PRODUCTION AND COMPARISON OF *ACACIA TORTILIS* ANTISEPTIC SOAP WITH SOME CONVENTIONAL ANTISEPTIC SOAPS

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ABSTRACT

Antiseptic soap produced from the Acacia tortilis plant was comparable with some conventional antiseptic soaps against Tinia species (fungi that cause ringworm).The foam height of the soap was 22.6cm, higher than all the antiseptic soaps analyzed. Thus suggesting its use, as an excellent toilet soap. The pH was 10.2, comparatively higher than the standard (6.5 – 9.5) set by National Agency for Food and Drug Administration and Control (NAFDAC), most likely due to incomplete alkaline hydrolysis resulting from the saponification process. The Chloride was 0.22%, Total fatty matter (TFM), 1.72, Moisture content 13.2% Alcohol insoluble 7.0%, and Free acidity 0.32%. To a large extent, the results of this work are in accordance with those presented earlier for the analyses of conventional antiseptic soaps [4]. The soap was black and highly soluble in water.

Keywords: Antiseptic soap, *Acacia tortilis*, *Tinia species*, Ring-worm, Saponification, Free acidity.

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Introduction

The need for excellent cleansing agents likes soaps, detergents and micelles is prerequisite to normal life. The above are metallic salts of higher fatty acids such as stearic, palmitic and oleic acids, with a good biodegradable ability. Soaps, though used as cleansing agents are also effective as mild antiseptics, ingestible antidotes for mineral acids or heavy metal poisoning as well as those made from heavy metals used as additives in polishes, inks, paints and lubricating oils [1].

In the early eighties, the manufacture of soap was crude and remote.ie fats, oils and caustic were piped into huge kettles and heated until boiled vigorously. After cooling for several days, tons of salt were added, causing the mixture to separate into two layers with the "neat" soap on top containing 70% soap and the "lye or nigre" soap on the bottom containing about 15 - 40% soap and glycerin. The produce was pumped into a giant mixer called crutches where builders, perfumes and other desired ingredients were added. Finally the soap was rolled into flakes or milled into bars or spray-dried into powder, but it is time consuming. The reaction is chemically represented as: (R represents the hydrocarbon chain)

$$C_3H_5(OOCR)_3 + 3NaOH \longrightarrow 3NaOOCR + C_3H_5(OH)_3, \quad [2]$$

Fat Caustic soda Soap Glycerin

An important modern process of making soap is the direct hydrolysis of fats by water at high temperature, this permits fractionation of the fatty acids, which are neutralized to soap in a continuous process. The advantage is the close control of the soap concentration, the preparation of soap of certain length for specific purposes and easy recovery of the by-product, glycerin. This method involves the splitting of fats into fatty acids and glycerin by means of water at minimum temperature and pressure of 120^0C and two-atmospheres respectively, then the fatty acid is saponified with caustic alkali and other substances like optical brighteners, water softeners, abrasives disinfectants, perfumes, colorants and antiseptic agents for medicated soaps to obtain specific characteristics [3].

