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Research Article

Physicochemical Characterization and Antifungal Activity of Palm Kernel Oil from Five Traditional Oil Palm (*Elaeis guineensis* Jacq.) Accessions from Man Introduced at the CNRA La Mé Research Station

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Abstract

Background and Objective: This study focused on five traditional oil palm accessions come from the region of Man, which were introduced through open pollination at La Mé Research Station. The different accessions collected were Blolè, Dompleu, Douèlè, Gbantongouin and Gbangbégouiné. The objective of the study was to evaluate the physicochemical properties and antifungal activity of the oils extracted from the palm kernels of these traditional palm trees. **Materials and Methods:** Palm kernel oil was prepared from five Dura-type accessions collected in Côte d'Ivoire, with kernels processed through depulping, drying, shelling, grinding and oven-drying prior to extraction. Total phenolic content of palm kernel oil was measured by the Folin-Ciocalteu method and expressed as gallic acid equivalents. Fatty acid profiles were determined via gas chromatography of fatty acid methyl esters. Antifungal activity was assessed using the agar dilution method against *Aspergillus* at three oil concentrations. All statistical analyses were performed using the Statistical Package for Social Science (SPSS) version 20. **Results:** The results indicated significant variations depending on the collected areas of the traditional palm tree accessions. The oil yields exhibited a range from 50.72-55.55%, with the Blolè and Dompleu accessions demonstrating the most optimal yields of 55-56%. The oxidation indices demonstrated a minimal level of lipid degradation, with palm kernel oil from Gbantogouin exhibiting the highest levels (peroxide index, 5.07 meq O2/kg, anisidine index, 1.23 and totox, 11.38). The acid value of the five palm kernel oil samples was found to be in accordance with the Codex standard of 4 mg KOH/g of oil. The palm kernel oil from Douèlè revealed its notably elevated saponification index (245.85 mg KOH/g of oil). Palm kernel oil from Blolè accession exhibited potent antifungal properties, evidenced by its capacity to impede the proliferation of Aspergillus sp. This effect was observed to be most efficacious at a concentration of 75 µL and within a 24 hrs time frame, resulting in a substantial inhibition rate of 72%. **Conclusion:** Palm kernel oils from traditional Man accessions have biochemical potential that could be exploited in the food, cosmetics and pharmaceutical industries.

Key words: Antifungal activity, cosmetic, food, palm kernel oil, physicochemical, traditional accession

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The oil palm (*Elaeis guineensis* Jacq.) is a monocotyledonous plant belonging to the Arecaceae family. Originally from West Africa, it is primarily cultivated for oil production[1]. It is of considerable economic importance due to its fruit yielding two distinct oils: palm oil, extracted from the mesocarp and palm kernel oil, derived from the seed kernel[2]. These oils are widely used in the production of a variety of food, cosmetic and pharmaceutical products[3,4]. Due to their diverse applications, the global demand for palm and palm kernel oils continues to rise. Global palm oil production is estimated at 76 million tonnes, while palm kernel oil accounts for around 8 million tonnes, bringing the total to approximately 84 million tonnes[5]. Currently, oil palm cultivation is concentrated primarily in tropical regions, particularly in Southeast Asia, where Indonesia and Malaysia together account for over 85% of global production[6].

Palm oil production in Côte d'Ivoire relies heavily on hybrid varieties selected for high yields[7]. However, although traditional oil palm accessions are less commonly used for palm kernel oil production, they may possess valuable physicochemical and biological attributes, particularly regarding fatty acid composition and antifungal properties[8,9]. Palm kernel oil is notably rich in medium-chain saturated fatty acids, including lauric acid (44-52%), myristic acid (16-21%) and capric acid (2-5%)[10]. Due to its unique physicochemical properties, the oil is sought after in the food, cosmetic and pharmaceutical industries[11]. Furthermore, several studies have demonstrated its antimicrobial and antifungal activities, highlighting its potential as a natural ingredient in therapeutic or preservative formulations[12,13]. Despite its importance, palm kernel oil production in Côte d'Ivoire remains relatively low at an estimated 35,000 tonnes per year, 25,000 t of which are exported[5].

