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Anti-oxidant Assessment of *Parsonsia straminea* (R.Br) F. Muell Stem Bark Crude Extract

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: *Parsonsia straminea* a member of the *Apocynaceae* family with ancestral record from Australia especially at the tropical region of New South Wales and Queensland has been scientifically been proven for its anti-seizure, anti-narcoleptic potentials, and traditionally use for seizures and movement disorders management among other unconfirmed claims. However, no record of its antioxidant rating, knowing the crucial physiological role of antioxidant in maintaining health of humans. This study evaluated the anti-oxidant of *P. straminea* stem bark crude extract (PSE).
Methods: Animals were grouped into six (n=5), they were orally treated with 0.2 ml/kg of distilled water as vehicle (VEH) control, 100, 200, 400, 800 and 1000 mg/kg of PSE for 1 day (acute) and 0.2 ml/kg of distilled water as vehicle (VEH) control, 50, 100, 200, 400, and 800 mg/kg of PSE for

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14 days (sub-acute). At the end of the treatments, serum, liver, kidney and brain were surgically removed according to prescribed methods of antioxidant assay protocol for the *in vivo*: Glutathione (GSH), Catalase (CAT), Supra-oxide Dismutase (SOD), Malonaldehyde (MDA), Myeloperoxidase (MPO) methods of anti-oxidant assessment**.** Secondary metabolites determination methods of phytochemical determination as well as *in vitro:* Ferric reducing ability of plasma (FRAP), Cupric reducing antioxidant capacity (CUPRAC), Hydrogen Peroxide (H_2O_2), 2,2-diphenyl-1-picrylhydrazyl (DPPH) & Ion chelating were done using crude extract of *P.straminea* stem bark.

Results: The phytochemical evaluation indicates the presence of terpenoids, saponin, flavonoids, phlobatannins, phenolics, alkaloids, steroids, triterpene, phytosterols, and tannin. The *in vitro* method related parameters revealed remarkable free radical scavenging abilities in an increasing order while the *in vivo* also showed significant (P<0.05) increase in GSH, CAT, SOD, and decrease in MDA, MPO when compared with the control.

Conclusion: This study suggested that there is anti-oxidant possibilities of *P. straminea* stem bark through the *in vitro* and *in vivo* models in acute and sub-acute phases of exposure.

Keywords: Anti-oxidant; Parsonsia straminea; phytochemicals; In vitro and In vivo.

1. INTRODUCTION

The human or the animal cells undergoes daily activities that bothered around metabolism and its after effects that at some point impact negatively as cellular burden increases which mostly result from free radical damages which may presents several signs and symptoms including: headache, muscle and or joint pain, gray hairs, decreased eyesight, memory loss or brain fog, susceptibility to infections, unstable blood sugar level, sensitivity to noise among others (Karthik, 2021). Patho-physiologically, oxidative stress only surfaced when there is imbalanced between natural anti-oxidant and free radicals in the body. This mostly occurs when there is obesity, cigarette smoking or tobacco, alcohol consumption, some medications, pollution, pesticides and industrial chemicals, fat in diet, high consumption of sugar, processed food, radiation exposure, among other factors (Gladys et al., 2002, Timothy, 2018). Oxidative related damage can be averted through supplementation of certain vitamins and related products with records of anti-oxidants potentials, such as Vitamin E, Vitamin C, turmeric, green tea, melatonin, cinnamon, garlic, onion, citrus fruits and other anti-oxidant natural product (Timothy, 2018). Many medicinal plants have made great therapeutic mark on the bases of their richness in anti-oxidant content (Xu, 2017). The records of anti-oxidative stress potential of the phytochemicals: polyphenols, flavonoids, steroids, organosulphur compounds and vitamins which are known for their free radical scavenging abilities that have alleviated or ameliorated inflammatory events in various systems of the body that are responsible for lots health challenges among men and women. *Parsonsia straminea* (Mueller, 1863, Shahidul and Rasheda, 2019) is a member of the Apocynaceae family with ancestral record from Australia especially at the tropical region of New South Wales and Queensland. The main objective of this study is to evaluate the antioxidant potential of *P.straminea* stem bark hydro ethanol extract through the *in vitro* and *in vivo* models.

