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Short Communication

The antimicrobial effect of oils from *Pentaclethra macrophylla* Bent, *Chrysophyllum albidum* G. Don and *Persea gratissima* Gaerth F on some local clinical bacteria isolates

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A comparative study of the antimicrobial effect of oils from *Pentaclethra macrophylla* Bent, *Chrysophyllum albidium* G.Don and *Persea grattissima* Gaerth F seeds on some local clinical bacteria isolates was investigated. The local clinical isolates were *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Staphylococcus epidermidis*. *P. macrophylla* seed oil had inhibition zone diameter (IZD) in millimeters in the range 5.4 - 29.3, *P. grattisima* 5.4 - 28.7 and *C. albidum* 7.6 - 30.0 for all the isolates tested. Except for the *E. coli* isolate AC that had inhibition zone diameter (mm) of 10.6, 8.4 and 9.5 respectively for the various oils, none of the isolates showed complete resistance to all the oils tested. There is a potential to use oils from non utilised oil seeds in management of wounds.

Key words: Non utilised oil seeds, antimicrobial, local clinical isolates, wounds.

INTRODUCTION

The desire to conserve resources spent on importation of oil for domestic and industrial use have increased the search for novel sources of oil to complement the traditional ones. There has been a focus on non utilised oil seeds for possible development and use (Obasi and Okolie, 1993). The antimicrobial effect of palm kernel oil on *Staphylococcus aureus* and *Streptococcus* species *in vitro* has been reported (Ugbogu et al., 2006). The African oil bean seed (*Pentaclethra macrophylla* Bent) is fermented and consumed especially in Eastern states of Nigeria. The fermented product "Ugba" is used as a food supplement and is consumed alone, mixed with other food ingredients or as a condiment in soups and salads (Achinewhu, 1986; Mbajunwa et al., 1998). African star apple (*Chrysophyllum albidum* G.Don) belongs to the family sapotaceae and is primarily a forest tree species. Its natural occurrences have been reported in diverse ecozones in Nigeria, Uganda, Niger Republic, Cameroun and Cote d´Ivoire (Bada, 1997). The fleshy pulp of this fruit is as snack and relished by both young and old. It is an excellent source of vitamins, iron and flavours to diets (Umelo, 1997).The roots and leaves are used for medicinal purposes (Adewusi, 1997). The seeds are used for local games (Bada, 1997) or discarded. Avocado pear (*Persea grattisima* Gaerth F) contain chemical constituents such as tannins, flavonoids, steroids, saponins, glycosides, phenolics, terpenes and alkaloids. Undocumented ethnomedical sources have ascribed that the seeds are used for treatment of obesity, high blood pressure, heart problems and hypertension. The leaves and stem barks are used for treatment of malaria and typhoid fever. The seeds are usually thrown away except for purposes of propagation. Except *Pentaclethra macrophylla* seeds, the seeds of *Chrysophyllum albidum* and *Persea gratissima* are usually thrown away. To the best of our knowledge no report exist on the use of oils from non utilised oil seeds for the management of wounds or as skin ointments. This paper reports the inhibitory effect of oils from these seeds and their potential in management of wound.

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Table 1. Physical and chemical properties of oils from *P. macrophylla*, *C. albidum* and *P. gratissima*.

Characteristic	*P. macrophylla*	*C. albidum*	*P. gratissima*
Specific gravity	0.89 ± 0.02	0.92 ± 17	0.90 ± 0.02
State at 29ºC	Liquid	Liquid	Liquid
Colour	Yellow	Pale yellow	Reddish brown
Odour	Agreeable	Agreeable	Agreeable
Acid value mEqKg –1	2.81 ± 0.01	3.56 ±0.20	11.46 ± 0.16
Peroxide value	2.35 ± 0.41	1.80 ± 0.28	5.73 ± 0.22
Iodine value	20.5 ± 2.0	31.06 ± 0.80	52.4 ± 2.0
Saponification value	209.4 ± 5.0	126.3 ± 4.0	106.6 ± 3.6
Percent free fatty acid	1.40 ± 0.01	1.76 ± 0.10	5.77 ± 0.07

(Akubugwo and Ugbogu, 2007).

