Making of Soap Using Various Oils

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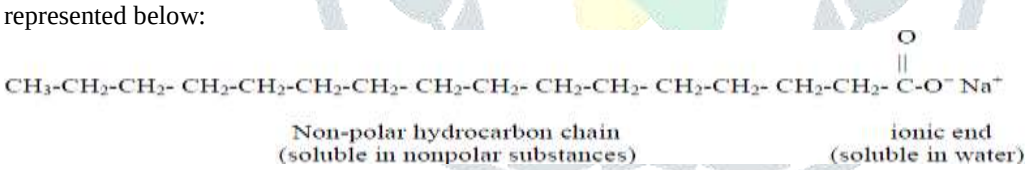
Abstract
Soaps are the sodium salts or potassium salts of stearic acids or any other fatty acids. They are prepared by the saponification process, which is, reacting the oil which contain triglycerides with caustic soda (NaOH) to give the soap. However different oils have different composition of fatty acids which are responsible for different properties of soaps made out of them. In the present work 5 different types of oils are taken. They are blended in various ratios to prepare 14 different samples of soap. Different properties of these samples were analyzed to see which soap is the best one. The cleansing and lathering properties of all samples were compared. The blend of coconut oil and castor oil at 3:1 ratio is found out to be the best with 76.8% of TFM and 89.46% of yield. The best blend is analyzed for various properties and they were compared with that given in the literature. The saponification values, iodine values of coconut oil and castor oil were found out and these values were also found for the blend. It was found that the blend was having SAP value of 230.4 and iodine value of 40 which are higher than the individual values. Thus, soap prepared using blend of both these oils has better properties than the soaps prepared by individual oils.

Keywords: Fatty Acid, physiochemical composition, Various oil

Introduction

A soap is a salt of a compound, known as a fatty acid. A soap molecule has a long hydrocarbon chain with a carboxylic acid group on one end, which has ionic bond with metal ion, usually sodium or potassium. The hydrocarbon end is nonpolar which is highly soluble in non-polar substances and the ionic end is soluble in water. The structure of the soap molecule is represented below:



The cleaning action of soaps because of their ability to emulsify or disperse water-insoluble materials and hold them in the suspension of water. This ability is seen from the molecular structure of soaps. When soap is added to water that contains oil or other water-insoluble materials, the soap or detergent molecules surround the oil droplets. The oil is, dissolved in the alkyl groups of the soap molecules while the ionic end allows it to be dissolved in water. As a result, the oil droplets are to be dispersed throughout the water and can be washed away.
Several things affect the soap-making process and the quality of this soap produced. The characteristics of this soap depend on the quality of oil, and the amounts of the caustic soda and water used to make it. The speed of the reaction between the oil and the caustic soda is influenced by free fatty acid content of the oil, the heat of the components before mixing, and how vigorously the mixing is to be done. Free fatty acid contents, vigorous mixing, and heat speed up the given soap-making process.

Experimental

10 g of the oil was measured into a plastic container. It was warmed in order to quicken the reaction between the alkali and the fat. A calculated amount of NaOH was weighed and a fixed amount of distilled water was added to it to prepare a 0.2 N NaOH solution. The caustic soda was stirred well using a stirring rod until it blends with the fat. The caustic soda was poured very gradually into it and stirred gently in one direction to enhance thorough mixing of the solution. The plastic container was insulated with pieces of cloths to prevent the fat from hardening before the soap mix properly. Small amount of sodium carbonate, sodium sulphate and sodium silicate were added into the soap mixture and it was stirred properly until it blends. The heating is done to 1100 C in a heating tub. Sodium sulphate is added during the soap is clarified but in the molten stage. It helps in the binding of the soap chemicals and it induces the foaming ability of the soap. It is equally a binder and an extender.

Result and Discussion

The physiochemical analysis Various oils tabulated in Table 1-8 given below.

Table 1: Yield and pH values of soap samples from blending of oils

Blend of soap making oil used	**Ratio of Oils in the blend**	**Yield(In percentage)**	**pH values**
Coconut oil+ Karanjia oil	4:1	89.21	9.73
	3:1	87.56	9.92
	2:1	89.34	9.95
Coconut oil+ Castor oil	3:1	89.46	9.46
	3:2	89.38	9.70
	1:1	88.23	9.52
Olive oil + Neem oil	3:2	86.66	9.30
	1:2	87.34	9.30
	1:1	85.32	9.54
Olive oil + Castoroil	3:1	89.36	9.46
	3:2	88.38	9.48
	1:1	88.13	9.61
Coconut oil + Olive oil	2:1	85.46	9.13
	3:1	89.67	9.38

Table 2: Lathering and cleansing power of soap samples from blending of oils

Blend of soap making oil used	Ratio of oils in the blend	Lathering power	Cleansing power
Coconut oil+Karanjia oil	4:1	Good	Good
	3:1	Good	Good
	2:1	Poor	Poor
Coconut oil+Castor oil	3:1	High	High
	3:2	High	High
	1:1	Good	High
Olive oil + Neemoil	3:2	Good	Good
	1:2	Poor	Good
	1:1	Poor	Good
Olive oil + Castoroil	3:1	Good	High
	3:2	Good	Good
	1:1	Good	Good
Coconut oil +Olive oil	2:1	Good	High
	3:1	Good	High

