UNDER PEER REVIEW

QUALITATIVE AND QUANTITATIVE ANALYSES OF FUNGICHEMICAL COMPOUNDS OF TOTAL EXTRACTS AND PARTITIONS OF *Ganoderma lucidum* HARVESTED IN CÔTE D'IVOIRE

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ABSTRACT

Objectives: The objective of this study is to evaluate the influence of different solvents (aqueous, ethanolic, ethyl acetate and hexane) on LUGA fungichemical compounds collected in the Lôh-Djiboua region of Côte d'Ivoire.

Study design: LUGA is an edible mushroom rich in nutritional, functional and therapeutic qualities. Despite its proven integration into traditional pharmacopoeias, its use for therapeutic purposes in Africa, and particularly in Côte d'Ivoire, remains poorly documented and scientific data are limited.

Place and duration of the study: All these preparations were carried out at the Laboratory of Biotechnology and Valorization of Natural Bioactive Substances (LBVSNB) of the National Center of Floristics (CNF) of the University Félix Houphouët Boigny in Abidjan, between April 2023 and August 2025.

Methods: Extraction methods, qualitative and quantitative analyses of polyphenols, flavonoids, terpenoids and alkaloids with spectrophotometers were used to obtain the results of this study.

Results: The extraction yields were calculated and showed a predominance of polar fractions, with values of 15.12% for the aqueous extract and 14.56% for the hydroethanolic extract, while the aqueous fractions of the partitions showed the highest yields (P1-1: 60.54%, P2-1: 62.82%). Fungichemical screening revealed the systematic presence of sterols, polyterpenes, flavonoids and polyphenols in all extracts, while saponosides, quinones, tannins and alkaloids were concentrated in the polar fractions. The total aqueous extract had the highest concentration of terpenoids (210 mg linolein equivalent/g of extract) and a trace of alkaloids (0.42 mg atropine equivalent/g of extract), twice as much as the hydroethanol extract, which is 0.20 mg atropine equivalent/g of extract. While the latter extract expressed the highest concentrations of flavonoids (60 mg linolein equivalent/g of extract) and polyphenols (0.70 mg gallic acid equivalent/g of extract). The partitions confirmed that polar solvents extract mainly hydrophilic compounds, while the hexanic and acetane fractions concentrate semi-polar or lipophilic terpenoids.

Bottom Line: Water is the solvent that has a higher polarity than ethanol, ethyl acetate, and hexane.

Keywords: LUGA, solvant polaire, solvent apolaire, polyphénols, flavonoïdes, terpènoïdes et alcaloïdes.

1. INTRODUCTION

Edible mushrooms are fungal species whose regular consumption, either raw or after cooking, poses no risk of poisoning or danger to human health (Phillips 2006 ; Eyssartier & Roux, 2016). They have been consumed for decades around the world, both for their nutritional qualities and for their functional properties (Madamo *et al.,* 2017). Beyond their nutritional value, the therapeutic use of mushrooms is particularly developed in Asia, particularly in China and Japan. In these countries, they have traditionally been used for the prevention and treatment of various diseases, such as certain cancers, liver diseases, and age-related effects (*Matsuda et al.,* 2009). Among these fungi are polypores belonging to the basidiomycetes, including Ganoderma lucidum. The etymology of this name is of Greek and Latin origin: "Ganoderma" derives from the Greek terms gano (shiny) and derma (skin), while "lucidum" is a Latin word meaning "shiny" or "luminous". This basidiomycete is therefore commonly referred to as the "shiny-skinned fungus" or "shiny-skinned fungus". Ganoderma lucidum is of increasing scientific interest due to its beneficial effects on human health, particularly in the prevention of oxidative stress, aging, immune disorders, and certain cancers (Loyd *et al.,* 2018). It is also a saprotrophic fungus, which grows mainly on dead wood, where it ensures the decomposition of organic matter (Kamalebo & Balagizi, 2021). In traditional Asian medicine, Ganoderma lucidum is widely used in various galenic forms such as capsules, herbal teas, and decoctions. It is also used to stimulate appetite, fight insomnia, treat bronchitis, hypertension, arthritis, and relieve nervous disorders (Wasser, 2005). In addition, this mushroom is also used in the treatment of coughs, respiratory diseases such as asthma, liver diseases (hepatitis), certain cancerous pathologies and to improve cognitive functions, especially intelligence quotient (IQ) (Zjawiony, 2004). Despite its proven integration into traditional Asian pharmacopoeias, the use of Ganoderma lucidum for therapeutic purposes in Africa, and particularly in Côte d'Ivoire, remains poorly documented. Although some traditional practitioners in the health regions of Lôh-Djiboua and Haut-Sassandra use it for the treatment of ulcers and inflammatory conditions, the available scientific data remain limited. It is in this context that the present study is inscribed, aiming to evaluate the influence of different solvents (aqueous, ethanolic, ethyl acetate and hexane) on the fungichemical compounds of Ganoderma lucidum collected in Côte d'Ivoire. The characterization of this fungichemical composition is an essential step for the valorization of this species in the development of new pharmaceutical or nutraceutical products.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

