



**ANALYTICAL STUDIES AND PHYSIOCHEMICAL PROPERTIES OF COMMERCIAL  
AVAILABLE SOAPS IN THE MARKET**

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**ABSTRACT**

Soap is sodium or potassium salt of fatty acid produced by saponification reaction. Soap is used on a day to day basis by households. The physicochemical properties of soaps determine their quality and hence determine their efficiency and their cleansing properties. we can determine the competency and cleaning properties of soaps by knowing the physicochemical properties. Six commercially available soaps were taken (3 natural soaps and 3synthetic soaps) for colour, odour, pH, moisture content, % of free alkali, acid value, saponification value, tfm, foam height, foam retention according to standard procedures. The pH of the solution is not more than 10.5, moisture content ranges between 13.5% to 20%, percentage of alkali is not more than 4, acid value is not more than 2, saponification value is not more than 800, foam height is not more than 250 ml, Tfm ranges between 55-80%.

**KEYWORDS:** Soap, pH, % of free alkali, moisture content, Saponification value, acid value, total Fatty matter.

**INTRODUCTION<sup>[6]</sup>**

Soap is a basic material indiscriminately used by the rich and the poor, since soaps are used both for bathing and washing, it has become an integral and indispensable part of human life. Soap is the metallic salt of fatty acid got through saponification of oil with alkali, oil/ fat etc., are formed by the fatty acid and glycerin. In other words when an oil or fat is boiled with a solution of caustic soda, resultant products are soap and glycerin. The chemical reaction is called "saponification" and is expressed as follows.

Oil + caustic soda = Soap + glycerin.

Soap is made by combining tallow (or other hard animal fat) or vegetable or fish oil with an alkaline solution. The two most important alkalies in use are caustic soda and caustic potash. Soap can be distinguished from Non Soap of Detergents (NSD's) by their composition; NSD's are largely made from petroleum by products. Soaps today are far too sophisticated and are available in a wide variety of forms for specific end uses. Soaps remove the dirt from the body and clothes. The soap that is used to wash the body is called "Toilet soap or bathing bar". The soap that is used for washing clothes is called either

**Physiochemical Properties**

**Experimental Design and Sample Collection:** Six commercial soaps were purchased from shops of

"Washing soap or laundry soap". The important classifications of toilet soap are floating soaps, marbled soaps, medicated soaps and carbolic soaps. It is not essential to start, with an oil or fat for preparing soaps. Then what are the raw materials required for the manufacture of soaps. They are alkalies, ethanol amines, fixed oils and fats, animal fats and oils, lard, vegetable soap oils and fats, perfumes etc. The important alkalies used are sodium carbonate, or soda ash, caustic soda or sodium hydroxide. Sodium carbonate is non saponifying alkali and is therefore used in the preparation of soaps from fatty acids. Caustic soda is the most widely used alkali in the manufacture of hard soaps which are the most common. Caustic potash is used only for the manufacture of soft soaps. Perfumes are added to soaps to attract the consumer. Toilet soap contains more of perfume than the laundry soap. Perfumes used may be natural, semi synthetic or entirely synthetic. Natural-essential oils used in soap are sandal wood oils, khas oils, palmarosa oil, ajwan oil, peppermint oil, and oil of lavender. The soap which is made of coconut oil and ground nut oil is scented with appropriate scents. The soap is mostly popular in south India because of the fact that it has scented structure.

different areas in Tamilnadu. The bar soap were removed from the wrappers and chopped into small pieces. A one factor completely randomized design was adopted with types of bar soap's being the main factor.

### Chemical Parameters

**1. pH<sup>[5]</sup>:** 1 gm of sample was taken and added few ml of water, stirred continuously until it got dissolved and made up to 100 ml with distilled water. The pH of the solution was taken by using standardized pH meter.

#### 2. Percentage of Free Alkali<sup>[2]</sup>

5 gm of sample was taken in a conical flask and added 50 ml of neutralized alcohol (ethanol), Boiled it under reflux on a water bath for 30 minutes. It was cooled and 1 ml of phenolphthalein solution was added, then it was titrated immediately with 0.1 N HCl.

**3. Foam Height<sup>[5]</sup>:** 1 gm of sample soap was taken, dispersed in 50 ml of water, then transferred into a 500 ml of measuring cylinder and volume was made up to 100 ml with water, 25 strokes was given and stand till aqueous volume measured up to 100 ml and measured the foam height above the aqueous volume.

#### 4. Foam Retention<sup>[5]</sup>

50 ml of the 1% soap solution was taken into a 250 ml graduated measuring cylinder, the cylinder was covered with hand and shaken for 10 times. The volume of foam at one minute intervals for four minutes was recorded.