2. METHODOLOGY

2.1 Animals

Male mice of 4 weeks old were procured from the Animal Breeding and Research Unit of the Pharmacology and Toxicology Department in Niger Delta University, Wilberforce Island. The mice were transported in a conducive condition in accordance with the animal handling and ethics committee (AEC) and acclimatized for 2 weeks. In the two weeks of acclimatization, the animal feeding routine was adjusted by feeding ad libitum with finisher product to improve weight to 25-30g and organ maturity. They were kept in a regular equal light/day cycle and humidity (Grandhin, 2021). Afterwards, the mice were grouped according to study design below.

2.2 Plant Identification, Confirmation and Crude Drug Preparation

The stem bark of *P. straminea* was collected from the Wilberforce Island rainforest, identified and confirmed by Dr. Gideon Alade and Prof. Kola Ajibesin both of the Department of Pharmacognosy & Herbal Medicine, Pharmacy Faculty, Niger Delta University. A sample with identification number NDUP/21/001 was kept in the herbarium. The stem bark of *P.straminea* was freshly prepared by rinsing off possible

contaminants with clean flowing tap water and then air dried at temperature 17^{o}c for 7 days. The dried stem bark was reduced to small pieces of about 6 mm per piece, 400 g of the pieces of *P.Straminea* stem bark was macerated with 1000 mL 50% ethanol for 72 h with vigorous daily agitation manually at an ambient temperature to promote adequate extraction of polar and relatively non polar phytoconstituents . After 72 h maceration, it was filtered into 500 mL beaker and the filtrate was concentrated at 45^{o}C temperature using rotary evaporator and dried using water bath at the temperature 50^{o}C (Abubakar and Haque, 2020).

2.3 Phytochemical Tests and Anti-Oxidant Evaluations

The freshly prepared extract was manually processed for phyto-chemical/secondary metabolites make-up detection: alkaloids, saponins, reducing sugars, flavonoids, terpenoids, tannins, steroids among others as described (Sofowora, 1993).

2.3.1 Alkaloids

Alkaloids assessment was done using 500 mg weight of *P.straminea* crude extract as described (Abubakar and Haque, 2020, Sofowora, 1993).

2.3.2 Saponins

Few amount, 200 mg weight of the crude extract of *P.straminea* was agitated with few milliliters (2-5 mL) volume of water in a test-tube and the combination/cocktail observed for the presence of a froth/foamy which does not break readily upon standing as recorded (Sofowora, 1993).

2.3.3 Flavonoids

Few millilitres (2-5 mL) volume of dilute ammonia (NH_3) solution was put into a portion of the aqueous filtrate of *P.straminea* stem-bark crude extract, then addition of concentrated H_2SO_4 and observed for: yellow coloration as recorded (Ayoola et al., 2008).

2.3.4 Ferric chloride test for phenolic compounds

A make-up volume, two milliliters (2.0 mL) of each crude extract of *P.straminea* stem-bark was measured into a test-tube and 0.01 moldm^{-3} Ferric chloride solution was added as drop by drop. Appearance of bluish-black color precipitate which indicate the presence phenolic compounds (Sofowora, 1993).

2.3.5 Tannins

Five hundred milligram (500 mg) weight of the crude extract of *P. straminea* stem-back was heated (> 50^{O}C) with twenty-five milliliters (25 mL) volume of water for five (5) minutes, cooled and filtered. Assessment was done according to Sofowora, (Sofowora, 1993).

2.3.6 Test for Triterpenes

A sum of 300 mg weight of crude extract of *P. straminea* stem-bark mixed with five milliliters (5 mL) volume of chloroform and warmed (45-55^{O}C) for thirty (30) minutes. Onto chloroform solution, small volume of concentrated sulfuric acid was added and mixed properly. The appearance of red color indicated the presence of triterpenes (Sofowora, 1993).

2.3.7 Salkowski Reaction test for Phytosterols

Add 5 mL volume of chloroform to 2 mL of the crude extract and then carefully add 1.0 mL of concentrated H_2SO_4(conc.) into a test tube along the wall. Then, shake the solution well and let it stand, the color reddish-brown was observed and recorded (Sofowora, 1993).

