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# MAKING SOAP FROM READILY AVAILABLE AGRICULTURAL AND HOUSEHOLD WASTES CAN INCREASE CLEANER IN RURAL AREA

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## Summary

In some areas of the world, soap is too expensive for many people to afford. For these people an alternative exists. They can make their own soap. In general, soap is made by the reaction of triglycerides and caustic soda. However, caustic soda, too, may be difficult to find or too expensive. The aim of this project is to develop a process for making soap from readily available agricultural and household waste materials, and other inexpensive chemicals. By using this process, rural people can get the benefits of readily available, inexpensive soap. Soap is made from animal fats or vegetable oils by saponification using strong base. The simple soaps can be isolated as cakes or bars, or it can be used as water solution. Many reaction conditions were studied to develop a recommended process that can be done using equipment and reaction conditions that can be performed in a kitchen or a fireplace. The soaps from this project were characterized primarily using infrared spectroscopy and several other analytical techniques as well as tests to show their effectiveness.



People in Tanzanian village with banana plantation

## GENERAL REACTION

When fats or oils are treated with strong bases such sodium hydroxide (NaOH) or, potash (KOH) they undergo saponification to form glycerol and soap (the salt of the long chain fatty acid) (Stettelheim 2001)

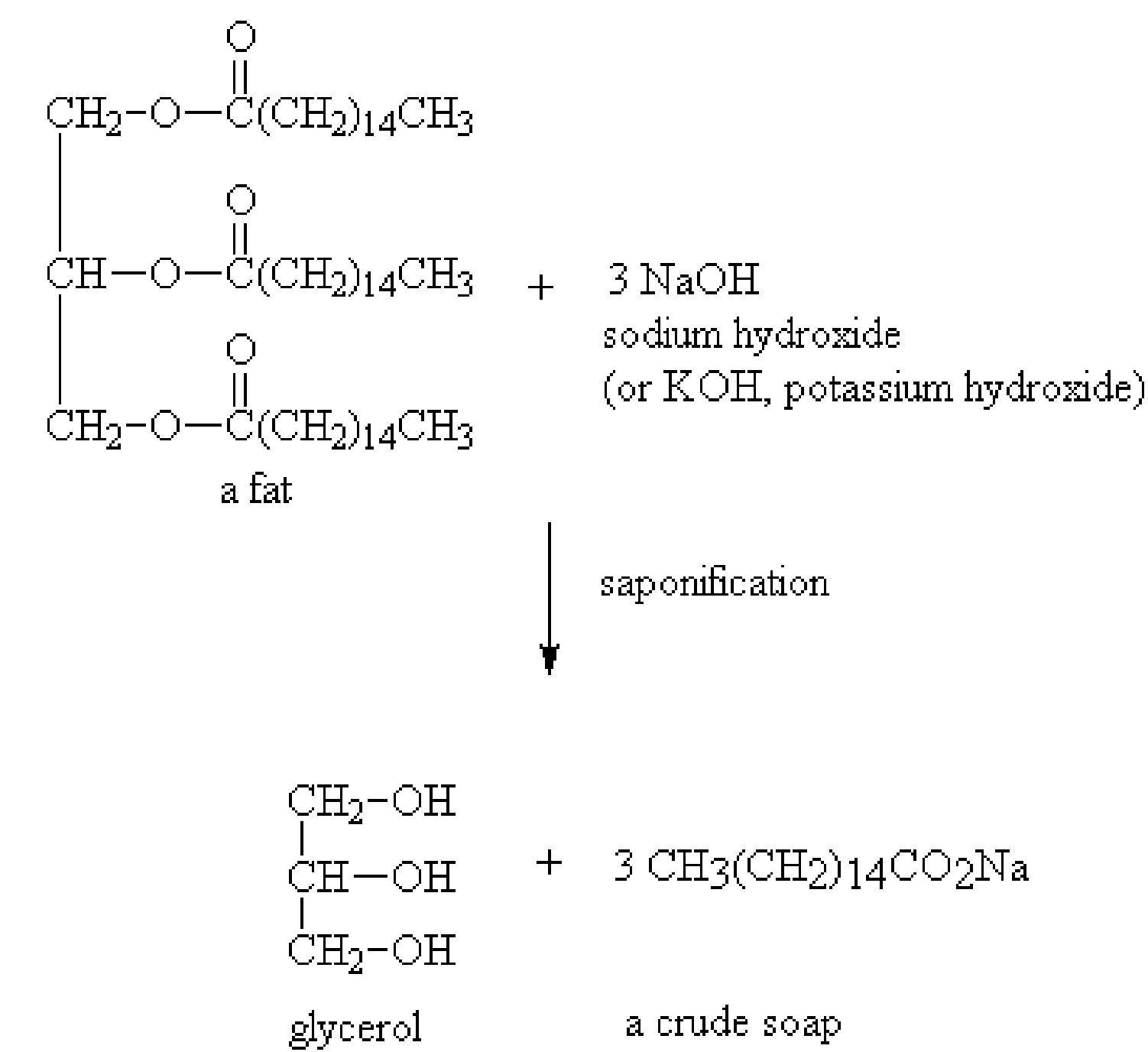


Table 1. Titration Results

	Initial HCl	Final HCl	Total	Weight NaOH	Weight KOH	Moles NaOH	Moles KOH
Wood ash solution	0.00ml	1.1ml	1.1ml	0.02g	0.0g	0.001030	0.000000
ICPCT data				0.00g	0.0g		
Banana ash solution	1.1ml	12.0ml	6.1ml	0.0g	0.0g	0.001030	0.001030
	12.0ml	11.1ml	6.1ml				