To enhance oil yields and broaden the genetic pool, the National Centre for Agronomic Research has introduced oil palm material with desirable traits from various origins at its experimental stations[14]. The aim is to develop high-performance planting material that can withstand diverse pedoclimatic conditions. In this context, a germplasm survey was conducted in the mountainous western region of Côte d'Ivoire, specifically in the Man department, where crude palm oil from traditional plantations is highly valued by consumers for its fluidity and organoleptic qualities[15]. The survey identified eleven traditional oil palm accessions that are commonly cultivated by farmers for palm oil production[16,17]. These palms, which resulted from open pollination, were subsequently introduced at the La Mé research station. The present study aimed to evaluate five of these accessions to assess their potential. Specifically, the study focused on the physicochemical characterization and antifungal activity of palm kernel oil extracted from these accessions.

MATERIALS AND METHODS

Study site: The study was conducted at the La Mé research station of the National Centre for Agronomic Research (CNRA) in southeastern Côte d'Ivoire. The station is located approximately 27 km from Abidjan. The station lies at an altitude of 13 metres between latitudes 5°26 N and longitudes 3°50 W and covers a total area of 2,740 ha. The climate is tropical and humid, characterised by relatively high daily thermal amplitudes, with an annual mean temperature of 27°C. The region experiences four distinct seasons: a major rainy season from April to July, a minor rainy season from September to November, a major dry season from December to March and a minor dry season in August[18].

Plant material: The plant material consisted of palm kernel oil samples extracted from the kernels of mature fruits harvested from five traditional oil palm accessions originating from the Man region in western Côte d'Ivoire. These accessions were introduced to the La Mé research station through open pollination in 2014. Varietal identification confirmed that all accessions were 100% Dura type. Each accession was coded according to its locality of origin, the producer's name and the number of the tree visited in the farmer's plot (e.g. Blo_Dio_05, locality = Blolé, producer = Dio, tree number = 05) (Table 1).

Extraction of palm kernel oil using: For each accession, Five Fresh Fruit Bunches (FFBs) were harvested, weighed and threshed to obtain spikelets. The fruits were separated manually with a knife and depulped to remove the mesocarp; the resulting nuts were then weighed. The nuts were then oven-dried at 105°C for 24 hrs to facilitate shell cracking. The extracted kernels were weighed, crushed in a mortar and

Table 1: Origin of traditional oil palm accessions from Man region introduced at the La Mé research station

Sample Codes	Origin
Blo_Dio_05	Blolé
Domp _Ma_02	Dompleu
Doue_Oul_03	Douèlè
Gbat _Seu_01	Gbatongouin
Gban _Gue_03	Gbangbégouiné

ground using a mechanical grinder to produce fine particles. The ground kernel powder was then oven-dried at 105°C for 30 min to remove any residual moisture.

To extract the oil, 5 g of the ground kernel powder was placed into three filter paper cartridges. These were loaded into a Soxhlet extractor and oil was extracted for 10 hrs using 300 mL of n-hexane as the solvent. After extraction, the solvent-oil mixture was concentrated under reduced pressure at 40°C using a rotary evaporator (BUCHI B-490). The extracted oil was then oven-dried at 40°C to remove any residual solvent, after which it was weighed to determine the extraction yield, which was calculated as follows:

$$\text{Yield (\%)} = \frac{\text{Mass of oil extracted}}{\text{Mass of kernel powder}} \times 100 \quad (1)$$

Each accession was subjected to three independent extractions, after which the oils were stored at 4°C until further analysis.

Physicochemical characterization: The physicochemical parameters of the palm kernel oil were determined according to International Organization for Standardization (ISO) methods: Refractive index: ISO 6320, Moisture and volatile matter: ISO 662, Acid value and free fatty acid content, ISO 660, Iodine value: ISO 3961, Saponification value: ISO 3657, Peroxide value: ISO 3960, Anisidine value: ISO 6885 and Unsaponifiable matter: ISO 3596. The total oxidation value (Totox) was calculated according to the method described by Djikeng *et al.*[19]:

$$\text{Totox} = (2 \times \text{peroxide value}) + \text{anisidine value} \quad (2)$$

Determination of total phenolic content: Total phenolic content was determined spectrophotometrically using the Folin-Ciocalteu method[20] with some modifications. In brief, 2 g of palm kernel powder was dissolved in 5 mL of n-hexane in an Erlenmeyer flask. The antioxidants were extracted three times using 5 mL of methanol and the methanolic fractions were then combined and concentrated using a rotary evaporator. Then, an aliquot (50 µL) of the methanolic extract was mixed with 1 mL of tenfold-diluted Folin-Ciocalteu reagent and incubated for 10 min. Then, 1 mL of a 7% (m/v) sodium carbonate solution was added. Absorbance was measured at 760 nm using a spectrophotometer (JASCO V530) against a blank. Gallic acid (0.5 g/L) was used as the standard and the results were expressed as milligrams of gallic acid equivalents per gram of extract (mg GAE/g).