2.3.8 Test for Phlobatannins

Sample was boiled (> 50^{O}C) with 1% aqueous hydro-chloric acid (HCL) to produce red color precipitate indicating the presence of phlobatannins (Harborne, 1998).

2.3.9 Molisch's test for Carbohydrates

Five hundred milligram (500 mg) weight of the crude extract of *P. straminea* stem-bark was mixed with Molisch reagent and then H_2SO_4 conc. added along the sides of the test-tube to form layers in each. Appearance of reddish violet color ring on the interference indicated the presence of carbohydrates.

2.3.10 General test for Glycosides (Reducing Sugars)

The sum of 200 mg weight of *P. straminea* stem-bark crude extract was boiled (> 50^{O}C) in few volume (5 mL) of dilute H_2SO_4 on a water bath for 2 minutes. The combination was cooled, filtered and rendered distinctly alkaline with 2 to 5 drops of 20 % NaOH. 1 mL each of Fehling's A/ B solutions added to the filtrate, heated on a water bath for 2 minutes and observed for a red-brown color precipitate (Sofowora, 1993).

2.3.11 Terpenoids

Just about 500 mg weight of crude *P. straminea* stem-bark was extracted with 2 mL volume of chloro-form in a test-tube then added 1 mL volume of concentrated sulphuric acid. The reddish-brown color at interface shows the presence of terpenoids (Sofowora, 1993).

2.3.12 Steroids

A quantity of 500 mg weight of crude *P. straminea* stem-bark extract was extracted with 2 mL volume of chloroform in a test-tube. About 2 mL volume, acetic anhydride was added to the extract. Concentrated sulphuric acid was carefully added through the side of the test tube. blue color that appeared at the interface suggested the presence of steroids (Sofowora, 1993).

2.4 Anti-Oxidant Evaluation: *In vitro*

2.4.1 Diphenyl-2-Picrylhydrazyl (DPPH) Radical Scavenging Assay

Exact **e**xtract weight of 5000 mg of the plant sample with ethanol volume (2-3 L) for 24 h was done and then filter the extract using Whatman No 1 Filter paper. Concentrate the extract to dryness at 40^{O}C temperature using rotary evaporator. *Antioxidant Activity by DPPH.* Put 0.5 mL of the plant sample to 3 mL of absolute ethanol and 0.3 mL of DPPH radical solution (0.5 mM in ethanol). Changes in the color (from deep violet to light yellow) at 517 nm after 100 minutes of reaction in the dark.

Blank: combination of 3.3 mL ethanol with 0.5 mL sample. *Control*: Mixture of 3.5 mL ethanol with 0.3 mL DPPH radical solution. The scavenging activity percentage (AA%) is determined according to Mensor, (2001) method.

$$AA\% = 100\text{-}\left(\frac{Abs\ sample - Abs\ blank}{Abs\ Control}\ X\ 100\right)$$

2.4.2 Hydrogen Peroxide(H_2O_2) Scavenging Capacity

like the procedure described in the DPPH above, add 300 mg weight of the extract to a volume of 200 mL of water and two milliliters (2 mL) of H_2O_2 in a ratio of 1:3. The diluted solution was pipetted (20 mL) into little volume (15 mL) of H_2O_2 (1:3) plus 60 mL of water. Standardized potassium permanganate solution was added till the faint pink color appears and persist for 30 sec. and recorded (Al-Obaidi, 2020).

2.4.3 Ferric reducing antioxidant power

The anti-oxidant ability of the medicinal plant, *P. straminea* stem bark determined by the use of spectrophotometric device (V5800, China) followed by the procedure explained (Benzie and Strain, 1996).

2.4.4 Metal Ion chelating activity

The metal-ion chelating activity related was assessed according to the method explained (Zhengjun et al., 2008).

2.4.5 Cupric ion reducing antioxidant capacity (CUPRAC) method

The chromogenic oxidizing reagent of the developed CUPRAC method, that is, bis-(neocuproine)-copper (II) chloride [Cu (II)-Nc], reacts with polyphenols [Ar (OH)n] in the manner according to Apak et al. (2008), Ezennia and Ezennia, (2008).

