Antıoxıdant, Alpha-amylase and Alpha-Glucosıdase Inhıbıtory Actıvıtıes of Ethanol Extract from *Cochlospermum planchonii* Hook F

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Abstract: Diabetes mellitus is a chronic metabolic disorder associated with persistent hyperglycaemia and oxidative stress, necessitating the search for safer and more effective therapeutic agents from medicinal plants. This study evaluated the antioxidant and in vitro antidiabetic potentials of *Cochlospermum planchonii* ethanol extract, its solvent fractions, and an isolated bioactive compound. The aerial parts of the plant were extracted by cold maceration with ethanol, followed by solvent partitioning and silica gel column chromatography to isolate compound CPE 91, which was identified as hexadecanoic acid methyl ester using GC-MS, FT-IR, and NMR spectroscopic analyses. Antioxidant activity was assessed using DPPH radical scavenging and ferric reducing antioxidant power (FRAP) assays, while antidiabetic activity was determined through α-amylase and α-glucosidase inhibitory assays. The ethanol extract exhibited the strongest antioxidant activity, with a DPPH IC_{50} of 0.25 µg/mL and the highest ferric reducing capacity among all fractions. It also demonstrated the greatest α-glucosidase inhibitory activity (41.11%; IC_{50} = 4.64 µg/mL), whereas the isolated compounds CPE 51, CPE 61 and CPE 91 (hexadecanoic acid methyl ester) showed appreciable inhibitory effects against α-amylase (IC_{50} = 8.00 µg/mL) and α-glucosidase (IC_{50} = 99.09 µg/mL) for CPE 91. These findings validate the traditional use of *Cochlospermum planchonii* in diabetes management and suggest that its antihyperglycaemic effect is mediated through antioxidant activity and inhibition of carbohydrate-hydrolysing enzymes. Further in-vivo studies are however recommended to establish its therapeutic efficacy, safety profile, and mechanism of action.

Keywords: Cochlospermum planchonii, Antioxidant activity, Diabetes mellitus, α Amylase inhibition, α-Glucosidase inhibition.

1. INTRODUCTION

Diabetes mellitus is a long-term and debilitating metabolic condition linked to issues in carbohydrate metabolism and dysfunction of insulin actions, which can result from either a lack of receptors or other factors; it is the most common non-communicable disease, mainly defined by an elevated blood glucose level. A secondary consequence of diabetes is compromised vision along with weight loss, immune incompetence, ischemic heart disease, kidney failure, stroke, ketosis and an increased risk of mortality. In 2012 approximately 1.5 million death globally were attributed to diabetes, and it is anticipated to become the 7th leading cause of death by 2030 (WHO, 2024). Although there are various synthetic

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medications like acarbose, voglibose, milformin and miglitol available to treat this disease, they can cause a range of side effects, including bloating, liver disorder, flatulence, abnormal discomfort and diarrhoea, which diminish the drug's effectiveness (Alara and Abdulrahman, 2019). Oxidative stress linked to the production of reactive oxygen species (ROS) such as hydroxyl radicals (OH^-) has been associated with several chronic conditions, including diabetes. The elevated levels of malondialdehyde (MDA) resulting from lipid peroxidation in the pancreatic tissues of diabetic patients indicate that free radicals contribute to the onset and progression of diabetes (Mabhida et al., 2022). Therefore, compounds that show both antidiabetic and antioxidant effects would be beneficial, especially if they have fewer serious side effects. This highlights the necessity to find out and create an effective and safer therapeutic agent which will be able to control glucose level without deleterious side effects, possibly from plants.

Cochlospermum planchonii (Cochlospermaceae) is a small bushy plant that grows low in savanna areas, reaching heights up to 2.5 metres; it can reproduce new plants using both seeds and rhizomes. It is called “Zunzuna” (Hausa), “Abanzi” (Igbo), "Gbehutu" or "Feru" (Yoruba) in Nigeria. It is frequently utilised as a traditional remedy in various sub-Saharan African countries such as Nigeria, Ghana, Cameroon, Gambia, and Senegal (Anaga and Oparah, 2009). It is also a common weed of cultivated fields in the Guinea Savanna zone. The leaves, stem and root bark of *C. planchonii* have all shown significant antifungal properties against *Colleototrichum capsica* (Nduagu *et al*. 2008). Additionally, the plant’s aqueous leaf extract has been proved to reduce blood glucose and has antidyslipdemic potential (Nduagu *et al*. 2008); the essential oils from the plant have demonstrated antibacterial activity. The leaves of the plant have been prepared as a decoction serving as a home remedy for issues like diarrhoea, gonorrhoea, jaundice and gastrointestinal diseases. Furthermore, an examination of plant root extract revealed that it contains eggallic acid, manganese and zinc salt (Sut *et al*., 2020)

The aims of this study is to investigate the antioxidant, α-amylase and α-glucosidase inhibitory activities of *C. planchonii* and to isolate some bioactive compounds responsible for the activities, additionally to confirm the traditional application of this plant in traditional medicine since many chemicals of the family Cochlospermaceae are not well known (Ahmad *et al.,* 2021).