2.1 Material

2.1.1 Harvesting and drying of *Ganoderma lucidum* organs

The fungus is the biological material of this study. It is a species of edible wild mushroom called *Ganoderma lucidum* coded "LUGA".
The collection of samples from our study took place in the health region of Lôh-Djiboua, more precisely in the health district of Divo, thanks to a number of equipment including IDA plastic bags for the preservation of dried samples of the mushroom. LUGA was harvested, cleaned and washed with sterilized distilled water to remove traces of mold and other detritus (waste). It was then cut with a stainless steel knife into small fragments and dried in a VENTICELL ^{R} ^{oven}; at 50°C for 5 days. This dried mushroom was then reduced to a very fine powder (pulverized) using a multifunction blender from the SILVER CREST brand.
It should be noted that throughout the handling, the distilled water used has been sterilized.

2.2 Methods

2.2.1 Extractions

2.2.1.1 Preparation of aqueous and ethanolic extracts

The very fine LUGA powder obtained after spraying was used to prepare the aqueous and ethanol extracts according to the method described by Zirihi *et al*. (2003) with some modifications. In fact, 100 g of vegetable powder was vigorously stirred in 1000 mL of solvents (distilled water or 70% ethanol) using an electric mixer for 5 turns of 60 seconds with a 5-second break after each round. The mixture obtained is filtered through a sieve and then the residues are remixed in 500 mL of solvents (distilled water or 70% ethanol) at the same time and twice in a row. Another filtration is carried out, once on percale fabric and twice on hydrophilic cotton that is increasingly tight, in a funnel. The liquid extract obtained is evaporated in the oven at 50 °C for 24 hours for the ethanolic extract and 48 hours for the aqueous extract to obtain a dry extract.

2.2.1.2 *Preparing Partitions*

The scores were made from the hydroethanolic extract. In fact, 10 g of this extract was weighed and dissolved in 100 mL of solvent (hexane-water) or (ethyl acetate-water) at 50% under a magnetic stirrer at room temperature of 20 °C at 1 turn per min for 24 h for good homogenization. After 24 hours of homogenization, the mixture was transferred to a decanting ampoule to observe the different phases of this partition. The two different phases observed were collected differently and placed in a VENTICELL ^{R} oven, for 24 h at 50°C, in order to obtain the different partitioned extracts as described by Ackah (2009).
All these preparations were carried out at the Laboratory of Biotechnology and Valorisation of Natural Bioactive Substances (LBVSNB) of the National Centre for Floristics (CNF) of the University Félix Houphouet Boigny in Abidjan.

2.2.1.3 Calculation of performance

The extraction yield (ER) is defined as the ratio between the mass of hydroalcoholic or dry aqueous extract obtained (M') and the mass of the plant material (mushroom powder) used (M). This makes it possible to know the concentration of the molecules present in each extract. The return is expressed as a percentage. It is calculated by the following formula:

$$\text{RE}\ (\%) = \frac{M'}{M} \times 100$$

RE: Extraction yield in percentage %.

M': Mass of dry hydroalcoholic or aqueous extract obtained in grams (g).

M: Mass of fresh plant matter (mushroom) used in grams (g).

2.2.2 Fungichemical study

2.2.2.1 Qualitative Analysis of LUGA Fungichemical Compounds

For these tests, a solution of the extract is prepared by dissolving 5 g of the extract in 50 mL of sterile distilled water. These tests were carried out using the analytical techniques described in the work of Lazureski *et al.* (2007), Abo (2013) and Mea *et al.* (2017).

