

Determination of phytochemicals and antimicrobial screening of leaf of *Chrysophyllum albidum* (linn).

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Abstract. *Chrysophyllum albidum* plant leaf was screened based on the acclaimed medicinal properties of the plant. Organoleptically, the pulverized leaf of the plant has greenish colouration, soft and fine texture, bitter in taste and has a spicy odour. Phytochemical screening indicated the presence of alkaloids (2.92%), saponins (11.33%), flavonoids (10.83%), terpenoids (2.15%), cardiac glycosides (1.83%) and tannins (2.42%). The plant contains trace metals as determined using Atomic Absorption Spectrometer. Calcium (2.50ppm), potassium (110.50ppm), sodium (0.36ppm), zinc (0.80ppm), iron (3.90ppm), and phosphorus (17.60ppm) were present in various concentrations. The aqueous extract of the plant leaf is slightly acidic (5.40) and ash content of 6.500. Bulk extract, saponins, alkaloids. And saponins extracts of the plant has activities on test organisms except saponins and flavonoids which have no activity on *Aspergillus niger*. These activities affirmed the acclaimed use of the plant for medicinal purposes.

Keywords: *Chrysophyllum albidum*, Antimicrobial, leaf, medicine, phytochemical.

INTRODUCTION

When a plant is designated as “medicinal”, it means that the plant is useful as a drug or therapeutic agent or an active ingredient of a medicine. Over 90% of the World’s population still rely on plant species for food, medicine, fodder and wood uses (Nfotabong-Atheull *et al.*, 2011; Vodouhe *et al.*, 2009 1,2). Among the numerous varieties of plant used by ethnomedical doctors is *C. albidum* (Udara

Chrysophyllum albidum is a dominant canopy tree of lowland mixed rain forest tree species which can reach 35 to 27m in height at maturity with a girth varying from 1.5 to 2m (Orwa, et al., 2009 3).

Some ethnobotanical studies on non timber forest products (NTFP’s) species have mentioned *C.albidum* as used by local communities for medicinal and food purposes(Leaky, 1991; Odugbemi *et al.*, 2001 4,5). Adu-boad, (2009)6] mentioned the medicinal value and nutritive value of various parts of *C.albidum*. The bark of the plant is locally used in healing coughing, icterus, and yellow fever while the leaves were employed to treat malaria, high blood pressure, and anemia. In southern Nigeria, it was reported that the bark was used to treat yellow fever and malaria, while the leaves was used as emollient and for treatment of skin eruption, stomachache, and diarrhea (Adisa,2000; Idowu et al., 2006 7,8). In this study, the bioactive component of *C.albidum* was evaluated.

MATERIALS AND METHODS

Plant collection, identification and preparation.

Leaf of *C. albidum* was harvested from the farmland near Orakwue's compound in Unubi, Nnewi south local Government Area of Anambra State, Nigeria in April 2015. It was identified by Prof J.C. Okafor of Trees ,crops and Tropical Center Enugu, as *Chrysophllum albidum*. Fresh leaves of *C. albidum* were collected, washed with clean water, shed dried and pulverized to powder using a mechanical grinder. The powdered sample tested organoleptically and then stored in airtight container ready for analysis.

Extraction

10g of the powdered leaf sample was introduced into a beaker and macerated in 200ml of ethanol for 24hrs. The extraction was repeated for exhaustive extraction. Filtration was done using Whatman No1 filter paper and the filtrate concentrated to 1/3 rd of the original volume using water bath at temperature of 40oC.

Determination of Phytochemicals.

The leaf crude extract presence of alkaloids, flavonoids, saponins, tannins, terpenoids, and glycosides using standard methods (Harborne, 1984; Alinor, 2007; Ogukwe et al., 2004) [9-11].

Antimicrobial Assay

The antimicrobial activities of the bulk, saponins , alkaloids, and flavonoids extracts were determined using the disc diffusion method (Ericson et al., 1960; Akinleye and Fabon, 1997) [12, 13].

Trace metal analysis

The crude extract of the leaf of *C.albidum* was subjected to trace metal analysis using Atomic Absorption Spectrometer (AAS).

RESULTS AND DISCUSSIONS

The results of organoleptic properties, quantitative and qualitative phytochemical analysis, trace metal composition, and antimicrobial assay of the leaf of *C. albidum* were shown in tables 1-5.

Table 1: Result of the organoleptic properties, ash content and pH of leaf of *C. albidum*

Parameter	Observation
Colour	Greenish
Texture	Soft and fine powder
Taste	Bitter
Odour	Spicy
Ash content	6.50%
pH	5.40

Table 2: Result of phytochemical screening of the ethanol leaf extract of *C. albidum*.

