natural solutions to promote health and prevent diseases by neutralizing free radicals, thereby reducing oxidative damage to cells and tissues.[1] Thus, flavonoids, a heterogeneous group of polyphenolic compounds, are bioactive compounds ubiquitous in various plant components such as flowers, leaves, and fruits, and they have garnered increasing interest due to their potential health benefits.[2] Several studies have provided evidence supporting the potential use of flavonoids in the treatment of cardiovascular diseases, thanks to their remarkable anti-inflammatory, antioxidant, and antiproliferative activity.[3,4,5,6]

The waste utilized for flavonoid extraction represents a promising approach from both environmental and functional standpoints. Traditionally, flavonoid production has been linked to the extraction of compounds from plants, leading to a notable environmental impact due to intensive natural resource consumption and waste generation. However, there has been a growing interest in exploring alternative sources such as agricultural residues and industrial by-products to produce these valuable compounds. Considering that Brazil is one of the countries with the highest food waste in the world, according to IBGE,[7] where approximately 46 million tons of food are discarded annually, there is a significant opportunity to utilize these food residues. The utilization of these discarded foods can not only reduce waste but also contribute to health promotion due to their antioxidant properties. Flavonoids, such as those found in melon rinds, may exhibit anti-inflammatory properties. These compounds function by inhibiting regulatory enzymes or transcription factors crucial for controlling inflammatory mediators, in addition to their significance as antioxidants.[8]

In this context, the present study aims to explore the antioxidant properties of Melon rind (Cucumis melo 'Santa Claus') based on the premise that antioxidants play a crucial role in promoting health and preventing diseases. This research presents a significant contribution to the scientific understanding of this widely cultivated fruit in the western region of Rio Grande do Norte.

2 MATERIAL & METHODS

Obtaining the flour

For obtaining the flour, the rinds were placed on aluminum trays and subjected to the drying process in an SL-102 Solab oven with air circulation and renewal at 105°C, then ground in a Willye-type knife mill, Fortinox brand. Following this processing, they were placed in plastic bags and stored for subsequent analysis. Figure 1 illustrates the process carried out to obtain the flour.

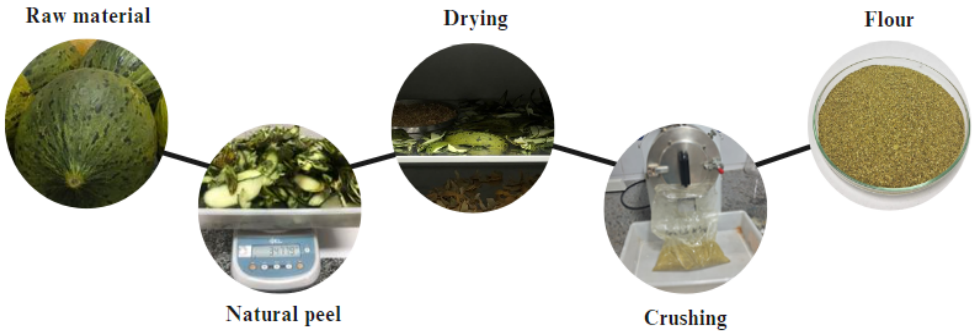

Figure 1 Flour obtaining process.

Extraction and quantification of flavonoids

In the present study, the extraction of flavonoids from the melon rind flour was conducted through dynamic shaking with ethanol, carried out in 10 trials. The independent variables of the experimental procedure were extraction time (30, 60, and 90 minutes); solvent concentration (50, 60, and 70%, v.v-1), and the ratio between mass and volume of solvent (1:20, 1:40, and 1:60). The trials were conducted at 200 rpm agitation and a temperature of 25°C. The experimental conditions for flavonoid extraction are presented in Table 1. Determination was performed based on the single pH method described by LEE and FRANCIS.[9] The results were calculated using Equation 1.

$$\text{Total flavonoids (mg.100 g}^{-1}) = \frac{Fd\ x\ Abs}{76{,}6} \qquad (1)$$

F_d = 100/(mass/volume of dilution) and 76,6 is the extinction coefficient for flavonoids.

