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Parka Biglolosa Plants Parts: Phytochemical, Antimicrobial, Toxicity And Antioxidant Characteristics.

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ABSTRACT

Parkia biglobosa plant seed husks and stem bark obtained in keffi, Nasarawa state, Nigeria, were screened for its phytochemicals, antimicrobial, toxicity and antioxidant characteristics. Carbohydrates, saponins, flavonoid, phtobatannin were found present. The crude extract of seed husks has no inhibitory activity at minimum inhibitory concentration (MIC) of 2.0mg/cm^3 on any of the micro-organisms but the bark has inhibitory activity on *Candida albicans, Escherichia coli*, *Bascillus Subtilis*, and plasmodium species. The LC_{50} of 4.613 and 3.732 were found for the seed husk and bark respectively. The antioxidant characteristics measured as % Ascorbic acid were determined to be 80.54 and 90.70 for the seed husk and bark respectively. This does not compare favourably with a standard antioxidant, ascorbic acid (93.7%).

Key words: Phytochemical, antimicrobial, toxicity, antioxidant.

1. INTRODUCTION

Parkia biglobosa belong to the family Fabaceace – pea family, of the order Fabaceae, it is popularly known as the Africa locust bean, Dorawa (Hausa) and Origili (Ibo) .The fermented seeds of *Parkia biglobosa* are used in all parts of Nigeria and indeed the west coast of Africa for seasoning traditional soups. The yellow pulp is a high energy giving food with up 60% sugar (Camp – bell 1980). The trees are often grown as shade trees. Parkia species have found use traditionally as food and medicinal agent. The bark is employed in wound healing, treatment of bronchitis, pneumonia, skin infection, gores, ulcer, bilharziasis, malaria, diarrhea and hypertension. In Gambia, the leaves and roots are used in preparing a lotion for sore eyes. A decoctions of the bark of *P. biglobosa* is also used as a bath for fever and as a hot mouth washes to steam and relieve toothache. The pulped bark used along with lemon for wound and ulcer. Fibres from pods and root are used as sponges and as string for musical instrument (Campbell, 1980). The powdered pods are used to paint traditional Hausa buildings in northern Nigeria. Parkia plants have been identified as source of tannin, saponins, gum, fuel and wood. Seeds of various species of Parkia have also been investigated for their protein and mineral content (Fetuga *et al.*, 1974)

2. Experimental:

2.1 Preparation of the plant

Parkia biglobosa seed husk and stem bark were obtained in Keffi, Nasarawa state, Nigeria and identified in National Institute for Pharmaceutical Research and Development Idu (NIPRD), Abuja, Nigeria. Samples were cleaned and air dried for some weeks. The seed husk was obtained by boiling the seed for two hours the extract concentrated on a water bath. The bark was pulverized. Samples were then air dried to constant weight for 3-6hrs cooled in desiccator and stored before analysis.

2.2 Extraction

The powdered stem-bark and seed husk of *P. biglobosa* were extracted with methanol in a soxhlet extractor as described by Furniss *et al.,* (1978) for 3hrs at solutes: solvent ratio of 1:10 w/w. The solvent was removed from extract by distillation using rotatory evaporator and extract transfer to an evaporating dish and dried on a water bath.

2.3 Phytochemical studies

Phytochemical screening for major constituents present in the seed husks and stem bark was carried out using the standard methods (Trease and Evans 1989; Harbone, 1992).

2.4 Antimicrobial screening using the Agar diffusion method

The Bauer and Kirby (1996) and Ericson (1960) disc diffusion method was used to determine the antimicrobial activity of the plant extract on these micro-organism: *Staphyllococcus aureaus, Bascillus subtilis, Escherichia coli, Pseudomonas, Candida albicans, Salmonella typhi*. The zones of inhibition and minimum inhibitory concentrations were measured using a transparent ruler using the interpretation chart of Kirby – Bauer (1996) Sensitivity test method (Omenka, 2000). Controls were maintained in dimethyl sulphoxide.

2.5 Toxicity Test:

The test was carried out on the extracts of seed-husk and stem-bark using Brine shrimp lethality bioassay (Meyer, *et al.,* 1982). The data obtained were subjected to analysis to determine the LC_{50}.

2.6 Antioxidant Analysis

Antioxidant, free radical scavenging assay of the plant extracts at 250 µg/cm^3 was evaluated using the 1,1-diphenyl-2-picryl hydrazyl (DPPH) assay at 518nm (Mensor *et al.,* 2001;Aderogba *et al,* 2004). It was calculated using the formular:

$$AA\ \% = 100 \quad \frac{\text{Absorbance of sample - Absorbance of blank}}{\text{Absorbance of control.}}$$

The result is expressed as mean ± standard error of the mean (SEM).

3. RESULTS

The phytochemicals present in seed husk extract are: carbohydrate, saponin, flavonoid, terpenes, sterols and cardiac glycoside. Those present in stem-bark extract are: tannin, anthraquinone, flavonoid and phlobatannin. The seed-husk extract shows no inhibition on growth of any micro-organisms but stem-bark extract inhibit growth of *Candida albicans*, *Escherichia coli*, *Bascillus subtilis* and *Pseudomonas species* at minimum inhibitory concentration of 2.0mg/cm^3 respectively.

