Quality Analysis of selected Liquid Soaps in Ghana.

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ABSTRACT

Four samples of liquid soaps were purchased from Accra Makola market and analyzed to determine the amount of excess fatty acid, excess alkali, of insoluble matter and moisture and volatile matter present in them. The soaps analyzed on were sunlight from Unilever, Morning fresh from PZ cussons, Care from Sanmex international and Dove from Unilever U.S.A. At the end of the analysis, it was realized that sunlight soap contained 6% fatty matter, no excess alkali, 0.2% insoluble matter, 46% volatile matter, and moisture content. Morning fresh soap contained 10% fatty matter, no excess alkali, no insoluble matter, 26% volatile matter, and moisture content. Care soap from Sanmex international contained 4% fatty matter, no excess alkali, 0.2% insoluble matter and 32% volatile matter and moisture content. Dove soap contained 12% fatty matter, 0.48% alkali, 0.2% insoluble matter, 16% volatile matter, and moisture content. The soaps analyzed proved to be of high quality and meet the standard values as set by the Ghana Standards Board.

Keywords : Liquid soap, Ghanaian market, Fatty acids, insoluble matter, moisture, Volatile moisture, Alkali.

1 INTRODUCTION

Cleanliness they say is next to Godliness. What would man have done if there exist nothing like cleanliness. Since the inception of man, cleanliness has been key to the survival of man and many tales and accounts could be told of epidemics with deadly consequences due to less attention been paid to cleanliness.

One commodity that has been key to man's personal cleanliness is soap. Soap is an integral part of man's daily activities from taking luxurious baths to laundry. Though soap comes in many varieties and for different uses, its preparation is the same worldwide.

Chemically, soap is a mixture of sodium or potassium salts of the long chain fatty acids. It is produced by the hydrolysis of animal fat with alkali in a reaction called saponification reaction.[1]

Vegetable oils can also be used. Soaps that are produced using sodium alkali are hard as compared to soaps that are produced from potassium alkali. Potassium alkali is therefore used in making liquid soaps.

Upon hydrolysis of animal or vegetable oils, they are converted to glycerol and fatty acids. The fatty acids then react with the alkali to form metal salts called soaps with the liberation of water.[6]

The oils use in making soaps occurs in many varieties. More than 100 are known to exist. Unfortunately, not all these oils are suitable for soap production as many of them form fatty acids that cannot be saponified. Usually, combinations of oils are use in soap production to give a high quality product. Some components of these combinations may not undergo saponfication upon hydrolysis and maybe left out as unreacted fatty acids in the soap.

Short chain fatty acids in soaps can cause irritation of the skin.[2]

The unreacted alkali use in soap production must be washed out since it has the tendency to bleach the skin.

Unfortunately, most producers of soap sacrifice quality for profit and retain unreacted alkali in soap. Sometimes, the alkali is left in the soap on purpose with the intention of producing

a soap that bleaches. Soap making in Ghana is believed to have been in existence long before the Europeans landed on our shores. It is believe that the Fantes were making soap from crude palm oil and potash from wood ashes.

Up to today, this ancient way of making soap still exists among many Ghanaian communities. This soap is believed to contain excess alkali in them but they are still widely use because of its good cosmetic properties and the good lathering ability. It is believe that the soap is capable of treating certain skin diseases such as ring worm and prickle heart rashes.3

In the 1960's, modern soap factories were established to meet the demand for high quality and affordable soaps in Ghana. These factories include unilever Ltd in Tema, Appiah Minkah soap in Kumasi and lovable soap in Takoradi.[3]

Between 1984 and 1989, there was a steady rise in the production of both toilet and laundry soap in Ghana. Soap, is chemically a combination of Na+ or k+ ions and fatty acids. Over a hundred fatty acids are known to exist today. Out of these hundred and over, forty are known to occur widely[1].

Fatty acids can be grouped into saturated and unsaturated fatty acids. Palmitic and stearic acid are the most abundant saturated fatty acids whiles oleic and linoleic acids are the most abundant unsaturated fatty acids. Quality soap making consist in great part of choosing the right proportions of the right oils with their different fatty acids. Most commercial soap manufactures skimp on quality because of cost and use low quality oils such as tallow from beef fat[2]. Most of these low quality oils contain fatty acids that are not saponifiable. Using them leaves a lot of fatty acids in the soap as unsaponified fatty acids. This reduces the quality of the soap produced.

Soaps made from high quality saponifiable oils such as olive, hemp and palm oil leave fatty acids that are well below the maximum accepted levels as set by the standards authorities.