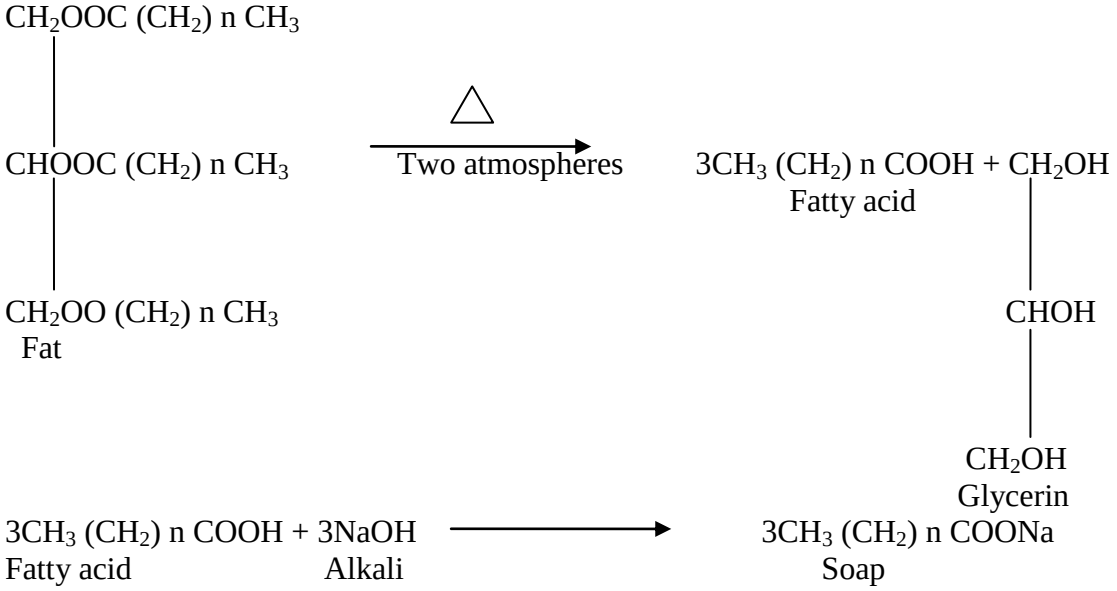

Figure: 1

In the process, glycerin is washed out of the system and soap is obtained after centrifugation and neutralization. This process is advantageous over the full boiled process in that it is more energy and time efficient, allows greater control of soap composition and concentration and ready recovery of the by-product (glycerin).

The mechanism of cleansing action of soap is simple though not simplistic and it consists of the followings:

Wetting or penetration of the fabric structure by the soap solution, in which case soap enhances the spreading and wetting ability of the water by reducing the surface tension, absorption of a layer of the soap at interface between the water and the surface to be washed and between the water and the dirt, dispersion of the dirt from the fabric material in to the wash water, facilitated by mechanical agitation and high temperature and preventing the dirt from being deposited back again unto the surface cleaned, by dissolving the dirt in the interior of the micelles. Thus most soaps are amphoteric. The principal consideration for the selection of a fatty acid for soap production is, it should contain average molecular weight carbon (C_{12} – C_{18}), low iodine value, high saponification value; very low unsaponifiable matter and high acid value. Usage of a fatty acid with the above characteristics with and caustic alkaline, gives very excellent soap. C_{20} fatty acid soaps are insoluble in water [4].

The demand for medicated /antiseptic soaps is always on the increase. These are toilet soaps prepared using a fatty acid, caustic alkaline with the incorporation of medicinal ingredient(s) of plant origin as an additive. These soaps have great application as body cleansing agents, as well as curing various types of skin problems [5].

In Yola, northern Nigeria, skin diseases are a major health challenge and it is locally believed that the bark of *Acacia tortilis* possesses medicinal properties that are effective in the management of skin ailments. [6].

Acacia tortilis (*Kindil* in Kanuri; *kiya* in Ga`anda; *chilluki* in Fulfulde), is widely spread in the Sahel, Sahara and northern Nigeria. It grows in sandy soils with reddish brown bark and has lathery properties [7 & 8]. Chemically, it contains compounds like, rhamonose, larabinose galactose, glucuronic acid, 4-methoxoglucuronic acid, calcium, Magnesium, Potassium and sodium. It is used in the manufacture of emulsions, soaps, pills and troches as an incipient demulcent for inflammation of the throat or stomach and as masking agent for acid testing [9].

Sequel to the high demand for antiseptic soaps, the high cost of the available ones produced from costly synthetic materials, this research aims at extracting metabolites from the bark of *Acacia tortilis* commonly found in northern Nigeria, and using the resulting extract in the production of antiseptic soap and comparing with some of the conventional antiseptic soaps. In line with this is the development of better quality, mild to the skin, at maximum recovery efficiency and minimum production and sales costs with a view to generating a pool of indigenous trained manpower, sufficient to meeting the demand and with cheap available antiseptic ingredient(s) [10].

