

## COMPARATIVE EVALUATION OF PHYTOCHEMICAL AND ANTIMICROBIAL ACTIVITIES OF *ELAEIS GUINEENSIS* TUSKS, *MUSA PARADISIACA* PEELS AND POTASSIUM CARBONATE ON BACTERIA ISOLATE FROM FERMENTED *PENTACLETHRA MACROPHYLLA* SEEDS

Kemka-Evans, C.I., M.O. Ngumah, C.U. Nwachukwu and N. Ugochukwu

Alvan Ikoku Federal College of Education, Owerri. Imo State.

### Abstract

The aqueous and soxhlet extracts of the *Elaeis guineensis* (palm tree) tusks, *Musa paradisiaca* (plantain) peels and potassium carbonate (potash) were screened for the presence of phytochemicals and their antimicrobial activities against the bacteria isolate from fermented *Pentaclethra macrophylla* seeds investigated. The bacteria isolates were *Bacillus* sp. and *Streptococcus* sp. The extract showed secondary metabolites such as tannins, saponin, anthranoid, anthraquinone, phenol, alkaloid, phylobatannins and cardiac glycoside. The extracts inhibited the growth of the bacteria isolates. The zones of inhibition exhibited ranged from 7mm -8mm in *Musa paradisiaca* peels extract, 7mm – 8mm in *Elaeis guineensis* tusk extract and 7mm – 8.5 in potassium carbonate extract. The antimicrobial activities of these extracts probably justifies their use in the preparation of certain foods like “African salad” which is a meal prepared with *P. macrophylla* seeds in the South East region of Nigeria. The outcome of this work suggest that *Musa paradisiaca* peels and *E. guineensis* tusk be used in the preparation of *P. macrophylla* seeds other than the more conventional method of using potassium carbonate in the South East region of Nigeria.

**Key Words:** Antimicrobial, Phytochemicals, Bacteria isolates, *Musa paradisiaca*, *Musa paradisiaca*, *Pentaclethra macrophylla*, African salad.

### INTRODUCTION

Palm tree tusks is obtained from processing what is left of the fruit after the seed of the oil palm tree (*Elaeis guineensis*) have been removed. The powder of the palm tree tusks or plantain peels are used with the seeds of *Pentaclethra macrophylla* in the preparation of a local dish known as “African Salad” in South East Nigeria. The local dish is a delicacy and of high nutritional value. It serves as an appetizer and is usually used in any important occasion.

The antimicrobial effect of palm tree (*E. guineensis*) have been reported by many workers. They reported that lauric acid oil extract from palm kernel seed had inhibitory effect on the growth of two bacteria isolates and *Candida albicans* [11]. It has been observed that the crude methanol, acetone and water extracts of leaves and pits of three varieties of *Phoenix dactylifera* had antimicrobial inhibitory effect against selected Gram positive and Gram negative pathogenic bacteria [7]. [2] reported antimicrobial activity of plantain peel against *Staphylococcus* bacteria. The local dish “African Salad”, although a highly valued dish in South East Nigeria needs careful preparation. Poor preparation of the dish causes stomach ache and if not well treated results to dysentery. This paper reports the antimicrobial effect of palm

tree tusks and plantain peels on the bacterial isolates (*Streptococcus* sp. and *Bacillus* sp) from *Pentaclethra macrophylla* seeds and its use in place of potassium carbonate for food preparation.

### MATERIALS AND METHODS

The plant materials of palm tusk and plantain were collected from Ikeduru in Imo State, Nigeria and dried under shade for two weeks. The samples were then pulverized into powder using manual grinder sterilized with 77% ethanol. The Potassium carbonate (potash) pellets were bought from the market and grounded into powder. The extraction was done using soxhlet extraction method as described in AOAC (1980). Twenty grammes of each of the samples were separately filled into different thimbles and 200ml of ethanol was placed in the flat bottom flask and soxhlet extraction set-up left for about one hour after which the extract was recovered from the ethanol. The extracts were used for antimicrobial testing against the bacterial isolates from fermented *Pentaclethra macrophylla* seeds. The extracts were subjected to phytochemical analysis. Anthranoid, Anthraquinone and phylobatannins were screened using the method of [10]. Phenol, Alkaloid and Tannins were screened

using the method of [4]. The Salkowski test was employed in the screening of Cardiac Glycosides. The agar diffusion (disc diffusion) method as described by [8] was adopted to evaluate the antimicrobial activity of the agents. The plates were approximately labeled and disc impregnated with ethanol served as control. The plates were then inoculated at 37°C for 24 hours. At the end of 24 hours, the zones of inhibitions were measured with a metre rule.

## RESULTS

The results of the antimicrobial activities of the soxhlet extracts and aqueous extracts of palm tusk, plaintain peels and potassium carbonate against the bacteria isolates from *Pentaclethra macrophylla* seeds were shown in table 1. The bacteria isolates are *Streptococcus spp.* and *Bacillus spp.* Table 2 shows the results of the phytochemical profile of the palm tusk, plaintain peels and potassium carbonate.

