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Determination of Alkali Content and Total Fatty Matter of Some Soaps Used Within Zaria, Nigeria

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ABSTRACT

Total alkali and Total fatty matter are important parameters in determining the quality of soap. Total alkali content and Total fatty matter were determined for some selected soap samples such as Giv, Farha, Septol and Dudu Osun. The soap samples were bought from Samaru market, Zaria, Kaduna State, Nigeria. Thereafter, were subjected to acidic treatment using 40 cm^3 of 0.5N HNO_3. After heating, separation was carried out between the aqueous layer and fatty layer by further use of chloroform. The aqueous layer was titrated with 0.5N NaOH using methyl orange as indicator. The titre value obtained was used to determine the total alkali content by calculation method. Similarly, the separated fatty matter floating on the aqueous layer was subjected to heating to evaporate the chloroform used for the extraction. The yield was then used to obtain the total fatty matter by calculation method. The results obtained for Total fatty matter shows Dudu Osun; 74% and Farha;70% which were within standard values. Likewise, for Septol and Giv; 26% and 66% were recorded respectively which were below recommended standard values. However, the total alkali content for all the soap samples analysed were within the range of 2.03% - 2.04 % which were within the standard range. These indicate the soap samples were of good quality and are safe for use on the skin.

Key words: Total Alkali Content, Total Fatty Matter, Giv, Farha, Septol, Dudu Osun

INTRODUCTION

Soap is a common cleansing agent. K.J Betsy described soap as sodium or potassium salts of various naturally occurring fats produced by saponification or basic hydrolysis reaction of fat or oil. The fatty acids such as stearic, palmitic, myristic, lauric and oleic acids are major contributors to the lathering and washing properties of soap. The purpose of producing soap may include washing, bathing, medication etc. [1].

The cleansing action of soap is due to the negative ions on the hydrocarbon chain attached to the carboxylic group of the fatty acids. In cleansing action of soap on oil and grease, the hydrocarbon chains have affinity for oil and grease while the carboxylic group is to water. This is the main reason why soap is mostly used with water for cleansing purposes [2]. However, soap characteristics chemically is a function of the strength and purity of alkali, the kind of oil used, completeness of saponification and the age of soap [3].

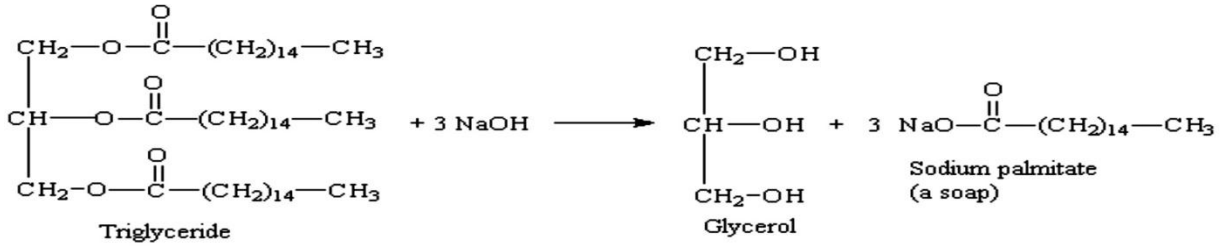

Fig. 1: Hydrolysis of a Triglyceride (Fat)

Considering the sensitivity of the skin and prevalence of skin and skin related diseases, there is need to keep close quality monitor on all skin preparations where necessary. In this present study, the total alkali content and total fatty matter content of some selected soap samples used within Zaria were determined and compared with standard values.

MATERIALS AND METHODS

The branded soap samples used in this study were bought from Samaru market, and mostly used for bathing were: Giv, Farha, Septol and Dudu Osun. These were randomly selected among others for the scope of this study. Further studies will cover other soaps

Total Alkali Content

In each of the soap sample, 5g was weighed and dissolved in 100 cm^3 hot water.

Thereafter, 40 $cm^3$of 0.5N HNO_3 was added to make it acidic. The mixture was heated until fatty acids were floating as a layer above the solution. It was cooled in an ice water to solidify the fatty acids. The fatty acids were separated and the aqueous solution was treated with 50 cm^3 chloroform to remove the remaining fatty acids. The aqueous solution was measured and 10 cm^3 of it was titrated against 0.5 N NaOH using methyl orange as indicator. The titre value obtained from this experiment was used to calculate the total alkali content using the following method [1].

Calculation

Total volume of the aqueous solution = V = __ cm^3

10 cm^3 of aqueous solution required t cm^3 of NaOH

V cm^3 of aqueous solution requires = $\frac{V\ x\ t}{10}$= A cm^3

Amount of NaOH required by acid in aqueous solution = A cm^3

Volume of HNO_3 required B cm^3 = $\frac{\text{A x Normalit of NaOH}}{\text{Normality of HNO3}}$

Volume of HNO_3 required for neutralizing NaOH = C = 40 – B

Amount of NaOH in 1000 cm^3 of soap (E) = $\frac{\text{C x 40 x Normality of HNO3 g}}{1000}$

250 cm^3 of soap solution contains (F) = $\frac{E\ x\ 250}{1000}\ g$

$2\ NaOH \longrightarrow Na_2O + H_2O$

80 g of NaOH ⟶ 62 g of Na_2O

F g of NaOH requires (Y) = $\frac{62\ \text{x F}}{\text{80 g of Na2O}}$

Weight of soap taken = 5 g

% of alkalinity = $\frac{Y\ x\ 100}{w}$= _____?