A qualitative phytochemical analysis of the extracts was performed to highlight the main groups of secondary metabolites. Sterols and polyterpenes were identified by the Liebermann–Burchard reaction after evaporation of the extracts, comparing the results to a cholesterol control. The presence of polyphenols and gallic tannins was detected by the ferric chloride reaction, while flavonoids were highlighted by the hydrochloric alcohol and magnesium test, with quercetin (quercetol) as a reference. The catechetical tannins were searched for using Stiasny's reagent, the formation of a flaky precipitate attesting to their presence. Quinonic compounds were detected by the Borntraeger reaction, characterized by a red to purple coloration of the ammonia phase. The alkaloids were identified by the reagents of Dragendorff and Bouchardat, with quinine as the control. Finally, saponosides were highlighted by the foaming test, based on the persistence of a stable foam after agitation.

2.2.2.2 Quantitative Determination of LUGA Fungichemical Compounds

2.2.2.2.1 Determination of polyphenols

10 mg of extract was weighed and dissolved in 10 mL of methanol to obtain a stock solution with concentration C_{SM} = 1 mg/mL. Subsequently, 1 mL of this solution was taken and added to 1 mL of Folin-ciocalteu (FCR). The mixture obtained was stirred and then left to rest for 6 minutes. 1 mL of sodium carbonate was added to the mixture and supplemented with sterile distilled water until 10 mL of solution was reached. This solution obtained was incubated in the dark for 1 hour. Finally, the reading of the absorbance (Y) was carried out at 735 nm against a blank prepared in the same way by replacing the

extract with the sterile distilled water as reported by Ndong *et al.* (2021). The calibration curve was plotted using the following function: **Y = 0.01810X +0.07179** where R2 = 0.9911
X is the concentration of polyphenol in mg of Gallic Acid equivalent/g of extract.
There is absorbance.

2.2.2.2.2 Terpenoid Dosage

250 mL of extract was dissolved in 5 mL of distilled water to obtain a stock solution with a concentration of MSC = 50 mg/mL. The resulting solution was transferred to a test tube to which 2 mL of chloroform was added, homogenized and left to rest for 3 minutes. Then, 200 µL of concentrated sulfuric acid was added to the mixture. The whole thing was incubated in the dark for 2 hours. After incubation, the reddish-brown precipitate formed was carefully separated from the supernatant. Then, 3 mL of methanol was added and mixed well until the precipitation completely dissolved. The absorbance (Y) reading was done at 538 nm against a white prepared in the same way, replacing the plant extract with methanol as described by Ghorai *et al.* (2012). The calibration curve was plotted according to the function below:
Y = 0.0036X−0.001 where R2= 0.9927**.**
X is the concentration of terpenoids in mg linolein equivalent/g of extract. Y is the absorbance

2.2.2.2.3 Alkaloid Determination

37.5 mg of extract was dissolved in 1.5 mL of ethanol to obtain a stock solution with a concentration of MSC = 25 mg/mL. Then, the pH of this solution was measured and maintained between 2 and 2.5 by adding a few drops of hydrochloric acid (HCl). Then, 2 mL of Dragendorff's reagent was added to the resulting solution. This mixture was centrifuged at 7000 rpm for 3 minutes. A few drops of Dragendorff were added to the centrifugate to complete the precipitation and then a second centrifugation was carried out. The centrifugate obtained is completely decanted and the precipitate was recovered and washed with 2 mL of ethanol (96°) and centrifuged again for 3 minutes. The supernade is discarded and the residue is treated with 2 mL of disodium sulphate solution. The brownish-black precipitate that is formed is then centrifuged for 3 minutes. Then, two drops of di-sodium sulphate were added to the medium to complete the precipitation and a second centrifugation was carried out during the same time. Finally, the residue is recovered and dissolved in 2 mL of concentrated nitric acid with heating if necessary. Then, the solution obtained was diluted by supplementing the volume to 10 mL with distilled water. And, 1 mL of this dilute solution was added to 5 mL of thiourea. The absorbance (Y) reading was performed at a wavelength of 435 nm against a blank consisting of nitric acid, distilled water and thiourea prepared as the sample according to the method used by Sreevidya & Mehrotra (2003). The calibration curve was plotted from the following function:
Y = 1.5306X where R2 = 0.8469. *Where X is the concentration of alkaloids in mg of atropine equivalent/g of extract. Y is the absorbance*