Saponification reaction involves the hydrolysis of fats and oils with alkali to produce soap. After production of the soap, the unreacted potassium hydroxide (KOH) should be washed off from the soap.

In the production of liquid soaps, the KOH is use. The KOH is soluble in water, ethanol and other solvents like ether, glycerol and very soluble in boiling dehydrated alcohol.[2]

The above solvents can therefore be used to wash the unreacted or excess KOH from the soap produced.

Potassium hydroxide is toxic by inhalation and ingestion .It is corrosive and irritating to the skin, eyes and respiratory track. It also bleaches the skin when it is exposed to it[2].

Soaps with large amount of unreacted potassium hydroxide in them thus have the potential of bleaching the skin. Commercial manufacturers sometimes intentionally retain excess potassium hydroxide in their soaps with the intention of producing a bleaching soap. Some manufacturers also retain excess potassium hydroxide due to poor methods of preparation.

Irrespective of the motives behind the retaining of potassium hydroxide in soaps, it must not exceed the maximum acceptable levels as prescribed by the standard Boards.

Matter insoluble in soap refers to foreign substances other than the components of soap. Some of these substances may be harmful if present in the soap and as such their presence should be avoided or reduced to a minimum.

Volatile matter

This refers to substances in the soap that are volatile. Volatile substances use as components of soap can easily vaporizes from the soap and reduce the quality of the soap. Volatile matter should therefore as much as possible be avoided in the manufacture of soaps.

OBJECTIVE

The objective of this analysis is to assess the quality of some liquid soaps on the Ghanaian market. To achieve this goal, levels of the following quality parameters of soap shall be determined:

- Excess fatty acid and the amount present.
- Excess alkali and the amount present.
- Amount of insoluble matter present.
- Amount of volatile matter present.

2.0 MATERIALS AND METHODS

Collection of samples

The analysis was conducted on four liquid soap samples purchased from the makola Market in Accra. The samples are sunlight from Unilever, Morning Fresh from PZ Cussons International, Care from Sandmex international and Dove bathing soap from Unilever U.S.A.

2.1 EQUIPMENTS AND APPARATUS

LIBROR EB 3200C Analytical balance, thermometer, beakers, spatula, measuring cylinders, volumetric flasks, burette, round bottom flask, heat mantle, reflux condenser, oven, dessicator, separating funnel and water bath.

2.2 REAGENTS

Methyl orange indicator,ethyl ether pure, methyl orange indicator , sodium chloride, sulphuric acid(0.2 M), potassium hydroxide ethanolic solution (0.1 M), ethanol(pure), phenolphthalein indicator (1 g / 100ml) of 95% v / v ethanol.

2.3 Determination of various parameters

Determination of total fatty matter

The soap was weighed into a beaker and dissolved completely in 100ml of hot distilled water. The solution was then transferred into a separating funnel and the beaker was washed with small quantities of hot water and the washings transferred to the contents of the separating funnel. A few drops of methyl orange indicator was added and from a burette, a quantity of the sulphuric acid prepared was added to it. The sulphuric acid was added until the color of the solution turned pink. An excess of 5ml of the acid was added. The solution was allowed to cool to room temperature and 100ml of ethyl ether added.

The separating funnel was shaken several times with the release of the stopper intermittently to release the pressure. The shaken repeated until the aqueous layer had become clear and allowed to stand. The aqueous layer was run into a second separating funnel and extracted with 50ml of ethyl ether. Another 50ml ethyl ether was used to extract the fatty acid from the aqueous layer. The three ether extracts were combined in the first seperatory funnel. The ether extractswere washed by shaking with three successive sessions of 50ml distilled water until the washings were neutral to methyl orange indicator. The ether extracts were filtered with dry filter paper covered with anhydrous sodium sulphate into a weighted flask. The seperatory funnel was washed out with small quantities of ether extracts and added to the weighted flask.

The ether solution was distilled slowly on a steam bath. 5ml of acetone was then added to the residue in the flask and warmed on the steam bath for about one minute. The flask was shaken at an angle of about 40° to direct a current of dry air into it to remove the acetone. The flask was then placed in an oven at a temperature of 90°C for 10 minutes. It was removed from the oven and blown with air for 15s and was cooled in the desiccator and reweighted. The drying procedure was repeated until the difference in consecutive weighing was less than 0.005gm. The fatty matter left was then calculated.