MATERIALS AND METHODS

Sources of seeds

Healthy seeds of *P. macrophylla*, *C. albidum* and *P. gratissima* were collected from Uturu, Abia State between January and April, 2007. The seeds were authenticated by a taxonomist in the department of Plant Science and Biotechnology of Abia State University, Uturu. The seeds were taken to the Department of Biochemistry of same University where they were dehulled (where applicable) sun dried, wrapped in polyethylene bags and kept in dessicators until needs.

Extraction of oil

The method reported by Akubugwo and Ugbogu (2007) was used for oil extraction. Exactly 250 g each of the seed samples were milled into a paste using Thermal Willey Mill (model ED-5). The paste was then transferred into a thimble and oil extracted using normal hexane *in vacuo* with soxhlet apparatus. The extracting solvent was evaporated leaving the concentrated oil. The oils were stored at 4ºC and used when required. The physicochemical characteristics reported by Akubugwo and Ugbogu (2007) are presented in Table 1.

Sources of isolates

Local clinical isolates (LCI) from wounds were obtained from Federal Medical Centre (FMC) Owerri Imo State, Nigeria. The isolates were characterised based on Gram stain, spore staining and biochemical tests (Cheesbrough, 2000).

Susceptibility testing

This was done as described by Osadebe and Ukwueze (2004). Antimicrobial activity of the various oils was done with Mueller Hinton agar (Biotech). Agar plates were inoculated with 0.1 ml broth culture of test organisms and spread with an L-shaped glass rod. Sterile cork borer was used to make agar wells on the media and 2 drops of the oils were introduced into the wells. The plates were allowed to stand for 1 h for prediffusion of the oils to occur (Esimone et al., 1998) and incubated at 37ºC for 24 h. The inhibition zone diameters were measured in millimeters (mm).

RESULT AND DISCUSSION

The isolates were identified as *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Proteus mirabilis* and *Pseudomonas aeruginosa*. The physicochemical characteristics of the oil extracts are presented in Table 1. *Pentaclethra macrophylla* oil had inhibition zone diameter (mm) range of 5.4 - 29.3, *Persea gratissima* 5.4 - 28.7 and *Chrysophyllum albidum* 7.6 - 30 for all the isolates. The least zone of inhibition was the effect of *P. macrophylla* oil on *S. aureus* DB isolate and *P. gratissima* oil *S. aureus* DD. The highest zone of inhibition was by *Chrysophyllum albidum* seed oil on *S. aureus* isolate DE (Table 2). Although many investigators have demostrated the antimicrobial activity of some higher plants (Akobundu and Agyakwa, 1987; Rocio and Rion, 1989; Almagboul et al., 1988; Misra et al., 1992; Hablemarian et al., 1993) and quite a number of chemical compounds have been shown to possese antimicrobial activity (Corthout et al., 1992), the antimicrobial effect of oils from non utilized oil seeds have not been exploited. The in vitro antimicrobial effect of the oils on most of the local clinical isolates were high and no complete resistance was observed in any of the isolates. This observation suggests that oils from these seeds can be used for management and disinfection of wounds. The people of Eastern Nigeria have been using palm kernel oil as skin ointment since prehistoric times although scientific evidence for its antimicrobial effect is lacking. These oils had higher inhibition than has been reported for palm kernel oil (Ugbogu et al., 2006). These oils can serve as alternative sources of ointment for maintenance of the skin and management of wounds in addition to the usual palm kernel oil. In addition, research has shown that the use of these type of inhibitory agent does not result to development of resistance organisms. There is need for further investigation of the oils of underutilised

Table 2. Antimicrobial effect of the oils on local clinical isolate.

