Assessment of antimicrobial and phytochemical properties of crude leaf and bark extracts of *Ceiba pentandra* on selected clinical isolates found in Nigerian teaching hospital

**Abstract**

*Ceiba pentandra* is a tropical tree of order Malvales and the family Malvaceae. The basic objective of this research work is to determine the antimicrobial and phytochemical properties of *Ceiba pentandra*. Fresh leaves and bark of *Ceiba pentandra* was collected at Akungba Akoko. *Ceiba pentandra* (leaf and bark) were prepared for extraction using ethyl acetate. The test organisms used for this research work are: *Escherichia coli*, *Salmonella typhi*, *Bacillus subtilis*, *Klebsiella pneumonia* and *Staphylococcus aureus*. Antimicrobial assay was carried out using Agar dilution method. Four concentrations were used namely; 60, 30, 15, and 7.5mg/ml Ethyl acetate was most highly reactive with the highest value of inhibition (11.0) and lowest value of inhibition (1.0). The phytochemical screening shows that flavonoid and Anthraquinone are absent while Cardiac Glycoside, Steroid, Phenol, Tannins, Saponin and alkaloid is present. Quantitative analyses were carried out on the elemental composition of *Ceiba pentandra*. The elements present are: Sodium, potassium, calcium, magnesium, zinc, iron, lead, copper and manganese. In *Ceiba pentandra* leaf, calcium has a higher value (29.34) while copper has the lowest value (1.00). Potassium has the highest value (43.21) while iron has the lowest value (4.36) in bark extract of *Ceiba pentandra* while lead and copper are not detected. Quantitative analyses of anti-nutrients were carried out on *Ceiba pentandra*. The anti-nutrients present are: Tannin, Phenol, Phylate, Oxalate, Saponin, Hvanoid and Alkaloids. Phylate has the highest anti-nutrients percentage (leaf 12.33% and bark 12.45%) while Tannin has the lowest value (leaf 2.30% and bark 2.25%). Proximate analysis was carried out on *Ceiba pentandra*. Ash, moisture content, crude protein, fat, fibre and carbohydrate are present. Carbohydrate has the highest percentage (leaf 53.72% and bark 53.79%) while Fat has the lowest percentage which is (leaf 8.53% and bark 8.50%). The research shows that *Ceiba pentandra* is an effective medicinal plant therefore the use of medicinal plants should be encouraged.

**Keywords:** antimicrobial activity, phytochemical activity, proximate composition, elemental constituent

**Introduction**

*Ceiba pentandra* is a tropical tree of order Malvales and the family Malvaceae. The tree grows to 70m (230ft) with a trunk up to 3m (9.8ft) in diameter with buttresses. The trunk and many of the larger branches are often crowded with large simple thorns. The palmate leaves are composed of 5 to 9 leaflets, each up to 20cm (7.9 in) long. The tree produces several hundred 15cm (5.9in) pods containing seeds. The seeds are round and flattened. The seed contains a yellow fibrous coating. The primary uses of the tree are as a source of fibre and timber. Some potential as a bio fuel and in paint preparation. It is difficult to spin, but it is used as an alternative to down as filling in mattresses, pillows, upholstery, zafus and stuffed toys such as teddy bears and for insulation. It was previously much used in life jackets, mattresses, pillows, upholstery, zafus and stuffed toys such as teddy bears and for insulation. It has been used as a bio fuel and in paint preparation. It is difficult to spin, but it is used as an alternative to down as filling in mattresses, pillows, upholstery, zafus and stuffed toys such as teddy bears and for insulation. It was previously much used in life jackets, mattresses, pillows, upholstery, zafus and stuffed toys such as teddy bears and for insulation. It has been used as a bio fuel and in paint preparation. It is difficult to spin, but it is used as an alternative to down as filling in mattresses, pillows, upholstery, zafus and stuffed toys such as teddy bears and for insulation.
for insulation, absorbent material and tinder. The fibre may also be used as biodegradable alternative to synthetic oil-sorbent materials, due to its hydrophobic-oleophilic properties.

Currenty, the main use of *Ceiba pentandra* is as a source of timber. The wood (trade names; funa, ceiba) is mostly used in plywood manufacturing, but also for making boxes and crates, and for lightweight jinery. Traditionally, entire trunks are hollowed out as dugout canoes, and the wood is used for lightweight furniture, utensils, containers, musical instruments, mortals, carvings and similar items. It is suitable for insulation, wooden sandals, heels, rafts, floats, lifeboats, models, insulation and particle board. The buttresses are made into doors, table tops, plates and trays.

