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# Quality and Antiseptic Properties Assessment of Indigenous Black Soap Produced in Nasarawa State, Nigeria

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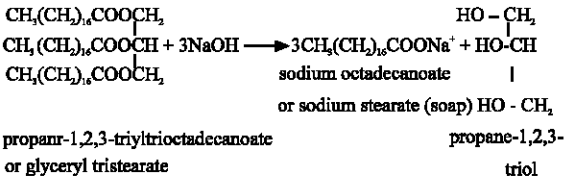
**Abstract:** The people of Nasarawa State, Nigeria had been engaged in traditional soap making prior to the advent of known conventional soaps and this practice has continued to date. The traditional soap tagged, Black Soap and conventional soaps (medicated and laundry) were analyzed for quality and antiseptic properties assessment using standard techniques. A comparison of results on pH, moisture content, Total Fatty Matter (TFM), free alkanity/acidity, chloride content, foamability and alcohol insoluble parameters showed that there were sharp differences in these parameters between Black soap and medicated soaps but striking similarities in some of the parameters (pH, foamability, TFM, chloride and free acidity) between Black Soap and laundry soaps. This suggests that Black Soap is more of laundry soap than medicated one.

**Key words:** Quality, antiseptic properties, Black Soap, conventional soaps

## INTRODUCTION

Soap is one of the oldest chemical substances known. Its history begins before the earliest written study (Abdel-Gel, 1984). Clay tablets inscribed in Sumerian in about 2500BC recorded knowledge of a potash soap made from oil and ash of a plant rich in potassium carbonate, $K_2CO_3$ and use of this soap in washing wool. Soap was also found in Egyptian literature mainly in connection with medical writings. A natural soda called trona was found in the Nile valley, which together with vegetable of animal fats were well suited for the manufacture of soap (Abdel-Gel, 1984).

In pre-Christian and early Christian times, Roman used putrid urine as a cleanser. Its effectiveness stems from its ammonium carbonate $(NH_4)_2CO_3$ content, which reacts with fats and oils in wool to produce a slight saponification (Funk and Wagnails, 1984). Subsequently, with civilization and advancement in technology, the uses overall process of soap making have become diversified, though the basic process remains unchanged. Soap is the hydrolysis of fats and oils with caustic alkali to yield propane-1, 2, 3 -triol and the corresponding sodium salts of the component fatty acids. These salts are the principal constituents of soap (Clarke, 1979). The properties of the soap produced depend mainly on the alkali and the fats or oils used (Aremu, 2006). Hard soaps used for laundry are chiefly composed of the sodium salts of saturated acids while softer toilet soaps are composed of the potassium salts of unsaturated acids (Ababio, 1990). The soap-making process using octadecanoic or stearic acid $(CH_3(CH_2)_{16}COOH)$ can be represented as shown:




Antiseptic is a substance used for destroying or stopping growth of micro-organisms in living tissues. Phenol otherwise called carbolic acid was one of the earliest antiseptics known (Hill and Holman, 1978). Phenol though a weak acid is a stronger acid than aliphatic alcohols. It was first used in 1860's to prevent wounds going septic after surgery. Phenol is effective in killing bacteria but it is also very corrosive to the skin and has been replaced by other antiseptics. Many of these are derivatives of phenol, for example, 2,4,6-Trichlorophenol (TCP) and Dettol (Solomons, 1984).

Traditional soap making had been an occupation of people from Wamba, Obi, Doma and Kokona local government areas of Nasarawa State, Nigeria even prior to the advent of known popular soaps with different trade names such as Sunlight, Premier, Keysoap, Lux, Joy, Tura, Asepso, Tetmosol etc. The soap produced by these communities is known as Black Soap. It is being used for various purposes; these include washing, cleaning, removal of heat and treatment of various skin disease such as rashes, ringworm, pimples, eczema, scabies etc. People involved in Black Soap making are mostly local women while few young men take this business as secondary to their major farming occupation. In recent times, producers of Black Soap have been enjoying an

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unprecedented patronage from other parts of the country, Nigeria for being cheap; as an effective antiseptic and maintenance of body desirable complexion.

