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Review Article

A review on the Phytochemistry and Pharmacological properties of *Picralima nitida* Durand and H. (Apocynaceae family): A potential antiCovid-19 medicinal plant species

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Abstract

In this mini-literature review, the traditional use, nutritional value, phytochemistry and biological properties of *P. nitida*, a plant used as a conventional African medicine is described. The literature discussed in this investigation established that extracts from P. nitida were very efficient in the treatment of several diseases including malaria. Hence we anticipate that it may be effective against Covid-19 virus also. We suggest that in vitro and in vivo assays should be conducted to confirm the activity of the plant against SARS-CoV-2.

Keywords covid-19, medicinal plant, *Picralima nitida*, phytochemistry, pharmacological activities

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Introduction

The world is confronted with a new coronavirus epidemiccalled COVID-19. This novel incipient disease is initiated by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. A genetic study has revealed that SARS-CoV-2 belongs to the Beta coronavirus family and is very similar to SARS-CoV-1 [1]. Despite the biosafety and hygiene measures to limit the large-scale spread of this pandemic, there is currently no antiCovid-19 drug approved by the World Health Organization (WHO). Therefore, traditional medicines can play a pivotal role in the management of this pandemic. Indeed, medicinal plants have been used in folk medicine for generations in most of the cultures throughout the world and are the primary form of treatment in many areas today [2]. However, among the 250,000-500,000 species of plants on earth, only a relatively small percentage (1-10 %) is used for food by humans and animals [3]; however, more may serve medicinal purposes. Medicinal plants are an important source of molecules with various pharmacological properties. These medicinal values of plants have been claimed to lie in their phytochemical components including alkaloids, tannins, flavonoids, and other phenolic compounds [4]. According to the World Health Organization, more than 80% of the population in Africa uses traditional medicine to solve the primary health problems. The traditional medicines have the advantage of being safe, effective, less expensive, and less risky, with significantly reduced side effects compared to modern medicines [5-9]. *Picralima nitida* Durand

and H. (Apocynaceae family) is widely distributed in the high deciduous forest of West-Central Africa from Ivory Coast to West Cameroons, and extending across the Congo basin and Uganda [10, 11]. Its ethnobotanical uses are well documented [2]. The analysis of aqueous, ethanol and methanol extracts of *P. nitida* revealed the presence of tannins, saponins, flavonoids, terpenoids, steroids and glycosides, reducing sugars, carbohydrates and like alkaloids including indole alkaloids; akuammine, pseudoakuammine, akuammidine, akuammicine, akuammigine, pseudoakuammigine, akuammiline and akuammenine [12-16]. Erharuyi and Falodun [2] reported that alkaloids are the major class of phytochemicals isolated from *P. nitida*. They demonstrated that extracts from this plant possess various biological activities including antimalarial, antileishmanial, trypanocidal, larvicidal, antipyretic, analgesic, anticoagulant, anti-inflammatory, anti-diarrhoeal, hypoglycaemic and anti-microbial properties [2]. COVID-19 involves serious complications such as heart injury, with cardiac dysfunction in COVID-19 patients, though its mechanism is still unclear [2]. The valuable properties of the *P. nitida* medicinal plant (including anti-platelet aggregation and anti-lung injury,) make it one the best fits and therefore a potential candidate in the fight against COVID-19. Particularly, the fact that *P. nitida* displays antimalarial activity can help to anticipate that it would show some potency or activity against Covid-19 virus. Indeed, Chloroquine, an antimalarial based-drug which has been synthesized from the alkaloid quinine, has revealed antiCOVID-19 properties [17-19]. Besides, SARS-COV-2 (Covid-19 virus) is an obligate endocytic parasite that behaves both like HIV by attacking T-cells [20] and like Plasmodium spp by destroying haemoglobin [21]. The potential role of medicinal plants and their secondary metabolites in the inhibition of COVID-19 virus has been largely demonstrated by the molecular docking technique [22]. In this article, we present the data on *Picralima nitida* and its major alkaloids that could justify their use in the treatment of COVID-19 in the Democratic Republic of Congo. In addition, the objective of the current study is to review the literature on the nutritional value, phytochemistry and pharmacological properties of P. nitida. This data would allow the use of this plant as a multifunctional and low toxicity drug candidate for the management of various diseases, including the COVID-19.