3 RESULTS & DISCUSSION

In Figure 2, the different aspects between the samples are visible, presenting extracts with more intense colors than others, which may be due to the different extraction conditions of the flavonoids present in the process. The results regarding the extraction of flavonoids from melon rinds and their respective conditions are presented in Table 1.

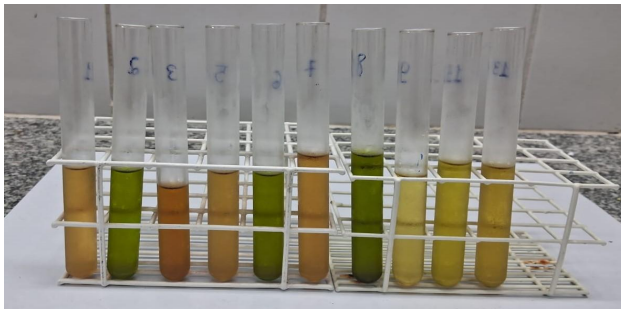

Figure 2 Flavonoid extraction.

Table 1 Total flavonoid contents

Trials	Solvent concentration (%)	Mass/volume ratio	Time (min)	Total flavonoid (µg/100g)
1	50	1:20	60	688,6
2	50	1:40	30	288,2
3	50	1:40	90	284,3
4	50	1:60	60	162,1
5	60	1:40	60	354,8
6	60	1:60	90	129,7
7	60	1:60	30	284,3
8	70	1:40	30	244,1
9	70	1:60	60	134,0
10	70	1:40	90	418,7

During the analyses conducted, it was possible to obtain flavonoid concentrations ranging from 129.7 to 688.6 µg/100g, with the maximum value observed with a solvent concentration of 50%, a mass/volume ratio of 1:20, and a 60-minute extraction time. In contrast, Rolim et al.[10] determined the flavonoid content in the peels and seeds of Galia melon (Cucumis Melo var. Reticulatus) through extractions with water, methanol, and water (70:30 v. v^{-1}), and ethanol and water (70:30 v. v^{-1}), resulting in lower values than those found in this study. For the peels, the levels ranged from 104, 125, and 262 (µg CE/100g) in the extractions with water, hydromethanol, and hydroethanol, respectively, surpassing those obtained from the seeds. Despite the different extraction methodologies, the results showed a significant flavonoid concentration in the peels. In another study conducted by Ferreira,[11] the presence of 0.3925 mg of flavonoids was identified in a quantity of 0.5 g of Niagara Rosada grape peel (Vitis labrusa L.). Each research adopted distinct methodologies and samples, justifying the discrepancies in the obtained results. Utilizing fruit peels for flavonoid extraction not only diminishes the volume of organic waste disposed of but also fosters favorable environmental effects by sustainably harnessing natural resources. These peels, in turn, contain bioactive compounds and antioxidant, anticancer, and anti-inflammatory properties that are beneficial to human health.

4 CONCLUSION

The development of a country and the well-being of its population are intrinsically linked. Flavonoids, compounds found in a variety of plant-based foods, offer a potential solution to this. Studies indicate that flavonoids possess antioxidant, anti-inflammatory, and neuroprotective properties, contributing to the reduction of chronic disease risk, such as cancer, cardiovascular, and neurodegenerative diseases. Harnessing agro-industrial waste to extract these compounds not only fosters environmental sustainability but also provides a readily available, natural source of health benefits, which could potentially advance development and enhance population well-being. Based on the research conducted, it can be confirmed that the rind flour of Honeydew Melon (Cucumis melo 'Santa Claus') demonstrated significant levels of total flavonoids (688.6 µg/100g), reaffirming the potential to be explored as a natural source of bioactive compounds that can contribute to the food and pharmaceutical industries.

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