*Ceiba pentandra* bark decoction has been used as a diuretic, aphrodisiac, and to treat headache, as well as type II diabetes. It is used as an addictive in some versions of the hallucinogenic drink. The root forms part of preparations to treat leprosy. Pulverized roots and root decoctions are taken against diarrhoea and dysentery. Root decoctions are oxytocic. Macerations of the root bark are drunk against dysmenorrhoea and hypertension. The root and the stem barks are taken to treat stomach problems, diarrhoea, hernia, gonorrhoea, heart trouble, oedema, fever, asthma and rickets; they are also applied on swollen fingers, wounds, sores and leprous macules.

Bark extracts are considered emetic: they are drunk or applied as enema. Macerations of the bark are cure for heart trouble and hypertension and are credited with stimulant and antihelminthic properties. Gum from the bark is an astringent and is used to treat diarrhoea and as an abortifacient. The leaves are credited with emollient and sedative properties. They are used against scabies, diarrhoea, and fatigue and as alternative, laxative and abortifacient. Young leaves are warmed and mixed with palm oil to be eaten against heart problems. Pounded leaves are applied as a dressing on sores, tumours, abscess and whitlows. Leaf sap is applied to skin infections and drunk to treat mental illness. Leaf macerations are drunk or used in baths against general fatigue, stiffness of the limbs, headache and bleeding of pregnant women. Leaf preparations are used as an eye-bath to remove foreign bodies from the eye. In veterinary medicine a decoction of the leaf is used to treat trypanosomiasis. The flowers are taken to treat constipation, and flowers and fruits are taken to with water against intestinal parasites and stomach ache. Kapok fibre is used for cleaning wounds; the seed oil is rubbed in for treatment of rheumatism and applied to heal wounds (Nganga 1992).

**Methodology**

Materials used for this experiment include, aluminium foil, cotton wool, sterile distilled water, Nutrient broth, Rotary evaporator, hand gloves, inoculating loop, Bunsen burner, incubator, weighing balance, plastic kgs, beaker, water, *Ceiba petandra* leaves and bark, Petri dishes, disposable dishes, autoclave, sieve, funnel, muella-hilton agar, syringe, metronidazole infusion, Ciprofloxacin infusion, paper tape, conical flask, McCartney bottles, Dimethyl-sulfoxide (DMSO), test tubes, universal bottles, heating mantle, magnetic stirrer.

**Sample collection and preparation of ceiba pentandra extracts**

Fresh leaves and bark of *Ceiba pentandra* was collected at Akungba Akoko, Ondo State Nigeria in the month of November 2015 and authenticated at the herbarium of the department of Plant Science and Biotechnology, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria, by Mr Ologunorisa.

**Preparation of ceiba pentandra extracts:** The leaves and bark of *Ceiba pentandra* were rinsed with sterile water and air dried for four days, and then diced into smaller pieces, 400g each of the sample were soaked in 1200ml of distilled water in an air tight sterile containers where each bottle is labelled as to what they contain at ratio 1:3 in which the mixture is soaked for 9days. After which it was filtered first using a muslin cloth then the No1 Whatman filter paper, funnel and a conical flask to obtain a pure extract. The samples were stored at room temperature until when due for vaporisation. Using the rotary evaporator, the solution was separated into solutes and solvents. The solute was then poured into a sterile petri plate and air-dried (Ugbugu et al.2000).

**Extraction of ceiba pentandra extracts:** Rotary evaporator was used in the removal of the solvent of extraction from the *Ceiba pentandra* extracts at 100°C for evaporation. After evaporation, the *Ceiba pentandra* extract were poured in a sterile petri plate and air dried.

**Standardization of organism:** The organisms were standardised using a serial dilution technique i.e. the stock sample on a slant was introduced in an already prepared nutrient broth and incubated overnight (18-24hrs). 0.1ml of the broth was introduced into 9.9ml of sterile distilled water to make a dilution of 1:1000 and also from the dilution, another 0.1ml was pipetted into 9.9ml of sterile distilled water to make a dilution of 1:10,000.