Table 3 Moisture and Hardness of soap samples from blending of oils

Blend of soap making oil used	Ratio of oils in the blend	Moisture (%)	Hardness
Coconut oil+ Karanjia oil	4:1	4.20	Hard
	3:1	3.9	Hard
	2:1	4.25	Hard
Coconut oil+Castor oil	3:1	4.3	Hard
	3:2	4.2	Hard
	1:1	4.3	Hard
Olive oil +Neem oil	3:2	3.9	Soft
	1:2	3.8	Not very hard
	1:1	4.0	Hard
Olive oil +Castor oil	3:1	4.1	Soft
	3:2	4.0	Soft
	1:1	4.2	Hard
Coconut oil +Olive oil	2:1	3.4	Did not bind
	3:1	4.3	Hard

Table 4: Total fatty matter of best blends of oils (%)

Oil Bend Selected	Massof Taken	Mass of matter in g	(TFM%)
Coconut+ Karanjia	5 g	3.32g	66.4
Coconut + Castor	5 g	3.84g	76.8
Olive + Neem	5 g	3.6g	72
Olive + Castor	5 g	3.5g	70

Table 5: Saponification value of the oil blend

Oil or blend	Saponification number
Coconut oil	268
Castor oil	180.3
Coconut+ Castor(3:1)	230.4

Table 6: Iodine Values of the oil blend

Oil or blend	Unsaponifiable matter(%)
Coconut oil	0.2
Castor oil	0.7
Coconut+ Castor(3:1)	1.3

Table 7: Unsaponifiable matter of the oil blend

Oil or blend	Iodine value
Coconut oil	10
Castor oil	68
Coconut+ Castor(3:1)	40

Table 8: Acid value of the oil blend

Oil or blend	Acid Value
Coconut oil	1.68
Castor oil	2.42
Coconut+ Castor(3:1)	1.92

Table:1-3 This table shows the hardness and moisture content of all the blends. Blend of castor oil which is a soft oil and coconut oil which a nut oil produces a very hard soap. This is the benefit of blending of which brings in the characteristics of both oils enhancing the property of the soap produced from the blend of both the oils. The soap produced from other oil blends like that of Olive oil and Castor oil, or Olive oil and Neem oil form soft soaps. The moisture affects the lathering and cleansing property of the soaps. However, this moisture is reduced with passage of time. Table : 4 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. The TFM measures the quality of soap and the accepted percentage value for toilet soap is between 76-77% while that of laundry soap is between 45-50%. The best blend is selected mostly on the basis of TFM. For oil blend of coconut oil + castor oil (3:2) the TFM is the highest at 76.8 which falls in the range of TFM required for toilet soap. TFM is what lends soap its soapy feel and it is the TFM and the insoluble matter in the soap that largely distinguishes soap from the others. Other soap blends also have appreciable TFM content with Olive oil and Neem oil with 72% and also can used for toilet soaps. The worst is of Coconut oil and Karanjia oil with 66.4% which makes it fit for laundry soaps. Table :5 It gives information concerning the character of the fatty acids of the fat- the longer the carbon chain, the less acid is liberated per gram of fat hydrolyzed. It is also considered as a measure of the average molecular weight (or chain length) of all the fatty acids present. The long chain fatty acids found in fats have low saponification value because they have a relatively fewer number of carboxylic functional groups per unit mass of the fat and therefore high molecular weight. Oils with high saponificaton values such as coconut oil (257.0) and palm oil (199.1) are better used in soap making [1]. Soap manufacturers blend their oils with coconut oil because of its high saponification value. When it is blended with castor oil then saponification number of the blend is higher than castor oil which certify the results in the above tables of better-quality soaps. Table :6 Iodine value or number is the number of grams of iodine consumed by 100g of fat. A higher iodine value indicates a higher degree of unsaturation. Table:7 Here the unsaponifiable matter of both castor oil, coconut oil and there is very low. These oils can be used for saponification without refining, although. phytosterol, cinnamic acid, karitene that are responsible for high values of unsaponified matter can be removed by boiling in water and ethanol. Table: 8 Acid value indicates the proportion of free fatty acid present in an oil or fat and may be defined as the number of milligrams of caustic potash required to neutralize the acid in 1 g of
the sample. A high acid value indicates a stale oil or fat stored under improper conditions.

Conclusion

Soap was prepared using all varieties of oils including that of all the various blends of oils. The soap was tested for various properties and compared with detergents. One soap making oil initself does not have all the properties. Therefore, blends of oils are prepared taking 2 oils together because it would be easier for analysis. All necessary properties like Lathering power, Cleansing power, pH, Hardness, Total Fatty Matter, Moisture, Yield were all studied to select the bestblend out of all the blends. The best blend was found out to be coconut oil and castor oil (3:1). ItsTFM value was found to be 76.8% which lies in the range of toilet soaps. It had the maximum yield out of all soaps with 89.46%. It had excellent lathering as well as cleansing power. As coconut oil is a nut oil, therefore soap prepared with this blend was very hard. Analysis of this blend confirms to that given in the literature and the results of the above analysis. Saponification number of this blend of oil was found to be 230.4 and the iodine number was found to be 40. Both high saponification number and iodine number indicates this blend to be highly preferred for soap making. The soap prepared is not affected by high iodine number as the soap prepared isvery hard. The acid value found that is 1.3, was also acceptable according to the literature. The unsaponifiable matter is also within the limits and oil blend can be used without being refined.

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