Analysis of fatty acids: To assess the fatty acid composition of palm kernel oils from the five accessions, fatty acid methyl esters were prepared following the SRPS EN ISO 12966-2 method[21]. The fatty acid content was analyzed via gas chromatography (Varian CPG 3900, Sydney, Australia), utilizing a flame ionisation detector and a CP-Select CB capillary column for FAME (50 m 0.25 mm, d = 0.25 m). Helium served as the carrier gas. The starting column temperature of 140°C was maintained for three minutes, thereafter, elevated to 220°C at a rate of 3°C per min and sustained for five minutes. The column temperature was ultimately elevated to 240°C at a rate of 2°C/min and maintained for 10 min. The injector and detector temperatures were established at 250°C. Individual peaks were seen by comparing their retention times with those of a reference mixture of 18 Fatty Acid Methyl Esters (FAME). The data were presented as a percentage of the total fatty acid content by weight.

Antifungal activity assay: The antifungal activity of palm kernel oil was assessed using the agar dilution method according to the NCCLS[22] guidelines. A Potato Dextrose Agar (PDA) medium was prepared and sterilised, with palm kernel oil incorporated at three concentrations: C1 = 25 µL, C2 = 50 µL and C3 = 75 µL. To improve miscibility, Tween 80 was added to the oil[23]. Four replicate plates were prepared for each concentration, along with control plates containing no oil. After solidification, 10 µL of an Aspergillus conidial suspension was deposited aseptically at the center of each plate. The plates were then incubated and the colony diameter was measured daily for three consecutive days, using the method described by Pitt and Hocking[24]. Growth inhibition was expressed as a percentage relative to the control. All tests were performed in triplicate.

Statistical analysis: All physicochemical and microbiological measurements were conducted in triplicate. The data was analyzed using IBM SPSS Statistics version 20 (IBM Corp., Chicago, IL, USA). Tukey's multiple comparison test was applied to identify significant differences in means, with statistical significance set at $p \leq 0.05$.

RESULTS

Oil content and physicochemical parameters: Table 2 shows the oil content of the kernels of the five traditional oil palm accessions, coded Blo_Dio_05, Domp_Ma_02, Doue_Oul_03, Gbat _Seu_01 and Gban _Gue_03 for Blolè, Dompleu, Douèlè, Gbantogouin and Gbangbégouiné origins, respectively. The

Table 2: Oil content and physicochemical parameters of palm kernel oils from the five traditional accessions

	Blo_Dio_05 Blolè	Domp _Ma_02 Dompleu	Doue_Oul_03 Douèlè	Gbat _Seu_01 Gbatongouin	Gban _Gue_03 Gbangbégouiné
Oil yield (%)	55.550±1.67^{c}	55.410±0.70^{c}	53.550±1.46^{bc}	50.720±0.65^{ab}	50.370±0.12^{a}
Refractive index	1.455±0.01	1.455±0.02	1.454±0.02	1.455±0.01	1.454±0.02
Moisture and volatile contents (%)	0.190±0.1	0.200±0.14	0.200±0.1	0.200±0.03	0.200±0.07
Acid value (mg KOH/g)	2.030±0.06^{ab}	2.740±0.37^{c}	2.480±0.06^{bc}	1.520±0.29^{a}	1.710±0.10^{a}
Free fatty acid (%)	1.020±0.03^{ab}	1.370±0.19^{c}	1.250±0.03^{bc}	0.760±0.15^{a}	0.860±0.05^{a}
Iodine value (g I2/100 g)	15.210±0.11^{a}	16.380±1.11^{ab}	17.630±0.06^{bc}	16.290±0.02^{ab}	18.000±0.36c
Saponification (mg KOH/g)	234.630±6.47^{ab}	240.140±1.76^{bc}	245.850±2.51^{c}	240.140±1.45^{bc}	226.300±3.61^{a}
Peroxide value (meq O_2/kg)	1.500±0.24^{a}	0.710±0.03^{a}	4.190±0.27^{b}	5.100±0.49^{c}	1.410±0.37^{a}
Anisidine value	0.850±0.06^{bc}	0.790±0.04^{b}	1.100±0.12^{cd}	1.230±0.08^{d}	0.360±0.14^{a}
Totox	3.850±0.41^{a}	2.200±0.07^{a}	9.480±0.54^{b}	11.380±1.03^{c}	3.170±0.70^{a}
Unsaponifiable content (%)	0.650±0.02^{a}	1.530±0.02^{d}	0.820±0.06^{b}	0.710±0.01^{ab}	1.310±0.10^{c}