2.4.6 Total antioxidant capacity assay (TAC)

The total anti-oxidant capacity/ability of the crude extract, *P. straminea* stem-bark extract was evaluated using spectrophotometric device by a way of employing the phosphor-molybdenum method according to the process explained and recorded (Prieto et al., 1999).

2.5 Study Plan

The study is designed as acute (single dose) with the following groupings: Vehicle (0.2 ml/kg) as control, 100, 200, 400, 800, & 1000 $mgkg^{-1}$, oral (*P.O*) and sub-acute (repetitive dose for 14 days) with the following groupings: Vehicle (0.2 ml/kg) as control, 50, 100, 200, 400 and 800 $mgkg^{-1}$ (*p.o*) of *P.straminea* stem bark crude extract.

2.5.1 *In Vivo* Method of oxidative stress determination

Single and repetitive treatments were employed in this study as explained above. After ten hours of the last administration in each of the treatments, the mice were sacrificed and about 0.5 ml of blood were obtained from the ocular cavity of each mouse. serum was gotten from the whole blood for evaluation of oxidative stress impact. The liver, kidney and the brain were harvested, homogenized and supernatant of the homogenates were carefully separated into well labelled containers according to their respective groups. The homogenates were stored under frozen condition pending determination of the anti/oxidant markers, myeloperoxidase (MPO),

malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT), glutathione (GSH), and nitric oxide (NO) as described by Gyuraszova et al., (2018).

2.6 Statistical Analysis

data gotten from the laboratory analysis were subjected to statistical analysis using graph pad prism 10.2. Two tail ANOVA with post hoc comparison test was used for data statistical expression as Mean ± SEM for table or graph. The significance difference score was taken from $p<0.05$ (de Smith, 2024).

3. RESULTS

The phytochemical screening showed the presence of terpenoid, saponin, flavonoids, phlobatamin, phenolics, alkaloids, steroids, triterpene, phytosterol, tannin (Table 1). The *In vitro* assay has shown remarkable free radical scavenging potential of *P. straminea* stem bark hydro-ethanol extract (Table 2). The *In vivo* assay has shown statistically significant increase in anti-oxidant bio markers including SOD, CAT, GSH and statistically significant decrease in oxidative stress bio markers including MDA and MPO (Tables 3-4) in kidney, liver and brain.

Table 1. Phytochemical Evaluation of *P.straminea* Stem Bark Extract

Class of Secondary Metabolites	Inference
Terpenoids	+
Glycosides	-
Saponin	+
Flavonoids	+
Phlobatamin	+
Phenolics	+
Alkaloids	+
Steroids	+
Triterpene	+
Phytosterol	+
Tanin	+
Carbohydrate	-

Phytochemicals of secondary metabolites. + indicates presence; - indicates absence

3.1 *In Vitro* Phyto-Anti-Oxidant Evaluation

Table 2. Phyto-Anti-Oxidants: free radical scavenging power of *P. straminea* stem bark hydro-ethanol extract

Anti-Oxidant Markers	Concentration (µg/mL)							
	5.6	31.3	62.5	125	250	500	1000	IC_{50}
AA	3.56±1.01	9.28±2.93	22.37±2.26	49.24±2.13	80.21±1.27	120.31±2.56	208.2±3.26	7.31
FRAP	8.8±01.1	12.8±0.2	18.8±0.2	25.7±0.2	29.0±0.2	35.5±1.1	45.4±0.4	22.68
TAC	0.1±0.0	0.6±0.1	2.7±0.3	4.4±0.3	6.6±0.3	17.3±0.5	22.4±0.3	17.24
CUPRAC	0.1±0.0	0.8±0.0	1.3±0.0	1.8±0.0	5.6±0.2	31.8±0.1	49.5±0.5	18.34
Ion Chelating	89.0±10.5	95.0±03.0	128.8±1.0	154.3±3.5	182.0±2.0	381.5±5.0	590.5±0.0	36.71
H_2O_2	6.1±01.2	7.3±01.6	8.8±01.2	11.8±0.3	13.6±0.7	19.4±1.3	25.2±0.5	39.35
DPPH	7.8±01.1	9.7±01.3	10.3±0.1	12.7±0.4	15.3±0.7	22.8±0.7	26.7±0.2	12.41