This research seeks to study required quality criteria and antiseptic properties of Black Soap produced in Nasarawa State, Nigeria in comparison with some conventional modern laundry and medicated soaps available in Nigerian markets. It is hoped that the data generated from this study will be tremendous applications in Black Soap production improvement.

## MATERIALS AND METHODS

**Samples collection:** The Black Soap samples were collected directly from the local women who were the major producers at Garaku, Wamba and Akwanga towns being the headquarters of Kokona, Wamba and Akwanga local government areas, respectively. While medicated soaps with trademarks; Tura, Tetmosol, Asepso and Topgel were purchased from Lafia market in Nasarawa State, Nigeria. Whereas fuve laundry soaps identified as Green Key Soap, Yellow Key Soap, NASCO Bar, Duck Soap and LBN Key Soap (being their trademarks) were purchased from Keffi market in Nasarawa State, Nigeria.

**Samples treatment/analysis:** Black Soap sample obtained was either in flake or powder form: Medicated soaps were in tablet or cake while laundry soaps were either in tablet or bar. Each soap was removed from the wrapper and ground into powder form. Seven different chemical tests that were carried out according to AOAC (1990) were pH, moisture content, total fatty matter, free alkalinity/acidity, chloride content, foam height and alcohol insoluble.

**pH:** The pH meter was calibrated using the buffer solution of pH between 4.0 and 7.0. Thereafter it was dipped directly into the sample while the reading was taken immediately.

**Moisture content:** The sample was first weighed and reweighed after open heating for about 30 min. The difference in weight gives the moisture content.

**Total fatty matter:** Five gram of the sample was weighed into a beaker. Ten millimetre of distilled water added and heated to dissolve while 20 mL of 2M $H_2SO_4$ was added to liberate fatty matter. It was cooked in a bowl and decanted leaving behind the fatty matter (extract) in the beaker. The extract was washed with distilled water till it is neutral to methyl orange indicator. It was then dissolved in 70 mL hot neutral alcohol and titrated with 1 M NaOH using phenolphthaline indicator. Total Fatty Matter (TFM) was then determined as FMV/W where F is the factor of the oils blended; M is the molarity of the base; V is the volume of base and W is the weight of the sample.

**Free alkali/acidity content:** Six gram of the soap sample was dissolved in 70 mL hot neutral alcohol and treated against 2M $H_2SO_4$ using phenolphthalein indicator. The free alkali/acidity was calculated as; 3.1 MV/W.

**Chloride content:** Five gram of the sample was completely dissolved in 100 mL hot distilled water. Ten milliter of 20% calcium nitrate solution was added for complete precipitation. The mixture was quantitatively transferred to a 250 mL volumetric flask and made up to mark with distilled water. It was then filtered while 10 mL of 20% potassium chromate solution was added to 100 mL of the filtrate and titrated with 0.1 M silver nitrate solution to a greenish-yellow colour. A blank determination was also carried out. Chloride content was calculated as $(V_R-V_B)$ 0.08865/W where $V_R$, $V_B$ and W were volume of real, volume of blank and weight of sample, respectively.

**Foam height:** Two gram of the sample was dissolved in a 1 L volumetric flask and made up to mark with tap water. Fifty milliter of the solution was introduced into a measuring cylinder such that it followed the walls of the column to avoid foaming. Two hundred milliliter of the solution was taken in a conical flask and poured into a funnel which was already clamped with the outlet closed. The measuring cylinder was then put directly beneath the funnel while the level (height) of the foam generated was read from the cylinder immediately the funnel outlet was opened.

**Alcohol insoluble:** Five gram of soap sample was dissolved in 50 mL hot alcohol and quantitatively transferred unto an already weighted filter paper. The residue was dried in the oven at 105°C for 30 min, cooled in the desiccators and weighed again.

All chemicals used were of Analar grade (British Drug House (BDH), London) and all determinations were in triplicate.

**Statistical analysis:** The results obtained were subjected to statistical evaluation. Parameters evaluated were grand mean, standard deviation and coefficient of variation.

