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ORIGINAL RESEARCH PAPER

QUALITY CONTROL AND EVALUATION OF CERTAIN PROPERTIES FOR SOAPS MADE IN ROMANIA♦

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Abstract: Several medical soaps with antiseptic properties and washing commercial soaps were analyzed to compare the values on quality criteria for different characteristics.
A comparison of results on the *p*H, the content of total fat, free alkalinity/acidity, chloride content, foam height and alcohol insoluble with the quality criteria have shown clear differences. Values for *p*H ranged between 5.5 and 8, for free acidity between 0.06 and 0.88%, the chloride content from 0.16 to 0.5%, the level of foam between 4 and 115 ± 2 cm and alcohol insoluble located between 20-28%. The results were compared with the data in the literature. It can be concluded that the values determined are within the limits set by standards.

Keywords: *antiseptic soaps, quality criteria, washing soaps*

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INTRODUCTION

The name of soap, after an ancient Roman legend, comes apparently from Mount Sapo, where animals were slaughtered. The rain had mixed fat, tallow and ashes on the Tiber. The women found that this mixture enhanced the work, and started to use the silty soil, moistened with a mixture of fat. Soap, by definition, is an active substance. In fact, it is the oldest active substances, and has been used about 4500 years.
For centuries, soap was the only one cleaning substance available. Historically, it has been claimed that the esteem of a country's civilization is based on consumption of soap. In the 18th century, because of the shortage of some raw materials, soap was a highly priced luxury, and only wealthy people could afford it. It became handy to other people only after the manufacture of sodium carbonate was developed. At the end of the 19th century, the first soap powder for laundry was made using sodium silicate as a builder. Whereas the use of sodium or potassium carbonate leads to a hard or soft soap, respectively, the chemical nature of the lipophilic part of the soap plays by far the largest role in determining the performance of the finished soap.
The soaps can be obtained by several methods: transesterification, hydrolysis and synthesis of fats and oils and surfactants. The soaps are made with fats, oils or fatty acids, treated with chemicals to high base. Antiseptics are substances used to destroy or stop the growth of micro-organisms in living tissue [1 – 6].
The medical soaps with antiseptic properties (*Borax, Dermafex, Roua de perle*) and washing commercial soaps (*Dove, Protex, Camay, Johnson, Nivea*) were analyzed to compare the values on quality criteria for the *p*H, content of total fat, free alkalinity/acidity, chloride content, foam height and alcohol insoluble.

MATERIALS AND METHODS

The soaps analyzed were purchased from Romanian market.
Solid soap was removed from the wrapper and ground into powder form. Following analysis were carried: *p*H, content of total fat, free alkalinity/acidity, chloride content, foam height and alcohol insoluble.
pH was determined using a CONSORT C535 multimeter.

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

Total fatty matter (TFM): 5 g of sample was weight and transferred into a 250 mL beaker. 100 mL of hot distilled water was added to completely dissolve the soap. 40 mL of 0.5N HNO_3 was added until contents turn slightly acidic. The mixture was heated over water bath until fatty acids were floating as a layer above the solution. Then it was cool suddenly in ice water in order to solidify the fatty acids and separated them. 50 mL of chloroform were added to the remaining solution and transferred to a separating funnel. The solution was shaken and separated into two layers. The bottom layer was drained. 50 mL of chloroform were added to the remaining solution in the separating funnel. The fatty acids were separated and the chloroform was dissolved again as in previous case and transferred to the collected fatty matter that was weighed in a porcelain dish. The contents were evaporated and the residue was weighed. From the

difference in weight, the % of fatty matter in the analyzed soaps samples was calculated using the relation:

$$\text{Fatty matter}\,[\%] = \frac{(B-A)}{C} \times 100 \quad (1)$$

where:
A – weight of the porcelain dish, g;
B – weight of the porcelain dish + soap after drying, g;
C – weight of the initial sample of soap, g.

Free acidity content: 6 grams of the soap sample was dissolved in 70 mL hot neutral alcohol and titrated against 2M H_2SO_4 using phenolphthalein as indicator. The free alkali/acidity was calculated as:

$$\text{Free acidity}\,[\%] = 3.1 \times \frac{M \times V}{W} \quad (2)$$

where:
M – molarity of H_2SO_4 solution, $mol \cdot L^{-1}$;
V – volume of H_2SO_4 solution used in titration, mL;
W – weight of the soap sample, g.

