Determination of the Total Fatty Matter Content in Selected Soaps

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***Abstract*-When one says about healthcare and wellness about external body care, we immediately think of soaps. Washing our hand/body has always been one of most effective ways of keeping diseases at bay. It is a simple act that pays in dividends when it comes to keeping ourselves healthy and safe. Total fatty Matter is one of the most important characteristics describing the quality of soaps and it is specified in commercial transactions. Higher TFM ensures that soaps are least harmful to the skin and do not cause dryness.The current study indented to determine the total fatty matter of soaps, and toidentify the soaps which have high total fatty matter. The obtained results showed variations in many cases, from that of the declared TFM on the labels of popular soap brands. So these soaps should improve their production process and make additional checks on the raw materials and additives which make these soaps unsatisfactory for use.**

***Index Terms*—Healthcare, Hand Hygiene, Soap quality TFM**

1.INTRODUCTION

Hand washing with soap is also one of the key cornerstones of COVID-19 prevention. Now more than ever as we embrace the new normal and live with COVID-19, hand hygiene needs to become an integral part of our daily routine and our lives, as we live through this pandemic, and beyond, to protect us from diseases. The Chemistry of soaps has proved to be a very significant branch considering the wide spread application of soaps for cleaning purposes.Body soap is a creamy liquid or a solid bar used for washing our body. It produces an alkaline reaction when in contact with a negatively charged ion, such as a molecule of sweat or dirt. Soaps are being advertised as beauty soaps, health soaps, complexion soaps, deodorant soaps, freshness soaps, baby soaps and herbal or medicinal soaps. None of the advertisements speak of what exactly, goes into the making of such soaps. Scientifically, soap is one of the higher fatty acid or a mixture of such compound. The soap making is an ancient art. The formula for soap consisting of water, alkali and oil. Therefore, soap is a sodium or potassium salt of fatty acid produced by saponification reaction using sodium or potassium hydroxide. A soap molecule has a polar, water soluble carboxylate head and long oil soluble hydrocarbon chain as tail. The hydrocarbon tail of soap dissolves itself into the oil substances but leaves the ionic and outside the oily surface[1]. The quality of good soap depends on the composition of fatty acids. The early soaps were adequate cleansers and fully biodegradable. With the passage of time, several changes took place in raw materials as well as in various methods of soap preparation. These factors reflect in the quality of soaps.In recent times several articles have been published to address the issue of quality and safety of commercially produced soap around the globe [2] - [7]. The chemical characteristics of soap depend on several factors: the strength and purity of alkali, the kind of oil used, completeness of saponification and age of the soap.Such chemical characteristics include moisture content, total fatty matter (TFM), pH, free alkali, and percent chloride etc. These physicochemical properties of soap determine their quality and cleansing efficacy [8]. The most important factor to be considered in soap quality is its total fatty matter (TFM).It is worth mentioning that poor quality soap has been implicated in many skin conditions such as acne, eczema, hives, rashes and skin irritation.

The poor quality soap is as a result of poor methods of preparation and utter carelessness on the part of the manufacturers during the production stage [9].We use soap every day, and that is why we need to be aware of the chemicals present in them. Soaps are made from various things, but the most common are oils, fats, and caustic soda. Soap is a function of fatty

acids [10]. The chief fatty acids in soap making are lauric acid, myristic acid, palmitic acid, stearic acid and oleic acid.

TFM or total fatty matter is a measure for identifying the amount of fatty matter present in soaps. Soaps are graded in terms of total fatty matter or TFM.TFM or total fatty matter is a measure for identifying the amount of fatty matter present in soaps. Higher the TFM quantity in the soap, better is its quality. Toilet soap is a cosmetic by law and it must fulfill the requirements of the relevant Indian standard. Bureau of Indian Standards (BIS) has categorized bath or toilet soaps as 'normal', 'baby, transparent, and antibacterial soaps. Among these, the baby, transparent, and antibacterial soaps are called specialty soaps targeted to specific users. The BIS categorizes toilet soaps into three grades based on the total fatty matter present in them. As per BIS, Grade 1 soaps should have 76 per cent minimum TFM, while Grade 2 and Grade 3 must have 70 per cent and 60 per cent minimum TFM, respectively [12].

However, not all the Indian soaps are created equal. This article will guide you in finding the best soap for bathing. We all use it, but not many of us know its origin. In the present study determines the TFM for some commonly used toilet soaps from the markets in Kerala, India and compared with the standard values. Another objective of this work is that the soap samples are classified into different grades according to their obtained TFM values. These values are important in determining the quality of a soap and suitability in the cleansing applications.

2. EXPERIMENTAL

2.1 MATERIALS

The tests used here for the determination of TFM can be carried out easily by consumers using simple laboratory apparatus and common chemicals. Twelve samples of soap were collected in duplicate from various brands to screen for the determination of TFM values. The reagents used for the present investigation are: concentrated sulphuric acid and petroleum ether were purchased from Nice Chemicals.