2.2.2.2.4 Flavonoid Determination

The determination of the flavonoids was carried out by a method based on the formation of a very stable complex between the aluminum chloride and the oxygen atoms present on the carbons 4 and 5 of the flavonoids. The protocol used is the one described by Zhishen *et al*. (1999) and Kim *et al*. (2003), with some modifications. In fact, it was in a glass hemolysis tube that 400 µL of extract, or standard, or distilled water for the control, were added to 120 µL of NaNO2 at 5%. After 5 minutes, 120 µL of 10% AlCl3 was added and the medium was stirred vigorously. After 6 minutes, a volume of 800 µL of NaOH at 1 M was added to this medium Ali-Rachedi *et al.* (2018). Absorbance is read immediately at 510 nm against the control. A methanolic solution of quercetin was prepared. Daughter solutions prepared from the stock solution at different concentrations between 0 and 1000 µg/mL were used to draw the calibration curve according to the following function: **Y = 0.4285X + 0.2711** with R2 = 0.7940 *Where X is the concentration of flavonoids in mg quercetin equivalent/g of extract.*

3. RESULTS AND DISCUSSION

3.1 Performance of LUGA excerpts and scores

LUGA's extraction yields show that aqueous extraction and 70% hydroethanol extraction had yields (15.12% and 14.56%) respectively that are broadly comparable. After partition, the aqueous fractions (P1-1: 60.54%; P2-1: 62.82%) showed the highest yields, while the organic fractions showed lower yields, notably the hexanic fraction (21.78%) and the acetan fraction (32.42%) as shown in Table I.

Table I: Yields of LUGA excerpts and scores

		RETURNS
Extracts	**Aqueous**	**15.12 %**
	Ethanol 70%	**14.56 %**
Partitions	**P1-1: Aqueous fraction**	**60.54 %**
	P1-2: hexanic fraction	**21.78 %**
	P2-1 : Fraction Aqueuse	**62,82 %**
	P2-2: Acetal fraction	**32.42 %**

P1: Partitions with hexane
P2: Sheet music with ethyl acetate

3.2 Qualitative and Quantitative Analyses of LUGA's Fungichemical Compounds

3.2.1 Qualitative analyses of LUGA fungichemical compounds

Qualitative fungichemical screening of LUGA extracts and fractions showed the presence of different secondary metabolites such as: sterols and polyterpenes; flavonoids; tannins and alkaloids.
The absence of saponosides, polyphenols and quinones was observed only in the organic fractions P1-2 and P2-2 (Table II).

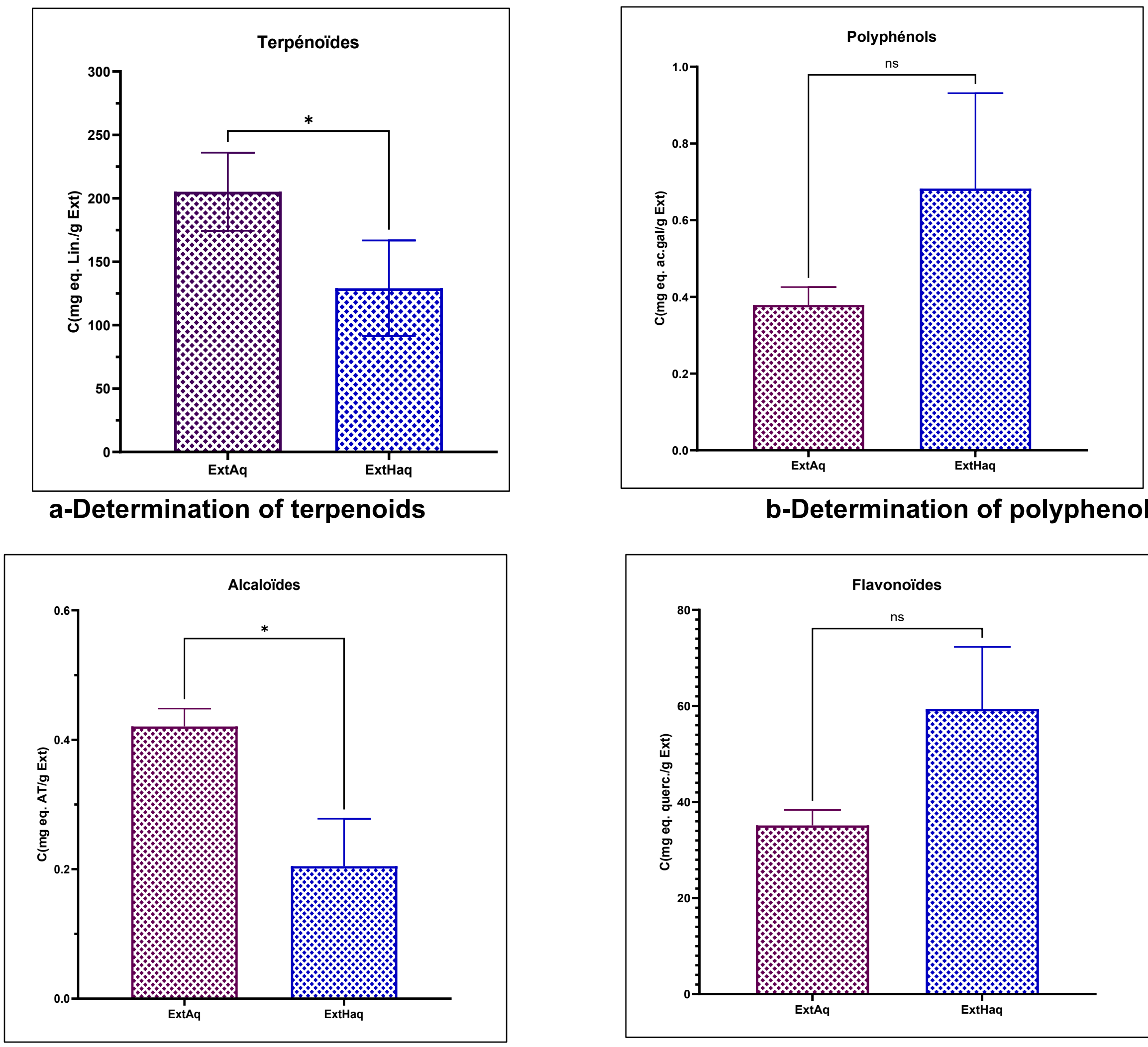
Table II: Fungichemical data for LUGA extracts and fractions