2. METHOD

2.1 Plant collections, identifications and preparations

The aerial part of *C. planchonii* was collected with the help of a traditional herbalist at Karau-Karau in the Zaria Local Government of Kaduna State on Friday, 12th July, 2024. The plant was recognised and verified at the herbarium of the Plant Biology Department at Bayero University, Kano, Nigeria, with an accession number BUKHAN 0536, before

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washing it with distilled water, air-dried under shades for 3 weeks and pounding it into powder with the aid of a wooden mortar and pestle, sieved with a mesh size 20 and stored in an airtight container until when required for use.

2.2 Extraction, Fractionation and Isolation of the plant materials

The ethanol extract of the plant material was obtained using the cold maceration method by soaking the plant materials (1000 g) in ethanol (2.5 litres) for 2 weeks and then filtering them. The filtrates were combined after the procedure was carried out three times. Dried crude ethanol extract (CPE) was obtained by evaporating the solvent on a rotary evaporator at 40°C. A portion (104 g) of the dried ethanol extracts was then suspended in 60% aqueous methanol and fractionated by sequential liquid-liquid partition with n-hexane (500 ml x 3) (CPN) and chloroform (500 ml x 3) (CPC). After this procedure, residual aqueous methanol fraction (CPM) were left behind; a rotary evaporator was used to remove the solvent and form dried fractions.

Based on the activity guided, the ethanol extract (CPE) (30g) was subjected to silica gel column chromatography (5id x 90mm, 600g, 60 – 120 mesh size) and eluted with a gradient from n-hexane to ethyl acetate and 10% methanol to yield 92 sub-fractions (CPE 1 – CPE 92). Sub-fractions CPE 51, CPE 61 and CPE 91 appear as a single spot on thin-layer chromatography (TLC) plates; however, CPE 91 (17mg, 21.14%, $R_f = 0.33$) was characterised using spectroscopic techniques to elucidate its structure.

2.3 Instrumentation

^{1}H – NMR (400MHz), ^{13}C –NMR (100MHz) experiments were carried out using a Bruker ADVABCE III HD high-field superconducting NMR spectrometer which was equipped with a cryoprobe and variable temperature capability at the Chemistry Department NMR Laboratory of King Fahd University of Petroleum and Minerals, Dharan (KFUPM), Kingdom of Saudi Arabia, on 20th March, 2025. The GC–MS was performed on CPE 91 using an Agilent GC–MS system (GC 5890 series II; MSD 5972). The fused-silica HP-5 capillary column (30mm x 0.25mm, 1d, film thickness of 0.25µm) was directly coupled to the MS. The carrier gas was helium with a flow rate of 1.2µl/mm^{-1}. The IR spectrum was measured on a Shimadzu FT-IR instrument, and the UV-Visible used is a Thermo-Scientific Multiskan GO spectrophotometer (Thermofisher Scientific, Vantaa, Finland) at the Organic Research Laboratory, Chemistry Department, Bayero University, Kano.

2.4 Determination of Antioxidant activity using 2,2 – Diphenyl - 1 –picrylhydrazyl). (DPPH)

With a few minor adjustments, the DPPH assay was carried out by the method of Jan *et al.* (2013) to form stock solutions. The DPPH (2.4 mg) was dissolved in 100 ml methanol. The stock solution was then diluted with methanol to obtain an absorbance of 0.980 ± 0.02 at 517 nm. Exactly 40µl of the plant samples (CPC, CPE, CPM and CPE) at different concentrations (15.6 - 1000µg/ml) were combined with 160µl aliquot of the DPPH solution. After 15 minutes of dark

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incubation, the mixture's absorbance was measured at 517 nm.

The above was repeated with ascorbic acid (AA) as the standard while the blank was made without the plant extracts. (CPC, CPE, CPM and CPE) The DPPH scavenging activity of various fractions was computed as

$$\text{Percentage inhibition \%} = \frac{[Absorbance\ of\ control - Absorbance\ of\ Sample}{Absorbance\ of\ control} \text{ x } 100$$

The concentrations of the extracts at which 50% inhibition was observed (IC_{50}) were calculated in µg/ml.

2.5 Determination of antioxidant activity using Ferric Reducing Antioxidant Power (FRAP)

The method of Moonmun *et al.* (2017) was used with some adjustment. A volume of 0.5 ml of the plant samples (CPC, CPE, CPM and CPE) at different concentrations (1000 – 15.6 µg) was combined with 0.1ml of 0.2ml phosphate buffer saline (pH 6.6) and 1ml of 1% potassium ferricyanide ($K_3Fe(CN)_6$) solution. This mixture was incubated at 50°C for 20 minutes, after which 1ml of 10% trichloroacetic acid was added, and the mixture was centrifuged at 3000 rpm for 19 minutes. 1ml of distilled water and 0.25ml ferric chloride were added to the resulting supernatant solution. The absorbance was measured at 700nm. Ascorbic acid (AA) was used as the standard while the blank was prepared as above but with water instead of the plant extracts. A standard calibration curve for ascorbic acid (AA) was generated; the linear equation was used to calculate the reducing power of the extracts. The higher reducing power was indicated by higher absorbance, and reducing power is a reflection of the antioxidant activity of any compound.

