Original Research Article

STUDIES ON THE TRADITIONAL AND PHYTOCHEMICAL USE OF KIGELIA AFRICANA (LAM.) BENTH LEAVES HARVESTED IN MALI

ABSTRACT

Kigelia africana, known by its vernacular name “Sinjamba” or “Dindan”, from the Bignoniaceae family, is a medicinal and ornamental plant widely used in African traditional medicine. The aim of this study was to identify traditional uses from herbalists and traditional health practitioners, as well as to study the phytochemistry and antioxidant activity of *Kigelia africana* leaves. Extracts were prepared using aqueous decoction with reflux heating and Soxhlet extraction for organic extracts.

Phytochemical families were identified using tube reactions. Antioxidant power was evaluated via the DPPH radical scavenging method. Characterization tests showed that the extracts are rich in total phenols, flavonoids, coumarins, tannins, mucilages, and cardiac glycosides. Methanolic and ethanolic extracts exhibited significant antioxidant activity with IC_{50} values of 163.90 ± 11.49 µg/mL and 192.86 ± 23.35 µg/mL, respectively, compared to ascorbic acid (41.57 ± 0.71 µg/mL). The antiradical activity appears to be linked to the plant’s richness in polyphenols, particularly flavonoids, supporting its traditional use in treating various ailments reported during the ethnobotanical survey.

Keywords: *Kigelia africana; traditional uses; phytochemistry; antioxidant activity.*

1. INTRODUCTION

Humans have always appreciated the soothing and analgesic virtues of plants throughout the centuries. Human traditions have developed knowledge and the use of medicinal plants, with two-thirds of the pharmacopoeia relying on their healing properties (Iserin, 2001). The use of traditional medicine is widespread in Africa. Its accessibility, availability, and popularity are undeniable, as approximately 80% of Africans rely on it for their healthcare needs. Moreover, according to the World Health Organization, nearly 6,377 plant species are used in Africa, accounting for 90% of traditional medicine (WHO, 2003). Many researchers are interested in medicinal plants due to their vast reservoir of potential compounds and bioactive molecules. In addition to primary metabolites, they frequently accumulate so-called secondary metabolites (Kreif, 2003), which are characterized by a great diversity of chemical structures, a wide range of biological activities (Wills *at al.,* 2000), and remain the subject of numerous in vitro and in vivo studies (Marc *at al.,* 2004; Huang *at al.,* 2005; Popovici *at al.,* 2009). In recent times, the call for natural bioactive substances has intensified due to escalating health worries (Timothy, 2025). According to Pousset (2006), the use of natural products rich in antioxidants could play an important role in the prevention of certain diseases. Furthermore, the high cost of healthcare services and medications, as well as socio-economic factors, drive a large portion of the population to use medicinal plants for treatment (Agban *at al.,* 2013). Today, 80% of the population has resorted to herbal medicine at least once (Arbonier, 2002). This attitude may also be linked to culture and ancestral civilization, which rely entirely or partially on herbal medicine due to its effectiveness, accessibility, and availability (Akharalyi *at al.,* 2010). In this context, we became interested in the traditional use and phytochemical properties of the leaves of *Kigelia africana*, a highly valued plant in Mali. *Kigelia africana* is a widely used medicinal plant in Africa. Different parts of the plant are used in the treatment of various diseases (Ogbeche *at al.,* 2002). The leaves are used to treat chronic cough, diabetes, hypertension, and malaria, while the fruit powder is used as an aphrodisiac. The bark is used for teething-related ailments in children, among other applications. In the cosmetic industry, the fruit is used in the production of anti-aging skincare products and eczema treatments due to its antimicrobial

properties (Singh *at al.,* 2006). This study aims to document the traditional uses and investigate the phytochemical and antioxidant potential of the leaves of this plant.

2. MATERIALS AND METHODS

2.1 Plant material

The leaves of *Kigelia africana* were collected in Kati, Mali on 12th august 2021. The plant was identified by a botanical specialist at the Department of Medicinal Plants on the herbal number 2925/DMT. After drying in the open air for two weeks, the leaves were pulverized to obtain a fine powder used for extractions.

2.2 Ethnobotanical survey

A survey was conducted among 20 traditional practitioners, including men and women. A structured interview guide made it possible to collect data on the traditional uses of the plant.

2.3 Preparation of extracts

2.3.1 Aqueous decoction: Made by refluxing with 10 g of vegetable powder in 100 mL of distilled water for 15 minutes.

2.3.2 Soxhlet extraction: Performed using solvents of increasing polarity (diethyl ether, chloroform, ethanol, methanol).

2.4 Phytochemical tests

Tube reactions were carried out to identify chemical groups such as flavonoids (Shibata reagent), tannins (Stiasny reagent) and coumarins (UV observation).

2.5 Antioxidant activity

The antiradical activity was evaluated by the DPPH method at 517 nm. IC_{50} values were calculated to compare the effectiveness of different extracts.