Phytocompound	Inference
Alkaloids	++
Saponins	+++
Flavonoids	+++
Terpenoids	+
Cardiac glycosides	+
Tannins	+

Key: + = Lightly present
++ = Moderately present
+++ = Highly present

Table 3: Result of quantitative analyses of the phytochemicals present in the leaf of *C. albidum*

Phytocompound	Value(%)
Alkaloids	2.92
Saponins	11.33
Tannins	0.53
Flavonoids	2.24
Terpenoids	2.15
Cardiac glycosides	1.83

Table 4: Result of trace metal analyses of the leaf of *C. albidum*

Element	Concentration(ppm)
Calcium	3.50
Potassium	110.50
Sodium	0.35
Zinc	0.80
Iron	3.90
Phosphorus	11.60

Table 5: Result of antimicrobial screening of the leaf of *C. albidum*.

Microorganism	Bulk extract(mm)	Saponins(mm)	Alkaloids(mm)	B lank
<i>Salmonella gallinarum</i>	1.60	0.88	0.52	NA
<i>Staphylococcus aureus</i>	13.00	6.30	10.98	NA
<i>Pseudomonas aeruginosa</i>	11.86	7.85	4.70	NA
<i>Escherichia coli</i>	10.35	6.00	5.00	NA

NA = No inhibitory action.

The results of the phytochemical compositions of the leaf of *C.albidum* shown in Table 2 and 3 indicate that the leaf of *C. albidum* has higher concentrations of saponins, flavonoids, and alkaloids and lower concentrations of tannins, cyanogenic glycosides, and terpenoids. Flavonoids have anti-allergic, anti-inflammatory, analgesic anti-oxidant activities. This is in conformity with the earlier report that the leaf of *C.albidum* possesses analgesic, anti-inflammatory, and venotonic effects associated with hemorrhoids. Anti-inflammatory activities are due to flavonoids, especially luteoline and β -sitosterol (Panthong et al., 2007)[14]. Saponins have antibacterial and anti-fungal properties. Its high percentage in the leaf of *C.albidum* has shown why it is used in the treatment of increased blood cholesterol and is beneficial to patients with arteriosclerosis and hypertension. Analgesic and anesthetic activity of the plant leaf is attributed to the presence of alkaloids in the plant as Harborne et al. (1988)[15] reported the anesthetic and analgesic properties of alkaloids. *Chrysophyllum albidum* is used in heart treatment due to the presence of cardiac glycosides it contains. Cardiac glycosides are naturally cardio active drugs used in treatment of congestive heart failure and cardiac arrhythmia (Brain et al 1985)[16].

The trace metal analyses of the plant as shown in Table 4, indicated the presence of potassium, calcium, zinc, sodium, iron, and phosphorus. The calcium content shows that *C.albidum* has bone healing and anti osteoporotic activities as was cited, and functions by increasing the early regeneration of bone tissues in fractured bones and increases bone density in osteoporotic condition. Potassium which has the highest concentration (110.50ppm) in *C .albidum* leaf helps the kidney to function normally. It plays a key role in skeletal and smooth muscle contraction, making it important for normal digestion and muscular function too. Presence of phosphorus (17.60ppm) in the plant leaf shows its importance in the synthesis of nucleic acids, ATP, and some proteins while zinc plays an important role in various cell processes which include normal growth, brain development, bone formation, and wound healing (Jaben et al., (Jabe[17].

The antimicrobial activities of the leaf of *C. albidum* against eight pathogens is

summarized in Table 5. It shows that ethanol extract of *C. albidum* leaf inhibited the growth of test organisms. The highest activity was on *Bacillus subtilis* (13.25mm) and least on *Salmonella gallinarium* (1.60mm). Saponins has the highest activity on *Bacillus subtilis* (9.70mm), least on *Salmonella gallinarium* 0.88mm), and no activity on *Aspergillus niger* (NA). Alkaloids have the highest activity on *Staphylococcus aureus* (10.98mm) and least on *Salmonella gallinarium* (0.52mm). Flavonoids have the highest activity on *Pseudomonas aeruginosa* (9.50mm), least activity on *Salmonella gallinarium* (0.40) and no activity on *Aspergillus niger* (NA). The highest activity observed in the bulk has shown the synergic effects of secondary metabolites in the treatment of diseases.

CONCLUSION

This research work has shown that *C.albidum* leaf contains vital secondary metabolites which work in synergy to prevent and cure diseases. The trace metals promote the proper functioning of the human systems.

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