2.6 *In vitro* Enzymatic Inhibition Assay

2.6.1 α-Amylase inhibition assay;

The inhibition of α-amylase was carried out by the method of Alqahtani *et al. (2020)* with minor adjustment. The plant extract (CPE) and the fractions (CPE 51, CPE 61 and CPE 91) were dissolved in 5% dimethylsulphoxide (DMSO). 500 µl of the plant extract/fraction/isolated compound (100 - 20 µg/ml) was mixed with 500 µl of 0.02 M sodium phosphate buffer (pH 6.8) containing 20 µl α-amylase (0.5 mg/ml) and incubated at 25°C for 10 minutes. 500 µl of 1% starch solution in 0.02 M sodium phosphate buffer (pH 6.9) were combined and incubated for another 15 minutes. This reaction mixture was stopped by adding 1.0ml dinitrosalicylic acid; the test tubes were then incubated in a boiling water bath for 5 minutes before cooling at room temperature, diluting the reaction mixture

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with 10 ml distilled water and measuring the absorbance at 540nm using a UV-Visible spectrophotometer. The control was prepared as above but without any of the plant crude The mean values were obtained from a triplicate experiment; the percentage inhibition of α-amylase activity was computed as

$$\text{Inhibition \%} = \frac{Absorbance\ of\ control - Absorbance\ of\ Sample}{Absorbance\ of\ control} \text{ X } 100$$

A plot of percentage inhibition against the concentration (µg/ml) of the plant materials was plotted, from which the IC_{50} values were obtained for each of the crude extracts, fractions, and isolated compounds using a non-linear regression analysis in comparison to the standard.

2.6.2 α-Glucosidase Assay;

The α-glucosidase inhibition assay was performed using the method described by Alqahtani *et al. (2020)* with minor adjustments. The plant extract (CPE) and fractions (CPE 51, CPE 61 and CPE 91) were dissolved in 5% DMSO. While a sodium phosphate buffer (100 mM, pH 6.8, 1 1ml) and 80 µl of the plant extract/fractions/isolated compound (100 - 20 µg/ml) were combined with 20 µl of α-glucosidase (0.01 mg/ml) and incubated at 37°C for 10 minutes. Then 50 µl of 5 mM p-nitrophenyl-α-D-glucopyranoside (pNPG) was added to the mixture to initiate the reactions. This reaction mixture was incubated at 37°C for 1 hour and then halted by adding 2.5 ml of 0.1 M Na_2CO_3.. The absorbance was measured at 400 nm using a UV-Visible spectrophotometer. The control was prepared the same as above, but distilled water was used in replacement of the plant materials, while acarbose was used as a standard. The average values were obtained from triplicate experiments.

The percentage inhibition was calculated as above in the α-amylase assay; also, the IC_{50} was determined as above.

3. RESULTS AND DISCUSSION

The extractable yield of the extracts obtained from 1000g of dry plant materials for each of the extracts was shown in Table 1. The highest yield of solid residue extraction was obtained using methanol as an extraction solvent; this is indicating that there are more polar constituents, such as polyphenols, in the plant.

Table 1. Extractible yield from *C. planchonii*

Extracts	Yield (g)	% extractable	Physical characteristics
CPE	148.2	14.8	Green Gummy
CPN	0.4	0.39	Green Gummy
CPC	0.39	0.67	Green Gummy
CPM	97.4	0.07	Black Solid

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Keys CPE = ethanol extract of *C. planchonii*, CPN = n-hexane fraction of *C. planchonii*, CPC = chloroform fraction of *C. planchonii*, CPM = methanol fraction of *C. planchonii*,

(a) **Antioxidant activity using DPPH**

The antioxidant activity of the different plant extracts/fractions from *C. planchonii* was determined using DPPH. DPPH is a free radical that is stable and has its benefit because it is not influenced by specific side reactions like metal ion chelation and inhibition from enzymes. A newly made DPPH solution has a strong purple colour and shows the highest absorption at 517nm. This purple colour usually loses its intensity when an antioxidant molecule neutralises DPPH free radicals. This occurs by either supplying hydrogen atoms or by donating electrons, likely due to a free radical interaction with DPPH, transforming them into a colourless product (2,2-diphenyl-1-hydrazine or a substituted analogous hydrazine), resulting in a decrease in absorbance at 517 nm (Gulcin and Alwasel, 2023). The antioxidant activity of the four different extracts of *C. planchonii* is expressed in terms of percentage of inhibition and IC_{50} values (Fig. 1a and b) using ascorbic acid as a standard.

Table 2: DPPH scavenging activities of crude ethanol extracts and their derived fractions of *Cochlospermum planchonii* in comparison with standard ascorbic acid and their IC50 values

Concentrations (µg/ml)	% Inhibitions CPC	CPE	CPM	CPN	AA
1000	85.00	90.33	88.30	79.46	92.98
500	80.43	90.08	86.29	74.41	92.17
250	71.03	81.75	78.17	65.69	91.91
125	61.97	73.39	73.99	65.26	91.50
62.5	54.22	71.77	66.85	57.50	89.44
IC_{50} (µg/ml)	03.99	00.25	09.48	16.58	02.91

Keys CPE = ethanol extract of *C. planchonii*, CPN = n- hexane fraction of *C. planchonii*, CPC = chloroform fraction of *C. planchonii*, CPM = methanol fraction of *C. planchonii*, IC_{50} = The concentrations of the extracts at which 50% inhibition was observed

Note: Data are expressed as mean percentage inhibition at each concentration.