Methodology

In this study, we conducted a search of relevant literature of the traditional plant species used as medicines from 1976 to 2020. The plant databases including Sciencedirect, PubMed, Google Scholar and Scopus, were used to retrieve the articles on *Picralima nitida*. The scientific name of this plant species was used as the keyword for the search, along with the terms phytochemistry, bioactivities, pharmacology and pharmacognosy. The chemical structures isolates from this plant naturally occurring compounds were drawn using ChemBioDraw Ultra 12.0 software package. Finally, bibliographical references were made using bibliographical software "Mendeley".

Botanical description

Picralima nitida Durand and Hook, (fam. Apocynaceae) is the only species of the genus Picralima [2]. When fully grown, the tree has a height up to 15-30 m. Its girth is about 60 cm or more with a dense crown and dark-brown or blackish brown color. The leaves are opposite and simple with stipules. The bark of this plant is hard, brittle, and pale to dark greyish black or brown and smooth to slightly rough or finely striped [12]. The corolla is about 2-5 cm long, glabrous outside with ribbed tube. The calyx is leathery and lobed, keeled shaped and about 2-5 cm long. The ovary is superior. The flowers of this species are bisexual and the fruits occur usually in pairs hanging at the end of a long stalk. It is smooth and has a round apex. It is about 11-20 cm long and 8-10 cm in diameter [23]. The fruit is glabrous and leafy green when unripe but yellow to orange in color when ripened. It has latex and no rubber in the pericarp [12, 23]. Its seeds are embedded in the white soft pulp and are obliquely ovate, obovate to oblong, flattened 2.5-4.5 cm long. These seeds are brown in color and are dicotyledonous with or without coma, endosperm is thick and often hairy, scanty.

Table 1. The alkaloids isolates from different parts of P.nitida [25, 28]

Plant part examined	Alkaloids identified	Mode of action	Plant part examined	Alkaloids identified	Mode of action
Root bark	Picracine		Mature seeds	akuammicine	It interacts with opioid receptors
	Akuammigine	It reduces hypertension and renal adrenal vasoconstriction		akuammigine	It Reduces hypertension and renal adrenal vasoconstriction.
	Akuammicine	It interacts with opioid receptors		pseudo-akuammigine	It stimulates the central nervous system, respiration, skeletal muscle contraction and smooth muscle contraction, while at high doses it inhibits them.
Stem bark	Akuammicine			picraline	
	Picratidine			akuammine	It increases the sensitivity of the Sympathetic Nervous System to its natural and artificial stimuli.
	Picracine			akuammidine	This compound reverses the hypertensive action and suppresses the renal vasoconstrictor effects of medium doses of adrenaline; It increases the hypotension caused by the initial doses of N-Ethyl-Norepinephrine and reverses the hypertensive action of medium doses of this amine.
	Akuammine	It increases the sensitivity of the Sympathetic Nervous System to its natural and artificial stimuli.	Immature seeds	akuammidine	
	Akuammidine	This compound reverses the hypertensive action and suppresses the renal vasoconstrictor effects of medium doses of adrenaline; It increases the hypotension caused by the initial doses of N-Ethyl-Norepinephrine and reverses the hypertensive action of medium doses of this amine.		akuammigine	It Reduces hypertension and renal adrenal vasoconstriction
	Picraline			akuammicine	It interacts with opioid receptors
	Akuammigine	It reduces hypertension and renal adrenal vasoconstriction.		picraline	
	Pseudo-akuammigine	It stimulates the central nervous system, respiration, skeletal muscle contraction and smooth muscle contraction, while at high doses it inhibits them.		akuammine	It increases the sensitivity of the Sympathetic Nervous System to its natural and artificial stimuli.
Fruit pods	Pseudo-akuammigine			pseudo-akuammigine	It stimulates the central nervous system, respiration, skeletal muscle contraction and smooth muscle contraction, while at high doses it inhibits them.
	Akuammicine				
	Akuammigine	It reduces hypertension and renal adrenal vasoconstriction			
	Picraline				
	Picratidine				

The seed has a light brown color, obovoid in shape, and smooth texture [12].