MATERIALS AND METHODS

Collection and Preparation of Samples

Fresh stem- bark of *Acacia tortilis* was collected from farmland in Fufore LGA of Adamawa State, Nigeria in the month of July, 2008. Identification was by the forestry Department of Federal University of Technology Yola. The samples were air dried in the laboratory away from direct sunlight, before pounded to a fine powder using pestle and mortar (stainless steel) to a mesh size of about 60 and stored in a dry-screw capped container [11].

300g of the powdered sample was extracted with a mixture of ethanol- water (1:1) to obtain an oily product (20ml *Acacia tortilis*, as antiseptic ingredient) that was used for the soap. Also, 40ml palm kernel oil, 20ml Coconut oil, and 20ml Shear butter.

Soap Production

The boiling process was used for the production of the soap. 40ml and 20ml of palm kernel and coconut oil mixture and 20ml each of the antiseptic ingredient(*Acacia* extract) and shear butter were placed in a 500cm^3 beaker and 20ml ethanol was added. 4g of sodium hydroxide in 20ml of water was added to the mixture. This mixture was heated for an hour on a water bath, maintaining the temperature in the range of 80 -90^{0}C, with frequent stirring. Little distilled water was added occasionally to prevent the content of the flask from becoming solid due to evaporation of water and alcohol solutions during the heating. After one hour, 100cm^3 of a saturated solution of sodium chloride was added to the hot mixture and allowed to cool. This addition, "throw" the soap out of the solution ("Salting out"). The soap floating on the surface of the solution was then filtered and placed in a mould to dry in form of a tablet [10].

Tablets of Tura, Tetmosol, Dettol, Movate, Roberts and Swan antiseptic soaps in circulation were purchased for the analysis.

pH Determination

The pH meter was calibrated using buffer solution of P^H between 4.0 to 7.0. This was dipped directly in the prepared samples and the readings taken.

Determination of moisture content

10g of each sample was weighed and reweighed after open heating for 30 minutes.

The difference in weight gave the moisture content which was expressed in percentages.

Determination of total fatty matter

5g of each sample was weighed into a beaker containing 10ml of distilled water and heated to dissolve 20ml of 2M H_2SO_4 was added to liberate fatty matter, cooked and decanted leaving behind the fatty matter in the beaker. The extracts were then washed with distilled water till they became neutral to litmus paper. They were then dissolved in 70ml hot neutral alcohol and titrated with 1MNaOH using phenolphthalein indicator. Total fatty matter (TFM), was determined as FMV/W, where F is the factor of the oil blended, M the molarity of the base, V the volume of the base used (titre value) and W the weight of the sample.

Determination of the Free Acid Content

6g of each of sample was dissolved in 70ml hot neutral alcohol and titrated against 2M H_2SO_4, using phenolphthalein as indicator. The free alkali / acidity was calculated.

Determination of Chloride Content

5g of each sample was completely dissolved in 100ml hot distilled water, 10ml 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 and 10ml 20% potassium chromate solution added to 100ml of the filtrate and titrated with 0.1M silver nitrate solution to a greenish-yellow colour. A blank determination was carried out as the control and their chloride content calculated.

Foam height

2g of each sample was dissolved in one litre volumetric flak and made up to mark with tap water. 50ml of the solution was introduced into a measuring cylinder such that it followed the walls to avoid foaming. 200ml of the solution in a conical flask was poured into a funnel, which was already clamped with the outlet closed. The measuring cylinder was directly beneath the funnel while the level (height) of the foam generated was read from the funnel immediately the funnel outlet was opened.

Alcohol Insoluble

5g of each soap sample was dissolved in 50ml of alcohol and quantitatively transferred into already weighed filter paper. The residue was dried in oven at 105^OC for 30 minutes, cooled in the desiccator and weighed again.

Microbial sensitivity analysis

20µg/ml, 30µg /ml, 40µg /ml and 50µg /ml concentrations of the acacia soap sample were prepared and similar concentrations of the other antiseptic soaps in circulation were also prepared. Standard media plates were prepared for all samples and 20ml of the standard, each was poured in all plates containing the samples. The control was sterilized for 30 minutes. The content was allowed to solidify before the addition of the *Tinia species*. Holes were made using 1.5 diameter cork borer inside which the above prepared soap solutions were poured and incubated for 7days at 37^0C. The diameter of the inhibition zone was measured using a centimeter ruler [11]. The larger the diameter, the more effective the soap

RESULTS AND DISCUSSION

The qualitative analysis and the microbial effects of Acacia antiseptic soap compared with others in circulation are shown in Tables 1 and 2.