## RESULTS AND DISCUSSION

Table 1 presents the results of chemical analyses on quality criteria and antiseptic properties of Black Soap collected from Wamba to 10.5 of that of Kokona with little

Table 1: Quality criteria[a] and antiseptic properties[a] of Black Soap collected from three different locations

| Sample location | pH | Foam height (cm) | Alcohol insoluble % | Moisture % | TFM % | Chloride % | Free acidity % |
|---|---|---|---|---|---|---|---|
| Kokona | 10.5±0.4 | 250.0±3 | 20.0±0.0 | 11.3±0.6 | 3.5±0.1 | 0.10±0.0 | 0.88±0.3 |
| Wamba | 10.1±0.3 | 205.0±4 | 28.0±0.4 | 9.3±0.1 | 2.5±0.1 | 0.10±0.3 | 0.75±0.1 |
| Akwanga | 10.3±0.2 | 230.1±1 | 24.0±2.0 | 10.0±0.0 | 2.3±0.3 | 0.22±0.7 | 0.80±0.1 |
| Gread mean | 10.3 | 228.3 | 24.0 | 10.20 | 2.77 | 0.14 | 0.81 |
| SD | 0.2 | 22.55 | 4.0 | 1.01 | 0.17 | 0.07 | 0.07 |
| CV% | 1.94 | 9.87 | 16.67 | 9.95 | 6.17 | 49.49 | 8.10 |
| SON Specification | Na | na | 7.0 | na | 55(min) | 1.0(max) | 0.1(max) |

[a]Values are means±standard deviation of triplicate determinations; SD = Standard Deviation; CV% = Coefficient of variation percent; SON = Standard Organization of Nigeria; na = not available; (min) = minimum; (max) = maximum

Table 2: Quality criteria[a] and antiseptic properties[a] of Black of Soap and some medicated soaps compared

| Sample | pH | Foam height (cm) | Alcohol insoluble % | Moisture % | TFM % | Chloride % | Free acidity % | Source |
|---|---|---|---|---|---|---|---|---|
| Black Soap | 10.3±0.2 | 228.3±22 | 24.0±4.0 | 10.2±1.0 | 2.77±0.2 | 0.14±0.07 | 0.18±0.07 | NS |
| Tura | 7.30±0.2 | 115±4 | 34±0.1 | 14.0±2.0 | nd | 0.04±0.0 | 0.18±0.1 | TI |
| Tetmosol | 8.6±0.3 | 125±6 | 70±2 | 16.6±2.0 | nd | 0.03±0.1 | 0.29±0.2 | JP |
| Asepso | 7.6±0.4 | 120±1 | 87±3.0 | 14.0±3.0 | 73.5±5 | 0.01±0.1 | 0.15±0.1 | EC |
| Top Gel | 5.9±0.1 | 105±2 | 10±2 | 6.6±1.0 | 83.5±6 | 0.01±0.1 | 0.18±0.1 | MCA |

[a]Values are means ± standard deviation of triplicate determinations; nd = not detected; NS = Nasarawa State, Nigeria; TI = Tura International Ltd; Ayaba Umueze Rd., Aba, Abia State, Nigeria; JP = Jaga Pharma Ltd Jaga Road, Oregun, Lagos, Nigeria; EC = Edward Cook and Co. Ltd; Salisbury Square, London;
MCA = Medical and Chemical Agency, SPAS, Vittore Olona, Italie

Table 3: Quality criteria[a] and antiseptic properties[a] of Black of Soap and some laundry soaps compared

| Sample | pH | Foam height (cm) | Alcohol insoluble % | Moisture % | TFM % | Chloride % | Free acidity % | Source |
|---|---|---|---|---|---|---|---|---|
| Black Soap | 10.3±0.2 | 228.3±22 | 24.0±4.0 | 10.2±1.0 | 2.77±0.2 | 0.14±0.07 | 0.18±0.07 | NS |
| Soda | 10.9±0.6 | 195±10 | 62±1 | 14.0±2.0 | 1.9±1.0 | 0.02±0 | 0.66±1 | NS |
| Key Soap (green) | 12.1±2 | 150±5 | 64±2 | 15.0±3.0 | 1.1±0.1 | 0.01±0.1 | 0.58±0 | UL |
| Key Soap (yellow) | 9.90.4 | 156±9 | 68±3.0 | 16.0±2.0 | 2.7±6 | 0.02±0.1 | 0.62±0.1 | UL |
| NASCO Bar | 10.6±0.4 | 13.5±1 | 8.2±0.3 | 18.8±1.0 | 63.2±5 | 1.71±0.1 | 0.07±0.1 | HP |
| Duck Soap | 10.1±1 | 9.8±0.4 | 6.5±0.4 | 16.0±0.7 | 67.5±4 | 0.92±0.1 | 0.06±0.1 | PZ |
| Key Soap (LBN Green) | 10.4±0.1 | 8.7±2 | 3.4±0.2 | 10.7±0.4 | 64.0±1 | 1.03±0.2 | 0.06±0.01 | LBN |

