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COMPARATIVE NUTRITIONAL AND PHYTOCHEMICAL ANALYSIS OF LEAF AND PULP FROM *ADANSONIA DIGITATA* OBTAINED IN BENISHEIKH TOWN, BORNO STATE

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ABSTRACT

This study compares the nutritional and phytochemical constituents of the leaf and pulp of *Adansonia digitata* (Baobab tree), traditionally used as stew (*Kuka soup*) and juice respectively in most part of Northern Nigeria. Both leaf and pulp are used in traditional medicine for the treatment of various diseases such as inflammation and digestive issues. HPLC and DPPH assay was used to identify the compounds and their antioxidant properties. Our findings showed both the leaf and pulp are rich in essential nutrients, including vitamins and minerals, and antioxidants. However, the leaf contains higher levels of certain phytochemicals, such as Alkaloids, flavonoids and Tannins while the pulp is rich in dietary fibre and sugars, making it nutritious and refreshing drinks. Both the leaf and pulp of *Adansonia digitata* can be valuable component of a healthy diet, further research is needed to fully explore their potential health benefits.

Keywords: Baobab, Leaf, Pulp, Traditional food, *Adansonia digitata*.

1.0 INTRODUCTION

Adansonia digitata, commonly known as the Baobab tree, is a drought-resistant, multipurpose plant native to sub-Saharan Africa. It is widely utilized for its nutritional, medicinal, and economic importance. In Northern Nigeria, particularly in the north-east and north-west regions, the leaves are used to prepare traditional dishes such as Kuka soup, while the fruit pulp is consumed directly or processed into juice and flavoured drinks. Both the leaf and pulp are deeply rooted in indigenous knowledge systems and are valued for their health benefits and dietary roles (Thompson *et al.*, 2024)

Recent studies have shown that baobab pulp and leaves are rich in essential nutrients including calcium, potassium, magnesium, iron, dietary fibre, and vitamin C. In addition to their nutritional content, both parts of the plant contain a range of bioactive phytochemicals such as flavonoids, tannins, saponins, and phenolic compounds, which contribute to their antioxidant, antimicrobial, and anti-inflammatory activities (Abdulwaliyu *et al.*, 2024). The pulp, in particular, has demonstrated high antioxidant capacity and potential for use in functional food formulations (Vinha *et al.*, 2024).

Despite its long-standing use in African diets and traditional medicine, limited comparative data exists on the nutritional and phytochemical differences between the leaf and pulp of *A. digitata*. This study, therefore, seeks to evaluate and compare the nutritional composition (including proteins, vitamins, minerals, fibre, and sugars) and phytochemical profiles (flavonoids, phenolics) of the leaf and pulp. The antioxidant properties of both will also be assessed to provide updated evidence that supports their nutritional relevance and potential health applications.

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Plate 1: A Baobab Tree and its Pulp

2.0 MATERIALS AND METHODS

2.1 Sample Collection

Fresh *Adansonia digitata* leaves and pulp were collected from local markets in Benisheikh Town, Kaga Local government area, Borno State, Nigeria. Samples were identified by Taxonomist at Department of Biological Sciences, Kashim Ibrahim University, Maiduguri. Samples were washed with distilled water, air-dried, and ground into fine powder, and kept in a polyethene bag at 25°C until required for use.

2.2 Nutritional Analysis

Macronutrients (proteins, fats, carbohydrates) and micronutrients (vitamins A, C, calcium, magnesium, potassium) were quantified using AOAC methods (AOAC, 2016). Sugars and fibre were measured using enzymatic-colorimetric methods.

2.3 Phytochemical Screening

Qualitative and quantitative analysis of phytochemicals (flavonoids, phenolics, alkaloids, tannins) were performed using standard protocols (Maheshwaran *et al*., 2024; Barbouchi *et al*., 2024).

2.4 HPLC Analysis

High-Performance Liquid Chromatography (HPLC) (Agilent 1260 infinity II HPLC) was used to quantify specific flavonoids and phenolic acids.

2.5 Antioxidant Assay

The antioxidant activity of the samples was determined using DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. Results were expressed as % inhibition and IC_{50} values.