Excerpt	Sterols and Polyterpenes	Flavonoids	Polyphenols	Saponosides	Quinones	Alkaloids	Tannins
Watery	**+**	**+**	**+**	+	+	+	+
Ethanol 70 %	**+**	**+**	**+**	+	+	+	+
P1-1 : Aqueous fraction	**+**	**+**	**+**	+	+	+	+
P1-2 : Hexanic fraction	**+**	**+**	-	-	-	+	+
P2-1 : Aqueous fraction	**+**	**+**	**+**	+	+	+	+
P2-2: Ethyl acetate fraction	**+**	**+**	-	-	-	+	+

3.2.2 Quantitative analyses of LUGA fungichemical compounds

<u>*3.2.2.1 Quantitative Determinations of Total Extracts*</u>

Total extracts presented the following metabolites: terpenoids, polyphenols, alkaloids and flavonoids. Indeed, the highest concentrations of terpenoids (210 mg linolein equivalent/g extract) and alkaloids (0.42 mg atropine equivalent/g extract) as well as the lowest concentrations of flavonoids (35 mg quercetin equivalent/g extract) and polyphenols (0.39 mg gallic acid equivalent/g extract) observed were expressed by the total aqueous extract. However, the lowest concentrations of terpenoids (125 mg linolein equivalent/g extract) and alkaloids (0.20 mg atropine equivalent/g extract) as well as the highest concentrations of flavonoids (60 mg quercetin equivalent/g extract) and polyphenols (0.70 mg gallic acid equivalent/g extract) observed were expressed by the total hydroethanolic extract as shown in Figure 1 (a, b, c and d).



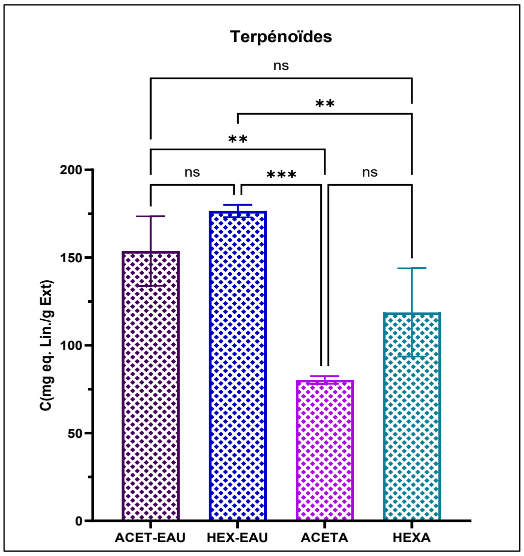
a-Determination of terpenoids **b-Determination of polyphenols**