**Standardization of ceiba pentandra extracts:** 0.6g of the extract was weighed into a sterile bottle in which 2.5ml of DMSO (Dimethyl sulfoxide) was used to reconstitute the extract after which 7.5ml of sterile distilled water was added to make up 10ml (60mg/ml) in total. 3ml of the reconstituted extract easy dispensed into another bottle carrying 3ml of sterile distilled water to make up 6ml (30mg/ml). The same procedure was done for 15mg/ml and 7.5mg/ml respectively.

**Antimicrobial assay**

The susceptibility testing was investigated by the agar diffusion method (Adeniyi et al. 2006). A 0.1ml of 1:10,000 dilutions (equivalent to 106cfu/ml) of fresh overnight culture of the non tuberculous *mycobacteria species* grown in Nutrient broth, was seeded into 40ml of molten Mueller-Hinton agar, and properly mixed in universal bottles. The mixture was aseptically poured into sterile Petri dishes and allowed to set. Using a sterile cork borer of 4mm diameter, equidistant wells were made in the agar. Drops of the suspended extracts with concentrations between 60 to 7.5mg/ml were introduced into the wells till it’s filled. Ofloxacin 2mg/ml was used as the control for bacteria and Fluconazole as that of Fungi. The plates were allowed to stand on the bench for an hour, to allow pre-diffusion of the extracts before incubation. The plates were incubated at 37°C for 24 to 48hours. The zones of inhibition were measured to the nearest millimeter (mm) using a standard transparent meter rule. All experiments were performed in duplicates.

**Phytochemical screening**

I. **Test for alkaloids:** About 0.2gram was warmed with 2% of H2SO4 for two minutes, it was filtered and few drops of Dragendonf’s reagent were added. Orange red precipitate indicates the present of Alkaloids.

II. **Test for tannins:** One milliliter of the filtrate was mixed with 2ml of FeCl3, A dark green colour indicated a positive test for the tannins (Edeoga 2005).

III. **Test for saponin:** One milliliter of the plant filtrate was diluted...
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with 2ml of distilled water; the mixture were vigorously shaken and left to stand for 10minutes, during which time, the development of foam on the surface of the mixture lasting for more than 10minutes, indicates the presence of Saponins.

IV. Test for anthraquinones: One milliliter of the plant filtrate was shaken with 10ml of benzene; the mixture was filtered and 5ml of 10% (v/v) ammonia were added, then shaken and observed. A pinkish solution indicates a positive test.

V. Test for flavonoid: About 5ml of each aqueous extracts was added with 1% NH₃ solution. A positive test result was confirmed by the formation of a yellow coloration or turbidity.¹

VI. Test for cardiac glycoside: About 5ml of the extract was mixed with 2ml of glacial acetic acid containing one drop ferric chloride solution. To this, 1ml of concentrated sulphuric acid was slowly underplayed to the sample mixture. A positive test result was confirmed by the presence of a brown ring at the Interface.²

VII. Test for steroids: 10ml of each ethanol extract are evaporated to insipient dryness over a steam bath and cooled to room temperature. It was then defatted repeatedly with hexane. The defatted aqueous layer was then warmed over a steam bath to remove the residual hexane. To this, 3ml of Fecl₃ reagent was added and 1ml of concentrated sulfuric acid was then slowly added. A positive test was evident when a reddish brown coloration occurred.³

VIII. Test for phenols- total phenol (spectrophotometric methods): 2g of each sample, 1ml of diethyl ether was added for defatting. The fat free samples were boiled with 50ml of ether for 15min to obtain the phenolic components which were measured at 505 nm following the standard method.⁴

Quantitative method of analyses of ceiba pentandra

Saponins: The grinded plant samples (20g) were extracted with 20% aqueous ethanol by using a water bath maintained at 55°C, for 4hour with stirring. After filtration the residue was re-extracted with 200ml of 20% ethanol. The combined extracts were reduced to 40ml volume separately (water bath temperature was 90°C). Diethyl ether (20ml) was used for extraction. The process was repeated three times. The ether layer was removed and 60ml of n-butanol was added to the water layer. Butanol extract was washed with 5% NaCl aqueous solution. After evaporation, the samples were dried in oven to a constant weight; the saponin content was calculated as percentage of the starting material Guevarra.⁵

Flavonoids: About 10g of the plant sample were extracted repeatedly with 100ml of 80% aqueous methanol, at room temperature. The whole solution was filtered through Whatman filter paper No 42. The filtrates were later transferred into a crucible and evaporated to dryness over a water bath. The dried extracts were weighed and the test procedure defined by Mahato and Sen 1997 was followed.⁶