Values are presented as Mean±SD, Values followed by the same letters in the same row are not significantly different at $p \leq 0.05$

oil content varied from 50.72-55.55%. Statistical analysis revealed significant differences at $p<0.05$ for collected samples. Thus, the traditional palm tree accessions from Blolè and Dompleu had the highest oil content (55.55 and 55.41%), followed by the accessions from Douèlè (53.55%). Finally, the accessions from Gbangbégouiné had the lowest oil content at 50.37%.

The physicochemical parameters of palm kernel oils extracted from traditional accessions are presented in Table 2. Analysis indicated significant differences ($p<0.05$) for all parameters except refractive index and moisture and volatile content. The acidity of the palm kernel oils ranged from 0.76-1.37% and the acid index values of the oils were from 1.52 mg KOH/g of oil to 2.74 mg KOH/g of oil. The Dompleu accessions (Domp_Ma_02) had significantly higher values (2.74 mg KOH/g of oil and 1.37%) than the other traditional palm accessions. Similarly to the acid index values, the oils extracted from the palm kernels in the five accessions were characterised by statistically different iodine indices. These values ranged from 15.21±0.11 to 18.00±0.36 g I/100 g oil. Accessions from Blolè (Blo_Dio_05) had the lowest iodine value (15.21±0.11 g I/100 g oil), while accessions from Gbangbégouiné (Gban_Gue_03) had the highest (18±0.36 g I/100 g oil).

The accessions from Dompleu (Domp _Ma_02) and Gbantogouin (Gbat_Seu_01) were statistically identical, with values of 16.38±1.11 and 16.23±0.1 g I/100 g of oil, respectively. The saponification index of the oil's ranged from 226.30±3.61 to 245.85±2.51 mg KOH/100 g of oil. Accessions from Gbangbégouiné (Gban_Gue_03) had lower values than those from Douèlè (Doue_Oul_03), which had the highest value (245.85±2.51 mg KOH/g of oil). The peroxide value of the palm kernel oil samples from the five traditional palm tree accessions ranged from 0.71±0.03 to 5.10±0.49 meq O/kg of oil. Accessions originating from Gbantogouin (Gbat _Seu_01) recorded the highest peroxide value (5.10±0.49 meq O/kg of oil), compared to accessions of other origins. The anisidine index, which is used to assess the degree of secondary oxidation of an oil, ranged from 0.36±0.14 to 1.23±0.08. Accessions from Gbangbégouiné had the lowest value of 0.36±0.14, followed by those from Dompleu and Blolè, which had values of 0.79±0.04 and 0.85±0.06, respectively. Accessions from Gbantogouin had the highest value of 1.23±0.08. The Totox value, which measures the primary and secondary oxidation products of palm kernel oils, ranged from 2.20±0.07 to 11.38±1.03. Accessions from Gbantogouin recorded the highest value of 11.38±1.03.

Polyphenol content and fatty acid composition of palm kernel oil: The polyphenol and fatty acid composition is shown in Table 3. The analysis revealed a significant difference ($p<0.05$) for all parameters examined. The polyphenol content of the evaluated palm kernel oils ranged from 82.49±0.44 to 103.36±0.25 mg GAE/g. The Dompleu and Gbangbégouiné accessions had significantly higher value than the other traditional palm accessions. The fatty acid composition of palm kernel oils from the five accessions is presented in Table 3. The palm kernel oils evaluated had a favorable fatty acid composition, with approximately 80% Saturated Fatty Acids (SFAs), while Monounsaturated Fatty Acids (MUFAs) and Polyunsaturated Fatty Acids (PUFAs) accounted for only about 20%. Lauric acid (C12:0) was the predominant Saturated Fatty Acid (SFA) in the palm kernel oils examined and its proportion was influenced ($p<0.05$) by the origin of the oil palm. Oil palms from Dompleu and Douèlè had significantly higher values than those from the other traditional palm accessions. The most dominant MUFA was oleic acid (C18:1), with values ranged from 14.72-16.49%.

