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PHARMACOGNOSTIC STUDY OF THE PULP OF THE DRIED FRUIT OF *COELOCARYON PREUSSII* WARB. (MYRISTICACEAE)

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ABSTRACT

Côte d'Ivoire boasts a rich biodiversity, providing a source of plants traditionally used to treat various diseases. *Coelocaryon preussii* is a large tree of the Myristicaceae family, whose dried fruits are sold in markets across West and Central Africa as a purgative and an antihypertensive remedy. The aim of this study was to characterise the dried pulp of the *Coelocaryon preussii* fruit. Following a brief review of the literature on the traditional use of the plant, a description of the macroscopic and microscopic features for the botanical identification of the drug was carried out, followed by the establishment of the phytochemical profile using tube tests and LC-HRMS chromatographic analyses. Macroscopic examination reveals a drug in the form of a very hard, brown, woody mass with a wrinkled and striated outer surface, marked internally by the seed impression. The anatomical study revealed an epicarp, a thick cuticle and a mesocarp consisting of parenchymatous cells, vascular bundles and secretory cells containing oily substances, as well as numerous sclerites. The powder, reddish-brown in colour, with a slightly aromatic odour and a neutral, floury taste, revealed sclerites, spiral vessels and tissue fragments upon microscopic examination. Phytochemical screening of the extracts identified several chemical groups, notably polyphenols, sterols, polyterpenes, flavonoids, alkaloids and saponins. Chromatographic analyses carried out using LC-HRMS provided a characteristic chemical fingerprint of the extracts studied. These findings contribute to a better understanding of this plant-based medicine used in traditional medicine, and provide useful information for its identification and quality control.

KEYWORDS: *Coelocaryon preussii*, macroscopic, microscopic and phytochemical analysis.

INTRODUCTION

Ivory Coast is a French-speaking country in West Africa with an equatorial climate, home to dense, evergreen, and species-rich rainforests.[1]

Like most tropical countries, it possesses abundant flora, rich in species—whether endemic to its forests or not—that are used empirically to treat ailments or to provide wood and wood products. In fact, nearly one-third of the Ivorian representatives of the phanerogamous flora, as well as a tiny minority of thallophytes (lichens and higher fungi), offer a wide selection of plants containing active compounds, whose curative or toxic properties enable the preparation of numerous remedies.[2]

Coelocaryon preussii is a plant species belonging to the Myristicaceae family. Its dried fruits (pulp) are commonly found on the stalls of medicinal plant markets in the city of Abidjan. It is a tree that grows up to 30 meters tall.[3] The species is found in Africa (Côte d'Ivoire, Benin, Nigeria, Central African Republic, Gabon, and the Democratic Republic of the Congo).[4,5,6,7,8,9,10,11]

The genus Coelocaryon is used in traditional medicine to treat various ailments. Indeed, the stems of *Coelocaryon oxycarpum* are consumed as a purgative. The leaves and seeds of *Coelocaryon sphaerocarpum* are used to treat drowsiness. *Coelocaryon preussii* is the best-known and most widely used species.[12]

The wood of this tree is very durable and is commonly harvested for commercial purposes. Marketed under the names "ekoune" or "ekun," it is highly prized in carpentry.[3]

In Côte d'Ivoire, the seeds of trees of this genus are used to treat diabetes and hypertension. The bark of the stems is used to treat hemorrhoids, dysentery, diarrhea, and venereal diseases.[13]

A chemical study of the leaves and stem bark of Coelocaryon klainei Pierre ex Heckel reported the presence of polyphenols, tannins, flavonoids, sterols/triterpenes, coumarins, saponins, and sugars.[11]

The part of the plant most commonly found on market stalls is the dried fruit pulp, which vendors recommend for managing high blood pressure and genital infections in pregnant women. A chemical study of the dried pulp led to the isolation and characterization of two known sterols, supporting its use in treating metabolic disorders.[14] Given the growing interest in this plant and its use in traditional remedies, it is important to gain a better understanding of this valuable raw material.

The objective of this study was to conduct a pharmacognostic study of the dried pulp of the *Coelocaryon preussii* fruit found in markets of Abidjan. The aim was to characterize the drug macroscopically and then microscopically, and to establish the phytochemical profile of three extracts of the drug (ether, methanol, and aqueous) as control samples.

1- MATERIALS AND METHODS

1-1- MATERIALS

1-1-1. Technical material

Equipment

For the pharmacognostic study and chemical tests, the equipment used consisted of a grinder (Star®), an optical microscope (Optika Italy®) version 2.1, a drying oven (MEMMERT®), a precision balance (KINLEE EK03®), a water bath (MEMMERT®), and a sand bath (LHG®).