Table 1: Comparison of antiseptic soap prepared from *Acacia tortilis* with some conventional soaps.

Sample	P^H	Foam height (cm)	Alcohol insoluble %	Moisture Content %	TFM %	Chloride %	Free acid Content %	Microbial Sensitivity
With Acacia	10.2	22.6	7.0	13.2	1.72	0.22	0.32	+
Without Acacia	8.4	19.4	6.0	12.9	1.42	0.24	0.22	-
Tura	8.2	11.4	30.0	14.4	0.27	0.07	0.16	+
Tetmosol	8.7	13.2	72.0	18.3	0.08	0.02	0.31	+
Dettol	7.4	10.3	18.2	14.6	64.2	0.02	0.21	+
Movate	6.7	10.5	11.3	7.4	72.7	0.20	0.16	+
Roberts	6.2	9.7	32.4	8.2	53.7	0.01	0.18	+
Swan	7.2	11.8	42.0	9.3	63.4	0.09	0.14	+
Acacia extract	----	-----	------	------	------	------	--------	+

Key: + = Positive (the antiseptic soap is effective in curing ringworm**)**
- = Negative (Not effective in curing the ringworm).

Table 2: Anti- Microbial effect of Antiseptic soap from *Acacia tortilis* compared with conventional soaps (Diameter of hole used =1.5 cm) and Zones of inhibition in centimeters.

Sample	Inhibition Zone of 20µg/ ml	Inhibition Zone of 30µg/ ml	Inhibition Zone of 40µg/ ml	Inhibition Zone of 50µg/ ml
With Acacia	0.9	1.1	1.3	1.5
Without Acacia	0.0	0.0	0.0	0.0
Tura Soap	1.1	1.3	1.3	1.4
Tetmosol	1.0	1.1	1.3	1.5
Swan	1.1	1.2	1.3	1.3
Dettol	1.0	1.0	1.2	1.3
Roberts	1.0	1.0	1.3	1.3
Acacia extract	1.2	1.2	1.2	1.5
Control	1.5	1.5	1.5	1.5

Results: Mean of three trials.

Table 1 shows the comparison of the quality criteria and antiseptic properties of *Acacia* antiseptic soaps and some conventional medicated soaps. The pH value of the medicated soap produced from Acacia was higher (10.2), than any of the soaps studied. This could be due to incomplete alkaline hydrolysis [4]. Foam height was higher in Acacia soap probably due to the type of oil (palm Kernel) whose major fatty acid component is lauric acid, known for its high "foamability" or the low foaming of the conventional medicated soaps could be due to low quantity of palm kernel in the blend or the use of low foaming oils like tallow oils [2, 12 & 3].

Table 2 shows the zones of inhibition (cm) of the various antiseptic soaps against the microorganism. The larger the diameter of the hole the more effective the soap. Thus from the Table, *Acacia* antiseptic soaps at 20µg/ ml is less effective than all the other concentrations. But from 30µg/ ml. up, it is very effective. At 50µg/ ml it is exactly the same with Tetmosol, the best

conventional medicated soap. This suggests that *Acacia* can be an excellent medicated soap ingredient. This paves the way for our usage of *Acacia tortilis* extract as an antiseptic agent.

Conclusion

Acacia tortilis contain active agent(s) that could be promising as a source for antiseptic soaps since, when compared to conventional antiseptic soaps. It is thus suggested that more research be conducted that will further elucidate and characterized the active components in this plant and its potential use as a pharmaceutical. This will ensure that the entire ethno- flora of the sanctuary be documented in a way that information about sustainable uses of plants is conserved. For, from predictions, "Time and research are the utopia to our African diseases, for the cure is at our back yard".

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