Table presents anti-oxidant potential of P.straminea stem bark crude extract: the scavenging power showed very remarkable value of free radical scavenging potential through IC_{50} values. CONC. = Concentration, FRAP = Ferric-Reducing-Antioxidant-power, TAC = Total Anti-oxidant Capacity, CUPRAC = Cupric Reducing Anti-Oxidant Capacity, H_2O_2= Hydrogen-peroxide, DPPH = 1,1 Diphenyl-2-Picryl Hydrazyl, AA= Ascorbic Acid, IC_{50} = Inhibitory Concentration.

3.2 *In Vivo* Anti-Oxidant Evaluation of *P. straminea* Stem Bark Hydro-ethanol Extract

Table 3. Acute evaluation of PSE for oxidative stress markers

Parameters	VEH	100 mg/kgPSE	200 mg/kgPSE	400 mg/kgPSE	800 mg/kgPSE	1000 mg/kgPSE
Liver: MDA	2.2±01.0	1.2±01.1*	1.2±01.1*	1.0±01.1*	1.0±01.0*	0.7±00.1**
Kidney: MDA	2.8±01.0	1.0±01.2*	1.0±01.2	1.0±01.3*	1.0±01.0	0.9±01.0**
Brain: MDA	2.3±01.0	1.9±01.4	1.8±01.2	0.9±01.3	0.8±01.0	0.8±01.0**
Liver: SOD	38.7±0.0	53.7±5.8*	43.5±8.0	57.9±01.3**	52.7±01.0*	58.1±01.0**
Kidney: SOD	44.2±0.0	38.6±6.0	43.6±0.8	49.0±01.3	50.0±01.0	52.0±01.0*
Brain: SOD	25.6±0.0	33.0±0.5*	37.4±1.3	39.1±3.7*	40.5±01.0**	49.7±01.0**
Liver: CAT	30.9±0.0	31.4±3.3	33.9±1.8	37.4±01.7	39.3±01.0	43.0±01.0*
Kidney: CAT	53.2±0.2	55.0±9.3	54.9±6.3	57.6±7.6	63.4±01.0	65.3±01.0*

Parameters	VEH	100 mg/kgPSE	200 mg/kgPSE	400 mg/kgPSE	800 mg/kgPSE	1000 mg/kgPSE
Brain: CAT	45.0±0.1	58.7±4.0	59.0±1.7	61.1±8.1	63.1±01.0	63.0±01.1**
Liver: GSH	28.6±0.0	33.6±1.8	39.3±1.7	40.0±0.3	46.1±01.1	59.4±01.1**
Kidney: GSH	25.1±0.0	27.9±1.8	33.8±0.9	36.6±0.4	36.5±01.0	47.3±01.1**
Brain: GSH	14.1±0.0	19.6±1.1	21.9±3.2	24.4±7.3	31.0±01.0	40.3±01.0***
Liver: MPO	12.5±0.0	10.4±0.0	11.1±0.8	12.7±0.3	11.2±01.0	10.8±01.0
Kidney: MPO	10.0±0.0	10.6±0.3	07.6±0.9	07.7±0.3	10.4±01.0	08.4±01.0
Brain: MPO	08.0±0.1	05.0±1.5	07.3±1.5	07.4±4.5	07.0±01.0	07.0±01.0

*VEH = Vehicle/control, PSE = P.Straminea Stem bark Extract. Oxidative stress markers measured with MDA (mmol/MDA wet tissue) = Malondialdehyde; SOD (Unit/mg protein) = Supero-Oxidase Dismutase; CAT (Unit/mg protein) = Catalase; GSH (Unit/GSH mg protein) = glutathione; MPO = Myeloperoxidase, *= significant (P <0.038); **= significant (P <0.0024). ***= significant (P <0.001).*

3.3 Oxidative Stress Markers Evaluations

Table 4. Sub-Acute Evaluation of Malondialdehyde (MDA), Superoxide Dismutase (SOD), Catalase (CAT), Glutathione (GSH), Myeloperoxidase (MPO) in Kidney, Liver, Brain and Serum