2.1.1Sample Collection

Soap samples were randomly selected, that is, no criterion was employed in selecting which soap samples to be analysed. Twelve different soap samples were acquired from different supermarkets around Irinjalakuda, Kerala, India. Two bars of each soap brand were procured. Samples from the market collected [Figure 1-12] for the present study and a brief description about them are given below.

1. Femina Soap:

Figure 1: Femina Soap

This soap is described as a Grade 1 medicated skin-care soap, which is used in the treatment and prevention from scabies and other skin-related problems. It offers effective protection against skin issues, such as skin irritation, inflammation, rashes, and redness on the skin. Not only can it be used for your skin, but also works effectively in keeping your scalp and head free from body lice. It has a mild fragrance and can be used on daily basis as well. It can ideally be used by girls.

2. Cinthol Soap

Figure 2: Cinthol Soap

It is a mild soap, which does not dry out the skin or make it oily. It is good enough for all skin types and dermatologically recommended for skin conditions such as allergies, rashes, and skin irritations, and the best bath soap for daily use.

3. Vivel Soap

Figure 3: Vivel Soap

Vivel Aloe Vera soap is enriched with Aloe Vera extracts and Vitamin E. It nourishes your skin from deep within giving you satin soft glowing skin. Its invigorating fragrance keeps your skin rejuvenated all day long. Give in to the care of Vivel Aloe Vera and experience a soft touch.

4. Lora Soap

Figure 4: Lora Soap

Lora Soap contain almond oil alleviates dryness and gives moisture to the skin. Almond oil is rich in Vitamins A, B1, B2 and E and relieves itching. It is the perfect oil for any skin type but people with dry skin will benefit the most from using it.

5. Dettol Soap

Figure 5: Dettol Soap

Dettol soap provides Dettol's trusted germ protection from a wide range of unseen germs; cleanses and protects your skin keeping you healthy every day.All Dettol products are recommended by Indian Medical Association (IMA)

6. Indulekha Soap

Figure 6: Indulekha Soap

Indulekha White Soap enriched with the goodness of coconut milk. It provides hydration, and rich moisturisation to the skin.

7. Radhas Soap

Figure 7: Radhas Soap

Radhas Ayurvedic Soap includes vetiverodes roots, vilamitchu roots, white turmeric, wild turmeric and pure coconut oil. These extracts help to clear fungus, skin irritation, dry skin, itchiness, kills body odour and keeps you smelling good all day long. 100% Vegetarian.

8. Rexona Soap

Figure 8: Rexona Soap

Rexona comes with goodness of 100% naturally sourced coconut oil and olive oil. This soap reaches the deepest skin cells and hydrates it, leaving behind soft and supple skin.With a refreshing scent, this soap bar rejuvenates you after every bath and keeps you clean for hours after that.

9. Lux Soap

Figure 9: Lux Soap

LUX Rose & Vitamin E soap gives moonlit glowing skin. The Lux Rose & Vitamin E soap bar adds a touch of glow to your skin and leaves it beautifully fragrant. Infused with 7 beauty ingredients, combining essence of aromatic French Rose known for it's soothing and beauty enhancing benefits, and with Vitamin E know to moisturize and nourish skin, this bar leaves.

10. Lifebuoy Soap

Figure 10: Lifebuoy Soap

Lifebuoy is the world's number 1 selling germ protection soap. Its advanced silver shield formula helps give 100% stronger protection against germs. To protect ourselves from infection causing germs, we must take the right measures. Inadequate personal hygiene can lead to illnesses, skin infections and unpleasant odours. Also, the changing of seasons like monsoon and winter can raise the threat of flu, cough and cold. That's why bathing with soap regularly can help protect from hidden infection-causing germs

11. Pears Soap

Figure 11: Pears Soap

Pears, a soap with 200 years of heritage, is prepared with a unique process of moulding & then matured till it reaches pure transparency. Each bar of Pears is still finished by hand and checked by eye. Benefits of pears soap is gently moisturizes your skin to keep it smooth, mild Fragrance & Soft lather to pamper your skin, dermatologist tested, enriched with Glycerin & Natural Oils.

12. Johnson's baby soap

Figure 12: Johnson's baby Soap

Johnson's baby soap is enriched with 1/4th baby lotion and vitamin E which is made especially for babies.

2.2METHODS

Many known methods for the determination of TFM of soaps exist, the method used here are not only simple and rapid but also very sensitive to check TFM values.

2.2.1Soap sample preparation for TFM determination

The soap samples were removed from the covers and reduced into smaller pieces with the aid of a knife. Then they were thoroughly mixed to obtain a homogeneous sample. The samples were then stored until when required for them to be subjected to TFM measurements as described below. Each TFM parameter was then measured in triplicate.

