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Full Length Research Article

Antimicrobial Activity of Sabulun Salo a Local Traditional Medicated Soap

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Abstract: The antimicrobial activity of *Sabulun salo*; a local traditional medicated soap widely used by different tribes in Nigeria such as Hausa, Yoruba and Nupe against skin infections was examined against some clinical isolates of pathogenic microorganisms (*Staphylococcus aureus, Escherichia coli* and *Candida albicans*) using agar dilution method. The pattern of inhibition varied with the soap concentration and the organisms tested. The soap was more effective on *S. aureus* with maximum zone of growth inhibition of 28 mm at 100% w/v followed by *C. albicans* (24mm). However, *E. coli* was resistant to the soap at all concentrations tested. The minimum inhibitory concentration (MIC) was found to be 12.5% w/v for both *S. aureus* and *C. albicans*. The antibacterial activities exhibited by *sabulun salo* in this study could be attributed to the presence of its constituents which signifies the potential of the soap as a of topical therapeutic agent. These findings therefore, justify the traditional medicinal use of *sabulun salo.*
Keywords: *Sabulun salo*, antimicrobial activity, skin infections, pathogenic organisms

INTRODUCTION

Sabulun salo; a local traditional medicated soap widely used by different tribes in Nigeria, such as Hausa, Yoruba (*ọṣe dudu*) and Nupe (*eko zhiko*). It is a black soap, which has been used for centuries in many African homes especially in Ghana and Nigeria. The soap is produced from a mixture of vegetable oils (palm kernel oil and shea butter) that make the soap to have antimicrobial properties recognised in the traditional African households (Getradeghana, 2000).

In recent time, the soap has been improved industrially into more presentable forms (although many people still prefer the traditionally prepared one) with different trade names such as '*Village Fresh*', '*Dudu Osun*' '*Zee Black Soap*' etc . The attribute of the soap includes gentleness on the skin, rich lather, protection against skin disorders (including rashes, eczema, scabies) treatment of skin infection (such as ringworm), protection of even skin toning and smoothness of the skin (Getradeghana, 2000).

The major fatty acids in palm kernel oil are lauric acid (C_{12}, 48%), myristic acid (C_{14}, 16%) and oleic acid (C_{18}, 15%). Certain fatty acids (medium chain saturates) and their derivations have adverse effects on various microorganisms (Kabara, 1978). Monolaurin has been specifically found to have adverse effect on potentially pathogenic microorganism. Isaac and Thomas, (1991) reported the inactivation of *S.epidermidis* and group B Gram-positive *Streptococcus* by lipases with high monolaurin content. The lauric acid content of the palm kernel oil has the additional beneficial function of being formed into monolaurin in human or animal body (Emg, 2000). This means that palm kernel oil may have higher antimicrobial effect *in vivo.* The palm kernel oil sample with highest lauric acid value have the highest effect on *S. aureus, Streptococcus* sp and *C. albicans*, this confirms that lauric acid is the antimicrobial agent in palm kernel oil (Ugbogu, 2006). *S.aureus* and *Streptococcus* sp. which cause skin and wounds infections are inhibited minimally by palm kernel oil. Although the antimicrobial activity observed is low, Kabara (1978) has shown that the use of this type of inhibitory agent does not lead to the development of resistant organisms.

Shea butter is the fat extracted from the kernels of *Vitellaria paradoxa*. The species is found in 19 countries across the African Savanna zone from Senegal to Ethiopia. Shea butter contains high level of UV-B absorbing triterpenes esters including cinnamic acid, tocopherols (Vitamin A) and phytosterols. Shea butter also contains a high percentage of unsaponifiables such as phytosterols compesterol, stigmasterol, beta and alpha-spino sterol (Wiesman, 2003). Shea butter is composed of five principal fatty acids, palmitic, stearic, oleic, linoleic acid and arachidic acid. Stearic acid and oleic acids account for 85–90% of the fatty acids (Maranz *et. al.,* 2004). It helps in healing scars, burns, stretch marks, dermatitis, eczema, sun burn and athlete's foot. It is important in prevention of ashy skin, chapping and skin rashes and rejuvenates skin pores and adds elasticity to skin. It is known for ideal hair dressing that protects the scalp from sores and rashes and prevents dandruff (Mike, 2008). Analysis of the kernel reveals the presence of phenolic compounds such as garlic acid, catechin, epicatechnin, gallate as well as quercetin and trans-cinnamic acid (Steven *et. al.,* 2003), some of which are known to have antimicrobial activities. The present study reports the results of the antibacterial potency of *sabulun salo* against some pathogenic microorganisms.