#### 5. Moisture Content<sup>[5]</sup>

A sample of 10 gm scrapped soap was put into a petridish and placed in an oven for one hour at 110°C. It was allowed to cool and then weighed the moisture content and percentage was calculated.

#### 6. Acid Value<sup>[16]</sup>

2 gm sample (soap) was taken in a conical flask; added 10 ml of ethanol (95%) and ether mixture was added and titrated against 0.1M potassium hydroxide solution using phenolphthalein as an indicator. End point was an appearance of pale pink colour.

**Note:** If the sample was not dissolved, it may be boiled in a water bath until the sample got dissolved.

#### 9. Test For Chloride<sup>[18]</sup>

##### Limit Test for Chloride

##### Procedure

Take two Nessler's cylinder and labelled one as Test (T) and another one as standard(S)

S. No	Test	Standard
1.	Dissolved the specified quantity of substance in 5 ml of water	Pipetted out 10 ml of standard chloride solution (25ppm) into the Nessler's cylinder added 5 ml of water.
2.	10 ml of dilute nitric acid was added.	10 ml of dilute nitric acid was added.
3.	Diluted to 50 ml with water.	Diluted to 50 ml with water.
4.	1 ml of 0.1M Silver nitrate solution was added.	1 ml of 0.1M Silver nitrate solution was added.
5.	Stirred immediately with glass rod and allowed to stand for 5 minutes.	Stirred immediately with glass rod and allowed to stand for 5 minutes.

#### 7. Saponification Value<sup>[16]</sup>

1 gm of sample (soap) was weighed and transferred into a beaker and dissolved in about 3 ml of ethanol, the contents of the beaker was washed with 7 ml of solvent for 3 times and transferred to a round bottom flask . 25 ml of 0.5N alcoholic potassium hydroxide was added and mixed well; the round bottom flask was attached to the reflux condenser. Another reflux condenser is setup with the blank with all other reagents present except the sample (soap). Both the flasks were placed in a boiling water bath for 30 minutes. The flasks were cooled to room temperature; phenolphthalein was added to both the flasks and titrated with 0.5N Hydrochloric acid. The end point of blank and test flasks were noted.

**Note:** The sample must washed with ethanol to remove unwanted materials (alcohol soluble materials), due to this may affect the saponification value.

**Saponification value = Titre value × 28.05 /Weight taken.**

#### 8. Total Fatty Matter (TFM)<sup>[7]</sup>

The bathing bar was made into small slices. Weighed 5 gm of soap sample using an electronic balance and transferred the sample (soap) into a separating funnel, added 30 ml of hot water from a beaker and mixed well. Excess 1:1 Hydrochloric acid was added to decompose the soap, till acids float as a clear layer on the top, cooled and added 50 ml ether, mixed well and separated. The aqueous layer was taken in another separating funnel and extracted with ether. Combined the ether extract were washed thrice with water to remove mineral acids and the contents were collected in a previously weighed china dish on a water bath. **Total fatty matter is calculated by following formula.**

$$\text{TFM} = \text{W2} - \text{W1} \times 100$$

**W2** = weight of china dish and ether extract, **W1** = weight of empty china dish.

## RESULTS

The evaluation and comparison of soaps study were done and results discussed below.

S. No	Samples	Colour	Odour	pH	% of free alkali	Foam height (ml)	Moisture content(%)	Acid value	Saponification value	Tfm (%)
1.	S1	Pale green	Faintly	10.45	3.60	200	6.72	0.84	537.15	78
2.	S2	Pale green	Faintly	10.45	3.80	220	11.12	1.68	572.20	59.7
3.	S3	Green colour	Faintly	10.46	4.03	210	11.92	2.24	600.27	68.7
4.	N1	Green colour	Faintly	10.16	1.73	240	13.26	1.40	506.10	68.2
5.	N2	Pink colour	Faintly	10.19	3.73	220	12.38	1.12	556.71	67
6.	N3	Green colour	Faintly	10.35	3.97	200	12.42	1.68	591.80	76.2

### Foam Retention

The sample was taken in 250 ml measuring cylinder and then measured the height of foam for 1-4 minute at one minute interval.

S. No	Natural soaps	1 minute(ml)	2 minute(ml)	3 minute(ml)	4 minute(ml)
1.	N 1	235	230	220	220
2.	N 2	210	210	205	205
3.	N 3	180	180	177	176
S. No	Synthetic soaps	1 minute(ml)	2 minute(ml)	3 minute(ml)	4 minute(ml)
1.	S 1	150	144	140	140
2.	S 2	172	172	172	172
3.	S 3	180	178	170	170

**Test for Chloride:** The chloride was present in the both natural as well as synthetic soaps. This was confirmed by limit test for chloride compared with standard.