Chloride content: 5 grams of sample was completely dissolved in 100 mL hot distilled water. 10 mL of 20% calcium nitrate was added for complete precipitation. The mixture was quantitatively transferred into 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:

$$\text{Chlorides}\,[\%] = 0.08865 \times \frac{V_1 - V_2}{W} \quad (3)$$

where:
V_1 – volume of silver nitrate 0.1 M used for titration of the sample, mL;
V_2 – volume of silver nitrate 0.1 M used for titration of the blank, mL;
W – weight of the soap sample, g.

Foam height: 2 g of the sample was dissolved in 1 L volumetric flask and made up to mark with tap water. 50 mL of the solution was introduced into a measuring cylinder such that it followed the walls of the column to avoid foaming. 200 mL 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 height of the foam generated was read from the cylinder immediately the funnel outlet was opened.

Alcohol insoluble: 5 g of soap sample were dissolved in 50 mL hot alcohol and quantitatively transferred in a pre-weighed filter paper. The residue was dried in the oven at 105 °C for 30 min, cooled in the desiccator and weighed again.

RESULTS AND DISCUSSION

Table 1 presents the results of the chemical analysis on quality criteria of some medical soaps with antiseptic properties while Table 2 presents the results of chemical analysis on quality criteria of some washing commercial soaps.

Table 1. *Chemical analysis on quality criteria of some medical soaps with antiseptic properties*

Commercial sample name	pH	Moisture [%]	Total fatty matter [%]	Free acidity [%]	Chlorides [%]	Foam height [cm]	Alcohol insoluble [%]
Borax	7.3	10.4	34	0.56	0.19	4.0±2	20
Dermafex	7.0	14	52	0.88	0.16	8.3±2	22
Roua de perle	6.5	13.6	61	0.74	0.18	10.1±2	23

Table 2. *Chemical analysis on quality criteria of some washing commercial soaps*

Commercial sample name	pH	Moisture [%]	Total fatty matter [%]	Free acidity [%]	Chlorides [%]	Foam height [cm]	Alcohol insoluble [%]
Dove	5.5	10	73	0.15	0.48	115±2	24
Protex	7.5	14	82	0.14	0.36	107±2	25
Camey	8.0	11.5	71	0.06	0.47	113±2	27
Johnson	7.5	16.2	74	0.13	0.50	104±2	23
Nivea	5.5	10.3	84	0.16	0.25	103±2	28

The *p*H value of *Camey* soap (8.0) was higher than any of studied soaps. The high *p*H content indicated high percentage amount of unspecified and unsaponificable matter due to incomplete alkaline hydrolysis.

Moisture content was low and varied between 10 and 16.2% while TFM content was higher in washing soaps (71 – 84%) than in medical soaps (34 – 61%).

The range of free acid content was between 0.06% in the *Camey* soap and 0.88% in the *Dermafex* soap.

Chloride ion values were lower in medical soaps than in washing soaps. Likewise foam height was found to be higher in washing soaps than in washing soaps with the maximum value found for the *Dove* soap (115 ± 2 cm). The minimum value for foam height was found for the medical soap *Borax* (4 ± 2 cm).

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 and 28%.

Kuntom *et al.* [7] have studied soaps with coconut oil, glycerin, olive oil, palm kernel oil and canola oil and the results showed that moisture content was between 9 and 16%, TFM content was between 74 and 92%, values that are in concordance with our results. Foam height 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 [8 – 10].

The values determined were within the limits set by standards [11].

CONCLUSIONS

The medical soap with antiseptic properties (*Borax*, *Dermafex*, *Roua de perle*) and washing commercial soap (*Dove*, *Protex*, *Camay*, *Johnson*, *Nivea*) were analyzed to compare the values on quality criteria for the pH, the content of the total fat, free alkalinity/acidity, chloride content, the foam height and the alcohol insoluble.
A cursory look at the obtained results reveals similarities in parameters like *p*H, moisture, free acidity, chloride and alcohol insoluble for medical soaps and washing soaps.
The results were compared with the data from the literature and it can be concluded that the values determined are within the limits set by standards.

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