c-Determination of alkaloids **d- Determination of flavonoids**

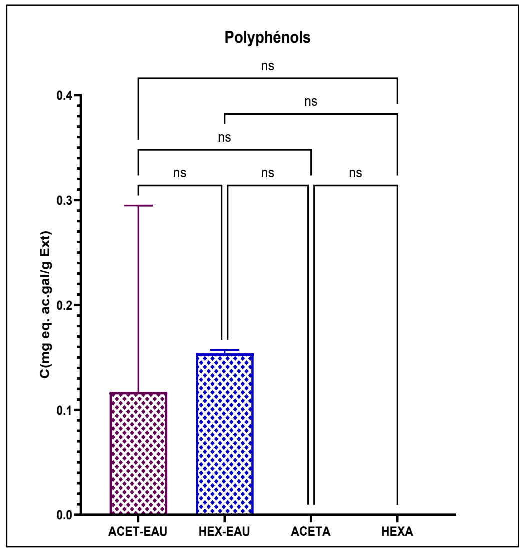
Figure 1: Quantitative Fungichemical Determinations of Total LUGA Extracts

3-2-2-2-Quantitative Partitions

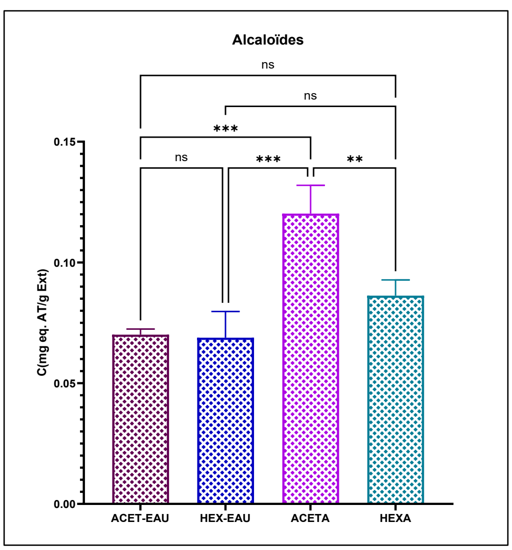
The metabolites assayed for each partition are: terpenoids, polyphenols, alkaloids and flavonoids (Figure 2). Indeed, the highest concentrations of terpenoids (175 mg linolein equivalent/g extract) and polyphenols (0.15 mg gallic acid equivalent/g extract) as well as the moderately low concentrations of flavonoids (30 mg quercetin equivalent/g extract) and alkaloids (0.07 mg atropine equivalent/g extract) were expressed by the hexane-water partition (PM1-1). On the other hand, the acetate-water partition (PM2-1) showed metabolites of low concentrations compared to the other partitions, i.e. the concentrations of: polyphenols (0.12 mg gallic acid equivalent/g extract), flavonoids (20 mg quercetin equivalent/g extract), alkaloids (0.07 mg atropine equivalent/g extract). Except for the terpenoid partition, where it had a high concentration of 153 mg linolein equivalent/g extracted compared to hexanic (P1-2) and acetan (P2-2) partitions. It should be noted that partitions (P1-2) and (P2-2) contain only a small amount of polyphenols, i.e. 0.001mg gallic acid equivalent/g extracted. But, partition (P2-2) had the lowest concentration of terpenoids (75 mg linolein equivalent/g extract) as well as the moderately high concentration of flavonoids (33 mg quercetin equivalent/g extract) and the highest concentration of alkaloids (0.12 mg atropine equivalent/g extract) compared to partition (P1-2) which had the highest concentration of flavonoids (45 mg quercetin equivalent/g extract) and the mean concentration of alkaloids (0.085 mg atropine equivalent/g extract) and terpenoids (125 mg linolein equivalent/g extract) as shown in Figure 2 (A, B, C and D).