Table 1: Physical parameter obtained from *Parkia biglobosa* extracts.

Test Performed on crude Extract	Seed-husk	Stem bark
Appearance	Black	Brown
Percentage Recovery (%)	14.5	4.0
Melting Point(^{0}C)	120-122	111-121

Table 1 show that the percentage recovery of the decoction from the seed-husk is 14.4 which is higher than the stem-back decoction (4.0).

Table 2: Toxicity and antioxidant activity test on *Parkia biglobosa extracts.*

Name of extract	Seed husk	Stem- bark
LC_{50} µg/cm^3 at 95% confidence interval	4.613	3.732
Antioxidant activity(Conc. µg/cm$^{3)}$	250	250
% Ascorbic Acid	80.54	90.70

4.0 DISCUSSIONS

4.1 Phytochemical characteristics

The phytochemical components present in *P. biglobosa* seed husk extract are carbohydrate, saponin, flavonoid, terpenes, sterols and cardiac glycosides while those present in stem-bark extract are tannin, anthraquinone, flavonoid, and phlobatannin. These are secondary constituents of natural products. Biological actions are due to these phytochemicals. Phytochemicals contribute to optimal health and lack of it lead to disorders called phytochemical deficiency disorders. The phonological age of the plant, percentage humidity of the harvested

materials, geographical location, climatic and soil conditions, time of harvest and method of extraction are possible source of variation for the chemical composition, toxicity and bioactivity of the extracts (Felix, 1982).

4.2 Antimicrobial activity

Antimicrobial activity shows that the seed-husk extracts have no inhibitory effect on the growth of all the micro-organism under investigation. This is because most of the bioactive secondary metabolites are absent in the extract. The seeds of *Parkia* species are used for food seasonings which are obtained by boiling and fermentation of the seeds (called ''dawadawa'' in Hausa and Iru in Yoruba. (Odunfa, 1981) identified the microbes associate with Iru fermentation as *Salmonella. hominis, Salmonella saprophytoccus*, *Xylolus and B. subtilis* therefore seed-husk extract cannot inhibit the growth of micro-organisms. The *P. biglobosa* stem-bark extract showed sensitivity on *C. albicans, B. subtilis, Pseudomonas* species and E. coli with the minimum inhibitory concentration (MIC) of 2.0 mg/cm^3. This is because the stem-bark contains phytochemicals such as tannin, flavonoid, anthraquinone and phlobatannins, (Thomas and Githens, 1989).These micro-organisms which the stem-bark extract have inhibitory effects on are causative agents of most illness for which the plant are traditionally reported to remedy. Tannins, flavonoids and phenolic compounds have been the major phytochemicals associated with antioxidant activity of medicinal plants, it prevents oxidative cell damage, lowers the risk of heart diseases (Okwu and Okwu, 2004) and protect against allergies, inflammations, micro-organisms, ulcers, viruses and tumours (Okwu and Omodamiro,2005; Trillini, 2000; Okunade, 2002). Tannins are antiseptic, have astringent properties and hasten the healing of wounds in an inflammed membrane as the wounds are free from attack of parasitic fungi, insects and yeasts infections. Therefore the extract of stem-bark used as antimicrobial for the cure of various ailments traditionally is justified.

4.3 Toxicity and antioxidant activity.

Toxicity test results (Table 2) based on brine shrimp lethal concentration detects substances that are cytotoxic enough to kill shrimps larvae on exposure to solution of the sample (Fatope, 1995) The extent of the toxicity of the extract which is bioactive is estimated using lethal concentration, LC_{50} value of the total mortality of the brine shrimp larvae. The lower the LC_{50} in µg/cm^3 the more toxic to microorganisms (more efficacious as drugs) it is. The low LC_{50} 3.53 of *P. biglobosa* stem bark extract signifies that it could be effective in controlling and inhibiting growth of micro-organisms as shown in its traditional uses as antimicrobials. The seed husk has high LC_{50} 4.613 and so could not inhibit growth of micro-organisms. Antioxidant activity of the extract (Table 2), indicates that the antioxidant activity of the extract of seed husk and stem-bark is 80.54 and 90.70 respectively and is low compared with a standard antioxidant agent ascorbic acid with %AA =93.7%. This shows that the natural antioxidant present in these extracts are not in enough quantity as to enable it acts as antioxidant which can effectively scavenge free radicals in system (Quettier-Dellen *et al,* 2000; Del Rio *et al,* 1999). The antioxidants stimulate the human system and induce protective enzymes in the liver or block damage to genetic materials thereby leading to healthy living. The difference in the value of the antioxidant activity of *P. biglobosa* stem-bark is insignificant when compared with the ascorbic acid and this contributes to the reason why the stem-bark extract could inhibit the growth of some micro-organisms. This further confirms that the stem-bark extract could be an effective antimicrobial agent.

5.0 CONCLUSION

These research confirms that the traditional medical use of stem-bark extract in treatment of fever, relieve of toothache, ulcers, and wound healing is justified and should be continued. The inhibitory activity of micro-organisms, toxicity and antioxidant characteristics of these extracts give promise to their potential application in the treatment of microbially induced disease conditions.

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