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EXPLORING THE RAMON TREE (*BROSIMUM ALICASTRUM*): UNVEILING ITS ROLE IN MEXICAN IDENTITY AND NUTRITION

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Abstract: The Ramon tree, also known as Brosimum alicastrum, is a large tree belonging to the Moraceae family that is native to Mesoamerica and the Caribbean. The tree is widely distributed in Mexico, from the tropical forests of the south to the Pacific and Gulf coasts and is capable of thriving in low humidity conditions. The Mayans cultivated the Ramon tree to use its seed as food in their diet, and these trees can still be found near Mayan archaeological sites. Currently, the Ramon tree is considered an underexploited plant with high economic potential. The seeds of the Ramon tree are used to make drinks and foods such as tortillas or bread. The nutritional composition of Ramon seeds is still being investigated, but they are known to contain protein, fat, crude fiber, and minerals such as copper, potassium, iron, and zinc. Ramon seed flour has been found to exhibit a higher content of phenolic compounds and antioxidant activity compared to corn flour, highlighting its potential as a substitute or complement in the formulation of food products. The presence of compounds such as p-hydroxybenzoic acid, gallic acid, chlorogenic acid, and vanillic acid contributes to its beneficial properties, and its ability to function as a functional ingredient opens up new possibilities in the food and nutritional supplement industry.
Keywords: Ramon tree, compounds bioactive, nutrition

INTRODUCTION

In the realm of botany and nutrition, certain plant species attain special significance due to their cultural roots and potential impact on human sustenance and health. The Ramon tree (*Brosimum alicastrum*) stands as one such example, deeply rooted in Mexican identity and increasingly capturing scientific attention (Dussol et al., 2017).

Also known as ojoche and Mayan walnut, the Ramon tree carries a historical narrative intertwined with traditions and the Maya people's relationship with their environment. Over time, its seeds have served as a vital food resource, providing sustenance to communities and civilizations. This cultural and nutritional legacy endures in the region's culture and culinary practices (Gillespie et al., 2004).

Within academic spheres, the Ramon tree has garnered substantial interest, emerging as a subject of intriguing study (Olguin-Maciel et al., 2017; Ozer, 2017; Subiria-Cueto et al., 2019). Its botanical composition and genetic reservoir offer avenues to unearth its potential and evolutionary trajectory. Additionally, investigations into its nutritional attributes and potential contributions to human health have expanded, revealing new insights and potential applications (Rodríguez-Tadeo et al., 2021).

This article aims to explore and examine the Ramon tree from various perspectives. From its cultural role to its potential in contemporary nutrition and health, this research seeks to shed light on the facets that render it significant in both cultural and scientific contexts. As details are dissected and connections established, it is anticipated that this inquiry will contribute to a fuller understanding of the Ramon tree and its multifaceted dimensions.

THE RAMON TREE AS PART OF OUR MEXICAN IDENTITY: GENERALITIES

HISTORICAL BACKGROUND

Intriguing echoes of history resound through the cultivation practices of the Mayans, who ingeniously nurtured the B. alicastrum for its seeds, an essential dietary element. These seeds, endowed with nutritional value, found their way into the

culinary traditions of the Mayans, enriching their gastronomic legacy. Remarkably, vestiges of this cultural bond persist today, as the trees bearing these historical seeds stand resolute near Mayan archaeological sites (Charles & Pardo-Tejeda, 1982).

However, despite this historical reverence, the Ramon tree's potential remains relatively untapped in modern times. A profound underutilization belies the vast economic prospects that lie within its branches. This perspective, supported by Ortiz et al. (1995), alludes to the intricate web of potential industries and opportunities that could blossom from a more comprehensive exploration of this arboreal treasure.

TAXONOMIC CONTEXT: TRACING THE THREADS OF LINEAGE

Nestled within the framework of taxonomic classification, the Ramon tree reveals its botanical lineage with an intricate array of identifiers. Table 1 presents the hierarchically organized classification, unveiling the tree's place in the broader tapestry of life. Tracing its ancestry from the Plantae kingdom to the Moraceae family, each taxonomic stratum adds depth to our understanding of its botanical constitution.

Taxonomic Classification	
Kingdom	Plantae
Subkingdom	Embryobionta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Hamamelidae
Order	Urticales
Family	Moraceae
Genud	*Brosimum*
Species	Aproximadamente 28

Table. 1.Taxonomic classification of Brosimum alicastrum

Distinguished by monikers such as Ramon, ojoche, and the Mayan walnut, Brosimum alicastrum emerges as a commanding presence within the Moraceae family (Ortiz et al., 1995). This arboreal giant boasts native roots that stretch across the landscapes of Mesoamerica and the Caribbean. Its residence within Mexican soil is a testament to its adaptability, spanning ecosystems from the lush tropical forests of the southern regions to the shores of the Pacific and the Gulf.

However, its ecological dexterity is not limited to climatic conditions alone. The Ramon tree's tenacity is manifest even within arid environs, thriving despite the constraints of low humidity. A sentinel of green in the face of environmental challenges, it stands tall, reaching heights of up to 40 or 45 meters in favorable circumstances. In the Yucatan Peninsula, it assumes a more modest stature, harmonizing with the region's topography at a height range of 15 to 22 meters (Hernández-González et al., 2018).

A captivating feature awaits those who venture to explore this botanical treasure. An injured or intentionally incised Ramon tree, with its scaly and ridged bark, exudes a unique offering – a viscous, milk-white latex that bears an inherent sweetness. This characteristic, noted by Charles and Pardo-Tejeda (1982) and further elaborated by Hernández-González et al. (2018)., underscores the tree's distinctive essence.