3.0 RESULTS AND DISCUSSION

3.1 Nutritional Composition

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Table 1: Nutritional Composition of Baobab Leaf and Pulp

Nutrient	Leaf	Pulp
Moisture (%)	8.5	12.0
Crude Protein (%)	13.3	12.4
Crude Fat (%)	3.6	0.3
Crude Fiber (%)	10.4	11.4
Ash (%)	9.7	5.6
Carbohydrates (%)	53.2	68.1
Energy (Kcal)	310	321
Vit C (mg/100g)	48.2	297
Calcium (mg/100g)	260	86
Iron (mg/100g)	5.1	2.2

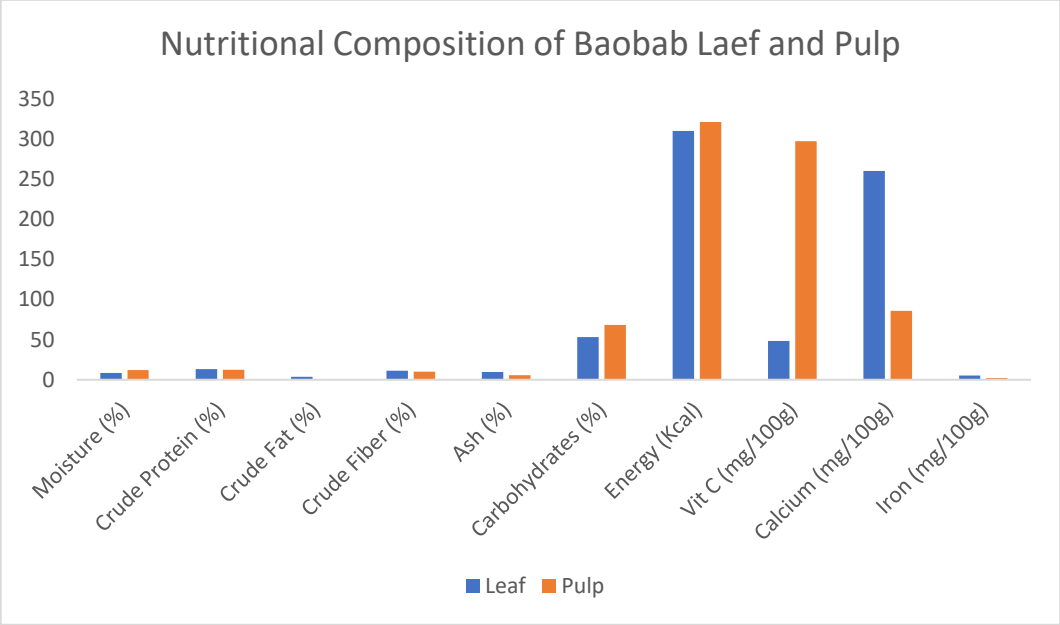

Figure 1: Nutritional Composition of Baobab Laef and Pulp

From Table 1 and Figure 1, the pulp showed higher levels of total sugars (68.1%) and vitamin C levels (297%) compared to the leaf, this is inline with finding of Glew *et al*. (1997) where fruit pulp was found to contain 300 mg/100g while the leaf was found to contain higher calcium contents of 260 mg/100g. Conversely, the leaf exhibited higher iron concentration (5.1 mg/100g) which is also in closed agreement with our findings. In a related study, Osama (2004) reported that Baobab fruit pulp contained 2.4% protein and 68.5 sugar, these variations could be due to different geographical location the plant was collected which might affect the contents.

3.2 Phytochemical Content

The Qualitative phytochemical constitutes of the Baobab leaf and pulp are presented in Table 2

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Table 2: Qualitative Phytochemical Constituents of Adansonia digitata Leaf and Pulp

Phytochemical	Leaf Extract	Pulp Extract
Alkaloids	+++	++
Flavonoids	+++	++
Phenols	++	+
Tannins	+++	++
Saponins	++	+
Terpenoids	+	+
Glycosides	++	++
Steroids	+	+
Anthraquinones	-	-

(+++) = Strong presence
(++) = Moderate presence
(+) = Trace
(-) = Absent

From Table 2, the leaf extract contained significantly higher levels of alkaloids, flavonoids and tannins than the pulp. Glycosides are found in moderate levels in both while steroids, terpenoids are in trace levels in both. Anthraquinones are not detected in both leaf and pulp of the plant. Phytochemicals derived from plant-based foods are used in management of chronic diseases such as cancer, diabetics and hearth related illness (Rodrigues-Negrete *et. al*., 2024).