Microscopy features

Osuala et al., [12] reported that microscopy of the powdered seeds revealed the presence of sclereids, parenchyma and epidermal cells, calcium oxalate crystal, and fat globules.

Chemical composition of P. Nitida

Some researchers have reported several known compounds and secondary metabolites. Phytochemical screening of *P. nitida* has revealed the presence of almost the same phytochemical groups like alkaloids, phenols, tannins, saponins, flavonoids, terpenoids, steroids and glycosides, oxalates, phytates, reducing sugars, carbohydrates, fats and oils in all parts of plant [12-16]. Erharuyi and Falodun [2] reported that alkaloids are the major class of phytochemicals isolated from *P. nitida*. The first set of alkaloids isolated from *P. nitida* are the indole alkaloids [24]. The names of these compounds were obtained from the indigenous name of the plant in Ghana 'Akuamma'. After these, several alkaloids have been isolated from this plant. Picraphylline, picracine, picraline, picralicine, picratidine, picranitine, burnamine, pericalline and pericine are some of the isolated alkaloids [25, 26]. In another study on *P. nitida*, ten different phytochemical compounds have been characterized, including 2,6-bis (1,1-dimethylethyl)-4-methyl phenol, N1-(4-fluorobenzylideno)-N2-(4-quinolinyl-1-oxide) hydrazine, sulfurous acid butyl cyclohexylmethyl ester, 1,2,3,5-cyclohexanetetrol, alpha-methyl mannofuranoside, hexadecanoic acid, methyl ester, 7-octadecenoic acid, methyl ester, 3,7,11,15-tetramethyl-2-hexadecen-1-ol, N,N-dimethyldodecanamide and N,N-dimethyl decanamide [26].

Nutrient composition of P. nitrida

The seeds contain vital essential amino acids such as leucine, phenylalanine, tyrosine, and non-essential amino acids.

Table 2. The mineral composition of *P. nitida* [12, 29].

Parameter	Concentration	% Composition
Calcium	12.686 ppm	0.578±0.68
Magnesium	11.665 ppm	0.359±0.18
Potassium	42.537 ppm	0.846±0.30
Chlorine	159 mg/L	-
Sodium	-	10.67±0.34
Phosphorus	-	0.367± 0.10
Iron	-	172.40± 0.70
Zinc	-	55.40±0.30
Manganese	-	38.20±0.20
Selenium	-	0.007±0.10

Values are means ± standard deviation of three determinations

Table 3. The proximate Composition of *P. nitida* seeds [29]

Nutrient composition	Mean composition
Moisture	10.67 ± 0.34
Ash	3.67 ± 0.34
Protein	3.50 ± 0.18
Crude fibre	8.78 ± 0.68
Fat	3.49 ± 0.10
Total Carbohydrate	69.9 ± 0.78

Values are means ± standard deviation of three determinations

The ground seeds contain more unsaturated fatty acids than saturated fatty acids and possess considerable amount of macro and micro-elements with iron, zinc, and manganese. The ground seeds also have vitamins A and E [29]. The results of the proximate composition of this species indicated that P. nitida peels contains an appreciable amount of nutrients: lipid, protein, and carbohydrate as well as moisture and ash [14]. Another study on mineral analysis revealed that the plant contains metals such as Ca++, Mg++, and K+ ions and non-metals, such as Cl- ions[12].

Pharmacological activities

Anticancer activity

The anticancer activity of *P. nitida* root bark against human epithelial MCF-7 cells has been reported by Engel et al., [45]. Studies have confirmed the presence of alkaloids, tannins, polyphenols, and steroids in *P. nitida*, and these components are associated with the anticancer property of this species.

Free radical scavenging activities

The in vitro antioxidant evaluation of methanol extract of *P. nitida* and its fractions using the DPPH free radical scavenging method showed that its crude extract has IC-50 value of 5µg/mL for radical scavenging activity which is significantly higher than that of ascorbic acid (2.55µg/mL). *Picralima nitida* has the potential for use as a natural plant antioxidant in preventing the free radical damage [2]. In another study on determining the antioxidant capacity of ethanol, ether, ethyl acetate, butanol, and aqueous extracts of plant seeds using free radical, it was noted that *P. nitida* seed extract exhibits highest antioxidant capacity [40].