Total Fatty Matter

In each of the soap sample, 5 g was weighed and dissolved in 100 cm^3 of hot water. Thereafter, 40 cm^3 of 0.5 N HNO_3 was added to make it acidic. The mixture was heated until fatty acids were floating as layer above the solution. It was cooled in an ice water to solidify the fatty acids. The fatty acids were separated and the aqueous solution was treated with 50 cm^3 chloroform to remove the remaining fatty acids. The separated fatty matter was mixed together, solvent was evaporated and the yield noted. The total fatty matter was calculated using the following method [1]:

Calculation

Weight of dish (x) =_____ g

Weight of dish + soap after drying (y) = ____ g

Weight of soap sample = 5 g

% of fatty matter = $\frac{(y-x)x\ 100}{\text{Weight of soap sample}}$ = _____

RESULTS AND DISCUSSION

Table 1: Percentage total fatty matter in the soap samples

S/No.	Name of soap	Weight of dish (g)	Weight of dish + soap after drying(g)	% of fatty matter
1	Septol	67.7	69.0	26
2	Dudu Osun	67.7	71.4	74
3	Farha	67.7	71.2	70
4	Giv	67.7	71.0	66

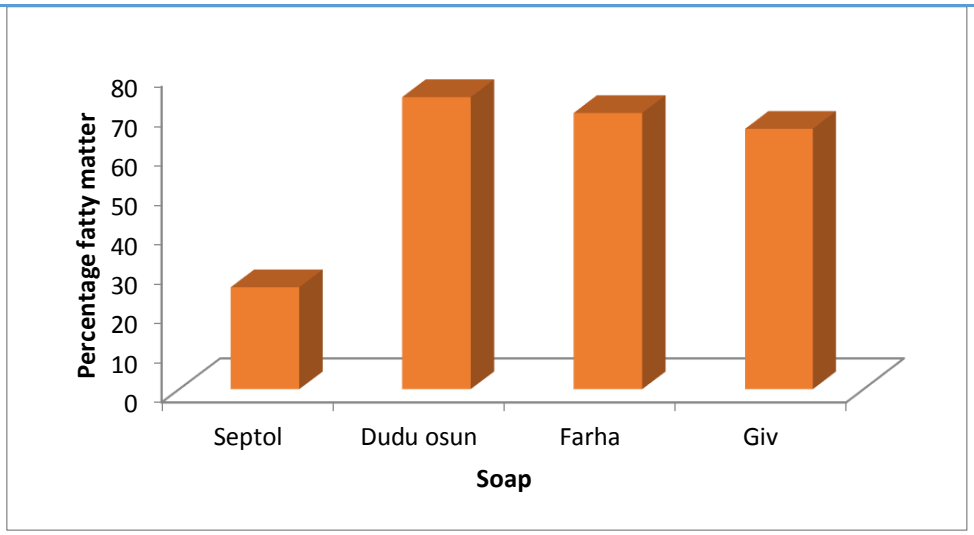

Fig. 2: Total fatty matter in soaps

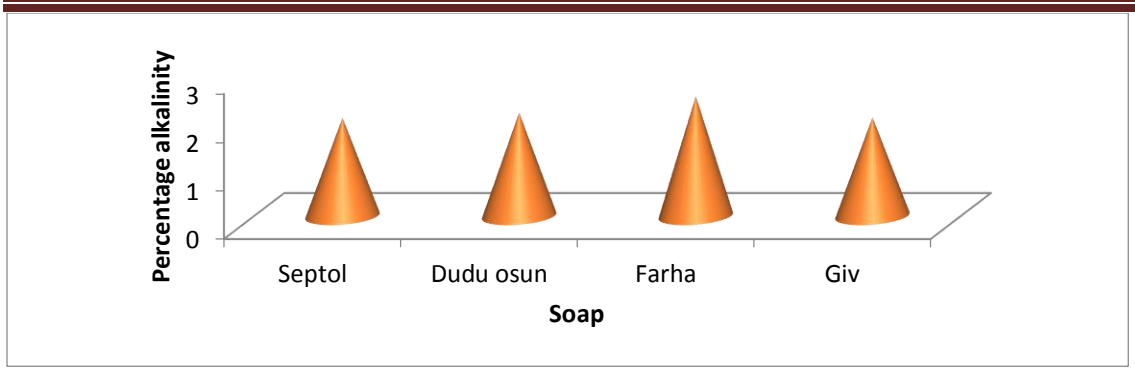

Fig.3: Percentage total alkali content in the soap samples

The total fatty matter is one important characteristic describing the quality of soap. The total fatty matter values of the results in Table 1, Fig.2 ranged between 26-74%. According to ISO 685,76% is the acceptable total fatty matter. Septol with 26%, and Giv with 66% total fatty matter are lower. This could be due to many additives such as fillers, preservatives, and colour in the soaps to confer special properties to the soap [4], and also the presence of unreacted NaOH in the mixture. However, Dudu Osun and Farhas' total fatty matter were 74 and 70% respectively, which according to ISO standard falls within the standard. Soaps with a lower total fatty matter have low quality.

Total alkali content is one parameter that determines the abrasiveness of any given soap. The range of values of the results in Fig.3 is between 2.03 -2.04%. The results fall within the standard values of 5% max declared by ISO standard [BIS] and 2% max declared by ISO specification [5]. This is an indication that the soap will not be harsh on the skin. Idoko *et al.* [4] carried out similar experiment on fifteen soap samples. In the study, eleven soap samples have total alkali content ranging from 0.06-0.22%. Though the alkali content were low, it was concluded that the results fall within the standard values of 5% max declared by ISO standard [BIS] and 2% max declared by ISO specification.

CONCLUSION

The analysis carried out revealed that Dudu Osun and Farha soap have acceptable quality whereas Septol and Giv have moderate quality with respect to their total fatty matter. However, all the soaps analysed were seen to have moderate total alkali content making them good on the skin and the environment.

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