Parameters	VEH	50 mg/kgPSE	100 mg/kgPSE	200 mg/kgPSE	400 mg/kgPSE	800 mg/kgPSE
Liver: MDA	1.3±0.5	0.8±0.1	0.8±0.1	0.5±0.3	0.3±0.1**	0.2±0.0**
Kidney: MDA	0.3±0.0	0.2±0.1	0.2±0.1	0.3±0.0	0.3±0.0	0.3±0.0
Brain: MDA	1.2±0.5	0.8±1.0	1.0±0.2	1.0±0.5	1.0±0.1	1.0±0.2
SERUM: MDA	17.2±2.1	12.5±1.2	12.5±2.9	14.1±1.9	15.1±0.0	13.8±0.8
Liver: SOD	24.9±1.6	25.5±3.0	25.0±3.8	29.6±0.7	35.3±1.6	48.7±0.6*
Kidney: SOD	37.1±0.6	38.2±0.2	38.1±3.3	41.6±6.0	46.5±2.5	49.2± 2.2*
Brain: SOD	32.8±0.7	39.3±4.7	35.1±0.2	37.0±2.6	42.1±1.9	45.1±7.9*
Liver: CAT	60.0±0.7	65.2±1.6	63.8±3.3	68.4±0.9	75.4±0.9*	76.3±3.8*
Kidney: CAT	52.0±3.8	58.5±1.9	60.7±2.7	63.8±4.2	77.9±1.0*	77.9±6.7*
Brain: CAT	50.3±2.9	54.5±2.2	69.4±5.0	70.8±0.6*	78.9±0.5*	76.0± 5.8*
Liver: GSH	49.2±0.7	68.6±5.3	57.5±0.8	47.6±5.3	103.9±9.7	66.9±1.5*
Kidney: GSH	30.3±2.5	32.6±2.9	39.1±4.6	48.2±4.0	48.7±7.8	66.6±1.2**
Brain: GSH	52.4±2.2	52.1±2.0	56.2±1.5	57.6±0.1	67.2±0.3	67.2±0.8*
Liver: MPO	128.5±3.9	56.8±5.7	61.0±4.3	53.4±3.2	88.8±8.5	64.4±3.0*
Kidney: MPO	127.2±3.2	79.6±4.8	81.1±10.2	74.6±7.8	85.8±2.7	65.7±8.0*
Brain: MPO	126.5±8.3	105.0±0.3	94.1±1.0	96.6±3.8	98.1±6.0	102.2±4.8*

*VEH = Vehicle/control, PSE = P. Straminea Stem bark Extract. Anti - oxidative stress marker, malondialdehyde MDA, (unit/mg protein) measured in kidney, liver, brain and serum showed statistically ** significant (P <0.004). superoxide dismutase, SOD, (unit/mg protein) measured in kidney, liver, and brain showed statistically *=significant (P <0.04), Catalase = CAT (unit/mg protein) measured in kidney, liver, and brain showed statistically *=significant (P <0.04), Glutathione, GSH, (unit/mg protein) in kidney, liver, and brain showed statistically *,** significant (P >0.04,0.01) and Oxidative stress marker, Myeloperoxidase, MPO, (unit/mg protein) measured in kidney, liver, and brain showed statistically *significant (P <0.04).*

4. DISCUSSION

Natural medicinal products of plant origin have been known of its corrective potential especially in oxidative stress induced disorders/disease conditions. It is well known and established fact that some natural medicine of plant source not only does it easily get metabolized and eliminated but promotes safety and healing by their free radical scavenging abilities (Balkrishna et al., 2024). Phytochemical like phenols, flavonoids, steroidal saponins, organosulphur compounds and vitamins. These phytochemicals in other words known to be secondary metabolites with great anti-oxidant potentials known to ameliorate inflammatory processes of some disease including diabetes, cancer, asthma, cardiovascular disease, neural disorders, among other conditions. Flavonoids and phenols are believed to be the most promising and measured phytochemical constituents among plant secondary metabolites (Payne et al., 2013). The phenolic and flavonoid content demonstrated that *P.straminea* possessed the high phenolic and flavonoid content (Payne et al., 2013) comparable to other study outcomes such (Balkrishna et al. 2024, Okaiyeto and Oguntibeju, 2021). The hydroxyl groups in phenols and flavonoids are important because they provide redox properties critical for antioxidant action and cellular integrity plays a vital role in the organ/system sustainable healthy functions in determining the overall body health status. For each and every cell to maintain