High-performance liquid chromatography (HPLC) experiments coupled with mass spectrometry were performed using an Agilent 1260 series system equipped with a quaternary pump, an autosampler, and a column oven, coupled in series with a diode array detector (DAD). The stationary phase used for metabolite separation was a Sunfire® C_{18} grafted silica column (2.1 × 15 cm, 5 µm) equipped with a precolumn.

Small equipment

The small equipment consisted of standard glassware, spatulas, filters, and forceps. A microscope slide and a coverslip were used for powder micrography; a dissection slide was used to prepare the anatomical-histological section.

1-1-2. Plant Material

It consisted of dried pulp from *Coelocaryon preussii*, purchased at the medicinal plant market in Adjamé, a district of the city of Abidjan (Côte d'Ivoire).

1-1-3. Solvents

The aqueous extract was prepared using distilled water. Ethyl acetate, methanol, and distilled water were used for elution in thin-layer chromatography. For HPLC elution, the mobile phase consisted of a mixture of MilliQ H_2O supplemented with 0.1% formic acid (FA) / methanol (MeOH).

1-1-4. Reagents

KOH (potassium hydroxide) was used to prepare the micrograph of the drug powder. Phytochemical screening required various reagents. The detection of catechin tannins was made possible using Stiasny's reagent and sodium acetate. For the characterization of gallic tannins, Stiasny's reagent, sodium acetate, and ferric chloride were used. Acetic anhydride and concentrated sulfuric acid were required for the detection of sterols and polyterpenes. 2× diluted hydrochloric acid, magnesium shavings, and isoamyl alcohol were used to detect flavonoids. A 2% alcoholic solution of ferric chloride enabled the characterization of polyphenols. Bornträger'reagent, chloroform, 2× diluted ammonia, and hydrochloric acid were used to screen for quinone compounds. The characterization of the alkaloids was carried out using 60° alcohol, Bourchardat (iodo-iodide reagent), and Dragendorff's reagent (potassium iodobismuthate reagent). As for the detection of saponins, this required the use of distilled water.

1-2. METHODS

1-2-1. Monographic study of *Coelocaryon preussii* (*C.p.*)

This was a literature review compiling information on the plant and its various traditional uses, with the aim of providing a summary description of the plant and its various applications.

The drug consisted of the dried fruit pulp.

1-2-2. Processing of the drug (Dried pulp)

The dried pulp of the plant was washed and dried at room temperature for one week. The drug was then subjected to hot aqueous extraction by boiling at 100°C (decoction), with stirring, in the following proportions: 20 g of powder per 100 mL of distilled water, for 30 minutes. The resulting extract was filtered through cotton. Petroleum ether, ethyl acetate and methanol extracts were also prepared by cold maceration of 20 g of powder in 100 mL of the respective solvents for 24 hours.

1-2-3. Botanical Study

The washed and dried pulp was studied botanically through macroscopic and microscopic examination. The macroscopic examination involved identifying the macroscopic characteristics of the drug, namely its organoleptic properties and general appearance. The microscopic examination, on the other hand, involved preparing an anatomo-histological section of the pulp and a micrograph of the powder.

1-2-4. Phytochemical screening of the aqueous extract of dried *Coelocaryon preussii* pulp

The various chemical groups were characterized in the extracts using the phytochemical methods described in the literature.[15,16,17,18]

Sterols and polyterpenes were detected using the Liebermann reaction. Five (5) mL of each of the three extracts were evaporated on a sand bath. The resulting residues were each dissolved hot in 1 ml of acetic anhydride, and 0.5 ml of concentrated sulfuric acid was added to the mixture. The appearance, at the interface, of a purple or violet ring, turning blue and then green, indicated a positive reaction.

The reaction with ferric chloride ($FeCl_3$) was used to characterize the polyphenols. To 2 ml of each extract (etheric, methanolic, and aqueous), a drop of 2% alcoholic ferric chloride solution was added. The appearance of a more or less dark blue-black or green color indicated the presence of polyphenols.

Flavonoids were detected using the cyanidin reaction. Two (2) mL of each extract were evaporated, and the residues were dissolved in 5 mL of hydrochloric acid diluted twofold. Upon adding 2 to 3 shavings of magnesium, heat was released, followed by the appearance of an orange-pink or purplish color. The addition of 3 drops of isoamyl alcohol, which intensified this coloration, confirmed the presence of flavonoids.

The test for catechin tannins was performed using Stiasny's reagent. Five (5) mL of each extract were evaporated to dryness. After adding 15 mL of Stiasny's reagent to the residue, the mixture was kept in a water bath at 80°C for 30 min. The observation of a coarse flocculent precipitate indicated the presence of catechin tannins. To test for gallic tannins, the previous solutions were filtered, and the filtrates were saturated with sodium acetate.