METHODOLOGY

Screening for Antimicrobial Activity

Clinical isolates of *C. albicans, S. aureus* and *E. coli* were obtained from the Department of Microbiology, Ahmadu Bello University, Zaria. The susceptibilities of the test organisms to *sabulun salo* were assayed using agar-well diffusion method (Ndukwe *et. al.,* 2005; Aliyu, *et al.,* 2009). The test organisms from growth on nutrient and potato dextrose agar plates incubated at 37 ^{o}C and at room temperature for 18 h for the bacteria and fungus respectively, were suspended in saline solution (0.85% NaCl) and adjusted to match a turbidity of 0.5 McFarland standard. The standardized suspension was used to inoculate the surfaces of Mueller Hinton agar plates and PDA plates (90mm in diameter) using sterile cotton swab. Different concentrations; 100%, 50%, 25%, 12.5%, w/v of the *sabulun salo* were prepared (using sterile distilled water) following serial dilution. Six wells were made on each plate using sterilised cork borer (8mm) and 0.3 ml of each concentration was transferred in to each of the 5 wells (appropriately labelled) and distilled water into the sixth well as the negative control. The plates were incubated at 37^{0}C for 24 hours and at room temperature for 48 hours, for the bacteria and fungus respectively. The plates were observed for zone of inhibition around the wells and the zones of inhibition were then measured and recorded using transparent metre rule. The entire test was conducted in duplicate.

The minimum inhibitory concentration was determined according to the National Committee for Clinical Standard (1999). The *sabulun salo* was dissolved in sterile distilled water and 2ml each of sterile Mueller Hinton broth and potato dextrose broth were transferred into a set 4 of tubes and 2ml of each concentration (100%, 50%, 25%, 12.5%, w/v) of the *sabulun salo* was added to obtain final concentrations of 50%, 25%, 12.5% and 6.25%, w/v respectively. Each test organism was inoculated into the labeled tube except the control; the tubes were incubated at 37^{0}C for 18 hours for the bacteria and at room temperature for 48 hours for the fungus. The MIC was taken as the lowest concentration that prevented visible growth.

The minimum bactericidal concentration and minimum fungicidal concentration were determined according to the National Committee for Clinical Standard (1999). From the test tubes used in the determination of MIC, the tubes that showed no visible growth were sub cultured onto freshly prepared Mueller Hinton agar and PDA at 37^{0}C for 48 hours for the bacteria and at room temperature for 48 hours for the fungus respectively. The least concentration at which the organisms did not recover and grow was taken as the MBC.

RESULTS

Table 1 presents the observed antimicrobial activities of the soap, while Table 2 show the results of MIC, MBC and MFC of *Sabulun salo* against the test organisms. Antimicrobial assay of *sabulun salo* revealed that the soap possessed antimicrobial activity against two of the test organisms. The largest zone of inhibition was observed against *S. aureus* (28mm) followed by *C. albicans* (24mm) at 100% w/v. However, *E. coli* was resistant to the soap (8mm) at all the concentrations tested. The MICs of the soap against both *S. aureus* and *C. albicans* was 12.5% w/v. The MBC and MFC results indicated that the soap has static effect on both *C. albicans* and *S. aureus* at both concentrations of 25 (%w/v) and 12.5 (%w/v).

Table 1: Diameter of zones of Inhibition (mm) of *Sabulun Salo* Against the Test Organisms

Test organisms	**Zones of inhibition (mm)/concentration (%w/v)**			
	100	**50**	**25**	**12.5**
S. aureus	28	22	8	8
C. albicans	24	21	8	8
E. coli	8	8	8	8

Table 2: MIC, MBC and MFC of *Sabulun Salo* Against the Test Organisms (%w/v)

Test organism	**MIC**	**MBC**	**MFC**
S. aureus	12.5	12.5	NA
C. albicans	12.5	NA	12.5

NA= Not applicable;
MIC = Minimum Inhibitory Concentration;
MBC = Minimum Bacteriocidal Concentration;
MFC; Minimum Fungicidal Concentration

DISCUSSION

The findings of this study show that *sabulun salo* has antimicrobial effect against *S.aureus* and *C. albicans* with a maximum zone of inhibition of 28mm and 24mm respectively. *S.aureus* and *C. albicans* have been incriminated in causing skin infections including boils, thrush, impetigo etc; the susceptibilities of these organisms to the soap indicate the therapeutic potentials of the soap in the treatment of such diseases. The cell wall of *S. aureus* which is a gram positive bacterium is made up of mainly peptidoglycan. Peptidoglycan is found to be distorted by long chain fatty acids that are found in palm kernel oil an active ingredient in *sabulun salo*. The activity of the soap against *S. aureus* therefore, could be attributable to the palm kernel oil present in the soap (Ugbogu, 2006). Ugbogu, (2006) reported that palm kernel oil has inhibitory effect on *S. aureus* and *Streptococcus* sp. The major fatty acids in palm kernel oil used for the production of *sabulun* salo are lauric acid, myristic acid and oleic acid. Certain fatty acids (medium chain saturates) and their derivatives have adverse effects on various microorganisms (Kabara, 1978). Monolaurin has been specifically found to have adverse effect on potentially pathogenic microorganism. Isaac and Thomas (1991) reported the inactivation of *S.epidermidis* and group B Gram- positive *Streptococcus* by lipases with high monolaurin content.