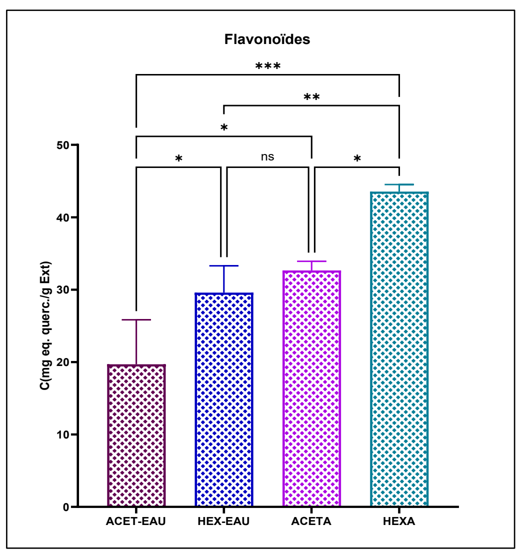
a-Determination of terpenoids



b-Determination of polyphenols



c-Determination of alkaloids



d-Determination of flavonoids

Figure 2: Quantitative assays of fungichemicals in LUGA partitions

DISCUSSION

The different yields obtained in Table 1 above are very high compared to the results of Kebaili *et al.* (2021); Merghid and Halimi, (2025) who found the following values for the aceta (P2-2) 0.63% and aqueous (P2-1) 5.78% fractions of *Ganoderma lucidum* in Algeria and Olennikov *et al.* (2011) who fractionated the extractables of *Laetiporus sulphureus* and obtained 0.61% for the hexanic fraction (P1-2), the acetan fraction (P2-2) 0.20% and the aqueous fraction (P2-1) 3.77%. The variation in extraction yields observed can be explained by several factors, including the extraction methods used, the geographical location, the duration and temperature of the process, the stage of maturity at harvest, the size of the mushrooms, the ratio of solvent to sample, and the nature of the solvents used (Khatua *et al.* (2019); Ghimire *et al.* (2021); Yim *et al.* (2011); Villalobos-Pezos *et al*. (2024)).

Also, these yields obtained from LUGA reflect the richness of this fungus in mainly polar metabolites, which is in agreement with the data reported in the literature (kebaili *et al.*, 2021; Merghid & Halimi, 2025). The yields close to aqueous extract (15.12%) and hydroethanol extract at 70% (14.56%) indicate that water and aqueous ethanol can be used to extract similar classes of compounds, mainly polysaccharides, polyphenols and water-soluble compounds, which are widely recognized as responsible for LUGA's biological activities (Olennikov *et al.*, 2011*).*

The high yields of the aqueous fractions from the partitions (P1-1: 60.54% and P2-1: 62.82%) confirm the predominance of strongly polar compounds in the fungal matrix. This is because LUGA is particularly rich in polysaccharides, especially β-glucans, as well as polysaccharide-bound proteins and hydrophilic phenolic compounds. These macromolecules are generally better solubilized in water, which explains their high concentration in aqueous fractions after partition (Olennikov *et al.*, 2011*).*

Conversely, the lower yields observed for organic fractions, in particular the hexanic fraction (21.78%), reflect a low proportion of non-polar compounds in the crude extract. This fraction is mainly likely to contain lipids, sterols and some non-polar triterpenes.

The acetate fraction (P2-2), with an intermediate yield (32.42%), reflects the notable presence of semi-polar metabolites in LUGA, including oxygenated triterpenes, some fungal flavonoids and less hydrophilic phenolic compounds. These substances are widely described as responsible for the anti-inflammatory, antioxidant, antifungal, and anticancer properties associated with LUGA (Khatua *et al.* (2019); Ghimire *et al.* (2021); Yim *et al.* (2011); Villalobos-Pezos *et al.* (2024)).

LUGA is a fungus that has several secondary metabolites that are: terpenoids, polyphenols, alkaloids, flavonoids, tannins, saponosides and quinonic compounds. Our results corroborate the work of Plosca *et al.*, 2025 who found the same chemical compounds in LUGA extracts.
Dosing some of these fungichemical compounds in total extracts revealed that:

Terpenoids are very abundant (210 mg linolein equivalent/g extract) in the aqueous extract and low (125 mg linolein equivalent/g extract) in the hydroethanol extract. As for the partitions, the determination of this same metabolite revealed a very abundant presence (175 mg linolein equivalent/g extract) in the aqueous fraction (P1-1), abundant (153 mg linolein equivalent/g extract) in the aqueous fraction (P2-1) and low (125 mg linolein equivalent/g extract) in the hexanic fraction (P1-2) and (80 mg linolein equivalent/g extract) in the acetan fraction (P2-2). Our results are in agreement with those of Wang et al. (2020) who found terpernoids in abundant amounts in LUGA. These different concentrations of terpenoids observed in different LUGA extracts show that it could have anti-inflammatory, antibacterial, antifungal, antioxidant and antiviral properties. Indeed, the results of the work of Plosca *et al.* (2025) demonstrated these same pharmacological properties in LUGA extracts.