Tannins: About 500mg of the plant sample was weighed into a 50ml plastic bottle. 50ml of distilled water was added and shaken for 1 hour on a mechanical shaker. This was filtered into a 50ml volumetric flask and made up to the marked level. Then, 5ml of the filtrate was transferred into a test tube and mixed with 2ml of 0.1M FeCl₃ in 0.1M Hcl and 0.008M potassium ferrocyanide. The absorbance was measured at 550nm within 10minutes. The tannins content was calculated using a standard curve of extract.⁶

Alkaloids: Five grams of the plant sample was weighed into a 250ml beaker and 200ml of 10% acetic acid in ethanol was then be added, the reaction mixture was covered and allowed to stand for 4hour. These were filtered and the extract will be concentrated on a water bath to one-quarter of the original volume. Concentrated ammonium hydroxide was added drop-wise to the extract until the precipitation is complete. The whole solution was allowed to settle and the precipitate was collected, washed with dilute ammonium hydroxide and then filtered; the residue being the alkaloid, which was dried and weighed to a constant mass.⁷

Determination of proximate analysis of ceiba pentandra

The proximate parameters (moisture, dry matter, ash, crude fats, proteins and fibers, nitrogen, carbohydrates and energy values) were determined using Association of Official Analytical Chemists Methods.

A. Determination of moisture content was done by drying samples in oven (WiseVen, WON-50, Korea) at 110°C until constant weight was attained.⁸

B. Nitrogen estimation was carried out by the micro-Kjeldahl (BUCHI, KjelFlex K-360, and Switzerland) method with some modification.⁹

C. The crude proteins were subsequently calculated by multiplying the nitrogen content by a factor of 6.25. The energy value estimation was done by summing the multiplied values for crude protein.

D. Crude fat and carbohydrate respectively at Water Factors (4, 9 and 4). Crude fats were determined by Soxhlet apparatus using n-hexane as a solvent.

E. The ash values were obtained by heating samples at 550°C in a muffle furnace (Wise Them, FHP-03, Korea) for 3h.⁹

F. The carbohydrate content was determined by subtracting the total crude protein, crude fiber, ash content and crude fat from the total dry matter.¹⁰

G. Crude fiber was estimated by acid-base digestion with 1.25% H₂SO₄ and 1.25% NaOH solutions.¹¹

Results

Table 1 showed the result for the yield extract of Ceiba pentandra. Ceiba pentandra parts used are leaf and bark. The initial weight of the leaf is 300g; the volume of solvent used is 1,200ml. Ceiba pentandra leaf extract is 6.5g while the initial weight of bark is 400g, and volume of solvent used is 1,200ml, Ceiba pentandra ethanol bark extract is 9.0g.

<table>
<thead>
<tr>
<th>Percentage yield</th>
<th>Initial weight of the sample (g)</th>
<th>Volume used (g)</th>
<th>Percentage yield of final weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>300</td>
<td>1200</td>
<td>6.5</td>
</tr>
<tr>
<td>Bark</td>
<td>400</td>
<td>1200</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 2 shows the antimicrobial activity of ethyl acetate leaf extracts of *Ceiba pentandra*

<table>
<thead>
<tr>
<th>Clinical isolate/Conc (mg/ml)</th>
<th><em>Escherichia coli</em></th>
<th><em>Salmonella typhi</em></th>
<th><em>Bacillus subtilis</em></th>
<th><em>Klebsiella pneumonia</em></th>
<th><em>Staphylococcus aureus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>8</td>
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<tr>
<td>30</td>
<td>6.5</td>
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<td>8</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>7.5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3 shows the antimicrobial activity of ethyl acetate bark extracts on selected clinical isolates at four concentrations; 60, 30, 15, and 7.5mg/ml. The clinical isolates used show higher zones of inhibition at concentration of 60mg/ml and lower zones of inhibition at concentration of 7.5mg/ml.

<table>
<thead>
<tr>
<th>Clinical isolate/Conc (mg/ml)</th>
<th><em>Escherichia coli</em></th>
<th><em>Salmonella typhi</em></th>
<th><em>Candida albican</em></th>
<th><em>Klebsiella pneumonia</em></th>
<th><em>Staphylococcus aureus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
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<td>6</td>
<td>3</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>7.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4 shows the minimum Inhibitory Concentration of *Ceiba pentandra* extract at concentration 60, 30, 15, 7.5, 3.75, 1.88 and 0.94mg/ml. It was observed that the organism can grow at concentration 7.5, 3.75, 1.88 and 0.94mg/ml, but inhibited with no growth at concentration 60, 30, and 15mg/ml.