Antifungal activity of palm kernel oil: The percentages of fungal growth inhibition measured after 24, 48 and 72 hrs for different samples of palm kernel oil from the five traditional accessions on *Aspergillus* sp are presented in Table 4. They were subjected to three different concentrations of palm

Table 3: Polyphenol content and fatty acid composition of palm kernel oil from the five traditional accessions

	Blo_Dio_05 Blolè	Domp _Ma_02 Dompleu	Doue_Oul_03 Douèlè	Gbat _Seu_01 Gbatongouin	Gban _Gue_03 Gbangbégouiné
Polyphenols (mg/g)	87.84±1.78^{b}	103.36±0.25d	82.49±0.44^{a}	98.76±0.79^{c}	102.77±2.23^{d}
Caprylic acid (C8:0)	2.59±0.01^{b}	2.62±0.01^{b}	2.28±0.02^{a}	2.42±0.01^{b}	2.25±0.01^{a}
Capric acid (C10:0)	3.25±0.01^{c}	3.14±0.01^{c}	2.22±0.01^{b}	2.10±0.01^{a}	2.12±0.05^{a}
Lauric acid (C12:0)	47.32±0.01^{a}	48.49±0.03^{b}	48.45±0.02^{b}	47.91±0.01^{a}	48.02±0.01^{a}
Myristic acid (C14:0)	17.34±0.04^{b}	16.14±0.05^{a}	17.30±0.02^{b}	17.25±0.07^{b}	17.46±0.03^{b}
Palmitic acid (C16:0)	6.89±0.02^{b}	7.30±0.03^{c}	6.16±0.01^{a}	6.60±0.03^{b}	6.23±0.01^{a}
Stearic acid (C18:0)	2.42±0.01^{c}	2.44±0.01^{c}	2.13±0.01^{a}	2.25±0.01^{b}	2.14±0.02^{a}
Arachidic Acid (C20:0)	0.21±0.01^{a}	0.19±0.02^{a}	0.31±0.01^{a}	0.30±0.02^{a}	0.32±0.01^{a}
Oleic acid (C18:1)	15.41±0.02^{a}	14.72±0.03^{a}	16.41±0.03^{b}	16.49±0.03^{b}	16.77±0.01^{c}
Linoleic acid (C18:2)	2.27±0.02^{a}	2.45±0.01^{b}	2.32±0.01^{ab}	2.33±0.01^{ab}	2.34±0.03^{ab}
SFA	80.02	80.32	78.85	78.83	78.54
MUFA	17.68	17.17	18.73	18.82	19.11
PUFA	2.27	2.45	2.32	2.33	2.34

Values are presented as Mean±SD, Values followed by the same letters in the same row are not significantly different at p≤0.05. SFA: Saturated fatty acid, MUFA: Monounsaturated fatty acid, PUFA: Polyunsaturated fatty acid

Table 4: Percentage inhibition of palm kernel oils from the five traditional accessions on *Aspergillus* sp.

		Inhibition rate (%)		
Accessions	Concentrations	24 hrs	48 hrs	72 hrs
Blo_Dio_05 Blolè	25 µL	31.50±9.18^{d}	14.27±2.69^{f}	5.95±2.78^{f}
	50 µL	48.00±4.78^{c}	23.02±2.20^{d}	11.06±1.11^{e}
	75 µL	72.00±8.00^{a}	47.32±5.90^{a}	14.21±1.10^{e}
Domp _Ma_02 Dompleu	25 µL	8.50±6.91^{e}	5.33±1.30^{g}	10.46±5.49^{e}
	50 µL	13.50±3.66^{e}	11.35±2.49^{f}	20.22±1.81^{d}
	75 µL	34.00±9.80^{d}	28.07±9.83^{c}	30.44±6.27^{b}
Doue_Oul_03 Douèlè	25 µL	38.00±2.14^{d}	18.55±0.81^{e}	13.76±3.13^{e}
	50 µL	47.00±3.55^{c}	25.55±2.55^{cd}	20.52±0.77^{d}
	75 µL	64.00±9.56^{b}	33.71±2.34^{b}	24.43±2.35^{c}
Gbat _Seu_01 Gbatongouin	25 µL	6.50±3.66^{ef}	7.31±3.11^{g}	5.05±3.40^{f}
	50 µL	14.50±2.98^{e}	6.11±1.85^{g}	22.93±2.76^{cd}
	75 µL	47.50±19.99^{c}	21.66±5.87^{de}	34.64±5.30^{a}
Gban _Gue_03 Gbangbégouiné	25 µL	39.00±1.41^{d}	13.77±6.23^{f}	12.65±2.98^{e}
	50 µL	49.00±5.65^{c}	24.56±3.50^{d}	21.20±4.45^{d}
	75 µL	65.00±7.62^{b}	49.15±7.33^{a}	29.52±3.46^{b}
Control	T0	0.00±0.00^{f}	0.00±0.00^{h}	0.00±0.00^{g}