NUTRITIONAL AND BIOACTIVE COMPOUNDS OF RAMON SEED FLOUR

The examination of the inherent nutritional composition within the seeds of *Brosimum alicastrum* (Figure 1) persists as a venture enmeshed with constraints within the current scientific milieu. A panoramic overview of accessible data, as encapsulated in Table 2, exposes a terrain characterized by prominent fluctuations. These divergences in reported values echo dissimilarities engendered by

methodological subtleties across distinct investigative pursuits. It behooves scholarly prudence to acknowledge the seminal contributions of Charles and Pardo-Tejeda (1982), who have offered insights into the nutrient and amino acid constituents that underlie *B. alicastrum* seeds. Nevertheless, it is imperative to emphasize that these revelations emanate from undisclosed sources, lacking the transparency of methodological exposition.

Fig 1. Seed of the fruit of the Ramon tree

Recent academic investigations conducted by Subiria-Cueto et al. (2019) and Perez-Pacheco et al. (2014) have presented proximate analyses concerning Ramon seeds, revealing a range in lipid content from 0.6% to 10.49%. This emerging body of research expands its scope to encompass a varied discussion on crude fiber content, spanning from 3.4% to 5.21%, as well as protein content, ranging from 11.5% to 2.02%. A notable aspect explored by Quintero-Hilario et al. (2019) investigates the effects of thermal treatments on Ramon seeds. Application of medium and high roasting, at 90°C for distinct intervals, results in a noticeable increase in crude fiber content, ascending from 3.98% in the initial seeds to 5.07% and 6.70% after medium and high roasting, respectively.

Parameter	Brosimum alicastrum seeds
Moisture (%)	36 - 58
Ash (%)	3.4 - 3.57
Protein (%)	2.02 - 11.92
Fat (%)	0.60 - 10.49
Total Carbohydrates (%)	68.98 - 75.1
Crude Fibe (%)	3.40 -6.70
Dietary Fiber (%)	13.00

Table 2. Nutritional composition of the Brosimum alicastrum seeds (dry weight)

The inherent mineral constituents within Ramon seeds, which play a pivotal role in shaping their nutritional profile, have garnered focused scrutiny. Subiria-Cueto et al. (2019) contribute substantively to this discourse, offering an exposition that delineates quantified values encompassing copper (0.5 mg/100 g), potassium (1256.0 mg/100 g), iron (4.0 mg/100 g), zinc (1.0 mg/100 g), and sodium (47.0 mg/100 g). A distinct perspective surfaces through the investigative exploration conducted by Quintero-Hilario et al. (2019), elucidating a divergent spectrum encompassing calcium (171.5 mg/100 g), magnesium (1508.2 mg/100 g), iron (11.0

mg/100 g), and sodium (5.4 mg/100 g).

n the exploration of vitamin content, Subiria-Cueto et al. (2019) introduce an unprecedented dimension, as they uncover the measurement of vitamin C within B. alicastrum seeds, quantifying a notable 2.3 mg of ascorbic acid per 100 g. Additionally, their investigations reveal the presence of carotenoids, bioactive compounds imbued with dietary significance, although their precise quantification remains beyond the scope of their study.

Overall, the nutritional composition of B. alicastrum seeds is still being investigated, and further research is needed to establish more comprehensive and consistent data on its nutrient content and potential health benefits.

ANTIOXIDANT BIOACTIVE COMPOUNDS

In the realm of antioxidant bioactive compounds, a significant breakthrough was achieved by Ozer (2017) who furnished comprehensive data on total phenolic compounds and antioxidant activity within Ramon seeds. The investigation revealed a noteworthy abundance of phenolic compounds (2467 mg GAE/100g), with p-hydroxybenzoic acid emerging as the predominant phenolic compound, accompanied by gallic acid, chlorogenic acid, and vanillic acid. This substantiates Ramon seeds as not only a functional constituent but also a reservoir of antioxidant potential (Moo-Huchin et al., 2019).

Additionally, the analysis unveiled that Ramon seed flour surpasses corn flour in its content of phenolic compounds and antioxidant activity (Subiria-Cueto et al., 2019). Furthermore, an observed temperature-dependent elevation in total phenolic compounds and antioxidant activity in Ramon seeds underscores its dynamic responsiveness to thermal factors (Quintero-Hilario et al., 2019).

These findings underscore the intrinsic potential of Ramon seeds as a prolific source of phenolic compounds and antioxidant activity. The presence of compounds such as p-hydroxybenzoic acid, gallic acid, chlorogenic acid, and vanillic acid augments its array of beneficial attributes. Its capacity to not only function as a constituent but as a functional component portends new horizons in the domain of food and nutritional supplementation, wherein antioxidant compounds are esteemed for their affirmative impact on human health.

Furthermore, the notable superiority of Ramon seed flour over corn flour in terms of phenolic compound content and antioxidant activity accentuates its viability as a substitution or augmentation in food product formulation, with attendant supplementary nutritional advantages. The eminent stature of Ramon seeds as a repository of phenolic compounds, coupled with their commendable antioxidant capacity, serves as an empirical bedrock, fostering their integration within the edifice of the food and nutraceutical industry, thereby propelling the cultivation of health-enhancing and functionally enriched products.

CONCLUSION

In conclusion, the exploration of the Ramon tree (Brosimum alicastrum) as an integral part of Mexican identity has unveiled a myriad of facets spanning from its historical background to its rich nutritional and bioactive composition. Historical evidence has affirmed its significance in the diet of ancient Mayan civilizations, while its proximity to Mayan archaeological sites attests to its enduring presence over time. Despite this cultural longevity, the Ramon tree remains an underutilized resource, ripe for comprehensive exploration in terms of its economic potential.

CONFLICTS OF INTEREST

No potential conflict of interest was reported by the authors.

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