Table 5 shows the qualitative analysis of the phytochemical screening of *Ceiba pentandra* leaf and bark extracts. It shows the presence of phytochemical such as alkaloid, saponin, tannin, glycoside, flavonoid, phenol, and sterol and shows that the anthraquinone is not present in both the bark and leaf of *Ceiba pentandra*.

Table 6 shows the quantitative analysis of minerals present in *Ceiba pentandra* leaf and bark extracts. The result shows that there is a large amount of Calcium (29.34), Magnesium (24.78), Potassium (23.12), Sodium (20.92), Iron (20.34), Zinc (17.34), and low amount of Manganese (4.92), Lead (2.78) and Copper (1.00) in the leaf of *Ceiba pentandra*. The result of *Ceiba pentandra* bark extract shows higher zones of inhibition at concentration of 60mg/ml and lower zones of inhibition at concentration of 7.5mg/ml.

Table 7 shows the quantitative analysis of Anti-nutrients present in *Ceiba pentandra* bark and leaf extracts such as tannin, saponin, flavonoid, alkaloid, oxalate, phenol etc. the result indicate that saponin is more present in the bark (6.49%) and leaf (9.75%) of the plant.

Table 8 shows the quantitative analyses of proximate nutrient composition of *Ceiba pentandra* extract such as Ash, Fat, Fibre, Carbohydrate, moisture content. The result shows that the leaf and bark of *Ceiba pentandra* contain high percentage of carbohydrate (53.72 % of leaf and 53.79 % bark) of the plant (Figure 1) (Figure 2).
Table 7 Quantitative analyses of anti-nutrients present in ceiba pentandra extracts result in percentage (%)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ceiba Pentandra Leaf</th>
<th>Ceiba pentandra bark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tannin</td>
<td>2.3</td>
<td>2.25</td>
</tr>
<tr>
<td>Phenol</td>
<td>3.49</td>
<td>3.45</td>
</tr>
<tr>
<td>Phylate</td>
<td>12.33</td>
<td>12.45</td>
</tr>
<tr>
<td>Oxalate</td>
<td>8.51</td>
<td>8.55</td>
</tr>
<tr>
<td>Saponin</td>
<td>7.52</td>
<td>7.61</td>
</tr>
<tr>
<td>Flavonoid</td>
<td>10.38</td>
<td>10.41</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>4.36</td>
<td>4.37</td>
</tr>
</tbody>
</table>

Table 8 Quantitative analyses of proximate nutrient composition of ceiba pentandra

<table>
<thead>
<tr>
<th></th>
<th>% Ash</th>
<th>% MC</th>
<th>% CP</th>
<th>% Fat</th>
<th>% Fibre</th>
<th>% CHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>8.72</td>
<td>7.32</td>
<td>16.25</td>
<td>5.34</td>
<td>8.53</td>
<td>53.72</td>
</tr>
<tr>
<td>Bark</td>
<td>8.78</td>
<td>7.33</td>
<td>16.19</td>
<td>5.4</td>
<td>8.5</td>
<td>53.79</td>
</tr>
</tbody>
</table>

Keywords: MC, moisture content; CP, crude protein; CHO, carbohydrate

Discussion

The extensive literature survey shows that *Ceiba pentandra* is an important medicinal plant with diverse pharmacological spectrum. The plant shows the presence of many chemical constituents which are responsible for varied pharmacological and medicinal properties. *Ceiba pentandra* extracts are potential sources of antimicrobial compounds especially against clinical isolate such as: *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *Klebsiella pneumonia*, and *Salmonella typhi*. Antimicrobial properties of *Ceiba pentandra* has desirable tools in the control of microorganisms especially in the treatment of infectious diseases as shown in Tables 3 & 4 which correlates with research of Aboaba et al.4 The active components usually inhibit the growth and metabolism of microorganisms due to their bacteriostatic and bacteriocidal effect against the microorganisms. The phytochemical screenings of the *Ceiba pentandra* (leaf and bark) were observed and it shows that Tannin, Phenol, Steroid, Phylate, Oxalate, Saponin and Alkaloids were present while flavonoids and antraquinone are negative. For leaf and bark, tannin is found to be useful for human physiological activities such as phagocyte cell, host mediated activity and a wide range of anti-effective action. One of the Molecular actions is to complete protein synthesis to specific forces such as hydrogen bonding and hydrophobic effect. Steroids present in *Ceiba pentandra* are responsible for the treatment of some endocrine disorder, regulation of blood sugar, salt imbalance, and antimicrobial infections. *Ceiba pentandra* bark and leaf also showed certain amount of saponin, alkaloids, flavonoids and tannins. The presence of phytochemical activity in *Ceiba pentandra* helps the body to neutralize both gram-positive and gram-negative bacteria due to their inhibitory effect. It was discovered that the presence of saponin is reported to be effective in the treatment of syphilis, rheumatism and certain skin disease: treatment of absceses and other swellings, ulcer and septic wounds; management of inflammation. Saponins are responsible for tonic and stimulating activities.

