

Short Communication

Lauric acid content and inhibitory effect of palm kernel oil on two bacterial isolates and *Candida albicans*

UGBOGU, O.C.*, ONYEAGBA R.A. and CHIGBU O.A.

Department of Microbiology, Abia State University P.M.B. 2000 Uturu, Abia State – Nigeria

Accepted 4 March, 2006

Palm kernel oil from various sources was assayed for lauric acid content and inhibitory effect against *Staphylococcus aureus*, *Streptococcus* sp. and *Candida albicans*. The different palm kernel oil samples showed noticeable inhibitory effect on *S. aureus* and *Streptococcus* sp. while no significant inhibitory effect was observed on *C. albicans*. The highest zone of inhibition was observed with the commercial palm kernel oil (PKO) followed by the mechanically extracted PKO. Similarly, lauric acid content was highest in the commercially obtained PKO followed by that mechanically extracted and least in the laboratory prepared PKO.

Key words: Palm kernel oil, lauric acid, inhibitory effect, bacterial isolates, *Candida albicans*.

INTRODUCTION

Palm kernel oil (PKO) is obtained from processing the kernel from the fruit of the oil palm tree (*Elaeis guineensis*). Palm kernel oil has similar uses to coconut oil owing to their similarity in composition (Pantzaris and Ahmad, 2004). The major fatty acids in palm kernel oil are lauric acid (C₁₂, 48%), myristic acid (C₁₄, 16%) and oleic acid (C₁₈, 15%) (Pantzaris and Ahmad, 2004). Certain fatty acids (medium chain saturates) and their derivatives have adverse effects on various microorganisms (Kabara, 1978) The antimicrobial effect of fatty acids are additive and total concentration is critical for inactivating bacteria (Isaacs and Thomas, 1991). The medium chain fats in lauric oils are comparable to fats in mother's milk and have similar nutraceutical effects (Kabara, 1990). Different preparations of lauric oils promote luxurious hair growth and protect the skin from bacterial and fungal infections (Kabara, 1990; Enig, 1998).

Monolaurin has been specifically found to have adverse effect on potentially pathogenic microorganisms. Isaac and co-workers (1992) reported the inactivation of *Staphylococcus epidermidis* and group B Gram-positive *Streptococcus* by lipases with high monolaurin content.

The people of Eastern region of Nigeria have been using palm kernel oil as skin ointment since prehistoric times although scientific evidence for its antimicrobial effect is lacking. This paper reports the antimicrobial effect of palm kernel oil obtained from different sources on two bacterial isolates (*Staphylococcus* sp. and *Streptococcus* species) and *Candida albicans*.

MATERIALS AND METHODS

Collection of samples

Commercially available palm kernel oil (PKO) was bought from Eke Okigwe Market, Imo State Nigeria. Mechanically extracted palm kernel oil was obtained from Polema Industries, Aba, Abia State. Other samples of Palm kernel oil were prepared in the laboratory using the traditional method of preparation. Extraction of Palm Kernel oil using the traditional method involved heating the palm kernels in a clean pot and periodically skimming out the released oil. Some of the palm kernels were steeped in water for 3, 6 and 24 h before heating to release the oils. The various palm kernel oils were labelled as shown in Table 1.

Determination of lauric acid content

The lauric acid content of samples was determined as free fatty acids (FFA) content. This was done by titration method of Harold et al. (1981). Twenty five millilitres of diethyl ether was mixed with 25 ml ethanol. Then 1 ml of phenolphthalein solution was added. The

*Corresponding author. E-mail: osychin@yahoo.com. Phone: 234(0)8037303493.

Table 1. Sources and methods of preparation of various palm kernel oils and their lauric acid contents.

Sample	Lauric acid (%)	Description
PKO ₁	1.0	Laboratory prepared Palm kernel oil without steeping.
PKO ₂	0.62	Laboratory prepared PKO steeped for 3 h.
PKO ₃	0.58	Laboratory prepared PKO steeped for 6 h.
PKO ₄	0.56	Laboratory prepared PKO steeped for 24 h.
PKO ₅	9.3	Commercially bought PKO from Eke Okigwe.
PKO ₆	2.0	Mechanically extracted PKO from Polema Industries Aba, Abia State, Nigeria.

Table 2. Antimicrobial activity of different palm kernel oil preparations.