Table 1 shows the titration results of 1g of banana ashes and wood ashes dissolved in 100ml of distilled water and titrated against 0.1M HCl by using three drops of phenolphthalein. The 0.02g NaOH and 0.0g KOH in wood ashes based on calculation assuming all the base comes from either NaOH or KOH. The 0.00g NaOH and 0.0g KOH in the same ash are based on ICPCT data for NaOH and KOH.

## PREPARATION OF FATS OILS

Cut the fat from meat and wash it with clean cold water. Cut it in small pieces and place it in cooking pan with water to fill the pan full. Boil it until the water evaporates, then reduce the heat and continue heating slowly until the fats melt out. Pour the oil into a container and save it at room temperature for several weeks before using it to make soap. Another method: fry the bacon in the frying pan and pour the oil after it has cooled to a safe temperature into a glass or metal container (recycle jar or can). A similar process can be used for any fatty meat. Oil extraction: oils can be extracted from fruits, nuts or seeds by heating, solvent or pressure. Pressure extraction separates oil from the solid particles by squeezing the oil out of the crushed mass of the seeds. Some oils need to be pressed out mechanically. Filter the oil to remove particles from the pressing operation and save the oil.

## PREPARATION OF SOAP SOLUTIONS

12g sodium hydroxide dissolved in 10ml water and 10ml of 95% ethanol. The solution was mixed with 2g of shortening and heated for 10 minutes in a boiling water bath. 100 solutions of ethanol and water was added in portion in the mixture and stirred occasionally. After heating, the soap solution was poured into a solution of 12g sodium chloride in 100ml of water. The soap was isolated by vacuum filtration using a buchner funnel from the combined reaction mixture and sodium chloride solution. Then the soap was allowed to dry for several days.

## PREPARATION OF SOAP SOLUTIONS FROM FAT ISOLATED IN COUNTRY

12g of sodium hydroxide dissolved in 30ml of water and warmed to 50°C. The solution was mixed with 100g of melted fat at 50°C and heated and stirred for 45 minutes. Then the soap was allowed to cure for several weeks. Soap from vegetable oils and ash-extract alkali use the same procedure as above.

