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Preparation of Soap Using Banana Peel and Olive Tree Ashes

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Most infections witnessed today originate from lack of observing cleanliness. However, the high cost of soaps especially in developing countries like Kenya makes cleanliness a luxury to many people. This project explored the possibility of using banana peel and olive tree ashes in making of soaps. These peels become a nuisance in both urban and rural areas. Besides, wood fuel remains a significant source of energy in many parts of the world. The study used ashes as an alternative source of lye required in soap making. The banana peels and olive tree stem were burnt into ashes. The ashes were mixed with distilled water and filtered. The filtrate was mixed with palm kernel oil, until lathering was achieved. Evaluation of the soaps was conducted using 15 students' respondents. Data analysis and presentation was carried out using frequency distribution and percentages. There was a significant difference ($P=0.000001$) in the concentration of potassium hydroxide between lye obtained from banana and olive tree ashes. There was no significant differences ($P=0.45$) in the responses given for soap obtained from banana peels and olive tree ashes. This project established that ashes obtained from banana peelings and tree were good alternative, ingredient for soap making. The use of banana peels and olive tree ashes should be encouraged for soap making as an alternative to the soaps in the market. Jobless youths need to embrace making of soaps using ashes as a way of generating income.

Keywords: Soap; preparation; Banana peels; Olive tree

INTRODUCTION

Homemade soap using local raw materials is an ancient method used in producing soaps for the family use in the olden days. Technically, soap making involves the use of sodium salts (Abulude *et al.*, 2010). Homemade soap is used in the family cleaning chores. The skills for homemade soap are gradually fading away. The younger generation may not be able to enumerate the ingredients used in making of soap (Warra *et al.*, 2009). The making of soap using vegetable matter has been an age old craft. Unfortunately the soaps that were made then, were soft, black, smelly and corrosive to the hands. Soap is one of the cleaning materials needed by every family

(Isah, 2006). Soap is so important that there is hardly any family that does not use it in their daily activities either in the solid bars, liquid and detergent forms (Sani and Hassan, 2007).

Soaps are salts of fatty acids and it may be hard or soft soap depending on the type of ingredients used (Ainie *et al.*, 2013). Soaps are made by the hydrolysis of fats with sodium hydroxide (Akunna *et al.*, 2013). This converts the glycosides of stearic, oleic and palmitic acids into sodium salts and glycerol. Soaps have a cleansing action because they contain negative ions composed of a long hydrocarbon chains attached to a carboxyl group (Mabrouk, 2005).

The hydrocarbon chain has an affinity for

grease and oil and the carboxyl group has an affinity for water (Roila *et al.*, 2001). That is why soaps are mostly used with water for bathing, washing and cleaning. They are also used in textile industries for textile spinning (Ahmed, 2004). Soaps often occur in form of solid bars or liquid form. There are many agricultural waste materials generated in homes and littered all over the environment (Kubmarawa and Atiko, 2000). These materials include palm bunch, coco-pod, plantain peels, banana peels, maize cobs, cassava peels and others (Dalen and Mamza, 2009). Some of these agricultural waste like coco-pod have adverse effects to soil fertility and so constitute environmental nuisance to man.

According to Taiwo and Osinowo (2001), several agricultural wastes of vegetable origin yield a high potash when combusted. These materials include plantain peels, cassava peels, palm bunch and wood (Phanseil *et al.*, 2004). The local production of potash from these agricultural wastes has been observed to be a cheaper alternative source potassium hydroxide which is an alternative to sodium hydroxide (Bhattacharyya and Chatterjee, 2010). Warra *et al.* (2009) observed that alkali content of potash obtained from ashes of plants origin were high and good for soap production.

Fats and oils used in soap making are naturally occurring esters used as energy-storing compounds by plants and animals. They are derived from propane 1, 2, 3-triol, $\text{CH}_2\text{OH}-\text{CHOH}-\text{CH}_2\text{OH}$ (Ogunsuyi and Akannawp, 2012). This molecule has the capacity to combine with one, two or three molecules of carboxylic acid. In practice, most fats are triesters derived from propane 1, 2, 3-triol and a variety of long-chain carboxylic acids, sometimes called fatty acids (Kuntorn *et al.*, 2005).

