ASSESSMENT OF THE QUALITY OF A BLEND OF PALM OIL AND PEANUT OIL FOR SOAP PRODUCTION

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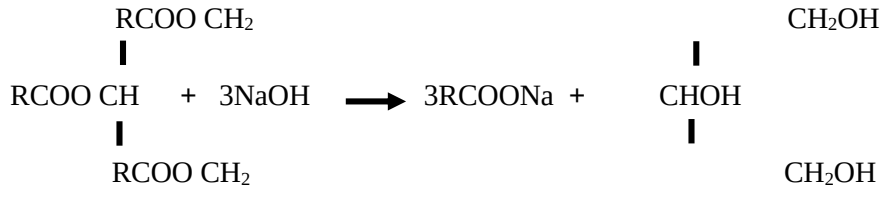
Abstract: *The quality of oil produced by blending peanut oil and palm oil was investigated to ascertain the possibility of using it for making soap. The use of palm bunch as a source of alkali for making soap was also investigated. The physicochemical properties of the oil blend were determined. The result with saponification value (141.7 mgKOH/g) and iodine value (63.1 I_2/100g) showed that the quality of the oil blend was not good for making soap in spite of the good values of free fatty acid and acid value. A soap was produced using alkali extracted from palm bunch and another soap was produced using pure potassium hydroxide alkali. The result showed that palm bunch can serve as a source of alkali for soap production. The production of soap using locally extracted alkali from palm bunch will reduce Nigeria's environmental pollution and also it is an entrepreneurial opportunity that can create jobs for jobless Nigerians thereby advancing the nation's economy in post covid-19 pandemic.*

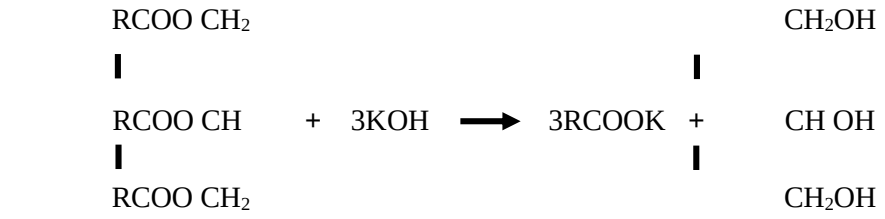
Keywords: Palm oil, peanut oil, soap production, palm bunch extracted alkali.

1. INTRODUCTION:

Soap is a commodity needed daily in the lives of people for cleaning, in fact the covid-19 outbreak of 2019 made soap an essential commodity needed to curb the spread of the deadly virus. Records from ancient Egyptian stone tablets dated 1550 BC indicate that the ancient Egyptians produced a soap-like substance from animal fat and alkaline salts (Joshi, 2017). Soap is a salt formed when the fatty acids in fats or oils react with an alkali such as potassium hydroxide (KOH) or sodium hydroxide (NaOH), this reaction of fat or oil with an alkali to form soap is known as saponification reaction (Ababio, 2005).



Fat or oil Caustic soda Sodium soap Glycerol



Fat or oil Caustic potash Potassium soap Glycerol

Soaps can be produced using different kinds of fats and oils depending on the type or specification of soap needed: palm oil, palm kernel oil, coconut oil, olive oil, canola oil, peanut oil and tallow (mutton fat). Local soap producers normally extract potash from agricultural wastes like empty palm bunch, plantain peels, cocoa pods e.t.c, this potash now serves as the source of alkali (potassium hydroxide) for soap production. These readily available wastes help to reduce production cost and prevent environmental pollution.

Two or more different fats or oils can be mixed or blended together to get a new oil which will now be used for soap production, but most local soap producers have focused on the use of palm oil only for soap making without blending it with any other oil. Due to the abundance of peanut in Nigeria, it is important to see if a blend of palm oil and peanut will give a better soap.

Various studies have been done on the production of soap using different oil blends with agricultural wastes serving as an alkali source (Aiwize & Achebo, 2012; Onyegbado et al., 2002). Their findings showed that soaps of good quality can be produced using different mixtures/ blends of oils with locally made alkali. But the use of a blend of palm oil and peanut oil for soap production is yet to be studied appropriately.

This study aims to determine the quality of oil produced by blending palm oil and peanut oil, to know if the quality will be enough for making soap. This study also investigated the use of palm bunch as a source of alkali in soap making. To achieve these, the physicochemical properties of the oil blend like saponification value, iodine value, acid value and free fatty acid were measured. and also the properties of soap produced using palm bunch extracted alkali (KOH) and pure laboratory grade potassium hydroxide (KOH) were measured.