The appearance of an intense blue-black color upon the addition of 3 drops of $FeCl_3$ indicated the presence of gallic tannins.

Quinone substances were tested using Bornträger'reagent. Two (2) mL of each of the 3 extracts were evaporated to dryness, and the residues were each triturated in 5 mL of 1/5 hydrochloric acid. The triturates were placed in a water bath for 30 minutes after being transferred to test tubes. After cooling, each of the triturates was extracted with 20 mL

of chloroform. The appearance of a red or violet color upon the addition of 2× diluted ammonia (0.5 mL) to the chloroform solution indicated the presence of quinones.

The alkaloids were characterized using Bourchardat's reagent (iodo-iodide reagent) and Dragendorff's reagent (potassium iodo-bismuthate reagent). Six (6) mL of each solution were evaporated to dryness. After dissolving the residues in 6 mL of 60% ethanol, two drops of the characterization reagent were added. The addition of Dragendorff's reagent produced a precipitate or an orange coloration, indicating a positive reaction. The addition of Bourchardat's reagent produced a reddish-brown precipitate, indicating a positive reaction.

Saponins were tested by transferring 10 mL of the aqueous extract into a test tube. The tube was shaken for 15 seconds and then allowed to stand for 15 minutes. A persistent foam height of more than 1 cm indicated the presence of saponins.

1-2-5. Chromatographic analyses of dried pulp extracts

1-2-5-1. High-performance liquid chromatography (HPLC)

The solvents used for the mobile phase (MilliQ H_2O supplemented with 0.1% formic acid (FA)/methanol (MeOH)) were eluted as a gradient under the following conditions: a gradient from 5% to 100% MeOH over 30 minutes. The column was placed in a thermostatic oven maintained at 35 °C. Samples were prepared at a concentration of 10 mg/mL, and the injection volume was 10 µL.

1-2-5-2. Mass Spectrometry (MS)

The parameters of the Dual-ESI source were previously optimized and set as follows: positive mode, spray voltage 3.5 kV; skimmer: 300 V; fragmentor voltage: 200 V; drying gas temperature: 320°C; drying gas flow rate: 10 L/min; and nebulizer pressure: 40 psi. Nitrogen (99.5% purity) was used as the drying and nebulizing gas. The mass spectrometry analysis conditions were as follows: HPLC-ESI(+)-Q/Tof; Auto MS/MS mode; collision energies: top 3: 30, 50, and 70 eV, followed by spectrum averaging; exclusion time: 50 msec.

2- RESULTS AND DISCUSSION

2-1. Monographic study of *Coelocaryon preussii*

2-1-1. Botanical characteristics

Designation[19]

Scientific Name : *Coelocaryon preussii* Warb.

Family : Myristicaceae

Synonyms : *Coelocaryon cuneatum* Warb., *Coelocaryon klainei* Pierre ex Heckel, *Coelocaryon multiflorum* Warb., *Coelocaryon klainei* Pierre

Three other species of the same genus are known: *Coelocaryon botryoides* Vermoesen, *Coelocaryon oxyparum* Staf, *Coelocaryon sphaerocarpum* Fouilloy.

Common names : ekoun, ékouné[20]

