



Extraction, Characterization and Anti-Microbial Activity of *Artocarpus heterophyllus* Seed Oil

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Abstract *Artocarpus heterophyllus* oil was extracted from its seed. The percentage yield was 4.99%. The characterization of the oil showed that the peroxide value is 6.4mg/kg; iodine value is 54.42g, saponification value is 149.00 KOH/g, specific gravity is 0.908, pH value is 4.20 and acid value is 5.4mg/KOH/mg. Punch Agar diffusion method was used to analyses the Antimicrobial properties of the oil. Antimicrobial activity shows some inhibitory effects against the test organisms; *Staphylococcus aureus*, *Atopic dermatitis*, *Malassezia globsin*, *Trichophyton microsporum* and *Propionibacterium* and minimum inhibitory concentration of the *A. heterophyllus* seed oil on these micro-organisms are as follows: 100, 00mg/ml, 50,000mg/ml, 30,000mg/ml, 20,000 mg/ml and 30,000mg/ml. respectively. Maximum bacterial concentration (MBC) are; *S. aureus* 500,000 mg/ml; *A. dermatitis* 120,000mg/ml; *M. globsin* 100,000mg/ml; *T. microsprum* 60,000 gm/ml and *P. bacterium* 80,000mg/ml respectively. Pharmacological screening confirmed the medicinal value of this seed oil.

Keywords Extraction characterization, *A. heterophyllus* oil, fungi, bacteria MIC and MBC.

Introduction

Artocarpus heterophyllus (Jackfruit) (Waleja, 1994) is specie of the tree in the *Artocarpus* genus of the melbery family. It is native to parts of southern and southeast Asia. It is widely cultivated in tropical regions of Indian subcontinent, Srilanka, Vietram, Malaysia and Indonesia. Jack fruit is also found in East Africa e.g. in Uganda and Mauritius, as well as throughout Brazil ad Carribean nations born fruits [1] reaching 36kg in weight and up to 90cm long and 20 inches in diameter [2]. Ripe Jack fruit is naturally sweet with subtle flavouring. It can be used to make a variety of dishes, including custards, cakes, etc. *A heterophyllus* wood is used in the manufacturing of furniture, doors and windows and roof construction. The heartwood of the Jack fruit tree is used as dye in dyeing the robes of the monks. This gives them their distinctive light brown colour [3].

The seed starch is given to relieve biliousnous and the roasted seeds are regarded as aphrodisiac,. The ash of Jack fruit leaves burnt with corn and coconut shells is sued alone or mixed with coconut oil to cure or heal ulcers. The dried latex yields actosterone, a compound with marked androgenic action. Mixed with vinegar, the latex promotes healing of abscesses, snake bite and glandular swellings. The root is a remedy for skin diseases and asthma. An extract of the root is taken in case of fever and diarrhea. The wood has a sedative property, its pith is said to cause abortion [4]. The alkaloids and flavonoids in this seed were preliminary characterized. The analysis portrayed the fact that *A. heterophyllus* seed contains these alkaloids; Quinine, tomatine and nicotin respectively [5]. These are wonderful alkaloid that can be used in the eradication of some disease causing germs. The analysis also revealed that the seed contains Myricetine, kaempferol, gossypetine, quercetine and isoliamnetine as the major types of flavonoid present in it [6]. Qualitative and quantitative phytochemcial analysis of *A. heterophyllus* seeds indicated the presence of alkaloids 0.55±0.012%; flavonoids 0.41±0.02%; tannin 0.240±0.001%; saponins 2.74±0.02%; phenol 0.08±0.001%; HCN 11.58±0.06%; protein 4.61±0.104;



crude fiber 3.29 ± 0.09 ; phytate 0.18 ± 0.001 and fat 4.97 ± 0.05 . Elemental analysis of seeds of *A. heterophyllus* portray the presence of Na $18.93 \pm 0.46\%$; Ca $17.37 \pm 2.32\%$; Mg $8.00 \pm 0.46\%$; Ca $17.37 \pm 2.32\%$ and K 205.30 ± 0.46 . The crude extracts of the seeds were found to inhibit the eight test bacteria and four test fungi. The eight test bacteria are: *Staphylococcus aureus*; *Bacillus subtilis*, *Streptococcus pyogenes*, *Listeria monocytogenes*, *Escherichia coli*; *Pseudomonas auregenosa*, *Klebsiella* and *Salmonella typhi*. The four test fungi are *Penicillium*, *Aspergillus niger*, *Fusarium oxysporum* and *Candida albican* [5]. In this present research, the author aims at extracting and characterizing *A. heterophyllus* seed oil. The crude oil will be used to inhibit five micro-organisms that attack the skin. The aim of this research is to find out the quantitative value of the phytochemicals present in the seeds and to analyze the effect of the seed extracts on some pathogenic micro-organisms.