2. LITERATURE REVIEW:

Much research has been done on the use of different oil blends for soap production. The use of locally extracted alkali from agricultural waste for making soap has also been investigated. Onyegbado, et al. (2002) used a blend of palm oil and palm kernel oil to produce soap, while extracting alkali from plantain peel ashes. This oil blend had a saponification value of 206 mgKOH/g. They used efficient filtration method to extract alkali from the plantain peel ash. The resulting soap produced was neat, milky white coloured and effective for use. Atiku, et al. (2014) prepared soap using palm oil only, and they extract alkali from millet stalk. The physico-chemical properties of the palm oil they used showed that it has a saponification value of 171.1 mgKOH/g, iodine value of 41.2 gI_2/100g and an acid value of 1.46 mgKOH/g. They therefore concluded that palm oil is effective for soap making. Zauro, et al. (2016) in their comparative analysis prepared one of the soaps with a blend of shea butter oil and palm kernel oil. Rubber seed oil and palm kernel oil were blended in the ratio of 20:80 to produce a quality soap in the work of Aiwize and Achebe (2012).

In the work of Adaku and Melody (2013), cassava peels and plantain peels were used as alkali sources for soap preparation, also a research carried out by Israel and Akpan (2016) showed that palm bunch and plantain peels are good sources of alkali to prepare soaps.

3. MATERIALS AND METHODS :

Palm oil and peanut seed were purchased from a local market in Ekwulobia, Anambra State. Dried empty palm bunch and palm bunch fragments were also gotten locally.

BLENDING AND BLEACHING OF OIL

Oil was extracted from the peanut seeds using soxhlet extraction method. The extracted peanut oil was blended (mixed) with palm oil in the ratio of 20:80 by weight. The bended oil was then bleached, which helped to improve the colour of the oil blend. The bleached oil which had a brighter colour was now good for making soup.

DETERMINATION OF THE PHYSICOCHEMICAL PROPERTIES OF THE OILS

The saponification value, iodine value, free fatty acid and acid value of the oils were determined using AOAC (1995) method.

PROCEDURE FOR EXTRACTION OF ALKALI FROM EMPTY PALM BUNCH.

The fragments of dried empty palm bunch were heated in a furnace for three hours at a temperature of 550^0c to ensure adequate burning. The sample which is now in ash form was homogenized, crushed and sieved to get particles that are small. The ash was then placed in a beaker and 1 litre of water was added to it, and the flask was left undisturbed for 24 hours. After 24 hours, it was filtered using a filter cloth. The filtrate contains the alkali. The filtrate was then concentrated by heating to ensure evaporation till it became dry. The solid remaining after evaporation is the alkali.

PROCEDURE FOR PREPARATION OF SOAP

The alkali extracted from palm bunch was impure and the percentage purity was assumed to be 40%. Taking account of the impure potash, the quantity of alkali from palm bunch needed to saponify 7g of the bleached oil blend was calculated to be 2.5g. Therefore 7g of the oil blend was measured into a beaker and 2.5g of the alkali was dissolved with 2.5g of water to get a 50% (w/w) solution. The oil was placed on a hot plate and heated to 90^0c and maintained at that temperature. The alkali was added slowly to the oil with continuous stirring and heating. The mixture was heated with continuous stirring until the solution became creamy (saponification complete) .When saponification was completed, the impure soap was poured into a saturated solution of NaCl (50g of NaCL in 150mL of distilled water) with constant stirring for 3 minutes to salt out the soap. After cooling, a pure soap floated on the surface while a solution

of glycerol and salt was at the bottom. The impurities at the bottom were removed by piercing the soap and pouring it out. The soap was removed and dried. The same procedure was adopted for preparing soap using pure potassium hydroxide.

DETERMINATION OF THE PROPERTIES OF SOAPS

The moisture content and total fatty matter of the soaps were determined using AOAC (1995) method.

4. RESULTS AND DISCUSSION:

The physicochemical properties of the palm oil and peanut oil before and after blending were measured, this is to know the suitability of the blended oil for making soap. The properties of the soaps produced using palm bunch extracted alkali (KOH) and pure potassium hydroxide (KOH) were also evaluated to know how effective the locally extracted alkali from palm bunch is in making soap.

Saponification value shows the quantity of potassium hydroxide needed to completely react with one gram of fat or oil under standard conditions. The oil blend showed a low saponification value of 141.7 mgKOH/g (Table 1), this low value can be attributed to the low saponification value of peanut oil (135.08 mgKOH/g). Oils with high saponification values are appropriate in soap production (Yousefi et al.,2013, cited in Babantunde & Bello, 2016). This reduction in the saponification value of palm oil due to addition of peanut oil shows that adding of peanut oil to palm oil for soap making is inappropriate.