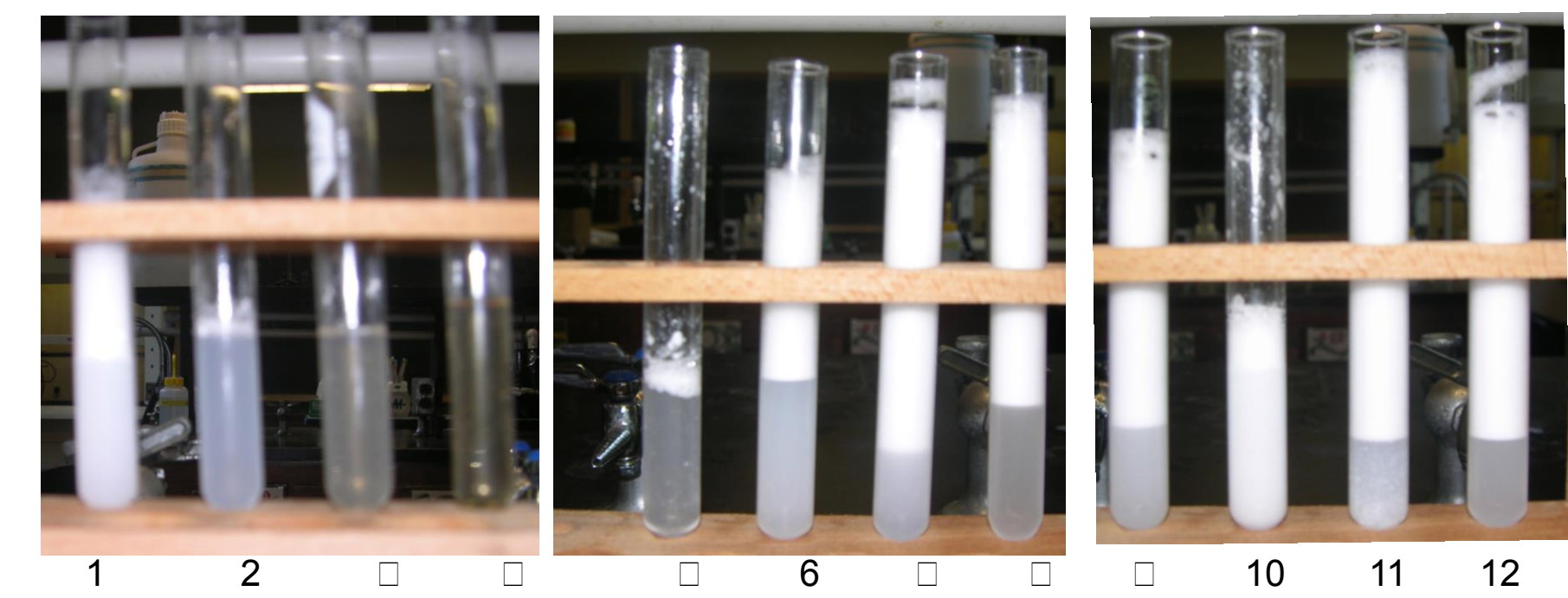


Sr. Eugenia and Roberto Lecca in front of granite millstone of olive press

Table 2. Data for Soap Samples

Foam Test	pH	Color of Test Tube	Lather
Dove soap (Control)	11	11	Strong
Soap made from beef fat	11	11	Very strong
Soap made from corn oil	12	12	Strong
Soap made from bacon fat	11	11	strong
Soap made from cotton seeds oil	11	11	Strong
Soap made from shortening	11	1	Medium
Soap made from banana ash solution + shortening	11	11	Nothing formed
Soap made from wood ash + bacon fat	11	11	Nothing formed

Table 2 shows the end point of soaps made from different fats and oils. The pH of soaps made from 100g of beef, bacon fat and corn oil with 12g NaOH have same pH as Dove soap from Rite Aid Drug Store. The other soaps have higher pH. No foam formed on soaps made from ash extract alkali.



Test Tubes for foam Test

## DISCUSSION

The soap produced using 10% sodium hydroxide solution was hard and gave the most foam in our foam test. The ash alkali soap had a harder consistency. The difference in hardness between the pure sodium hydroxide and the ash-extract soap could be accounted for the presence of other metallic ions in the ashes.

The foam ability of the pure sodium hydroxide soap was very different from that of the ash-extract soap (table 2). This could be caused by the presence of calcium ions in the ash which reduced the carboxylate solubility and hence could reduce soap foam formation. Also, it could be the result of low concentration of extracted alkali, which was not as effective as the pure sodium hydroxide. The results in table 2 show the pH and the foam formation in different soaps made from different fats and vegetable oils. By using Dove soap as a control, the results give the possibility of that, soaps were made in this project could be safe on human skin. The infrared spectra show absorbances typical of alkali metal carboxylates.

## SOAP RECIPE

Ingredients For a Traditional Animal Fat Soap (For example if you want to make a one bar of soap)

100g of fat  
12g of sodium hydroxide (NaOH) or 10g of potassium hydroxide (KOH)  
100 ml of distilled water or rainwater

**Instruction** Add the NaOH in the water, mixing careful until dissolved. Heat the lye solution to 50°C on a stove. Melt the fat in a saucepan and bring it to 50°C on the stove. Blend the lye solution into the fat, stirring clockwise. Maintain the temperature about 45°C to 50°C and stir for 45 minutes or until the soap shows tracing. Then pour it into a clean mould and leave to set for 2 days. Then release it from the mould and leave it to cure for 2-3 weeks.



## PISHI WA SAHARA

Kitu vinavohitajika kama kutengeneza kipande kimoja cha sabuni ya mafuta kutoka kama mnyama 100g za mafuta 12g za tindikali (NaOH) au 10g za KOH 100ml za maji ya mvua

## WONJOJO

Pima kiano cha maji kama ilivohapo juu. Pima kiasi cha tindikali na kuchanganyie kwenye maji. Koronga ili tindikali iyeyuke kwenye maji na kisha upashe moto ule mchanganyiko hadi kipimo cha joto kifikiye 50. Upashe moto mafuta kama kiasi kile cha joto. Utaaribu mimina tindikali kwenye mafuta huku ukikoroga kama nguvu. Hakikisha kipimo cha joto kisipande ama kupugua 50. Endelea kukoronga mpaka mchanganyiko umekuwa mzito kama uji. Ipa sabuni na ikeke kwenye chombo safi. Iache sabuni ipoe kama muda wa siku mbili hivi na baadae unaeza kuitoa kwenye chombo na itakuwa tayari kutumika baada ya majuma 2-3

## CONCLUSION

The soap made from pure sodium hydroxide with animal fat extracted in the kitchen, corn oil, and cottonseed oil was good and acceptable for household use. More study is needed for the alkali derived from plantain peels ashes because the resultant soap was not effective as soap made from pure sodium hydroxide.

## ACKNOWLEDGMENTS

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