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The highest % inhibition was found in the ethanol extract (CPE) at 90.3% (IC_{50} =0.26µg/ml. The ethanol extract displayed a stronger antioxidant activity than the positive control of ascorbic acid (IC_{50} = 2.908 µg/ml), and these correlate with the findings of Moyo et al. (2010); however, Olotu *et al. (2019)* reported that the methanol extract of *Cochlospermum planchonii* has a significant antioxidant activity of 93 ± 0.11% in the DPPH assay as compared to ascorbic acid (73 ± 0.13%). These strong antioxidant activities of the ethanol extract may be due to the richness of the extract with various secondary metabolites, as there is a correlation between polyphenol content of the extract and anti-radical activity because the extract has the potential to scavenge for free radicals and the capacity to bleach the DPPH (Olotu *et al*., 2019).

The component found in these plants could be linked to their ability to act as antioxidants; they might be used to help reduce oxidative stress caused by long-term high blood sugar, which can help to prevent complications related to diabetes, improve insulin sensitivity, reduce damage to the pancreatic β-cells and perhaps even delay the progression of diabetes (Kokil *et al*., 2020)

(b) Antioxidant activity using ferric reducing antioxidant power (FRAP)

A compound's ability to reduce something can be an important sign of how well it may act as an antioxidant. The ferric reducing antioxidant power (FRAP) test is based on the ability of antioxidants to convert Fe^{3+} to Fe^{2+}ions. This occurs in the presence of a coloured complex potassium ferricyanide, trichloroacetic acid and ferric chloride, and the resulting absorbance is measured at 700nm by a UV spectrophotometer. The FRAP of the crude extracts and their derived fractions of the plants were determined in relation to that of the ascorbic acid standard.

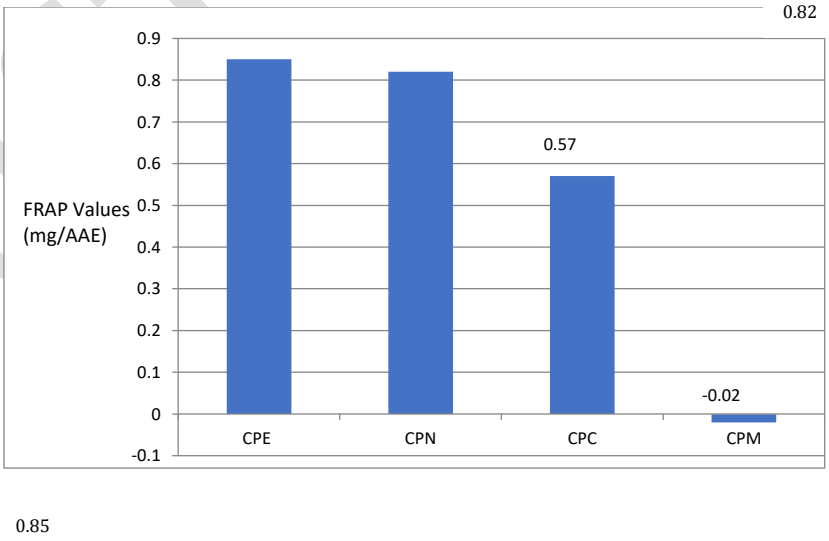

Fig. 1 FRAP values of *C. planchonii* are expressed as mg/AAE/g extract.

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The FRAP assay results of *Cochlospermum planchonii* is expressed as mg/equivalent of ascorbic acid as shown in figure 1. The ethanol extracts showed the highest reducing power of 0.852 mg/AAE/g extract, followed by the n-hexane fraction; the FRAP values vary from 0.852 to -0.031 mg/AAE. The ferric reducing antioxidant power of *Cochlospermum planchonii* increased in the following order: CPE>CPN>CPC>CPM.

The ability of plants to reduce is likely linked to the hydroxyl group found in the phenolic compounds; this group can act as an electron donor, which leads to the transformation of the Fe^{3+} ferricyanide complex to its ferrous form. The ability of plant extracts to reduce substances might be an important sign of how well they can act as antioxidants; additionally, plant extracts with reducing power can help protect the liver by stopping the formation of lipid peroxide (Machado *et al*., 2023).

Characterisation of CPE 91

CPE 91 appears as a yellowish paste (0.17 g, 21.14%, $R_f = 0.31$). The MS spectrum (fig. 2) shows a molecular ion peak $[M+H]^+$ at m/z 256, which corresponds to the molecular formula $C_{16}H_{32}O_2$ the common fragmentation are m/z 239 for the loss of water from molecular ion, m/z 213 is due to the loss of a methyl group (CH_3) from the molecular ion, the peaks at m/z 185 correspond to the loss of C_2H_4O from the fatty acid portion, while m/z 129 is characteristic of smaller acyl fragments often observed in fatty acid derivatives.