### RESULTS AND DISCUSSION

Soap is already considered a part of every household but not everyone is familiar about the **difference between natural and synthetic soaps**. When went to the supermarket, it would seen that all soaps are made with the same ingredients and would only vary on the colour and the scent. However, most of the soaps that seen in the supermarket are not real soaps at all. They are harsh detergents or synthetic soaps that may cause more skin irritation or even health problems. A lot of people are now trying to use natural products rather than those made with chemicals. Some people are now trying **natural soaps** as a part of their hygiene and health benefit. Apparently, natural soaps do not contain chemicals that are found in the commercial ones. If to check the ingredients of the soap made with natural ingredients, make sure that it only contains essential oils of natural fats and pure moisturizing oils of should not seen any other chemicals included in the list of ingredients or it will not be considered **natural soap** anymore. Choosing natural over synthetic is a good decision really cares about hygiene and health. **Synthetic soaps** contain chemicals that can be harsh to the skin causing many health conditions such as allergies, eczema, unexplained rashes, and even skin dryness. For people who have sensitive skin or have some skin problems, it is advised to use mild soaps such as those made with organic ingredients. In this experiment we have concluded by the comparison between the synthetic and natural bars by performing the above given test and the result has been reported.

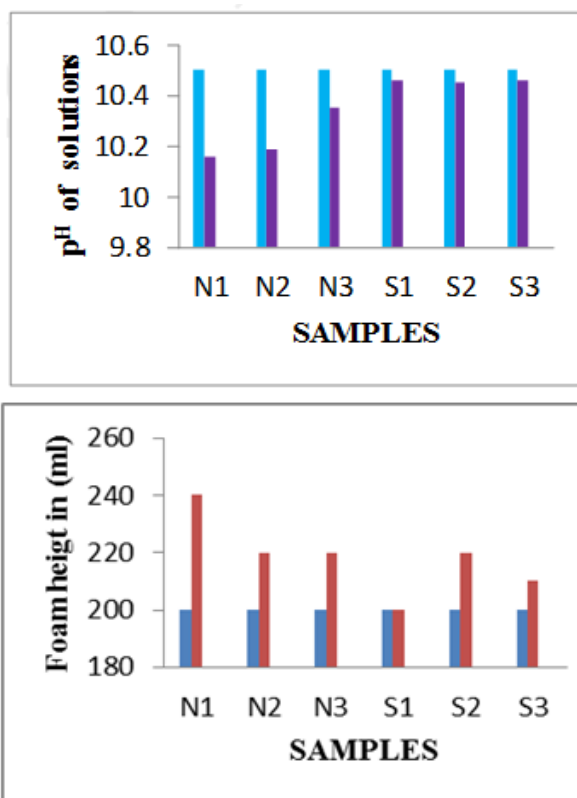


Figure. 1. Comparison of pH with Figure 2 Comparison of foam height compared standard values with standard values.

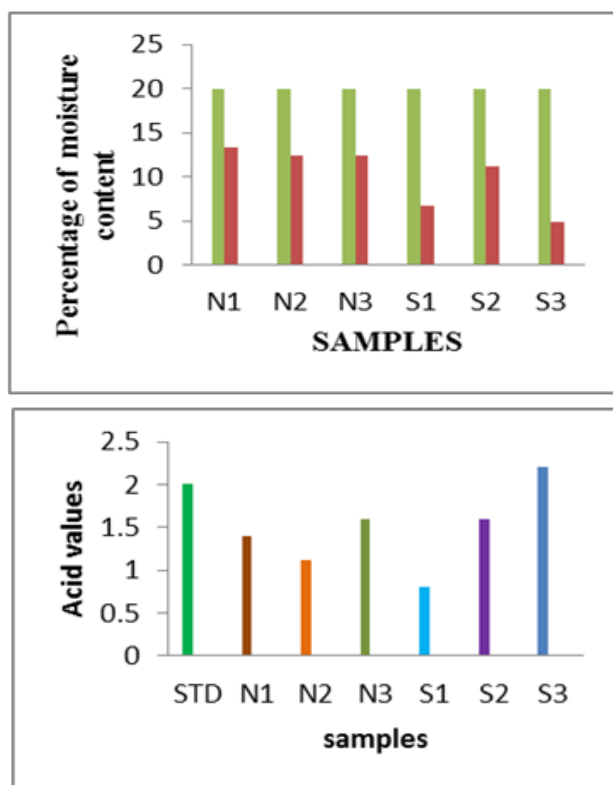


Figure. 3 Comparison of moisture content Figure 4 Comparison Acid Values with Standard Values Standard Values.

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