Flavonoids are part of the phytochemical constituents of *Ceiba pentandra* which represent the most common and widely distributed groups of plant phenol that serve as flavouring ingredients of spices and vegetables. Flavonoids are known to have hypoglycemic activity used in the treatment of diabetes, exhibit anti-inflammatory, anti-angiogenic, anti-allergic effect, analgesic and anti-oxidant properties; enzymes inhibitors, vascular, oestrogenic, cytotoxic antitumor, anti-spamodic and anti-diarrhoeic activities, anti-dysentery and infectious diseases, hepatoprotective and anti-fungal agents. Flavonoids are known to exhibit a wide range of biological activities one of which is either ability to scavenge for hydroxyl radicals and superoxide anions radicals and thus health promoting in action. It was also observed that the presence of phytochemical in qualitative and quantitative signifies the important role which they play in plants and in animal. Themineral composition shows that sodium (Na), potassium (K), Calcium (Ca), Magnesium (Mg), Zinc (Zn), Iron (Fe), Lead (Pb), Copper (Cu) and Manganese (Mn) are present in leaf and bark. For leaf, themineral Iron, zinc, Magnesium are present in large quantity while Calcium, Phosphorous, Sodium, Manganese, Lead and copper are present in lesser quantity.

There are moderate amounts of alkaloids in the leaves and bark of *Ceiba pentandra* in Table 8. Pure isolated alkaloids and the synthetic derivatives are used as the basic medicinal agents due to their analgesic improve wound healing an inflamed mucus membrane (Stray1998). The study showed moderate amount of Tannin in both leaf and bark extracts supporting the strong use of *Ceiba pentandra* in healing wounds, various ulcers and burns in traditional herbal medicine. The tannins, flavonoids and the alkaloids as seen in the results give...
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The nutrient proximate composition of Ceiba pentandra extracts (leaf and bark) shows that ash content, crude protein, fat, fibre, carbohydrate, were present in Ceiba pentandra leaf and bark according to Harborne 1999. Carbohydrates are hydrolyzed in the body to yield glucose, which can be utilized immediately or stored as glycogen in the muscles and liver for future use. Proteins are body builders, they replace worn out tissues, and proteins are also immune booster and can help in cell division as well as growth. Fats are important in energy production. Also, fats and oils help to regulate blood pressure of vital cell parts. Moisture is a universal solvent. It dissolves other substances, carries nutrients and other materials round the body, creating the possibility for organs to perform their function effectively. Fibers are parts of fruits, grains and vegetables which can neither be digested nor absorbed by human system. They reduce the levels of palm cholesterol and prevent colon cancer and cardiovascular disease.

The experiment indicates that Ceiba pentandra is useful in the treatment of cardiovascular disorders, stomach-ache, diarrhoea, ulcer, bronchitis fever, menstrual irregularities, headache, hepatitis, malaria and measles.

The bark and leaf extract also contained vitamins C and E and can help repair free radical damages to the cells. The presence of a molecule suggests that Ceiba pentandra can be used as vitamin supplement.

Conclusion

Ceiba pentandra is an important medicinal plant with diverse traditional uses and broad pharmacological spectrum; almost all morphological parts of Ceiba pentandra indicated the presence of many chemical constituents which are attributed for the varied pharmacological and traditional properties of the plant. Result of the phytochemical screening is also useful for further investigation of biological activity of the plant according to the presence of phytochemical group.

Recommendations

It is therefore recommended that much consideration should be into Ceiba pentandra plant as it has so many usefulness much especially for treatment of infections. The use of Ceiba pentandra should be encouraged.

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Conflict of interest

The author declares no conflict of interest.

References


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