Botanical description

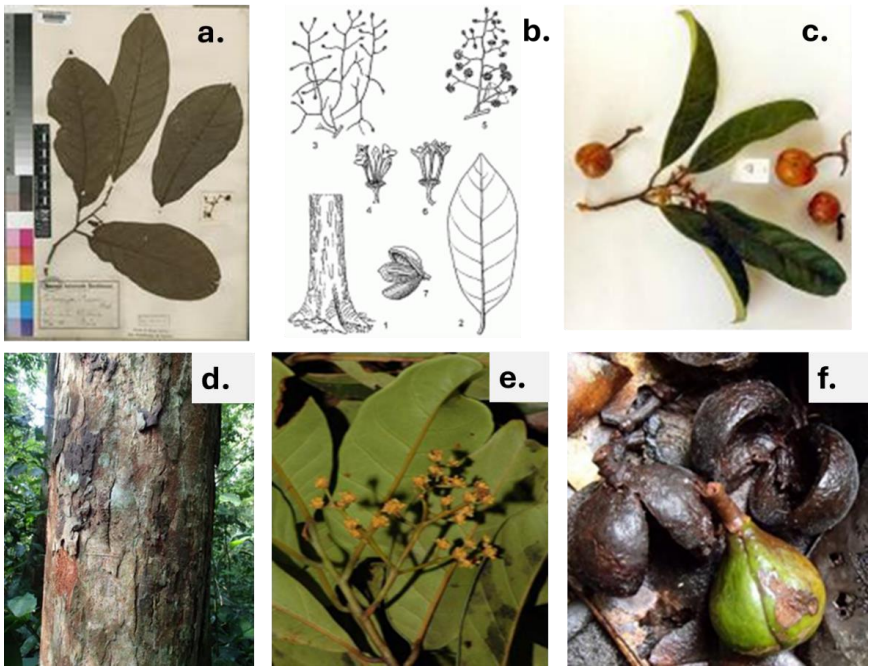


Figure 1: a. Herbarium sheet of *C.p.* leaves [20]; b. Drawing of *C.p.* flowers, leaves, fruits, and trunk [20]; c. Leaves and fruits of C.p. [21]; d. Bark of the trunk of *C.p.* [22]; e. Aerial parts (leaves, flowers, fruits) of *C.p.* [22]; f. Fruits (pericarp) of *C.p.*[22]

These are evergreen trees growing up to 35 meters tall, with alternate, simple, entire leaves, a more or less pyramidal crown, and brown, flaking bark.

The sap is an abundant creamy liquid. The leaves are subcoriaceous (length: 15–25 cm, width: 6–8 cm), with an acute base, a subrounded to acuminate apex, and a glabrescent petiole (length: 10–12 mm). The flowers (male = 3–4S + (3–5E) and female = 3–4S + C), actinomorphic and unisexual (dioecious), are grouped in simple umbels or assembled into branched panicles, composed of a deciduous involucre and a circular receptacle bearing the flowers. They consist of a cup-shaped perianth with 3–4 free or basally connate sepals, valvate and more or less triangular. The male flowers have 3–5 stamens with filaments fused into a column, and the female flowers have a superior, spherical, unicarpellate, and unilocular ovary.[23]

The fruits are ellipsoid to oblong or globose drupes, 3.5–4 cm × 2.5–3 cm, in groups of up to 3; the surface is yellowish to reddish-brown when ripe, glossy, and deeply wrinkled; with a 1–1.5 cm long pedicel, it opens longitudinally into two fleshy valves and contains a single seed with rounded ends, ± 2.8 cm long and ± 1.3 cm in diameter, black and shiny.[24]

These seeds contain a fatty substance with the odor of cocoa butter; they are edible.[25]

Geographical Distribution[21]

The plant is widespread in several countries in West and Central Africa: Côte d'Ivoire (Taï Forest, Banco Forest), southern Benin and Nigeria, extending to the Central African Republic, Gabon, and the Democratic Republic of the Congo.

Chemical Constituents[13]

Several secondary metabolites are found in the plant, namely: alkaloids, tannins, saponins, and terpenoid steroids.

2-1-2. Anatomical study of the dried fruit pulp of *C.p*.

a/ Macroscopic examination of the drug

❖ **General appearance**

The herbal drug consists of the fruit pulp, from which the seed has been removed and which has been dried. It appears as a mass with a woody, very hard consistency. The outer surface is brown, wrinkled, and longitudinally striated. The inner surface is orange-brown, indented by the seed mark.

Figure 2 : Dried fruit pulp of *Coelocaryon preussii* (Photos by Akoubet A); (a) outer surface; (b) inner surface.

❖ **Organoleptic characteristics**

The *C.p*. drug, in addition to its brown color, has a slightly aromatic odor. The powder made from dried C.p. fruit pulp is reddish-brown in color, has an aromatic odor, and a neutral, mealy taste.

Figure 3: Powdered dried fruit pulp of Coelocaryon preussii (Photo by Akoubet A).

b/ Microscopic examination of the drug

❖ **Cross-section of the dried fruit**

Stained with carmine-green alum (Mirande's reagent).

The cross-section shows, from the outside in:

- The epicarp (a), covered by a thick cuticle (b), composed of rounded, granular cells

- The mesocarp, composed of more or less contiguous cellulosic cells (d), numerous secretory cells (c), some of which still contain essential oil, and numerous sclerites, either isolated (f) or in clusters (g); their walls are either relatively thin or very thick with concentric striations; vascular bundles run through the mesocarp (e).

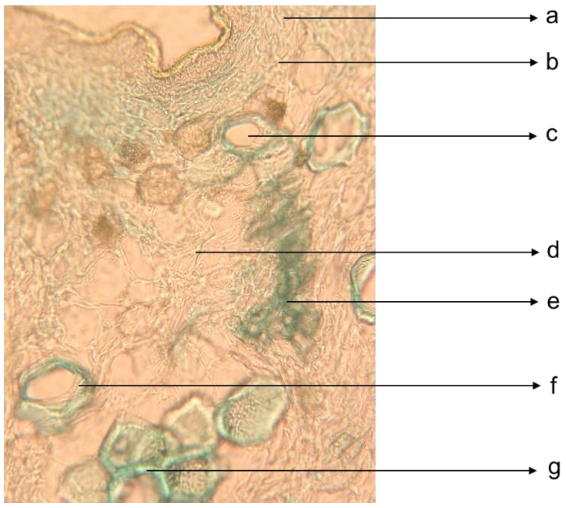


Figure 4: *Coelocaryon preussii* -Cross-section of the fruit: epicarp (a, b), mesocarp (c, d, e, f, g).