Methodology

Sample collection and preparation:

The seed were collected under *A. heterophyllus* tree growing at umuabu village, adazi-enu in Anaocha local government Area of Anambra State. The soft coat was removed to obtain the seed. The seeds were washed, cut into small pieces and dried under the air and mild sun for three weeks. The seed was then ground or blended into powder and stored in polyethylene bottle until needed for analysis. The oil was extracted using soxhlet apparatus and normal hexane as the solvent. The oil was oven dried to remove the solvent. Characterization of the oil was done using the standard analytical methods [7]. The antimicrobial activities of *A. Heterophyllus* seed oil was determined by agar well diffusion method [8]. The zone of inhibition was recorded to the nearest size in cm.

Results and Discussion

Table 1: Some physical and chemical characteristics of *A. Heterophyllus* seed oil

Parameter	Inference
Saponification value	149.00 KOH/g
Iodine value	54.42g
Peroxide value	6.4mg/kg
Acid value	5.4
Specific gravity	0.908g
pH @ 10% dilution	4.20
% yield of oil	4.99%

Lipid Content of 4.99% per 100g

Oleic acid	0.66g
Stearic acid	0.62g
Carboxylic acid	0.57g

Table 2: Result of anti-bacterial activity of *A. heterophyllus* seed oil on two bacteria

Test organisms Bacteria	Vol (ml)	Zone of Inhibition	Negative
<i>S. aureus</i>	0.05 0.40	2.7 0.1	NA
	0.10 0.60	3.0 0.2	NA
	0.20 0.80	4.1 0.3	NA
	0.30 1.00	6.0 0.5	NA
<i>A. dermatitis</i>	0.10	0.2	NA
	0.30	0.9	NA
	0.40	1.5	NA
	0.50	3.0	NA



Table 3: Result of anti-fungal activity of *A. heterophyllus* seed oil on three test fungi

Test organism Fungi	Vol (ml)	Zone of Inhibition (cm)	Negative control (50%)
<i>T. Microsporium</i>	0.05	2.7	NA
	0.10	3.0	NA
	0.20	4.1	NA
	0.30	6.0	NA
<i>M. globosin</i>	0.05	1.8	NA
	0.10	2.0	NA
	0.20	3.3	NA
	0.30	0.5	NA
<i>P. bacterium</i>	0.05	1.0	NA
	0.10	2.6	NA
	0.20	4.0	NA
	0.30	5.0	NA

Discussion

The percentage yield of the oil extracted with n-hexane for *A. heterophyllus* seed is very much lower than the 12.00+ 0.28% obtained by Akubugwo et al [9] but it is however higher than 1.42+0.03% and 2.56% reported for seeds of *Piliostima thonningii* and *C. albidium*—other under exploited plants found in Nigeria [10-11]

The specific gravity of the oil is 0.908g. This value compare with 0.82 and 0.84 reported for pulp and seed of *Dacryodes edulis* [12]. The physical and chemical properties of *A. heterophyllus* seed oil is shown in table 1. Peroxide value of 6.4mg /kg was obtained. The peroxide value is used as an indicator of deterioration of oils. Fresh oils have values less than 10meq kg⁻¹, Values between 20 and 40 result to rancid taste [9]. The iodine value is also an index for assessing the ability of an oil to go rancid [13]. The iodine value obtained (54.42) indicate that the oil contains appreciable level of unsaturated bonds. Storage procedure used should ensure protection of oil from oxidative deterioration. Saponification value is used in checking adulteration. The high value recorded for *A. heterophyllus* seed oil is an indication that it has potential for use in the industry. The acid value for *A. heterophyllus* seed oil is 5.4.

Table 2 and 3 portray the result of antimicrobial activity of *A. heterophyllus* seed oil on two bacteria and three fungi. The tables show that at 0.05-0.3ml volume the oil indicates good inhibitory effect on the four test micro-organisms. These are *A. dermatitis*, *T. microsporium*, *M globosin* and *P. bacterium*. The oil indicates good inhibitory effect because the inhibition zone is up to 12mm (1.2cm) and above *A. heterophyllus* seed oil showed minimal inhibitory effect on the micro-organism –*S. aureus*. This is because at 0.1-0.3ml volume, the zone of inhibition recorded less than 12mm (1.2cm). 50% pure ethanol used as control shows no action on all the test micro-organisms.

Conclusion

A. heterophyllus seed oil portrays good quantitative estimates of some physical and chemical properties of oil. This is an indication that the *A. heterophyllus* seed oil could be used effectively for industrial purposes. The anti-microbial screening of the oil exposes the fact that at 0.1ml, *A. heterophyllus* seed oil can inhibit these micro-organisms effectively; *T.microsporium*, *M. globosim* and *P. bacterium*. At this same volume, the oil shows minimal effect on two miro-organisms; *S. aureus* and *A. dermatitis*. At higher volume 0.4-0.5ml, the oil inhibitaed *A. dermatitis* effectively. *A. heterophyllus* seed oil could also be used for medicinal purpose

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