3. RESULTS

3.1 Traditional uses

Table I: Uses in traditional medicine of *Kigelia Africana*

Diseases Treated	Posology	Frequency
Use of *Kigelia africana* leaves in traditional medicine		
Cough	Drink a glass of leaf decoction tea in the morning and evening until recovery	1
Respiratory insufficiency, malaria, and anemia	Oral intake of leaf decoction until Morning and evening	1
Diabetes	Decoction taken as a beverage	1
Use of *Kigelia africana* Bark in Traditional Medicine		
Skin diseases	A decoction of the bark used as a bath in the morning and evening.	1
Child teething	Bark macerated for 24 hours, used as a drink and bath Once per day	1
Use of *Kigelia africana* Fruit in Traditional Medicine		
Aphrodisiac for men	Fruit powder added to boiled milk or mixed into meat sauce and consumed for three consecutive days.	4

Breast and genital development	Dried fruit reduced to powder, mixed with shea butter, and used as an ointment once a day for one month.	2
Menstrual regulation	Fresh fruit cut into pieces and infused; drink a glass of tea in the morning and evening for three months.	2
Ulcer, diabetes, hypertension	Fruit decoction taken orally in the morning and evening.	1
Cold and flu	Decoction used in fumigation until recovery, morning, noon, and evening.	1
Aphrodisiac for men	Fruit powder added to boiled milk or mixed into meat sauce and consumed for three consecutive days.	4
Constipation and malaria	One teaspoon of an infusion of Kigelia africana mixed with acacia, honey, and bitter kola, taken morning and evening (for ages 12 and above).	2
Cough, respiratory relief, unknown diseases	Fruit powder infused and used like coffee in the morning and evening.	1

The leaves are mainly used to treat cough, diabetes, and malaria. The fruits and bark are also utilized for conditions such as eczema and hypertension.

3.2 Phytochemical Composition

Table II: Phytochemical Composition of *Kigelia africana*

Chemical Constituents	Aqueous Extract	Plant Powder
Alkaloids	-	+
Flavonoids	+	+
Tannins	+	+
Coumarins	+	+
Quinones	+	-
Terpenic Compounds	+	-
Reducing Compounds	-	-
Saponins	-	+
Sterols and Triterpenes	+	+
Cyanogenic Compounds	-	-
Mucilages	+	+
Anthocyanins	-	-

Anthracenic Compounds	-	-
Cardiotonic Glycosides	+	+

Legend

+: Positive reaction, **-:** Negative reaction

The analyses revealed the presence of flavonoids, tannins, coumarins, and cardiotonic glycosides.

3.3 Antioxidant Activity

Table III: IC_{50} Values of Each Extract

Extracts	Ethanol	Chloroform	Acetate	Methanol	Aqueous	Standard (Ascorbic Acid)
CI_{50} (µg/mL)	192,86 ±23,35	296,96±18,46	250,77±17,71	163,90±11,49	302,39±19,40	41,57±0,71

The methanolic extract exhibited the highest antiradical activity (IC50 = 163.90 ± 11.49 µg/mL), followed by the ethanolic extract (IC50 = 192.86 ± 23.35 µg/mL). These results confirm the plant's efficacy.

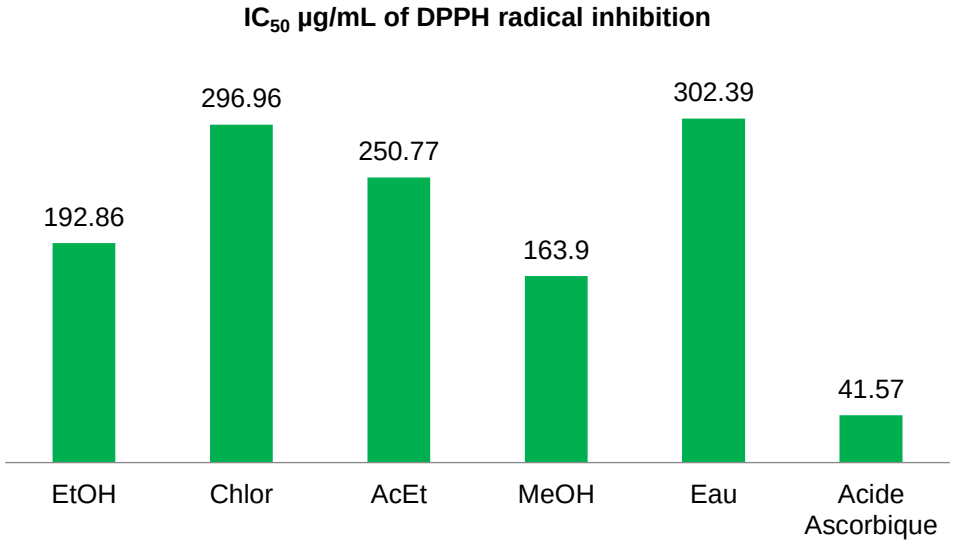

Figure 1: Histogram of the values of the final inhibitory concentrations 50 of the different extracts in µg/mL

4. DISCUSSION

This study aimed to investigate the traditional use and phytochemistry of *Kigelia africana* leaves in the context of traditional treatment for certain ailments. An ethnobotanical survey was conducted among 20 individuals (16 men and 4 women), revealing that 17 diseases are treated with this plant: 5 with the leaves,

2 with the bark, and 10 with the fruits. The fruit is the most commonly used part (58.82%), followed by the leaves (29.41%) and the bark (11.76%).