Antimalarial activity

The in vitro antimalarial activity of *P. nitida* extracts has been investigated. Iwu et al., [23] indicated that the alkaloid extracts of the fruits of this species exhibit activity against drug-resistant and drug-sensitive malarial strains of *Plasmodium falciparum* and these alkaloids show significant inhibitory activity against both clones of *P. falciparum* at IC50 values of 0.0.1-09 g/ml. In another study, the significant inhibitory activity of the methanol fruit extract was obtained on multi-drug resistant human *Plasmodium falciparium* with IC50 value of 1.75 µg/mL [30]. Extracts of different parts (seed, fruit rind, and stem bark) of *P. nitida* showed remarkable inhibitory activity against drug resistant clones of *P. falciparum* at doses of 1.23- 32 µg/mL [46]. The results *in vitro* antiplasmodial activity of the ethanol seed extract of the plant in chloroquine-sensitive *Plasmodium berghei* infected mice showed that the ethanol seed extract of this plant exhibited a significant *in vivo* antiplasmodial activity in both early (4-Day chemo-suppressive test) and established infections (Curative test). Ethanolic seed extract of *P. nitida* produced a dose-dependent chemo-suppressive effect of 65.5%, 70.4% and 73.0% respectively for 35, 70 and 115 mg/kg/day doses [31]. Methanol seed extract of *P. nitida* demonstrated significant activity against the chloroquine-resistant *Plasmodium falciparum* W2 strain with IC50 value of (10.9, 1.1) µg/mL [33]. The root, stem bark and fruit rind extracts displayed significant inhibitory activities against the asexual erythrocytic form of *Plasmodium falciparum* with IC50 values of 0.188, 0.545, and 1.581 µg/mL respectively [32].

Uterotonic effects

Uterotonic effect of aqueous ethanolic fruit extract of *P. nitida* on uterine contractility was investigated using the rat model [41]. The results of this study revealed that the extract was found to induce a dose-dependent myometrial contraction at concentrations ranging from 0.035-0.28 mg/ml, whereas concentrations above this range caused a progressive relaxative effect on the uterine muscle tissue. The effective concentrations (EC50) were 0.056 mg/ml and 1.06 mg/ml for contractile and the relaxative responses respectively. These results demonstrated that the extract did not elicit any contractile response in a physiological salt solution devoid of calcium ions. The contractile response

Table 4. The percentage amino acid composition of *P. nitida* seeds [29]

Amino acids abbreviations	Value (%)	Amino acids abbreviations	Value (%)
Essential Amino Acids		Non-Essential	
Argenine (Arg)	1.25	Alanine (Ala)	0.64
Histidine (His)	4.15	Cysteine (Cys)	3.92
Leucine (Leu)	11.83	Glycine (Gly)	0.69
Lysine (Lys)	3.24	Proline (Pro)	0.81
Methionine (Met)	1.64	Tyrosine (Tyr)	6.08
Phenylalanine (Phe)	9.21	Serine (Ser)	1.11
Threonine (Thr)	0.75	Glutamate (Gln)	2.36
Tryptophan (Try)	9.93	Aspartate (Asp)	1.14
Isoleucine (Ile)	5.44	Total NEAA	16.75
Valine (Val)	9.76	% Non-Essential	25
Total EEA	48.2		
% Essential	74%		

Where: EEA, Essential amino acids; NEAA, Non-essential amino acids, TNEAA, Total Non-essential amino acids

Table 5. The percentage fatty acid composition of *P. nitida* seeds [29]

Fatty acids	% composition	Unsaturated fatty acids	% composition
8. 0 Caprylic acid	1.41	16.1 Palmitoleic acid	12.05
10.0 Capric acid	1.24	18.1 Oleic acid	37.85
12.0 Lauric acid	1.95	18.2 Linoleic acid	40.75
14.0 Myristic acid	0.83	18.3 Linolenic acid	2.75
16.0 Palmitic acid	12.05	20.3 Arachnidonic acid	2.02
17.0 Margaric acid	1.07	21.1 Erueic acid	.0.09
18.0 Steric acid	5.36	Total	95.51
22.0 Behenic acid	0.05	% Unsaturated fatty acids	78. 87%
24.0 Lignoceric acid	0.11		
Total Saturated fatty acids	24.07		
% Saturated fatty acids	20. 13%		
Total fatty acids	119.58		