Polyphenols are abundant (0.70 mg gallic acid equivalent/g extract) in the hydroethanolic extract and low (0.39 mg gallic acid equivalent/g extract) in the aqueous extract. As for the partitions, the determination of this same metabolite revealed an abundant presence (0.15 mg gallic acid equivalent/g extract) in the aqueous fraction (P1-1), a low presence (0.12 mg gallic acid equivalent/g extract) in the aqueous fraction (P2-1) and a total absence (0 mg gallic acid equivalent/g extract) in the organic fractions (P1-2) and (P2-2). Our results are in line with those of the work of Achoury and Lahneche (2023) who found these same quantities of polyphenols in one of the edible fungi called *Cylocybe sp* collected in Algeria and which stipulate that the variation in the concentrations observed in the different extracts examined depends on the polarity of the solvents used. Indeed, a solvent with high polarity makes it possible to extract secondary metabolites such as alkaloids, phenolic compounds, carotenoids, tannins, sugars, amino acids, polysaccharides (Kebaili, 2022). These different concentrations of polyphenols observed in different LUGA extracts show that LUGA has antioxidant properties that protect cells from premature aging and free radical damage while strengthening the body's immune system (immune defenses). Based on the data in the literature, we can say that LUGA has anti-inflammatory and antiviral properties, improves cardiovascular health, protects the skin and contributes to the health of the gut microbiota. Also, our work is in agreement with the results of Javier *et al.* (2010) which showed that any food rich in polyphenols contains these same medicinal properties.
Alkaloids are abundant (0.420 mg atropine equivalent/g extract) in the aqueous extract and low (0.20 mg atropine equivalent/g extract) in the hydroethanol extract. As for the partitions, the determination of this same metabolite revealed a low presence (0.07 mg atropine equivalent/g extract) in the aqueous (P1-1) and (P2-1) fractions and (0.085 mg atropine equivalent/g extract) in the hexanic fraction (P1-2) and abundant (0.12 mg atropine equivalent/g extract) in the acetan fraction (P2-2). Our results are lower than the results of the work of Rijia *et al.* (2024) who found 0.720 mg atropine

equivalent/g dry ec. in *Ganoderma applanatum.* All this shows that LUGA contains alkaloids. Despite their presence in low concentrations, they occupy a very essential place among the secondary metabolites with a multitude of pharmacological properties such as antimicrobial and anticarcinogenic (Kakatum *et al.*, 2012; Achoury and Lahneche, 2023). It should be noted that alkaloids are nitrogenous compounds with a bitter taste and free bases that are soluble in non-polar organic solvents (Pereira *et al.*, 2023).

Flavonoids are abundant (60 mg quercetin equivalents/g extract) in the hydroethanolic extract, whereas they are present in lower abundance (35 mg quercetin equivalents/g extract) in the aqueous extract. Regarding the partitioned fractions, the assay of this same metabolite revealed a very high abundance (45 mg quercetin equivalents/g extract) in the hexane fraction (P1-2); a substantial abundance—specifically 30 mg quercetin equivalents/g extract and 33 mg quercetin equivalents/g extract, respectively—in the aqueous fraction (P1-1) and the acetate fraction (P2-2); and finally, a low abundance (20 mg quercetin equivalents/g extract) in the aqueous fraction (P2-1). Our results exceed those reported by Rijia et al. (2024), who found 15.84 mg quercetin equivalents per gram of dry sample in *Ganoderma applanatum*.These varying concentrations demonstrate that LUGA is a flavonoid-rich fungus, containing these natural compounds (polyphenols). Consequently, it may possess antioxidant, anti-inflammatory, immunomodulatory, cardioprotective, antimicrobial, anticancer, antifungal, neuroprotective, hepatoprotective, antibacterial, and antiviral properties (Al-Khayri et al., 2022; Muheisen & Ali, 2019; Review, 2025).

4. CONCLUSION

This study, carried out on *Luga* collected in Côte d'Ivoire, made it possible to extract and fractionate the bioactive compounds of this fungus using different extraction methods (solvents of increasing polarity and partitioning of extracts) in order to carry out their qualitative and quantitative analyses.
It appears that *Luga* collected in Côte d'Ivoire has a significant richness in bioactive compounds ("secondary metabolites") depending on the polarity of the solvents used. Also, this study revealed the importance of the selection of extraction solvents and analytical methods to accurately characterize total extracts and their fractions. are concentrated in triterpenes and alkaloids. These data provide a solid scientific basis for exploiting the potential therapeutic properties of this mushroom in medical, nutraceutical or cosmetic applications.

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DEFINITIONS, ACRONYMS, ABBREVIATIONS

CSM: Concentration of the stock solution
Mg: Milligram
g: gram
ExtAq: aqueous extract
ExtHaq: hydroethanolic extract
ACET-EAU: acetate-water fraction
ACETA: Acetatic Fraction
HEX-EAU: fraction Hexane-eau
HEXA: hexanic fraction