Isolate code	Organism	Inhibition zone diameter (mm)		
		P. macrophylla	***C. albidum***	***P. gratissima***
AA	*Escherichia coli*	13.0	14.0	23.0
AB	*Escherichia coli*	28.4	24.2	22.5
AC	*Escherichia coli*	10.6	9.5	8.4
BA	*Proteus mirabilis*	27.9	26.8	11.7
BB	*Proteus mirabilis*	16.1	23.7	22.0
CA	*Pseudomonas aeruginosa*	23.4	16.8	6.3
CB	*Pseudomonas aeruginosa*	13.9	7.6	25.1
CC	*Pseudomonas aeruginosa*	5.7	22.4	17.4
DA	*Staphylococcus aureus*	29.3	27.5	28.7
DB	*Staphylococcus aureus*	5.4	10.4	12.2
DC	*Staphylococcus aureus*	8.1	25.8	27.0
DD	*Staphylococcus aureus*	24.7	8.8	5.4
DE	*Staphylococcus aureus*	9.1	30.0	25.3
DF1	*Staphylococcus epidermidis*	24.5	29.7	24.9
DF2	*Staphylococcus epidermidis*	6.8	28.9	24.5

seeds in order to employ them in the production of ointments for wound disinfection and management.

REFERENCES

Achinewhu SC (1986). The effect of fermentation on carbohydrate and fatty acid composition of African oil bean seed *Pentaclethra macrophylla*. Food Chem. 19: 105-116.

Adewusi HA (1997). The African star apple (*Chrysophyllum albidum*) indigenous knowledge (IK) from Ibadan, South Western Nigeria. Proceedings of a National Workshop on Potentials of the Star Apple in Nigeria, pp. 25-33

Akobundu IO, Agyakwa CN (1987). A handbook of West African weeds. International Institute of Tropical Agriculture, p. 240

Akubugwo IE, Ugbogu AE (2007). Physicochemical studies on oils from five selected Nigerian plant seeds. Pak. J. Nutr. 6: 75-78.

Almagboul AZ, Basho AK, Karim A, Salim TA, Khalid SA (1988). Antimicrobial activity of certain Sudanese plants used in folklore medicine. Screening for antifungal activity VI. *Fitoterapia* 59:393-396

Bada SO (1997). Preliminary information on the ecology of *Chrysophyllum albidum* G.Don in West and Central Africa. Proceedings of National workshop on the potentials of star apple in Nigeria, pp 16-25.

Cheesbrough M (2000). District Laboratory Practice in Tropical Countries. Cambridge University Press.

Corthout B, Piefers L,Cleays M (1992). Antiviral caffeoylester from *Spondias mombin*. Phytochemistry 31: 1979-1981.

Esimone CO, Adikwu MU, Okonta JM (1998). Preliminary antimicrobial screening of the ethanolic extracts from lichens *Usnea subfloridans* (L). J. Pharm. Res. Dev. 3: 99-101.

Hablemarian S, Gray AI, Waterman, PG (1993). A new antimicrobial sesquiterpene from *Premma oligotrichia*. J. Nat. Prod. 56: 140-143.

Mbajunwa OK, Akingbala JO, Mulongoy K, Oguntimein G (1998). starter culture evaluation for the production of Ugba from African oil bean seed *Pentaclethra macrophylla*. J. Sci. Food Agric. 77: 127-132.

Misra TN, Singh RS, Pandey NS, Prasal C, Singh BP (1992). Antifungal essential oil and a long chain alcohol from *Achyranthis aspera*. Phytochemistry 31: 1811-1812.

Obasi NBB, Okolie NP (1993). Nutritional constituents of the seed of the African Pear *Dacryodes edulis*. J. Food Chem. 43: 297-299.

Osadebe PO, Ukwueze SE (2004). A comparative study of the phytochemical and antimicrobial properties of the Eastern Nigeria Mistletoe (*Loranthus micranthus*) sourced from different host trees. J. Biol. Res. Biotech. 2: 18-23.

Rocio MC, Rion JL (1989). A review of some antimicrobial substances isolated from medicinal plants reported in literature 1978- 1982. Phytother. Rev. 3: 117-125

Ugbogu OC, Onyeagba RA , Chigbu OA (2006). Lauric acid content and inhibitory effect of Palm kernel Oil on two bacterial isolates and *Candida albicans*. Afr. J. Biotechnol. 6: 1045-1047.

Umelo R (1997). Potentials for utilization of African star apple (*Chrysophyllum albidum*) for jam making in Nigeria. Proceedings of a National workshop on the potentials of star apple in Nigeria. p. 103.