**Table 1: Antibacterial Activity of the Soxhlet and Aqueous Extracts of Palm Tusks, Plaintain peels and Potassium carbonate.**

Antibacterial agent	Test Bacteria	
	<i>Streptococcus spp.</i>	<i>Bacillus spp.</i>
Soxhlet Palm Tusk Extract	8.0 mm	-
Aqueous Palm Tusk Extract	7.0mm	-
Soxhlet Plaintain Peels Extract	8.0 mm	-
Aqueous Plaintain Peels Extract	7.0 mm	-
Soxhlet Potassium Extract	8.5 mm	8.0mm
Aqueous Potassium Extract	7.0 mm	7.0 mm

**Table II: Phytochemical Screening of Soxhlet and Aqueous Extracts of Potassium carbonate, Palm tusk and Plaintain Peels.**

Phytochemical Test	Sox. PA	Aq. PA	Sox. PL	Aq. PL	Sox. A	Aq. A
Anthranoid	-	+	+	+	+	-
Anthroquinone	+	-	+	-	-	-
Phenol	+	+	+	+	-	+
Alkaloid	-	-	-	-	+	-
Tannins	+	+	+	+	-	+
Phylobatannins	-	-	-	+	+	+
Saponins	-	+	+	+	+	+
Cardiac Glycoside	+	-	+	-	+	-

### Key

Sox. A : Soxhlet Potassium Extract  
 Aq. A: Aqueous Potassium Extract  
 Sox. PL: Soxhlet Plaintain Peels Extract  
 Aq. PL: Aqueous Plaintain Peels Extract  
 Sox. PA: Soxhlet Palm Tusk Extract  
 Aq. PA: Aqueous Palm Extract

## DISCUSSION

The results of the antimicrobial activities of the extracts showed that the test bacteria (

*Streptococcus spp.* and *Bacillus spp.*) were susceptible to the agents. The soxhlet extract of Potassium carbonate shows the highest

antimicrobial effect on the test bacteria. *Bacillus* spp was more resistant to the antimicrobial agents showing susceptibility only to the soxhlet and aqueous extracts of Potassium carbonate. The soxhlet extracts and aqueous extracts of both the plantain peels and palm tusks show similar effects against *Streptococcus* spp. (8.00mm and 7.0mm zones of inhibition) respectively. The antimicrobial activity of plantain peels (*Musa paradisiaca*) has been reported by previous investigators. This work is in line with [2] who reported antimicrobial activity of plantain peel against *Staphylococcus aureus* and *Pseudomonas* spp. The soxhlet extracts recorded more inhibitory activity than the aqueous extracts, this could be because alkaloid which is reported to have the most efficient therapeutic significance [9] and is more readily extracted by ethanol.

Moreover, other phytochemicals also dissolve readily in ethanol due to its volatility [1]

The phytochemical screening results also show that the agents possess phytochemicals. The plantain peel (*Musa paradisiaca*) extracts had the highest number of phytochemicals except alkaloid and phylobatanins. Soxhlet extract of potassium carbonate was the only agent that had alkaloid and this may have contributed to

the highest antibacterial activities obtained with this extract.

The work therefore suggests that although potash, palm tusk and plantain peels are used in culinary purposes mostly in preparing fermented *Pentaclethra macrophylla* "ugba" seeds partly due to their saponification effects, these agents also have antibacterial activities on some pathogenic bacteria (*Streptococcus* spp) found in ugba.

The antibacterial activities of the extracts of potassium carbonate, palm tusk and plantain peels can be attributed to the presence of phytochemicals. The role of these phytochemicals in conferring antibacterial activities on the materials have been reported [3].

The outcome of this work also suggests that plantain peel extract and palm tusk extracts can also be used in the preparation of fermented *Pentaclethra macrophylla* "ugba seeds" (salad) other than more conventional method of using potash. This is because the extracts of plantain peel and palm tusk also contain saponins which gives a saponification effect on the salad or fermented ugba. This could be a preferred alternative due to the reported toxic effect of potassium carbonate [5].

## REFERENCES

1. Adediji, J., Hartman, T.G., Rosen, R.T and Ho C.T (1991), Free and Glycosidically Bound Aroma Compounds in Log Phim (Spondias Mombin). J. Agricultural and Food Chemistry, (USA). 39, 1494-1497.
2. Ahmad, I and Beg, A.Z (2001), Antimicrobial and Phytochemical Studies on 45 Indian Medicinal Plants Against Multi-Drug Resistant Human Pathogens. J. Ethnopharmacol, 74, 113-123
3. Ayoka, A.O., Akomolafe, R.O., Iwalewa, E.O and Ukponmwan, O.E. (2005), Studies on the Axiolytic Effects of S. mombin. African J. Traditional Complementary and Alternative Medicine, 2, 133-165.
4. Harborne, K (1973), Phytochemical Methods: A Guide to Modern Techniques of Plants Analysis. Chapman and Hall, New York. 73-75.
5. He, F. J (2010), Effects Of Potassium Chloride and Potassium Bicarbonate Endothelial Function, Cardiovascular Risk Factors, and Bone Turnover In Mild Hypertensives, Ss (3):681-8.
6. Hostettman, K (1991). Saponins. Cambridge University press London. 72-81.
7. Kahkashan, P., Najat A. B and Dina A. W. (2001), Antibacterial activity of Phoenix dactylifera L. leaf and pit extracts against selected Gram negative and Gram positive pathogenic bacteria. Journal of Medicinal Plants Research, 6(2), 296-300,
8. Ogbuhie, J.N., Uwaezuoke, J.C and Ogiehor, S.I (1998), Introductory Microbiology Practical. Springfield Publishers, Owerri 78-83.
9. Stray, F. (1998). The Natural Guide to Medicinal Herbs and Plants. Tiger Books International, London: Pp12-16.
10. Trease, G.E and Evans, W.C. (1983) Pharmacognosy (11<sup>th</sup> ed.). Baillere and Tindall; London. 243-551.
11. Ugbogu, O.C, Onyeagba, R.A and Chigbu, O.A (2006) Lauric Acid Content and Inhibitory Effect of Palm Kernel oil on two Bacterial Isolates and Candida albicans. African Journal of Biotechnology, 5 (11), 1045-1047