3.3 Antioxidant Activity

Table 3: DPPH Radical Scavenging Activity of *Adansonia digitata* Extracts

Sample	Concentration (µg/mL)	% Inhibition
Leaf Extract	50	42.8±1.5
	100	61.2±2.0
	200	75.5±1.8
IC_{50} (µg/mL)=62 µg/mL	400	89.1±1.2
Pulp Extract	50	30.4±1.3
	100	48.7±1.6
	200	80.0±1.5
IC_{50} (µg/mL)=105 µg/mL	400	81.1±0.5
Ascorbic Acid (standard)	50	55.6±1.4
	100	92.3±1.0
	200	94.5±0.8
IC_{50} (µg/mL)= 48 µg/mL	400	98.6±1.1

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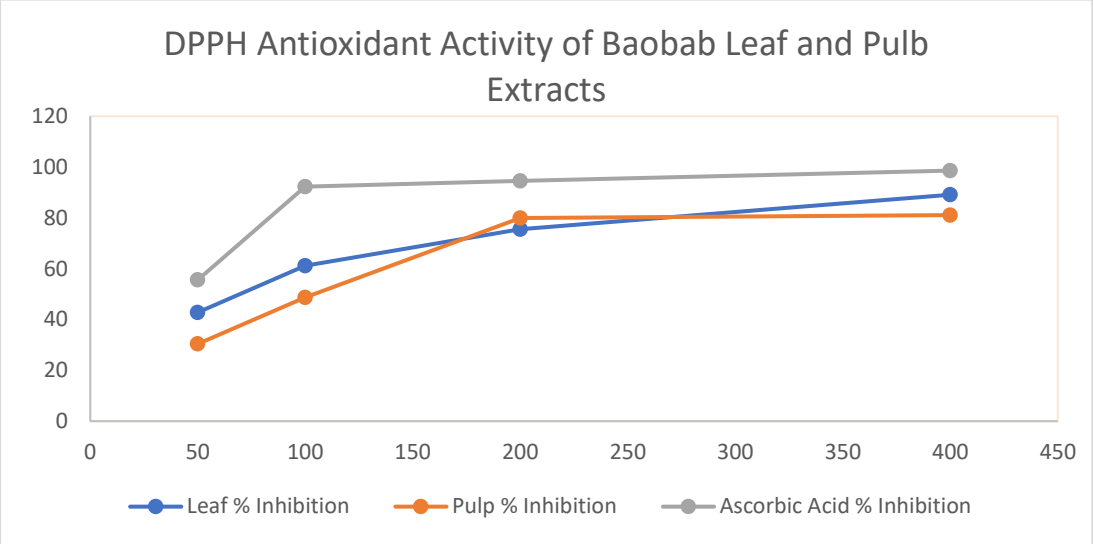

Figure 2: DPPH antioxidant activity of Baobab leaf and Pulp Extracts

From Table 3 and Figure 2, Both extracts exhibited notable DPPH radical scavenging activity, but the leaf extract had a lower IC_{50} value (62 µg/mL) compared to the pulp (105 µg/mL), indicating higher antioxidant potency in comparison with standard Ascorbic acid which showed IC_{50} of 48 µg/mL.

These findings suggest that the leaf, being richer in phytochemicals, has stronger medicinal potential, especially for oxidative stress-related diseases. Meanwhile, the pulp's richness in fibre and natural sugars supports its use as a nourishing and hydrating drink.

4.0 CONCLUSION

The study demonstrates that both the leaf and pulp of *Adansonia digitata* are rich in essential nutrients and bioactive compounds. While the leaf is a more potent source of antioxidants due to higher flavonoid and phenolic content, the pulp offers excellent nutritional benefits with high fibre and sugar content. These findings validate their traditional uses and underscore the need for further clinical studies to explore their full health potential

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