Organisms	Zone of inhibition (mm)					
	PKO ₁	PKO ₂	PKO ₃	PKO ₄	PKO ₅	PKO ₆
<i>Staphylococcus aureus</i>	2.5	2.0	1.8	1.9	3.2	2.9
<i>Streptococcus sp.</i>	1.7	1.4	1.2	1.0	1.9	1.8
<i>Candida albicans</i>	0.7	0.5	0.3	0.2	1.0	0.9

solution was carefully neutralized with 0.100 M NaOH. Then 1 – 10 g of the oil was dissolved in the mixed neutral solvent and titration carried out with aqueous standardized 0.100 M NaOH with constant shaking until a pink colour persists for 15 seconds. The acid value was determined with the formula: acid value = (titration (ml) x 5.61)/weight of sample.

Source of isolates

The bacterial isolates, *S. aureus* and *Streptococcus sp.*, were obtained from the Microbiology Laboratory of Abia State University, Nigeria, and their identity confirmed by catalase, coagulase and motility tests. The identity of *C. albicans* was confirmed using the germ tube test (Cheesbrough, 2000).

Assay for antimicrobial activity

The different preparations of palm kernel oil were assayed for their antimicrobial activity using the disc diffusion technique. The discs were prepared as described by Isu and Onyeagba (1998). Sterile paper discs (Whatman No. 1 filter paper) of 5 mm diameter were impregnated with the different palm kernel oils and dried in the oven at 60°C for about 15 min. Agar plates were seeded with 0.1 ml broth culture of test organisms and the prepared discs were placed on the plates. They were incubated at 37°C for 18 – 24 h and observed for clear zones of inhibition.

RESULTS AND DISCUSSION

The different palm kernel oil samples showed noticeable inhibitory effect on *S. aureus* and *Streptococcus sp.* but no significant inhibitory effect was observed on *C. albicans*. The highest zone of inhibition of 3.2 mm was observed with PKO₅ (Table 2). There were variations in the levels of lauric acid in the various PKO samples

(Table 1). The highest lauric acid (9.3%) content was observed in the commercially bought sample.

The *in vitro* antimicrobial effect of the palm kernel oil samples was low, although the samples contain lauric acid. Lauric acid has the additional beneficial function of being formed into monolaurin in the human or animal body (Enig, 2000). This means that palm kernel oil may have higher antimicrobial effect *in vivo* than observed in this study. The PKO₅ which contained the greater lauric acid value had the highest effect of 3.2, 1.9 and 1.0 mm on *S. aureus*, *Streptococcus sp.* and *C. albicans*, respectively. This confirms that lauric acid is the antimicrobial agent in Palm kernel oil. The method of extraction seems to affect the level of lauric acid present in the samples. It is likely that steeping reduces the lauric acid content as observed in the study.

The bacteria, *Staphylococcus aureus* and *Streptococcus sp.*, which can cause boils and infections of wounds, were inhibited minimally by palm kernel oil. Although this antimicrobial effect observed is low, Kabara (1998) have shown that the use of this type of inhibitory agent does not lead to the development of resistant organisms. Palm kernel oil can be used as an ointment for the body to minimize infections by microorganisms and this may justify its usage amongst the populace in some parts of Nigeria.

REFERENCES

- Cheesbrough, M (2000) District Laboratory practice in tropical countries. Cambridge University Press.
- Enig, MG (1998) . Lauric oils as antimicrobial agents. *In Nutrients and foods in AIDS* (Waston R. ed.) CRC Press London 81 – 97.
- Enig MG (2001). Coconuts: In Support of good health in the 21st Century. *Am(r) J. of Clinical Nutr.* 59: 841-846.
- Harold E, Ronald SK, Ronald SG (1981). Pearson Chemical analysis of

- foods 8th edition. Churchill Livingstone, Edinburgh, London. pp. 620 – 621.
- Isaacs CE, Thomas H (1991). The role of milk derived antimicrobial lipids as antiviral and antibacterial agents. In *Immunology of Milk and the neonate* (Mestecky ed.) Plenum Press, New York 220 -228.
- Isaacs CE, Litov RE, Marie P, Thomas H (1992). Addition of lipids to infant formulas produces antiviral and antibacterial activity. *J. Nutr. Biochem.* 3: 304 -308.
- Isu NR, Onyeagba RA (1998) *Basic Practicals in Microbiol.* 2nd edition Fasmen Communication Okigwe Nig. p.137.
- Kabara JJ (1978) Health oils from the tree of life. *In Pharmacological effect of lipids* (1) (Kabara J.J, ed.) AOCS Press London p.624 – 629.
- Kabara JJ (1990) Lauric oils and health benefits in *Pharmacological effects of lipids* (3) (Kabara J.J. ed.) AOCS Press London 120 – 130.
- Pantazari TP, Ahmad MJ (2004). Palm Kernel oil. *Palm oil processing technology report. Res. Instit. of Malaysia.* p.220.