Determination of free caustic alkali content

Soap was accurately weighed and 200ml of ethanol mix with it in a flask connected to a reflux condenser. The flask was brought to a gentle boil for about 5min in order to remove carbon dioxide. The flask was removed and allowed to cool to about 70°C. About four drops of phenolphthalein indicator was added to the contents of the flask. Ethanol solution of potassium hydroxide was added until the solution just turned pink. Ethanol solution of HCl was also titrated with the solution until the color of the solution was identical with the color obtained when the ethanol was used to neutralize it.

Determination of insoluble matter

The soap was weighed into a conical flask and 200ml of ethanol was added to it. The conical flask was then connected to a reflux condenser and heated gently whiles continuously swirling. The filter paper to be used for the filtration was heated in

the oven controlled at 103°C temperature for one hour. It was then weighed and placed in a funnel on a second conical flask. When dissolution of the soap appears to be complete, the liquid was decanted on the filter paper and the insoluble matter in the conical flask washed by decanting with ethanol that had previously been heated to near its boiling point and the insoluble matter transferred to the filter with the aid of small quantities of ethanol. The filter and the residue were washed until they were free from soap. The conical flask was placed on water bath to keep the filtrate gently boiling. An independent heated funnel was also used. The funnel was also covered with a watch glass to ensure that ethanol vapor that cooled through condensation dropped back into the solution. The filter paper was dried in air and then placed in the oven at a temperature of 103°C.

After an hour, it was removed and left in the desiccator, long enough to cool to ambient temperature and weighed. The drying procedure was repeated until the difference in mass between two successive weightings was less than 0.001g. The final mass was recorded.

Determination of moisture and volatile matter

The soap was weighed in a Petridis and dried to constant mass in the oven at a temperature of 105° C. It was then heated, cooled and weighed again until constant weight was attained. The difference in weight was then calculated.

3.0 RESULTS AND DISCUSSION.

Table of results

Table1. Show Percentage of Fatty matter and Free caustic alkali

NAME OF SOAP	AMOUNT OF FATTY MATTER RECOVERD/g	PERCENTAGE OF FATTY MATTER RECOVERD	AMOUNT OF FREE CAUSTIC ALKALI RECOVERED/Cm^3	PERCENTAGE OF FREE CAUSTIC ALKALI
SUNLIGHT	0.30	6.00	0.00	0.00
MORNING FRESH	0.50	10.00	0.00	0.00
CARE	0.20	4.00	0.00	0.00
DOVE	0.60	12.00	0.53	0.04

Table 2. Show percentage of insoluble matter and Moisture and volatile matter

NAME OF SOAP	AMOUNT OF INSOLUBLE MATTER RECOVERD/g	PERCENTAGE OF INSOLUBLE MATTER	AMOUNT OF MOISTURE AND VOLATILE MATTER RECOVERD/g	PERCENTAGE OF MOISTURE AND VOLATILE MATTER
SUNLIGHT	0.01	0.20	2.30	46.00
MORNING FERSH	0.01	0.00	1.30	26.00
CARE	0.01	0.20	1.80	32.00
DOVE	0.01	0.20	0.80	16.00

Discussion

From the results obtained, it was realized that all the soaps contain amounts of fatty matter in them though all the amounts fall below the maximum accepted values as prescribed by the standard authorities. The presence of excess alkali was not detected in any of the soaps with the exception of the Dove bathing soap, which contains some amount of alkali.

This alkali could have been intentionally left in the soap with the aim of producing a bleaching soap or it was left in the soap for other purposes. Since the amount of the alkali present falls below the accepted levels, it cannot be classified as harmful.

The amount of fatty acid in the Dove soap was 12%.This value is less than the maximum value of 45% allowed by the Standard Board and therefore is acceptable. The other soaps been sunlight from Unilever, Morning fresh from PZ Cussons international and care from Sanmex international all registered some amounts of fatty acids (6%,10%,4%) respectively.

All the soaps also registered small percentages of insoluble matter in them which is an indication that foreign substances may have been introduced to the oils before they did undergo saponification. This however will not affect the quality of the soap since all the values fall under the recommended maximum values. The presence of moisture and volatile matter also suggest the presence of substances which are volatile in the soap.

4.0 CONCLUSION

From the results obtained from the analysis, it can be concluded that all the soaps analyzed meet all the quality criteria as set by the Ghana Standards Board and can therefore be classified as been of good quality.

5.0 RECOMMENDATION

The soaps analyzed proved to be of high quality and meet the standard values as set by the Ghana Standards Board. They can therefore be recommended for usage.

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