TABLE I. Physicochemical properties of palm oil and peanut oil before and after blending.

PARAMETERS	PALM OIL	PEANUT OIL	OIL BLEND
Saponification value (mgKOH/g)	179.21	135.08	141.65
Iodine value (I_2/100g)	52.03	51.8	63.10
Free fatty acid (%)	0.89	1.13	0.84
Acid value (mgKOH/g)	1.79	2.26	1.68

Iodine value indicates the level of unsaturation in a fat or oil. The iodine value of the oil blend rose to a value of 63.1 I_2/100g which is much higher than the different iodine values of the individual oils (Table 1). This high value may be due to the heating of the oil blend during bleaching. Osagie and Enyi (2015) reported an iodine value of 98.42 I_2/100g for refined rubber seed oil which was used in soap making. Oils with low iodine values are suitable in soap production (Dosunmu & Ochu, 1995, as cited in Adebayo, et al., 2012). The higher the level of unsaturation of fat or oil, the higher the iodine value and vice versa. Free fatty acids are formed by the hydrolysis of fat or oil due to long storage, exposure to air, light, heat and presence of moisture. The oil blend showed a free fatty acid of 0.84% which is suitable for making soap. The palm oil used to make soap in the work of Atiku (2014) had a free fatty acid of 18.04%. Lower values of free fatty acid for an oil sample is best for soap making because it shows low level of degradation of the oil. Acid value is the mass of potassium hydroxide (KOH) needed to neutralize one gram of the free fatty acid present in the fat or oil. A fat or oil with high acid value shows deterioration of the sample due to environmental conditions like storage and exposure to air, and is not suitable for soap making. The oil blend had an acid value of 1.68 mgKOH/g which makes it suitable for soap making because Eka and Chidi (2009) measured a low acid value of 3.96 mgKOH/g for butternut oil and affirmed its suitability for soap making because of this low value. The individual effect of the free fatty acid and acid values of the individual oils on the free fatty acid and acid value of the oil blend cannot be fully ascertained.

The Properties of the soap produced using locally extracted alkali and pure potassium hydroxide shows how effective the locally made alkali is in soap making (Fig.1). Soaps with high moisture content would lead to reaction of the excess water with unsaponified fat, which is called hydrolysis of soap on storage (Sarfaraz et al., 2019). The moisture content of the two soaps produced (Table 2) does not fall within the limits of Encyclopedia of Industrial Chemical Analysis (10%-15%), this is due to the soap preparation method.

TABLE 2. Properties of soap produced using locally extracted alkali (KOH) from palm bunch and pure potassium hydroxide.

Parameter Of Soap	Palm Bunch Extracted Alkali (KOH) Soap	Pure Potassium hydroxide (KOH) Soap
Total fatty matter (%)	48.84	49.32
Total free alkali (%)	42	76

The more a soap's value for total fatty matter (TFM), the more its moisturing and lubricating ability on dry skin. The higher the TFM content of a soap, the higher the soap's quality (Sarfaraz et al., 2019). A standard toilet soap gotten from a Nigerian shop has a TFM content of 75% minimum.

Figure 1: Soaps produced using different alkali: (a) palm bunch extracted alkali (b) pure potassium hydroxide alkali.

The palm bunch alkali soap and pure potassium hydroxide soap showed low values of TFM of 48. 84% and 49.32% which are not up to the standard, this may be due to the soap's production procedure or the oil used. The soap prepared using pure potassium hydroxide is harder than the palm bunch alkali soap. The difference in values of the moisture content and TFM content of the two soaps is due to the method of preparation of the soaps.

5. CONCLUSION:

In this study, the physicochemical properties of the bleached oil blend were analyzed to ascertain the quality of the oil blend. The properties of the soap produced from locally extracted alkali and pure potassium hydroxide alkali were also determined. From the result, blending palm oil and peanut oil led to a reduction in the quality of the oil for soap production, therefore blending palm oil and peanut oil is not suitable for making soap. It can also be ascertained that alkali extracted from palm bunch ash can be used for making good soap. This shows that the production of soap using locally extracted alkali from palm bunch can create jobs for jobless Nigerians and reduce the cost of soap production in post covid-19 pandemic. The use of locally extracted alkali will also reduce the dependence on synthetic alkali imported overseas. This local alkali will save Nigeria the cost and effects of the palm bunch being a source of environmental pollution if not utilised for making soap.

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