2.2.2 Determination of total fatty matter (TFM)

An accurately weighed soap sample [5 g] of soap was taken in beaker and dissolved in 200 ml of distilled water. A small quantity (10-20 drops) of concentrated sulphuric acid was added and warmed it till the soap was completely converted to oil. The whole liquid was transferred into a separating funnel and allowed it to stand for half an hour. The aqueous layer was discarded and the organic layer was twice washed with boiled water. Then the organic layer was vigorously shaken with small amount of petroleum ether and lower layer was collected in another separating funnel and twice extracted with petroleum ether. The combined ether extracts were collected in dry weighed beaker. The ether was evaporated off by keeping the beaker in a water bath. The beaker and its contents were dried in a hot air oven at 100 ºC.

Calculation:

Mass of the soap = M g

Weight of the empty beaker = W_1 g

Weight of the beaker containing fatty material = W_2 g

Weight of fatty material = $(W_2 - W_1)$ g

Total fatty matter (%) = $\frac{(W_2 - W_1) \times 100}{M}$

3. RESULTS AND DISCUSSION

Total Fatty Matter was one of the essential characteristics describing the quality and nature of soap. The precept of total fatty matter for different

soap samples were observed as given in Table 1. These values are also represented as a graphical form in Figure 1.These differences in the (TFM%) is responsible for high moisture contents in soap. Other factors that influence the TFM value may be due to the type and quantities of the used fatty materials and also perhaps due to the difference in the saponification method.

Table 1. TFM values of selected commercial soaps in Kerala, India.

Commercial Name of soap	TFM (%) found in Test results
Femina	39.18
Cinthol	70.74
Vivel	58.52
Lora	39.34
Dettol	67.70
Indulekha	78.98
Radhas	54.96
Rexona	79.70
Lux	60.00
Lifebuoy	60.30
Pears	80.00
Johnson's baby soap	82.76

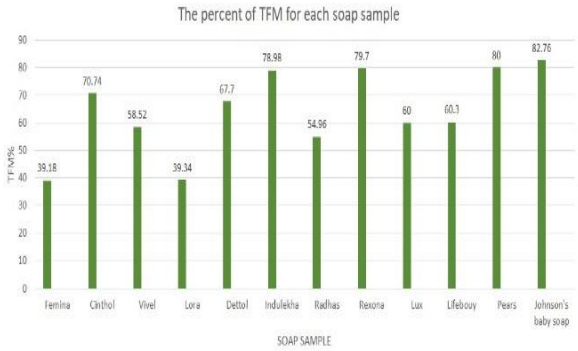

Figure 1: The TFM value for each soap sample

BIS categorized toilet soaps in to three grades based on the total fatty matter present in them. If TFM is above 76%, grade I, which is having good quality. TFM above 70%, belongs to grade II and TFM above 60% belongs to grade III. According to International Standards (ISO), good quality soaps must have TFM above 76%. According to the TFM values of soap samples, these are classified into different grades [Table 2].Higher the TFM quantity in the soap, better is its quality. Based on the tested TFM results, Indulekha, Rexona, Pears and Johnson's baby soap are good quality soaps and also known as Grade 1 soaps. Grade 1 soaps are high quality or very good soaps. Cinthol is a grade 2 soap. Grade 2 soaps are good soaps. Grade 3 soaps are Dettol, Lifebuoy and Lux. These soaps are satisfactory ones. The rest of the soaps had TMF values less than theBIS standard for toilet soap. For Femina, Lora and Radhas soaps have very low TFM values and not come under any of the three grades. This could be as a result of so many additives like fillers, preservatives, colour etc. in the soaps to confer special properties to the soaps. The lower TFM value is also due to presence of unreacted NaOH in the mixture. So these soaps are found to be low quality soaps.Most of the soaps analysed were of acceptable quality and are fit for use.Thebest soap for daily use in India needs to have the correct amount of TFM percentage.

Table 2. TFM values of selected commercial soaps in Kerala, India and their grades.

Commercial Name of soap	TFM (%) found in Test results	Grade
Femina	39.18	-
Cinthol	70.74	Grade 2
Vivel	58.52	-
Lora	39.34	-
Dettol	67.70	Grade 3
Indulekha	78.98	Grade 1
Radhas	54.96	-
Rexona	79.70	Grade 1
Lux	60.00	Grade 3
Lifebuoy	60.30	Grade 3
Pears	80.00	Grade 1
Johnson's baby soap	82.76	Grade 1

4. CONCLUSION

It can be summarized that the study indented to determine the total fatty matter of soaps, revealed that, the soaps which have high total fatty matter having good quality. The obtained results showed a variation in the TFM of the analyzed soap. It is the most important characteristics describing the quality of soap. The low total fatty matter is associated with hardness and lower quality of soap. The bathing samples which we have studied are all in the standard range of TFM values. Thus, we urge sagacious use of these cleaning products; keep your skin healthy by choosing the right soap for your skin; select a soap that keeps a balance among the physicochemical properties discussed. From this we can conclude that

our commonly used soap samples are of having higher TFM value, making them good for health and environment. The study recommends that poor quality soaps should make necessary improvements in their production process and make additional checks on the raw materials and additives which make these soaps unsatisfactory for use.

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