evoked by a fixed concentration of the extract (0.07 mg/ml) decreased as the concentration of verapamil (0.02-0.2 µmol) increased. The extract (0.07 mg/ml) did not restore the spontaneous myometrial contraction previously abolished by adrenaline (9.1 nmol) and a selective β-adrenergic receptor agonist, salbutamol (0.2 µmol) respectively. However, about 26.3% contraction was observed when a non-selective β-adrenergic stimulant, isoprenaline (0.1 µmol) was added simultaneously with the extract. Also, propranolol (0.3 µmol) potentiated the contractile response of this extract.

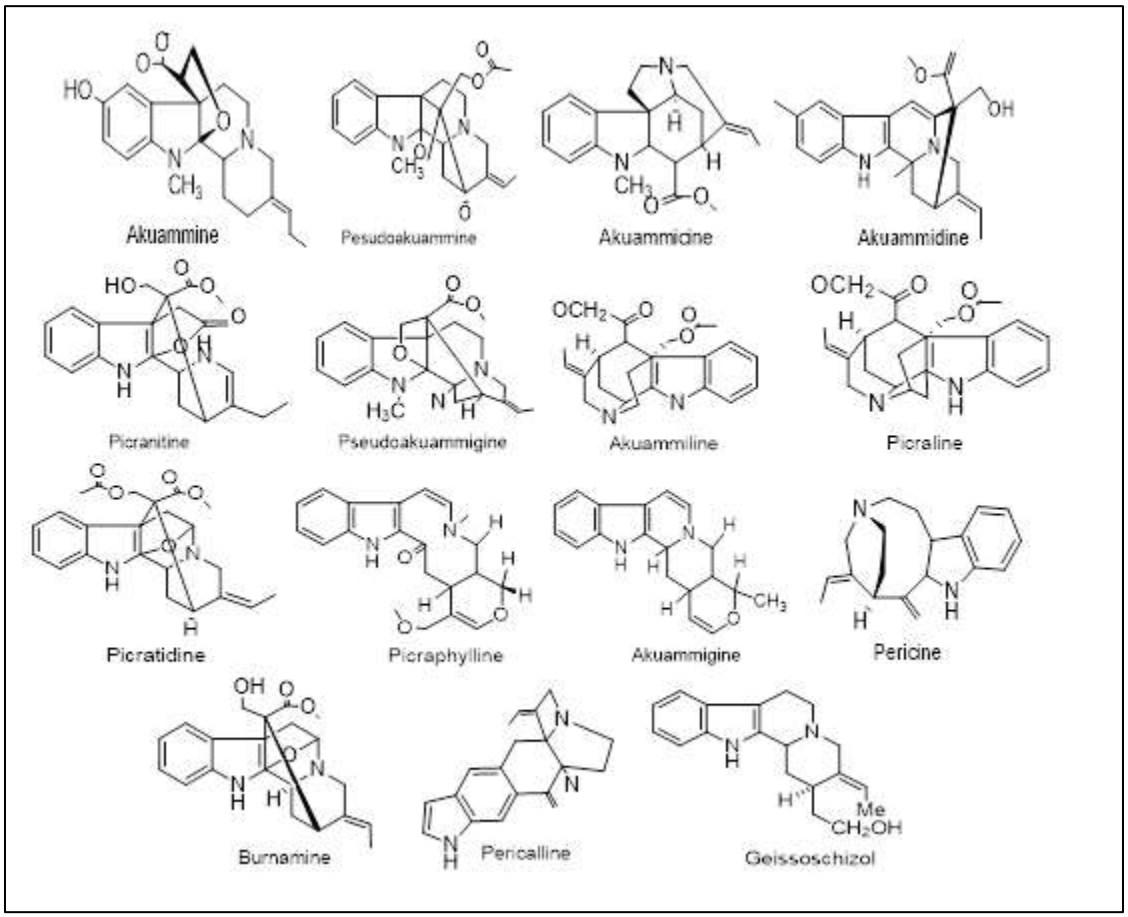

Figure 1. Chemical structures of alkaloids isolated from *P. nitida*

Antipyretic and analgesic activities

Ezeamuzie et al., [30] demonstrated the antipyretic activity of methanol fruit extract of *P. nitida*. The result of the present study revealed that the methanol fruit extract at a dose of 50 mg/kg produced a mean percentage antipyrexia of 38.7% on lipopolysaccharide induced pyrexia in rabbits, which was comparable to aspirin (29.0% at 200 mg/kg). Extracts of the plant have been shown to possess significant analgesic activity in the rat pedal model [23].

