EXPLORING THE POTENTIAL OF ORA-PRO-NÓBIS IN LEATHER PRODUCTION: A FOCUS ON SUSTAINABILITY

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ABSTRACT

Given the growing demand for healthy and sustainable food alternatives, this study explores the integration of biorefinery principles into ora-pro-nóbis based leather production, an Unconventional Food Plants (UFP). The main objective was to evaluate leather production with different concentrations of ora-pro-nóbis (50 g and 60 g of puree/100 g of leather-forming mass) in terms of thickness, color parameters, scanning electron microscopy, and total phenolic compound content. The results demonstrate that variations in puree concentration significantly influence the properties, increasing thickness (0.29 to 0.34 mm) and total phenolic compound content (740 to 785 mg GAE/100 g of leather) with increasing ora-pro-nóbis puree concentration. Thus, leathers can be considered a new possibility for ora-pro-nóbis consumption, contributing to the availability of more nutritious food alternatives.

Keywords: Unconventional Food Plants. *Pereskia grandifolia*. Active compounds.

1 INTRODUCTION

In recent years, with lifestyle changes and the decline in family size, the food industry has adapted to this new reality by prioritizing the development of quick and convenient meals. However, as health concerns grow among the population, there is an increasing demand for healthier food options. In this context, fruit-based snacks, also known as leathers[1], have emerged as a nutritious and flavorful alternative, particularly replacing fried or high-calorie products.

In addition to fruits, leathers can be produced from vegetables, such as ora-pro-nóbis, known to be a potential source of proteins and active compounds[2]. Ora-pro-nóbis is considered a plant with high added value, classified as Unconventional Food Plants (UFP) with popular use as a food product, presenting nutritional and/or medicinal properties. Increasing its impact as food becomes important, as its consumption is limited due to cultural factors or lack of population awareness.

Thus, Unconventional Food Plants (UFP) like ora-pro-nóbis are related to Sustainable Development Goal 2, which concerns zero hunger, aiming to promote a more sustainable agriculture chain[3]. Therefore, food production needs to offer alternative sources to meet nutritional needs and new consumption trends, which increasingly follow a conscious path of healthy and sustainable eating. Therefore, the nutritional and technological potential of these plants, as well as characteristics like obtaining a bioproduct with high nutritional value, low cost, and added value, should be taken into account.

Acoording to Chew et al (2017), the biorefinery concept involves the optimal utilization of renewable raw materials, providing high-value-added products[4]. Ora-pro-nóbis leathers can be used for the sustainable reutilization of this plant, while offering a product of high added value to the consumer.

Within this context, the main objective of this study was the production and characterization of ora-pro-nóbis based leathers, presenting a new consumption form for the plant, a source of active compounds, with a focus on sustainability. The leathers were characterized concerning visual evaluation, thickness, color parameters, scanning electron microscopy, and determination of total phenolic compound content.

2 MATERIAL & METHODS

The leathers was produced by ora-pro-nóbis leaves puree (OPNP) in different concentrations (50 g and 60 g of OPNP / 100 g of leather forming mass - LFM) and a fixed concentration of agar-agar (2 g of agar-agar / 100 g of LFM). Initially, the OPNP was heated in a water bath to 80 °C, and separately, the agar-agar was solubilized in water at 100 °C[5]. After this period, the filmogenic solution (agar-agar + water) was cooled to 50 °C, and the OPNP was added under mechanical stirring at 1000 rpm for 2 minutes. The LFM was spread on Teflon plates by tape casting using an automatic spreader ZAA 2300. The device was operated at a constant speed of 10 mm/s. The thickness of the leathers was controlled using a universal applicator, with a thickness of 4000 µm. The leathers were dried in a circulating air oven (Marconi, MA 35) at 50 °C for 9 hours.

The leathers were visually evaluated for formation, ability to be removed from the support, and ease of handling. The thickness was determined using a digital micrometer (Mitutoyo Corp). The color parameters luminosity (L*), chroma a*, and chroma b* were determined using a spectrophotometer (HunterLab, Aeros). The surface structure analyzed by scanning electron microscopy (SEM) on a Hitachi TM microscope, and the total phenolic compound content was determined by the Folin Ciocalteu method according to Singleton et al.[6].

3 RESULTS & DISCUSSION

Overall, it was noticed that, regardless of the concentration of ora-pro-nóbis puree used for leather production, their formation was observed, showing ease of removal from the support and handling. Regarding thickness (Table 1), an increase in puree concentration (from 50 to 60 g / 100 g LFM) resulted in a significant increase in thickness, differing significantly from each other ($p < 0.05$), possibly due to the increase in solids content in the sample.