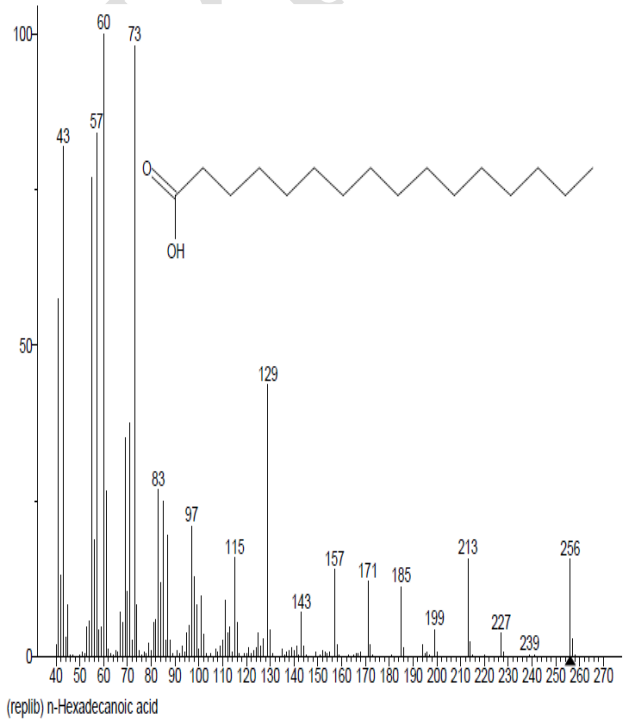

Fig. 2: MS spectrum of CPE 91

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The FT – IR spectrum (Figure 3) shows a strong absorption band at 1704.79 cm^{-1} due to C=O bond stretching of the ester group, while a medium band at 1186.64 cm^{-1} corresponds to the stretching of the C–O bond of the ester group. The strong band at 2929.80 cm^{-1} is for the symmetrical and asymmetrical stretching of the C–H bond in the long aliphatic carbon chain, while the aliphatic C–H bending vibration is observed at 1369.68 cm^{-1} (Table 3).

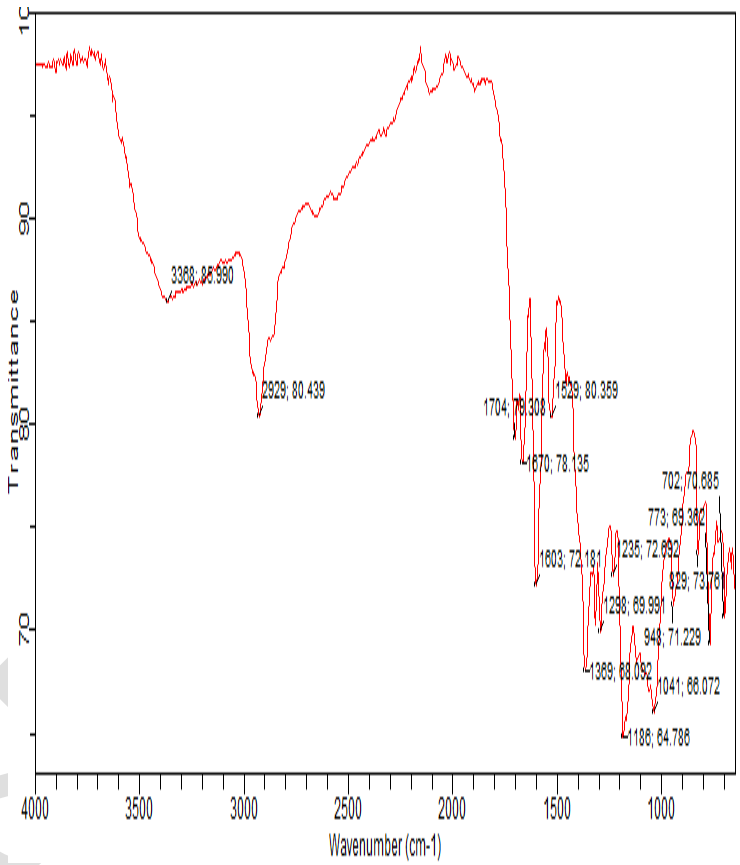

Fig 3; FT–IR spectrum of CPE 91

Table 3 FT-IR Data of CPE 91

S/no	Frequency (cm^{-1})	Vibration type
1	2929.80	C–H stretching
2	1704.89	C =O. stretching
3	1369.68	C–H bending
4	1186.68	C–O stretching
5	773.69	C – H out-of-plane bending

The proton NMR (figure 4) shows signals between 1.1 and 2.4 ppm and 0.67 and 0.97 ppm, which suggests the presence of methylene and methyl groups, respectively. The signal at 3.2 – 3.4 ppm suggests the proton to methyl ester (-OCH_3).