Antidiabetic activity

Teugwa et al., [39] reported that the hydroethanolic extract of whole plants (150 mg/Kg) and methanol leave extract of the plant (300 mg/Kg) exhibited significant antidiabetic activities with 39.40% and 38.48% glycemia reduction, respectively. Inya-Agha et al., [47] investigated the hypoglycemic effect of the methanol extracts of seed, and fruit rind of *P. nitida* in rats. The result of this study showed a significant ($P<0.01$) hypoglycemic effect of all extracts at 300 and 900 mg/kg in alloxan-induced diabetes in rats. In another study, Aguwa et al., [48] confirmed the hypoglycemic effect of the aqueous seed extract of *P. nitida* in alloxan-induced diabetic rabbits.

Microbial activities

Studies on *P. nitida* indicate that extracts from this plant have an action against *Staphylococcus aureus*, *Enterococcus faecalis*, *Bacillus cereus*, *Escherichia coli*, *Salmonella typhi*, and *Proteus mirabilis* [14, 27]. These results give credence to the use of the extract in herbal medicines for the treatment of

Table 6. The extract, concentration, standard, model system used, pharmacological action and plant part biologically active compounds isolated from *P. nitida*

Plant parts	Extract	IC50 or CMI	Standard	System model	Biological activities	Reference
Fruits	Methanol extract	1.75 µg/mL	Chloroquine and Quinine	*Plasmodium falciparium*	Antimalarial activity	[23, 30-33]
Seeds		(10.9±1.1) µg/mL).				
	Ethanol extract	35, 70 and 115 mg/kg/day doses		Mice		
seeds, fruit rind, stem Bark	Alkaloids extract	0.0.1-09 g/ml.		*Plasmodium falciparium*		
Root, stem bark and fruit rind extracts	-	0.188, 0.545 and 1.581 µg/mL				
Seeds	Chloroform extract		-	*Leishmania donovani*	Antileishmanial activity	[34]
bark	Water extract	8 mg/kg	-	Rats	Trypanocidal activity	[35]
Leaf	ethanolic and aqueous extracts	0.660% and 1.057% w/v	-	*Anopheles gambiae*	Larvicidal activity	[15]
Leaf and seed	Aqueous, methanol extracts	0.164, 0.333 and 0.150 mg/mL				[36]
Seeds	Ethanol extract	P<0.05	-	Guinea pig brain, Rats	Analgesic activity	[26, 30]
Fruits	Methanol extract	50mg/kg	Aspin	Rabbits	Antipyretic activity	[30]
		5.0 mg/kg; 102 mg/kg	-	Rats	Anti-inflammatory activity	[37]
			-	*S. dysenteriae, E. coli, S. aureus, P. vulgaris, E. cloacae, S. feacalis, P. aeruginosa, P. mirabilis, S. typhi, B. cereus, C. albicans, P. vulgaris*	Antidiarrhoeal activity	[38]
Stem bark and leaves and seeds	methanol and hydroethanol extracts	300 mg/kg	Insulin	Mice	Antidiabetic activity	[39, 40]
seed, stem bark and root	Ethanol, benzene, chloroform and aqueous (cold and hot) extracts	-	-	*E. coli, P. aeruginosa, B. subtilis, S. aureus, S. kintambo*	Antimicrobial activity	[38, 39]
root bark	methanol extract, Pet-Ether fraction, Chloroform fraction, Ethyl acetate fraction	5µg/mL	ascorbic acid	. Blood cells	Free Radical Scavenging Activities	[2, 40]
Fruit	Ethanolic extract	0.056 mg/ml and 1.06 mg/ml	-	Rats	Uterotonic effects	[41]
Seeds	Methanol extract	10mg/kg	Aspin	Wistar rats	Hepatotoxicity	[42]
	Methanol extract and chloroform fraction	1000mg/kg	-	Rats	Anti-ulcer activity	[43]
	Aqueous decoction	3000 mg/kg/p.c./ou	-	Mouse	Acute toxicity	[44]
Whole plant and leave	Hydroethanol and methanol extract	150mg/kg	-	-	Antidiabetic activity	[39]