This survey, carried out in four localities, highlighted common uses of *Kigelia africana* among traditional healers, who use different plant parts to treat the same disease. For example, decoctions of leaves and fruits are prescribed for ailments such as colds, flu, malaria, cough, and diabetes, corroborating data from the literature. According to Saini ***at al.*** (2009), *K. africana* is used to treat various conditions, including skin infections (fungal infections, boils, psoriasis, eczema) and internal diseases (dysentery, malaria, pneumonia, etc.). In West Africa, the root and unripe fruits are used as vermifuges and to treat hemorrhoids and rheumatism. In Central Africa, although the raw fruits are toxic, they are processed to treat rheumatism and certain skin conditions (Raynal-Roques, 2005).

The phytochemical screening of *Kigelia africana* leaves was conducted using two methods: one on the aqueous extract and the other on the plant powder. These methods compared the traditional technique with a modern approach involving precipitation and coloration reactions, as well as thin-layer chromatography (TLC) for confirmation. The results revealed the presence of tannins, sterols, triterpenes, coumarins, mucilages, sugars and holosides, cardiotonic glycosides, and flavonoids. However, alkaloids were absent in the aqueous extract but present in the powder. Cyanogenic compounds and anthracenosides were absent in both cases.

These results confirm previous data: Saini at al. (2009) reported the presence of flavonoids and quinones, while Diakité (2015) and Mobark ***at al.*** (2019) detected alkaloids. Studies by Nasiru and Oluwasegun (2014) identified glycosides, hydrolyzable tannins, and flavonoids in *Kigelia africana* leaf extracts.

The presence of these metabolites supports the traditional use of the plant for treating ailments such as flu, rheumatic pain, and inflammation. Tannins, sterols, triterpenes, and mucilages particularly contribute to these therapeutic properties.

The antiradical activity, beneficial in managing chronic diseases such as cardiovascular diseases and cancer, was evaluated using the DPPH radical scavenging method. Methanolic and ethanolic leaf extracts demonstrated significant antioxidant activity, with IC_{50} values of 163.90 ± 11.49 and 192.86 ± 23.35, respectively, comparable to ascorbic acid (41.57 ± 0.71). This activity is primarily attributed to the presence of flavonoids, tannins, and other phenolic compounds, which act synergistically to neutralize free radicals and reduce oxidative stress.

The studies by Shai ***at al.*** (2008) and Akinmoladun ***at al.*** (2007) confirm these findings, highlighting significant antiradical activity in leaf extracts due to their richness in flavonoids and antioxidant compounds.

The pharmacological studies carried out confirm the anti-inflammatory, analgesic, antioxidant and anticancer activity of the extract of different parts of the plant. New compounds with a potent antioxidant, antimicrobial and anticancer effect such as verbascoside, verminoside and pinnatal, among others, have been identified (Bello, 2016).

The data obtained confirm the importance of *Kigelia africana* in the Malian traditional pharmacopoeia. The strong antioxidant activity observed is consistent with its richness in flavonoids and tannins. These compounds are well known for their ability to neutralize free radicals, thereby reducing oxidative stress and preventing various diseases.

5. CONCLUSION

Kigelia africana leaves are a potential source of phytochemical compounds, including polyphenols (flavonoids, tannins), coumarins, mucilages, sterols, and triterpenes. The rich phytochemical profile of this plant not only supports its traditional uses but also highlights its diverse therapeutic potential.

The antioxidant activity of *Kigelia africana* results from the synergy between its flavonoids, tannins, alkaloids, reducing compounds, coumarins, mucilages, sugars, holosides, and cardiac glycosides. Each of these constituents plays a direct or indirect role in neutralizing free radicals and protecting cells from oxidative damage. These properties explain the plant's effectiveness in many traditional treatments.

Kigelia africana extracts contain antiradical compounds that may account for its antioxidant, antidiabetic, and anti-inflammatory activities, thus confirming its relevance in traditional medicine. These properties could be beneficial in managing numerous pathologies. The study of the powdered leaves of this plant, enriched by data from the literature and ethnobotanical surveys, could encourage wider use of *Kigelia africana* leaves.

Nevertheless, further research is essential to isolate, purify, and precisely identify the compounds responsible for these biological activities.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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