The effect of long chain fatty acid may be the disruption of the fungal membrane leading to leakage of macromolecules such as nucleotide, inorganic acid or phosphorylated ammonium compound (Arora, 2004). This explains the inhibitory effect exerted by the soap against the fungus *C. albicans.*

There was no observed inhibitory effect on *E. coli* by the soap at all concentrations used. *E. coli* being Gram negative organism has little peptidoglycan in its cell wall and this may hinder the activity of the active components of the soap (fatty acids). The resistance of *E. coli* to antimicrobial agents is usually due to chromosomal mutation which lowers the permeability of the bacteria to the agents or acquisition of resistance (R) plasmids and transponsoms (Arora, 2004). Therefore, the resistance showed by *E. coli* to *sabulun salo* may be due to chrosomal mutation which may have resulted to lower permeability of the bacterial cell. However, Ekwenye and Ijeomah (2005) reported that palm kernel oil has inhibitory action against *E. coli* with no inhibition against *S.aureus, Pseudomonas aeruginosa, Aspergillus niger* and *C. albicans*. Although the effect of the soap was static on *C. albicans* and *S.aureus*, raising the concentration of the soap may possibly be cidal and also activity may be found on *E. coli*. It should be noted that increase in purity of the palm kernel oil and shea butter (used in the preparation of the soap) may have significant effect on the properties and quality of the soap.

CONCLUSION

The antimicrobial activity exhibited by the *sabulun salo* extract against the test organisms (*S.aureus* and *C. albicans*) that are associated with various skin infections, have provided scientific justification for the ethno medicinal uses of the soap by Hausa, Yoruba and Nupe tribes in Nigeria. It is recommended that further studies should be conducted on *sabulun salo* with a view to its industrial production employing hygienic standards.

REFERENCES

Aliyu, M.S., Hanwa, U.A., Tijjani, M.B., Aliyu, A.B. and Ya'u, B. (2009). Phytochemical and antibacterial properties of leaf extract of *Stereospermum kunthianum* (Bignoniaceae). *Nigerian Journal of Basic and Applied Sciences*, **17(2):** 235-239.

Arora (2004). *Textbook of Microbiology*. Satish Kumar publishers, India.

Ekwenye, U.N. and Ijeomah, C.A. (2005). Antimicrobial effect of palm kernel oil. KMTL *Science Journal* **6:** 22-26.

Emg, M.G. (2000). *Lauric oils as antimicrobial agents* CRC press London Pp. 81-87.

Getradeghana, B.T. (2000). Evaluation of African traditional soap. *Global Journal of Pure and Applied Science* **6**:174-179.

Isaac, C.E., and Thomas, H. (1991). *The role of milk derived antimicrobial lipids as antiviral and antibacterial agents*. Plerium press, New York Pp. 220-228.

Kabara, J.J. (1978). *Health oils from the tree of life, in pharmacological effects of lipids*. AOCS press London. Pp. 624-629.

Maranz, S.Z., Wiesman, J. and Bianchi (2004). Germplasm resources of *Vitellaria paradoxa* based on variations in fat composition across the species distribution range. *Agroforestry Systems* **60**: 71-76.

Mike, L. (2008). Phenolic constituents of Shea (*Vitellaria paradoxa*) Kernels*. Journal of Agriculture and Food Chemistry* **51**: 6268-6273.

National Committee for Clinical Laboratory Standard (NCCLS) (1999). Performance Standards for Antimicrobial disc and dilutions of susceptibility test for bacteria isolated from animals. Pennsylvania, X, USA, document (M31 – A)

Ndukwe, I.G., Ampitan, J.O., and Isah, Y. (2005). Phytochemical and antimicrobial screening of the crude extracts from the root, stem bark and leaves of *Vitellaria paradoxa. African Journal of Biotechnology* **6(16):**1905-1909.

Steven, M., Zeev, W. and Nissim, G. (2003). Phenolic constituents of Shea (*Vittellaria*) Kernels*. Journal of Agriculture and Food Chemistry* **51**: 6268-6278.

Ugbogu, O.C. (2006). Lauric acid content and inhibitory effect of palm kernel oil on two bacterial isolates and *C. Albicans. African Journal of Biotechnology* **5(11):**1045-1047.

Wiesman, Z.S. (2003). Chemical analysis of fruits of *Vitellaria paradoxa.* School of Agriculture and Forest sciences, University of Wales: Bangor, UK; Pp.131-139.