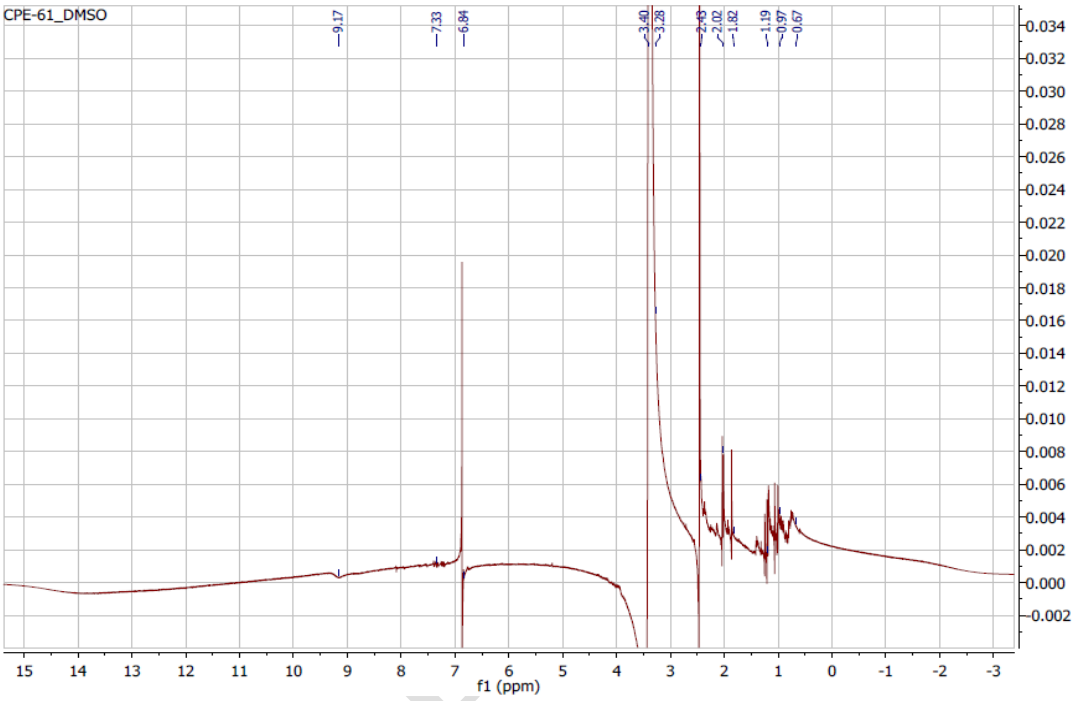

Fig. 4: Proton NMR spectra of CPE 91

In the carbon-13 NMR (figure 5), the terminal methyl carbon appears at 14ppm, methylene group appears as a series of peaks at 25 – 35 ppm, and the C = O appears downfield around 174 – 177 ppm; therefore, based on the above spectral characteristics and by direct comparison with literature data, the compound CPE 91 is hexadecanoic acid methyl ester (Mahardika et al., 2025) (Ajoku et al., 2015).

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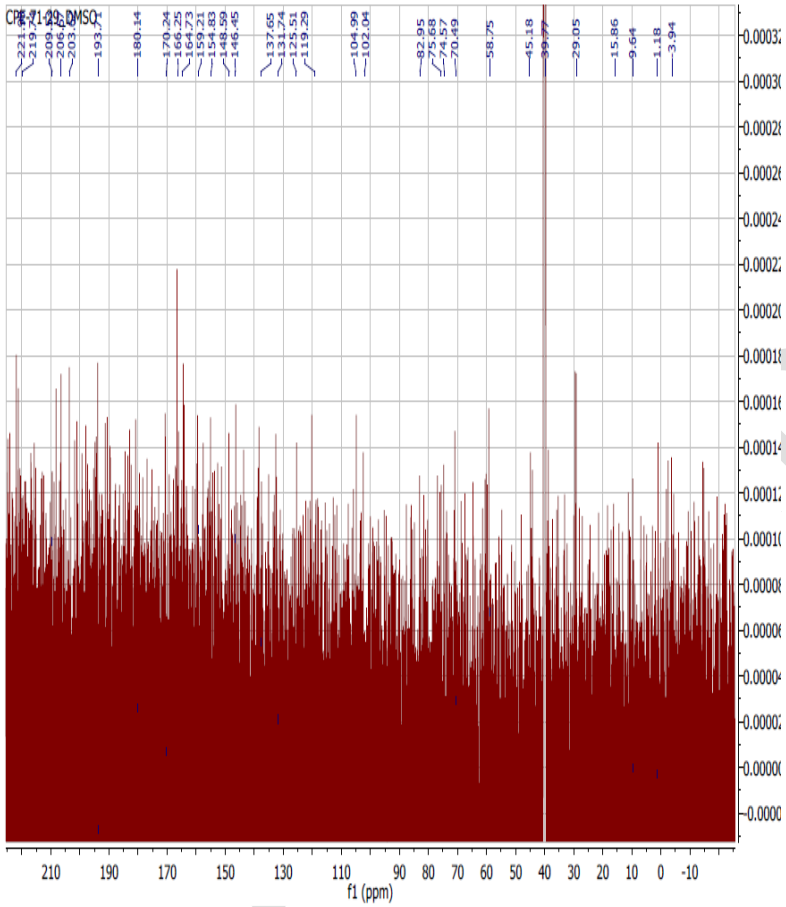

Fig. 5: Carbon-13 NMR spectrum of CPE 91



CPE 91

Hexadecanoic acid methyl ester, otherwise known as methyl palmitate, has previously been isolated from the seed of both *Hibiscus trionum* and *Hibiscus sabdariffa* (Lohdip et al., 2014). Hexadecanoic acid has also been found to trigger the breakdown of membrane structures, lead to considerable dilation of the aorta, reduce the phagocytic functions and nitric oxide production in some cells, and lower levels of tumour necrosis factor-alpha, prostaglandin and interleukin all while not impacting ATP levels (Lian et al., 2024).