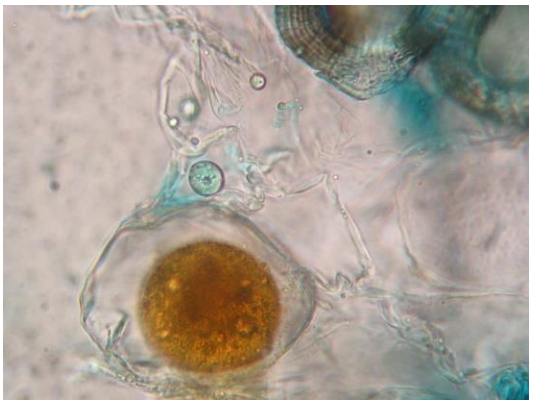


Figure 5: Essential oil cell.

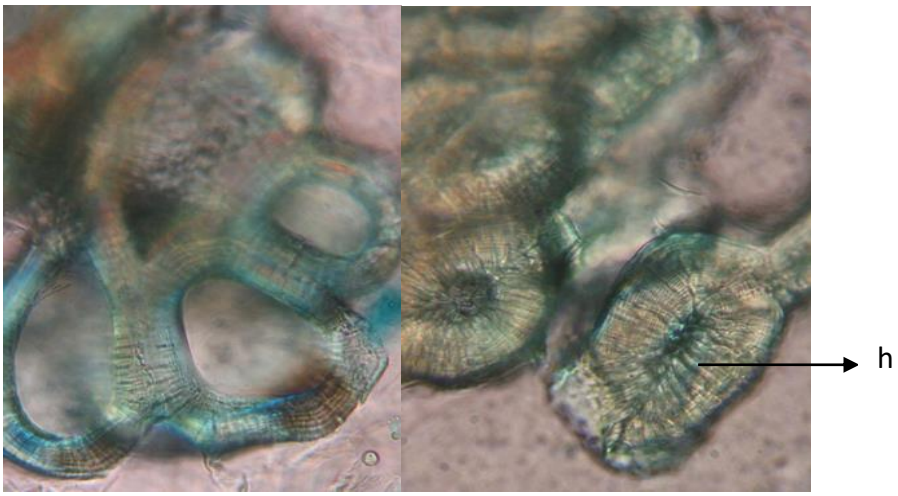


Figure 6: Sclerites with thickened walls and concentric striations (h) (ici en amas).

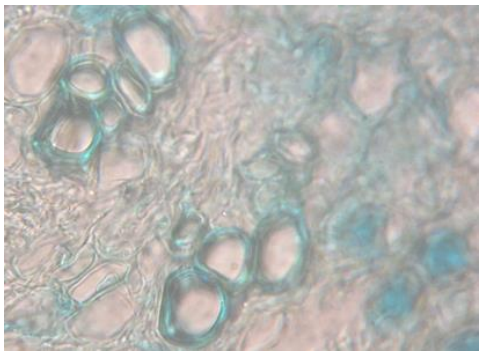


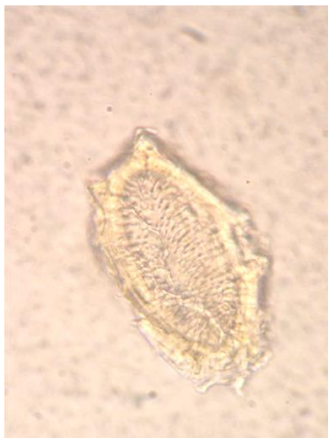
Figure 7: Vascular bundles.

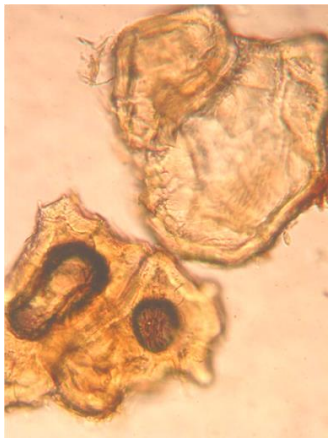
❖ **Microscopic image of the dried, pulverized fruit**

Mounted in chloral hydrate solution (Ph. Eur., 2.8.23)

The pulverized fruit is reddish-brown in color. It exhibits the following features:

- Numerous sclereids, either with thin walls and a wide lumen or with very thick walls, concentric striations, strongly canaliculate, and a narrow lumen (photos 1 and 2);
- Spiral or annular vessels (photo 3);
- Fragments of mesocarp containing more or less flattened ovoid parenchyma cells and rounded secretory cells, either intact or fragmented (photo 4)
- Rare fragments of epicarp containing polygonal cells accompanied by a thick cuticle (photo 5).