Values are presented as Mean±SD, Values followed by the same letters in the same row are not significantly different at p≤0.05

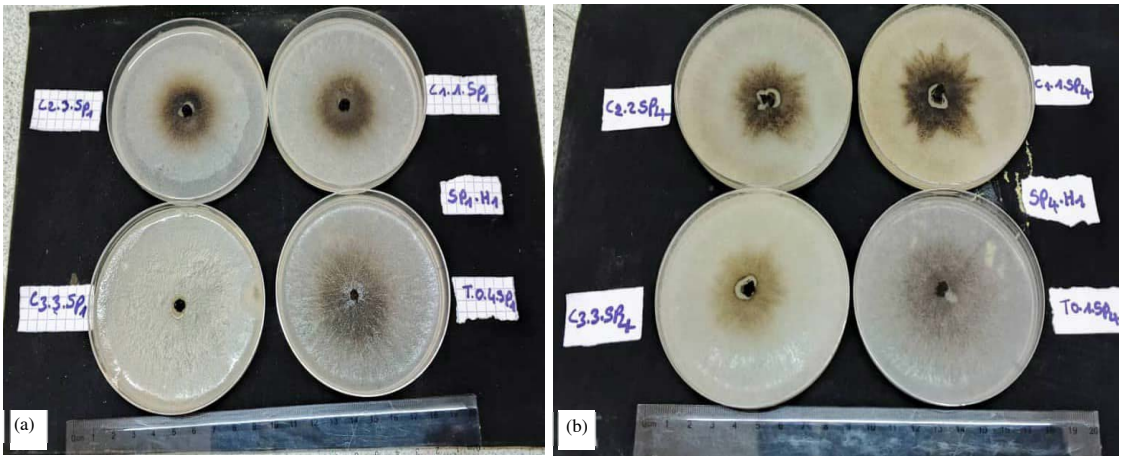

Fig. 1: Antifungal activity of palm kernel oils from traditional accessions on the growth of *Aspergillus* sp.

kernel oil (25, 50 and 75 µL). A control (T_0) was also included for comparison. In general, antifungal activity increases with oil concentration. For each oil, the inhibition rate was consistently higher at 75 µL than at 25 µL, particularly after 24 hrs. However, the inhibition rate tends to decrease over time. Statistical analysis revealed that the Blolè and Douèlé accessions exhibit the most pronounced antifungal effects. At 75 µL, Blolè palm kernel oil showed an inhibition rate of 72% after 24 hrs, which was the highest rate observed (Fig. 1). Blolè palm kernel oil also stands out for its consistently high efficacy at all concentrations, particularly after 24 hrs. Interestingly, Gbatongouin palm kernel oil at 75 µL exhibited increasing activity over time, reaching 34.64% after 72 hrs. The control (T_0) measurements resulted in zero values. The absence of any effect in the control group conclusively confirms that the observed inhibition is indeed caused by palm kernel oil.

DISCUSSION

The physicochemical and antifungal properties of Palm Kernel Oil (PKO) extracted from palm trees from Blolè, Dompleu, Douèlè, Gbantogouin and Gbangbégouiné showed significant variation depending on the geographical origin of the samples. These differences are likely due to genotypic variability among the palms, as previously demonstrated in oilseed studies[25].