IN VITRO ENZYMATIC INHIBITION ASSAY

(a) Alpha amylase inhibition assay

Figure 6 displays the α-amylase inhibitory activity of the crude ethanol extract of *Cochlospermum planchonii* and several of its isolated compounds. Acarbose, which is classified as an α-glucosidase inhibitor and is

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recognised for its ability to inhibit both α-amylase and α-glucosidase, was used as a positive control in the assay (Abu *et al.,* 2020)

The ethanol extracts of *Cochlospermum planchonii* (CPE) and some of its isolated compounds (CPE 51, CPE 61, and CPE 91) reduced α – amylase activity in a dose – dependent manner with the highest tested concentrations (100µg/ml). Showing 47.39% (IC_{50} = 5.96) inhibition of α – amylase by the ethanol extract of *C. planchonii* which was significantly (P < 0.05%) less effective than the positive control, acarbose, 76.79% (IC_{50} = 2.79), at the same concentrations. The most important inhibition appears in the ethanol extract (CPE), while the isolated compound CPE 51 has the lowest effects of 27.31% (IC_{50} = 22.37).

The increasing demand for safe and effective diabetes treatment has led to the use of medicinal plants, which are seen as important sources of substances that block digestive enzymes; these substances help prevent the breakdown of complex carbohydrates in the intestine. These inhibitors help to lower blood sugar by blocking the action of starch digestive enzymes like α – amylase and α-glucosidase (which are present in the small intestinal brush border). α – amylase is an enzyme that contains calcium, which helps start the process of breaking down starch into smaller sugars such as monosaccharides and disaccharides. This happens by cutting the glycosidic bonds that are in the structure of glucose. Inhibitors of α – amylase can slow down the process of starch digestion. This means they postpone the formation and uptake of glucose by inhibiting the enzymes involved in glycolysis. This could lower how quickly glucose enters the bloodstream, which may help decrease the rise in plasma glucose in people with diabetes (Tunny *et al.,* 2019).

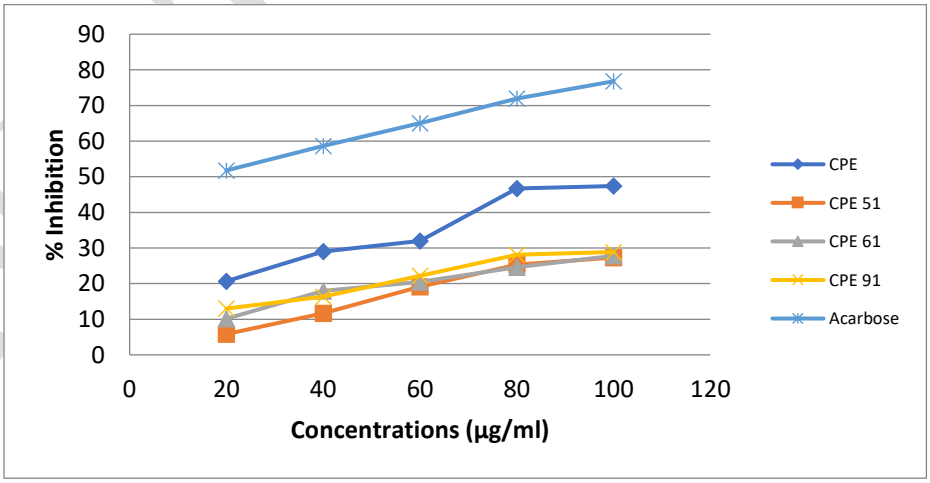

Fig. 6: *In vitro* inhibitory activity of *Cochlospermum planchonii* extract and some of its isolated compounds against α – amylase in comparism with Acarbose (% inhibition ± SD)

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The presence of key bioactive phytoconstituents in the plants, especially flavonoids, is likely responsible for the inhibition of α – amylase by these extracts and isolated compounds. Plant polyphenols have been shown to inhibit α – amylase and α-glucosidase activities (Lam *et al.,* 2024).

Earlier research focusing on plants for α – amylase activity has demonstrated that *Galega officinalis, Phaseolus vulgaris* and *Tamarindus indica* at a concentration of 200 mg/ml have inhibitory activities of 35%, 75% and 90%, respectively (Zanzane *et al.,* 2020). Other plants that are reported to be potent inhibitors of α – amylase and are in accordance with these finding are *Vernonia amygdalina (*Bitter leaf) (Patathananone *et al.,* 2023) *Salencia oblonga* (Gladis and Chellaram, 2018), *Onimis augustissima* (Hind *et al.,* 2017), and *Citrullus lanatus* (watermelon) (Sani and Nasir, 2017).

The arrangement of the flavonoids (polyphenols) based on how many hydroxyl groups they have and where these groups are attached plays a role in their enzymatic inhibition. As the number of the hydroxyl groups on the B-ring rises, the inhibitory activity also increases (Li *et al.,* 2024).

(a) Alpha glucosidase inhibition assay

In this study, the percentage inhibition achieved with the standard antidiabetic drug acarbose was notably high within the tested concentration range (100 - 20 µg/ml) as illustrated in figure 7. The optimal percentage inhibition of 73.11% (IC_{50} =3.04) was observed for acarbose at 100 µg/ml, which slightly decreases to 50.31% at 20 µg/ml; this indicates that the percentage inhibition of the standard used in this study was dependent on the concentration.