Unencapsulated sclerites (Photo 1) **Cluster sclerites (Photo 2)**

Figure 8 : Sclerites.

Figure 9 : Spiral vessels and ringed vessels (Photo 3).

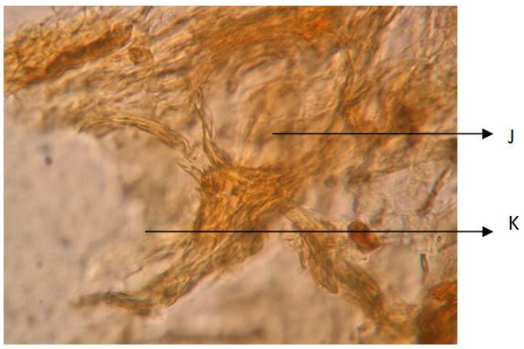


Figure 10 : Whole secretory cells (J), fragmented secretory cells (K) (Photo 4).

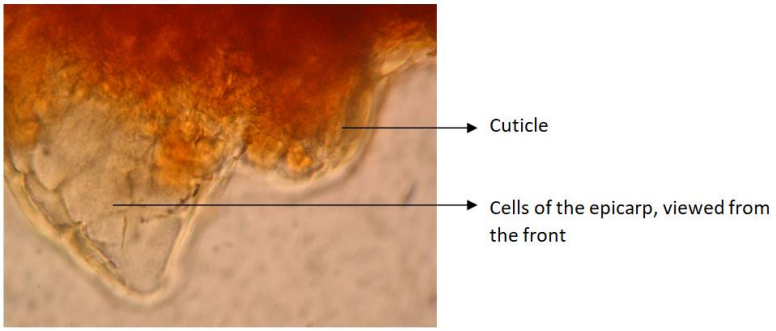


Figure 11: Fragment of epicarp (photo 5).

2-2. Phytochemical Study

2-2-1. Phytochemical Screening of Dried Pulp Extracts from C.p.

Table 1: Results of the phytochemical screening of aqueous, methanolic and petroleum ether extracts from *C.p.*

	Sterols/ polyterpens	Polyphenols	Flavonoids	Tannins		Quinones	Alkaloids		Saponins
				Catechical	Gallic		Bourchardat	Dragendorff	
Aqueous extract	-	++	-	-	-	-	+	+	-
Methanol extract	+++	++	+++	-	-	-	+	+	NA
Nonpolar extract (petroleum ether)	+++	-	+++	+	-	-	+	+	NA

2-2-2. Spectral analyses of dried pulp extracts

- **LC-HRMS analyses**

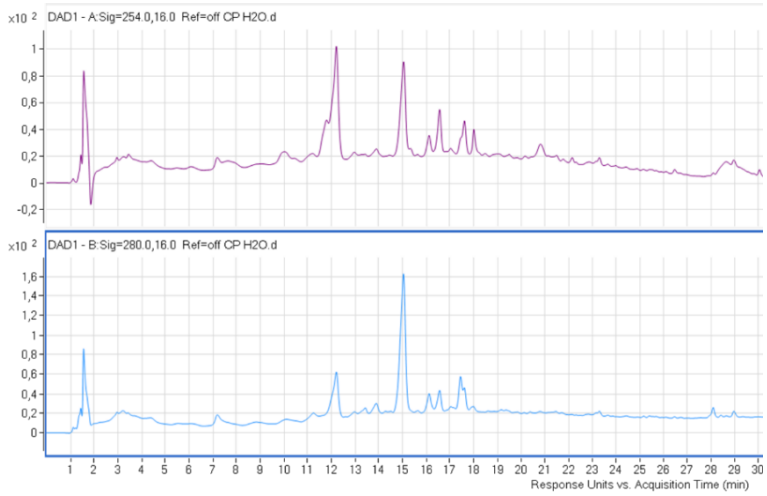


Figure 12: Chromatographic profile of the aqueous extract at 254 nm and 280 nm UV.