In terms of oil yield, the highest values were exhibited by accessions from Blolè and Dompleu (55-56%), followed by Douèlè (53-54%) and then Gbantogouin and Gbangbégouiné (50-51%). These results are higher than those obtained by Jacob *et al.*[26], who reported yields of 45.51% in palm kernel from Katsina State in Nigeria. Similarly yields were observed by Paulin and Irène[27], confirming the potential of these kernels as a valuable raw material for the vegetable oil industry. The refractive index values (1.454-1.455) of the extracted Palm Kernel Oils (PKOs) fell within the Codex Alimentarius[28] range for conventional edible oils, consistent with the values reported by Alshafea *et al.*[29]. The moisture content (0.19-0.20%) was close to the Codex limit of 0.2%, suggesting that these oils would remain stable over extended storage periods. Acid values (1.52-2.74 mg KOH/g) and free fatty acid content (0.76-1.37%) were low, well below Codex thresholds (10 mg KOH/g and 4%, respectively), suggesting minimal hydrolytic degradation. These results are consistent with earlier reports[10,30] but contrast with those of Paulin and Irène[27], who recorded considerably higher AVs (15.46-20.28 mg KOH/g) in PKO from the Tenera and Dura varieties in Côte d'Ivoire. The iodine value (15.21-18.00 g I/100 g) fell within the Codex recommendation of 14.1-21.0 g I/100 g, reflecting the low degree of PKO unsaturation. These findings are consistent with those reported by Tuo-Kouassi *et al.*[31] and Alshafea *et al.*[29] but higher than those reported by Charity and George[32]. The highest saponification value was observed in the Douèlè sample (245.85 mg KOH/g), which is consistent with the high values reported for Nigerian PKO[32]. This indicates the presence of significant proportions of short and medium chain fatty acids, which are desirable for soap and cosmetic manufacturing. However, peroxide values varied significantly among accessions. Palm kernel oil extracted from Gbantogouin accessions showed the highest value (5.07 meq O/kg), indicating initial stage of oxidation, though this was still below the critical limit of 15 meq O/kg set by Codex. Similar trends were reported by Kaboré *et al.*[33] in edible oils from Burkina Faso, although their values reached 21.97 meq O/kg. The para-anisidine values (0.36-1.23) were well within the recommended maximum of 10[34,35] and lower than the values reported by Tuo-Kouassi *et al.*[31]. Totox values were highest in Douèlè and Gbantogouin (9.48 and 11.38, respectively) but remained far below the critical threshold of 30, as reported by Tuo-Kouassi *et al.*[31]. The unsaponifiable matter content ranged from 0.65-1.53%, which is higher than the levels found in certain unconventional oils, such as those from *Terminalia catappa* (0.57%), *Moringa oleifera* (0.5%) and *Canarium edulis* (0.63%)[36]. This fraction is rich in bioactive compounds such as carotenoids, tocopherols, tocotrienols, phytosterols and squalene[37], thereby enhancing the nutritional and functional value of PKO.

The polyphenol content (82.49-103.36 mg GAE/g) was highest in the Dompleu and Gbangbégouiné accessions. This is in accordance with the findings of Kouadio[38] and supports the antioxidant potential of PKO. This could contribute to food preservation and the prevention of diseases related to oxidative stress[8]. The fatty acid composition complied with Codex specifications, with lauric and myristic acids dominating, as previously reported by Niamketchi et al.[10] and Kouadio[38]. Lauric acid is valued for its antimicrobial properties[39] and its use in the production of soaps and cosmetics[31]. Essential fatty acids, such as oleic and linoleic acids, were also present. Oleic acid has been associated with reduced oxidative stress in pulmonary arteries and improved lipid metabolism[40].

In terms of its antifungal activity, PKO demonstrated significant inhibitory effects against Aspergillus sp., with the Blolè accession achieving 72% inhibition after 24 hrs at a concentration of 75 µL. This performance may be due to differences in chemical composition influenced by genotype, extraction methods and storage conditions. These findings are consistent with those of Yapi and Kouadio[23], who showed that palm kernel oil form Tenera variety had greatest antifungal activity on *Aspergillus* sp. These results were also in

accordance with Koffi et al.[41], who reported the total inhibition of Fusarium sp. using rubber seed oil. This suggests that PKO may contain bioactive compounds with potent antifungal properties. The absence of inhibition in the control treatments confirms that the observed effects were due to the PKO.

CONCLUSION

This study revealed marked variability in the oil content, physicochemical characteristics, polyphenol concentration and fatty acid composition of palm kernel oils from five traditional accessions. Accessions from Dompleu and Blolè showed the highest oil yield and favorable quality traits, while Blolè and Douèlè demonstrated superior antifungal activity against *Aspergillus* sp. The predominance of lauric acid and high saturated fatty acid content confirmed the typical composition of palm kernel oils, with variations influenced by accession origin. These results highlight the potential of specific traditional accessions, particularly Dompleu and Blolè, as promising sources of high-quality oil with functional and bioactive properties.

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