α-glucosidase is an enzyme responsible for the conversion of complex carbohydrates into glucose. These enzymes work by slowing down how complex carbohydrates are broken down into glucose and decreasing their absorption in the intestines. This leads to decreased blood sugar levels after eating (Zhang *et al.,* 2024). α-glucosidase catalyses the breakdown of 1,4 α-bonds of the unabsorbed oligosaccharides and disaccharides and converts them into monosaccharides; therefore, α-glucosidase located in the brush border of the intestinal epithelium (enterocytes) is responsible for the last stage of carbohydrate digestion before absorption occurs.

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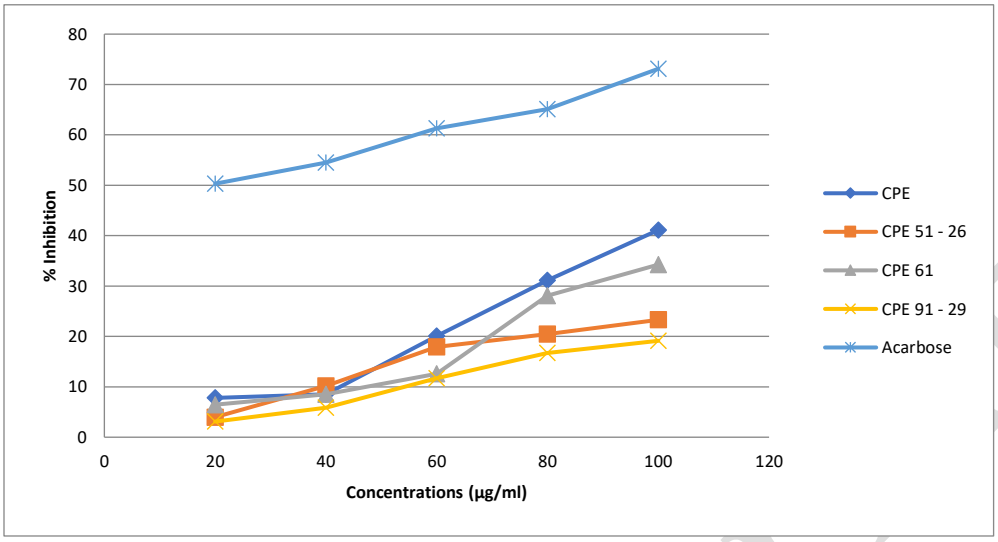

Fig. 7: *In vitro* inhibitory activity of *Cochlospermum planchonii* extract and some of its Isolated compounds against α-glucosidase in comparism with acarbose (% inhibition (± SD)

The results obtained for α-glucosidase inhibition are in consistent with the ones obtained in *Calophyllum inophyllum* (Emmannuel *et al.,* 2020) and *Picralina mitida (*Stapf) (Okeke *et al.,* 2025)

A comprehensive review of studies showed that terpenes,alkaloids, flavonoids and phenolic compounds exhibit a strong inhibitory effect on α-glucosidase (Deng *et al.,* 2025). According to Zhang and coworkers (2019), compounds linked to anthocyanidin and isoflavone displayed a minor inhibitory impact on α-glucosidase; likewise, rutin, a glycosylated flavonoid, showed an acarbose-like inhibitory effect on mainly maltase activity (Lam *et al.,* 2024).

A common method for managing diabetes mellitus is to restrict the digestion of carbohydrates in the intestine. This is true even though the gastrointestinal system is not significantly involved in the development of diabetes. Changing its physiological functions can help lower blood sugar levels by blocking the enzymes that break down carbohydrates, specifically α – amylase and α-glucosidase (Scoot and Spencer, 2000). The slowing down of these enzymes caused a delay in the digestion of carbohydrates, making the overall digestion time of carbohydrates longer. This led to a decrease in the speed at which glucose was absorbed, which in turn reduced the in increase in blood sugar levels.

4. CONCLUSION

This study demonstrates that the ethanol extract of *Cochlospermum planchonii* possesses notable antioxidant and in vitro antidiabetic activities, supporting its traditional use in diabetes management. The extract showed the strong DPPH radical scavenging, ferric reducing antioxidant power, and inhibitory effects against α-

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amylase and α-glucosidase, while hexadecanoic acid methyl ester was identified as a contributing bioactive compound. These findings suggest that *Cochlospermum planchonii* may help control postprandial hyperglycaemia through antioxidant action and inhibition of carbohydrate-hydrolysing enzymes. Further in vivo and toxicity studies are recommended to confirm its therapeutic efficacy and safety.

AUTHOR CONTRIBUTION

Author 1: Conceptualization, methodology, validation, formal analysis, writing-original draft preparation, writing, review and editing
Author 2: Conceptualization, supervision, validation, visualization, project administration
Author 3: Methodology, validation, formal analysis
Author 4: Validation, supervision
Author 5: Validation, supervision, review, funding acquisition.

ACKNOWLEDGEMENT

We wish to thank and acknowledge TETFUND for providing the funding for the research and the management of Nuhu Bamalli Polytechnic, Zaria, for granting us this research opportunity.

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