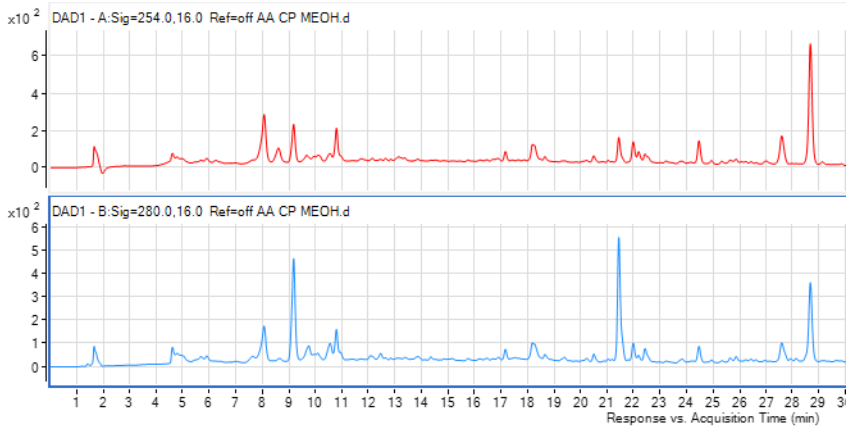


Figure 13: Chromatographic profile of the methanolic extract at 254 nm and 280 nm UV.

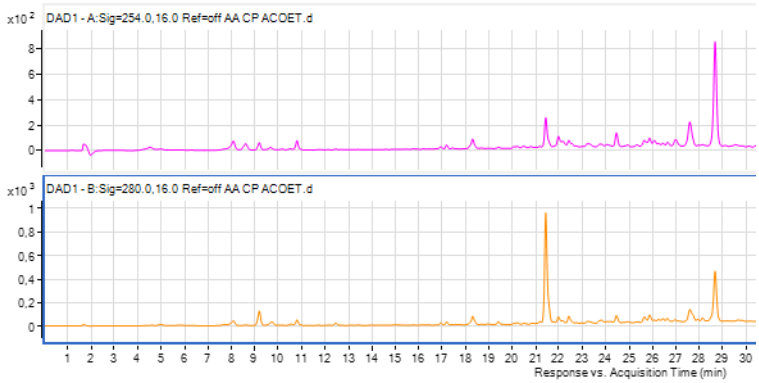


Figure 14: Chromatographic profile of the ethyl acetate extract at 254 nm and 280 nm UV.

DISCUSSION

The aim of this study was to contribute to the pharmacognostic characterisation of the dried pulp of the fruit of *Coelocaryon preussii*, a plant-based medicinal product frequently sold in the medicinal plant markets of Abidjan. The macroscopic, microscopic and phytochemical analyses carried out in this study provide a better understanding of the morphological, anatomical and chemical characteristics of this plant raw material, whilst offering useful information for its identification and quality control.

Macroscopic analysis and comparison with species of the Myristicaceae family

Macroscopic examination of the dried pulp of *Coelocaryon preussii* fruit reveals a very hard, brown, woody mass with a wrinkled, longitudinally striated outer surface, whilst the inner surface appears orange-brown with an indentation corresponding to the position of the seed. These characteristics are typical of the fruits of many species belonging to the Myristicaceae family, which generally produce drupe-type fruits containing a single seed. In this family, the fruit consists of a fleshy pericarp surrounding a seed that is often rich in aromatic compounds and lipids. Similar observations have been reported for Myristica fragrans, a species well known for producing nutmeg and mace. In this species, the fruit is also an ovoid or pear-shaped drupe that splits lengthwise when ripe, exposing the seed surrounded by a coloured aril.[26]

The presence of a relatively thick and fibrous pulp is also a common feature in this botanical family. This structure helps to protect the seed and aid in the dispersal of the fruit. The reddish-brown colour observed in the powder of the

dried pulp, as well as its slightly aromatic odour, may be associated with the presence of phenolic compounds and lipid substances, which are widely reported in species of the Myristicaceae family. These compounds often contribute to the organoleptic properties of plant-based medicines derived from this family.

Anatomical analysis and significance of sclereid structures

Anatomical examination of the dried pulp of *Coelocaryon preussii* reveals a classic structural organisation of the pericarp, comprising an epicarp covered by a thick cuticle and a mesocarp consisting of parenchymatous cells traversed by vascular bundles. The presence of a thick cuticle on the epicarps plays a key role in protecting the internal tissues from environmental stress and dehydration. The abundant presence of secretory cells containing oily substances observed in the mesocarp is particularly noteworthy. In the Myristicaceae family, these secretory cells are known to store essential oils rich in aromatic compounds. Indeed, the leaves and fruits of many species in this family possess secretory cavities containing essential oils or aromatic compounds. Similar observations have been reported in anatomical studies of Myristica fragrans, where the presence of cells rich in essential oils and phenolic compounds has been demonstrated in the tissues of the fruit and seed.[27] These structures play a major role in the accumulation of secondary metabolites responsible for the pharmacological and aromatic properties of these plants.

The abundance of sclerites observed in the pulp is also a notable anatomical feature. Sclerites, characterised by their thick, lignified walls, impart mechanical rigidity to plant tissues. Their presence explains the particularly hard consistency of the dried pulp observed during macroscopic examination. In many plant-based medicines, these sclereid elements serve as essential microscopic markers for the identification of plant powders.