diseases and infections. Ubulom et al., [15] reported that both the aqueous and ethanol leaf extracts of *P. nitida* exerted an antifungal effect on *Aspergillus flavus* and *C. albicans* in a dose-dependent manner, but no antifungal effect was exhibited against *Microsporum canis*. The basic fraction of the methanol extract of the stem bark of this species has been shown to exhibit significant antimicrobial activity against a wide range of Gram-positive bacteria and fungi, but limited activity against Gram-negative bacteria [49].

Anti-leishmanial activity

The chloroform extract of the seed of P. nitida was evaluated for possible antileishmanial activity using a radiorespirometric micro-test technique and the result of this study confirmed its activity against Leishmania donovani at 50 µg/mL [34].

Antiulcer activity

Okonta et al., [43] demonstrated the antiulcer activity of *P. nitida* extracts. In this study, oral administration of the methanol extract, chloroform fraction and methanol fraction at 1000 mg/kg reduced gastric ulcer by 56.4%, 40.0%, and 56.3%, respectively; and the fractions of the extract significantly ($P<0.05$) reduced gastric emptying time when compared to the control. Gastric acidity was significantly decreased when compared with saline group, 40.25 mEq/L in methanol extract, 50.0 mEq/L in methanol fraction but had no significant effect on gastric secretion volume.

Hepatoprotective activity

Results of Idu et al., [42] showed that the treatment with *P. nitida* extracts had no adverse effect on the body weight of Wistar rats. Biochemical analysis showed increase in CAT and GSH which are good antioxidant agents. Photomicrographs show moderate amelioration from steatosis caused by Carbon tetrachloride in the treatment groups.

Toxicopathological and acute toxicity

Taofik et al., [50] reported that the extract had no significant effect on all kidney function indices assayed but caused a significant reduction ($P < 0.05$) in the activities of liver enzymes accompanied by a significant decrease in the liver to body weight ratio, serum total protein, and globulin concentrations. No significant alteration was observed in the serum levels of albumin and conjugated bilirubin, whereas the extract brought about a significant increase ($P < 0.05$) in serum total bilirubin concentration. In this study, the hematological analysis revealed no significant effect on erythrocyte indices in contrast to white blood cell count and its differentials which were significantly elevated ($P < 0.05$) following the extract administration. The acute toxicity of seeds aqueous decoction from P. nitida was assessed after giving the crude decoction to mice in increasing doses ranging from 600 to 3000 mg/kg of body weight (b.w.). The use of the herbal medicine, through oral route (or), at different doses, does not cause some clinical signs. The results made it possible to obtain the dose at bordering on solubility which squares with the tolerated maximal dose or TMD (3000 mg/kg/b.w./or). This toxicological parameter (tolerated maximal dose) is by far higher than 94.885 mg/kg b.w./or, the recommended daily dose bytraditional healers. Therefore, the dose prescribed by traditional healers is not toxic, justifying the use of the plant in traditional conditions of preparation and oral administration.

Conclusion and future prospects

The Covid-19 pandemic is a major health crisis of the 21st century for which no cure is currently available and which requires an alternative solution based on the endogenous knowledge. *P. nitida* medicinal plant species owing to its valuable properties have been used traditionally in folk medicines to treat various ailments including malaria, which make it the best candidate in the fight against the current dread disease. The current study aimed to review the literature on the traditional use, nutritional value, phytochemistry, and biological properties of this valuable plant species. The results of the bibliographic investigation showed that *P. nitida* treats several diseases including diabetes mellitus and malaria, etc. Concerning the phytochemistry, several compounds have been identified including several alkaloids, as the major class of compounds of these species whose properties make this plant a potential anti-COVID-19 candidate. Molecular docking studies are,

therefore, necessary to evaluate the binding reaction of alkaloids with the major SARS-COV-2 target enzymes.

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