physiological function, that implies that there is possibility of imbalance between the free radical biomolecules and the anti-oxidants, GSH, CAT, SOD capable of mopping up or reducing the free radical load which in turn reduce cellular stress and instability in functions (Okaiyeto and Oguntibeju, 2021). Because of these vital secondary metabolites present in some of these plants, play health maintenance role by promoting cellular level of GSH, CAT, SOD (Okaiyeto and Oguntibeju, 2021). The result (Table 1) uncover the aspect of terpenoids, saponins, flavonoids, phlobatamin, phenolics, alkaloids, steroids, triterpenes, phytosterol, tannins among other phytochemical (Payne et al., 2013) in *P.straminea* stem bark crude extract. This evidenced the outcome of the biogenic anti-oxidants (Tables 3-4) showing no negative lopsidedness. The free radical scavenging power indicates gradient dependent anti-oxidant activity supported by the IC_{50} values of less than10 µg/mL were deemed extremely strongly active, while those with values ranging from 10 to 50 µg/mL were considered to have strong antioxidant activity, and those with values ranging from 50 to 100 µg/mL were regarded to have moderate antioxidant activity (Okaiyeto and Oguntibeju, 2021). Our results have shown strong anti-oxidant activity (Tables 2-4). However, medicinal plants with lack of these secondary constituents will do little or not much corrective impact on health disorder (Hussen and Endalew, 2023). Some of the *in vitro* antioxidant potential of *P.straminea* stem bark crude extract has implicated its antioxidant potential with hydrogen peroxide which is a major metabolite of oxygen generated through the *in vivo* pathway activated by phagocytes and oxidase enzymes. Hydrogen peroxide is known to potentiate great antimicrobial potentials, as well as strains of fungal. The H_2O_2 scavenging activity is evaluated based on peroxidase system involving horseradish peroxidase, which is the most commonly used enzyme (Hussen and Endalew, 2023). Also, superoxide radical is known to form during a normal respiration phase which reduced oxygen from 1-3% into the radical oxygen specie. Physiologically, the oxygen molecule reduction takes place in the mitochondria and this is enhanced in the presence of the crude extract of *P.straminea*. In the ion chelating method, it is well understood that free radicals also originate from heavy and transition metals, namely mercury, lead, arsenic, and iron which leads to cellular burden and oxidative stress related disease. Elimination of these disease promoting metals is one essential thing with herbal products to enhance chelating therapy. The basic chelating therapy is a treatment that is used in medicine to remove the toxic metals from the body through the excretion route. Another heavy metal agent that induces cellular toxicity is arsenic, which happens to be one of the oldest poisonous agents in circulation with a knowledge of its cause of neurodegenerative diseases as well as cardiovascular disease and cancer (Bibi Sadeer et al., 2020). Iron is also involved in chelating therapy, though iron is involved cellular physiological interplay which is implicated in some disease conditions such as hepatic, cardiovascular, metabolic, cancer and neurodegenerative diseases. The treatment of iron involved diseases actively includes chelating agents. The removal of iron, copper, and lead from the central nervous system is a slow process, since penetration of chelators across the blood brain barrier is restricted. The improve efficacy of the chelating therapy, flora and Pachauri have suggested in their studies that the use of combination therapy or nutraceuticals should be embraced (Flora and Pachauri, 2010).

5. CONCLUSSION

This study suggested that there is anti-oxidant possibilities of *P. straminea* stem bark through the *in vitro* and *in vivo* models in acute and sub-acute phases of exposure.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

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

CONSENT

It is not applicable.

ETHICAL CONSIDERATION

These investigations were ethically authorized by the Research Management and Development (Research Ethics Committee) with reference identity, NDU/PHARM/AEC/047d in the Department of Pharmacology and Toxicology, Pharmacy Faculty, Niger Delta University, Wilberforce Island Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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