Microscopic analysis of the powder

Microscopic examination of the powder reveals several characteristic anatomical features, including sclereids that are either isolated or clustered, spiral or annular vessels, and fragments of mesocarp parenchyma cells. The presence of spiral and annular vessels confirms the existence of xylem-conducting elements within the fruit's structure. Similar observations have been reported in several pharmacognosy studies on the fruits and seeds of the Myristicaceae family, where spiral vessels, parenchyma cells and secretory cells constitute essential microscopic criteria for the identification of plant drugs derived from this family. The fragments of epicarp accompanied by a thick cuticle observed in the powder also represent an important diagnostic feature. The identification of these microscopic structures is particularly useful in the quality control of plant drugs marketed in powdered form, as macroscopic characteristics often disappear during grinding.

Phytochemical profile and comparison with other species

Phytochemical screening of the aqueous extract, methanol extract and petroleum ether extract reveals the presence of several groups of secondary metabolites, including sterols, polyterpenes, polyphenols, flavonoids, alkaloids and saponosides. The high content of polyphenols and flavonoids in the methanolic extract can be explained by the polarity of methanol, which favours the extraction of phenolic compounds. These results are consistent with data reported in the literature concerning species of the Myristicaceae family, which are known to produce a wide variety of secondary metabolites, including terpenes, phenolic compounds, alkaloids and essential oils.[28] In *Myristica fragrans*, for example, the seeds contain between 5 and 15% essential oil composed of terpenes and phenylpropanoids such as myristicin, safrole and eugenol.[29] The polyphenols and flavonoids identified in the pulp extracts may be responsible

for the antioxidant and anti-inflammatory properties attributed to this plant. Numerous studies have shown that phenolic compounds play an important role in the prevention of cardiovascular and metabolic diseases.

The presence of these compounds could therefore explain the traditional use of *Coelocaryon preussii* in the treatment of high blood pressure and other conditions. The presence of sterols and polyterpenes in the non-polar extracts also confirms the findings of previous studies that successfully isolated sterols from the dried pulp of this species. Plant sterols are known for their cholesterol-lowering and anti-inflammatory properties, which could contribute to the therapeutic effects observed in traditional medicine. Furthermore, the detection of alkaloids and saponosides indicates that the fruit pulp possesses significant chemical diversity. Alkaloids are known for their multiple pharmacological activities, notably their antimicrobial and hypotensive properties.[30] Saponoses, for their part, often exhibit anti-inflammatory and immunomodulatory properties.[31]

The value of chromatographic analyses

Chromatographic analyses carried out using LC-HRMS have provided a characteristic chemical fingerprint of the extracts studied. Chromatographic fingerprints are now an essential tool in the quality control of herbal medicines. They enable the overall chemical composition of an extract to be characterised and variations linked to geographical origin, harvesting conditions or extraction methods to be identified. In the case of *Coelocaryon preussii*, this chromatographic fingerprint could serve as a chemical signature to guarantee the authenticity and traceability of the herbal medicine sold on the market.

Pharmacognosic significance of the study

The results obtained confirm that the dried pulp of the fruit of *Coelocaryon preussii* possesses specific morphological, anatomical and chemical characteristics that can be used as criteria for identification and quality control. These data are particularly important in the context of traditional African pharmacopoeia, where herbal medicines are often sold in fragmented or powdered form. The detailed pharmacognosic characterisation of this herb is therefore an essential step in ensuring the safety and efficacy of traditional remedies that use it.

CONCLUSION

This study has provided important information on the pharmacognostic characterisation of the dried pulp of the fruit of *Coelocaryon preussii*. Macroscopic and microscopic analysis identified several diagnostic features, notably the presence of an epicarp covered by a thick cuticle, a mesocarp rich in parenchyma and secretory cells, and an abundance of sclerites with thickened walls. These anatomical structures constitute reliable criteria for the identification of this herbal drug, particularly when it is marketed in powdered form.

Phytochemical screening revealed the presence of various groups of secondary metabolites such as polyphenols, sterols, polyterpenes, flavonoids, alkaloids and saponosides. The presence of these compounds may be responsible for the pharmacological properties attributed to this plant in traditional medicine, particularly in the treatment of certain metabolic or cardiovascular conditions.

Chromatographic analyses have established a characteristic chemical fingerprint for this plant-based drug, thereby providing a potential tool for its quality control and authentication. Overall, this work contributes to the scientific

understanding of Coelocaryon preussii and provides an important foundation for future studies aimed at furthering the chemical characterisation and pharmacological evaluation of the bioactive compounds present in this species.

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