[a]Values are means ± standard deviation of triplicate determinations; NS = Nasarawa State; UL = Unilever Nigeria Plc, RC 113 Agbara Industrial Estate, Ogun State; HP = NASCO Household Products Ltd., 44, Yakubu Gowon Way, Jos, Nigeria; PZ = PZ Nigeria Ltd, 45/47 Town Planning Way, Ilupeju, Lagos; LBN = Lever Brothers Nigeria Ltd., Ijora, Lagos

variation of 1.94%. The high pH content indicating high percentage amount of unspecified and unsaponificable matter due to matter due to incomplete alkaline hydrolysis (Figbile, 1976) Black Soap was observed to lather very well based on the foam height which ranged between 205-250 cm among samples from three different locations since foam height measures the ability of a soap to lather. The alcohol insoluble which measures the amount of non-soap ingredients known as builders or fillers such as sodium silicate, sodium phosphate, sodium carbonate and minor constituents (bleaches, whitening agents and fluorescing agents present in the finished product) varied between 20-28% with CV % of 16.67. Moisture content and Total Fatty Matter (TFM) were low with CV % of 9.95 and 6.17, respectively. Chloride ion values were highly varied with CV % of 49.49 and it was the highest variability among all the parameters investigated. The reason might be due to source of alkali used for the production of Black Soap. Investigation carried out showed that producers of Black Soap depend on ashes of palm leaves, locust bean pod, *Prosopis africana* pod and beniseed pod as sources of potash. This kind of potash is very rich in some of these inorganic salts (Kochhar, 1986). The range of free acid content was between 0.75% in Wamba sample to 0.88% in Kokona sample. This value is higher that Standard Organization of Nigeria (SON) specification. The implication is that saponification process for the Black Soap is incomplete thereby leaving a good percentage of free fatty acids.

Comparison of quality criteria and antiseptic properties between Black Soap and some medicated soaps are presented in Table 2. The pH value of Black Soap was higher than any of medicated soaps studied. Likewise foam height was found to be higher in Black Soap which could be traced to the type of oil or palm kernel whose major fatty acid component is lauric acid which is known for its high formability (Ong *et al*., 1990; Olonisakim *et al*., 2005; Aigbodion *et al*., 2004). The relative low foam shown by conventional medicated soaps may be due to blending of palm kernel oil with low foaming oils such as tallow oil. Alcohol insoluble value in Black Soap was lower than any of medicated soaps. This shows crudity and non-refinement of Black Soap which has no standard measurement in terms of builder ingredients incorporated in soap production. Other parameters such as TFM, chloride and free acidity are not comparable, it is either lower or higher in Black Soap compared with any of the medicated soaps.

Table 3 shows comparison of quality criteria and

antiseptic properties of Black Soap and some laundry soaps available in Nigerian markets. A cursory look at the Table reveals similarities in parameters like pH, foam height, TFM, chloride and free acidity. This suggest that Black Soap is more of laundry soap than medicated one. The temptation to tie the antiseptic effect of the Black Soap to its free acidity becomes greater more so that laundry soaps are known not to have any antiseptic effect.

## CONCLUSION

The present study indicates that Black Soap is not refined. The analytical results revealed that Black Soap showed higher free acidity when compared with any of medicated soaps. But striking similarity in pH, foam height, TFM, chloride and free acidity were observed between Black Soap and some of the laundry soaps studied which suggests that Black Soap is of more laundry quality rather than medicated or antiseptic soap. However, further work is recommended on oil characterization and chemical analyses of other raw materials that make up Black Soap with a view to ascertaining chemical constituents responsible for the antiseptic properties.

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