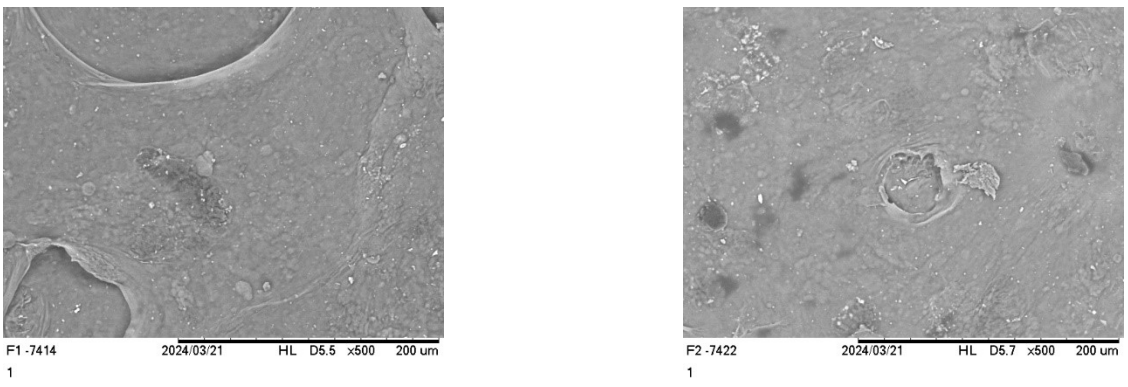
The increase in ora-pro-nóbis puree concentration did not significantly alter the color parameters of the leathers (Table 1), which showed positive values of luminosity, chroma a*, and chroma b*. The chroma a* values were 1.82 and 1.89 for the leather produced with 50 g puree / 100 g of LFM and 60 g puree / 100 g of LFM, respectively, indicating a tendency towards green coloration, characteristic of ora-pro-nóbis leaves. Ora-pro-nóbis leaves are green due to the presence of chlorophyll, a pigment responsible for the green color in plants[7].

Table 1 Thickness, color parameters, and concentration of total phenolic compounds of leathers with different concentrations of ora-pro-nóbis puree (OPNP).

Analysis	Formulation	
	50 g (OPNP)	60 g (OPNP)
Thickness (mm)	0.29±0.05[b]	0.34±0.04[a]
Luminosity	37.12±2.03[a]	38.04±1.73[a]
Chroma a*	1.82±0.25[a]	1.89±0.15[a]
Chroma b*	9.51±1.79[a]	10.49±0.74[a]
Total phenolic compounds (mg GAE/ 100 leathers)	740.30±62.72[b]	785.84±25.48[a]

The leathers produced from ora-pro-nóbis puree exhibited significant levels of total phenolic compounds (Table 1), with values of 740.30 mg GAE/100 leathers for the concentration of 50 g of OPNP and 785.84 mg GAE/100 leathers for the concentration of 60 g of OPNP, indicating that the leathers can be considered a potential source of phenolic compounds. These values are higher than those reported for plant extracts obtained from ora-pro-nóbis leaves, which ranged between 26 and 66 mg/g of extract[7]. Phenolic compounds are a class of secondary compounds found in plants that possess antioxidant properties and can bring various health benefits, suggesting that the full utilization of ora-pro-nóbis leaves for leather production is feasible to propose a new consumption form of this UFP.

The leathers exhibit a heterogeneous surface, regardless of the concentration of ora-pro-nóbis purée used, as can be observed in the micrographs (Figure 1). This characteristic is expected mainly due to the composition of ora-pro-nóbis leaves, which are rich in fibers and proteins.



(A) (B)

Figure 1 Scanning electron microscopy of leathers based on different concentrations of ora-pro-nóbis puree: (A) 50 g of OPNP/100 g of LFM, and (B) 60 g of OPNP/100 g of LFM.

4 CONCLUSION

Based on the results obtained in this study, it was observed that the increase in ora-pro-nóbis puree concentration directly influenced some characteristics of the leathers, such as the content of phenolic compounds, which was higher in the higher concentration of puree used (60 g / 100 g of LFM). This finding highlights not only the possibility of fully utilizing ora-pro-nóbis leaves in leather production, but also suggests a new way of consuming of this UFP, contributing to its valorization and sustainable utilization.

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