Banana peelings are obtained from banana fruits. The fruits are obtained banana (*Musa paradisiaca*) plant (Mark-Mensah and Firempong, 2011). Banana is a starchy fruit which is consumed raw when ripe or cooked when raw. The banana plant is fast growing attaining a height of 3-5m (Ikotun *et al.*, 2017). The fruits grow in bunches of up to 200 fingers each. Bananas are widely grown across the worlds mostly in the tropics (Adewuji *et al.*, 2008). It is a major food in developing countries, and are also an important export crop to industrial countries. The fruits are highly nutritious. They have an abundance of carbohydrates, minerals such as phosphorus, calcium, and potassium as well as vitamins A and C (Asiagwu, 2013). They are a

major source of income also for many small-scale farmers. A large proportion of the world's bananas are grown by small scale farmers in subsistence scale. An estimated 20 million people eat plantain as their major source of dietary carbohydrate (Warra *et al.*, 2010). They are particularly important in East Africa, where they constitute the main staple food for about 50% of the population. In Africa, Uganda is the largest producer of plantains and produces about 9 million tons per annum. The fruits can be fried, baked, or roasted, and are also sold in pulp form, as chips, and in confectionery. In some countries, they are used to produce alcohol (Atiku *et al.*, 2014). The fruits can also be used as animal feed. The major pests are the banana weevil and parasitic nematodes (Beetseh and Godwin, 2015).

Sawdust is used in generating ash for making soap. Sawdust is a by-product of cutting, grinding, drilling, sanding and pulverizing wood (Aiwisea and Achebob, 2012). It is composed of fine particles of wood and can present a hazard in manufacturing industries, especially in terms of its flammability (Akpan *et al.*, 2006). The burning of saw dust (dry basis) results into ash which contains 45 percent of calcium carbonate, 10 percent potash, and 1 percent phosphate (Dalen and Mamza, 2009). The ash also contains trace elements of iron, manganese, zinc, copper and some heavy metals. It is an effective liming material and source of soil organic matter, N, P, K, Ca and Mg (Roila *et al.*, 2001). Some metallic oxides such as mercuric oxide dissociate to elemental state and vaporize completely (Onyegbado *et al.*, 2002). Potassium hydroxide can be indirectly made from saw dust ash, this form is known as caustic potash or lye. Because of this property, saw dust ash has also traditionally been used to make saw dust-ash soap, it also acts as a flux, reducing the melting point of the glaze and an effective as an odor control agent, especially in composting operations (Isah, 2006).

The major constituent of ashes is potassium hydroxide (Onyeagbado *et al.*, 2002). Pure potassium hydroxide forms white, deliquescent crystals. Potassium hydroxide is a strong base. It dissolves readily in water, giving off much heat and forming a strongly alkaline caustic solution (Akpan *et al.*, 2006). Potassium hydroxide closely resembles sodium hydroxide in its chemical properties and has similar uses. It is used in making soap, in bleaching, and in manufacturing chemicals. However, its use is limited by its high cost (Asiagwu, 2013).

Currently, the art of homemade soap using caustic soda is gaining acceptance because of emphasizes on entrepreneurship education in our educational system (Adewuji *et al.*, 2008). Production of soap using agricultural wastes is a veritable source of gainful employment for individuals (Wegbue *et al.*, 2011). Soap is one of the most essential needs of man used for several purposes. Therefore, soap made with potash characteristically provide fulfillment to the important need of man for maintaining cleanliness (Sani and Hassan, 2007). However, in spite of the popularity of homemade soaps and the benefits of its production, homemade soap has not been given the adequate attention that it deserves (Warra *et al.*, 2009). Similarly, its potentials as a medium for showcasing creativity is not fully being exploited (Taiwo and Osiwo, 2001). Another concern of this study equally is the fact that the production of homemade soap is a very viable business opportunity for self-employment which has not been fully exploited (Ahmed, 2004).

The recent emphasis on entrepreneurship in our educational institutions makes it imperative that opportunities that can be exploited for self-employment should never be neglected (Warra *et al.*, 2009). In addition, a number of agricultural wastes are littered all over the environment and accumulation of these wastes poses a serious health hazard (Roila *et al.*, 2001). Throwing away some of these agricultural wastes is a waste of resources which are potential source of raw materials needed in soap making (Dalen and Mamza, 2009). Therefore, such agricultural wastes could be converted to potash used for soap making (Asiagwu, 2013). The main purpose of this study was to produce soap using banana peels and olive tree ash as active ingredients.

MATERIALS AND METHODS

Collection of banana peelings and olive tree wood

Banana peelings were collected from garage market in Wanyororo B. The peelings were placed in khaki bags and transported to St. Josephs' school laboratories. The olive tree branches were harvested from tress in the school compound.

Preparation of ash

The banana peels and olive trees branches were dried under room temperature ($19\pm 2^{\circ}\text{C}$) for two weeks. Three kg each of banana peels and olive stem were burnt separately to ashes in a furnace (Thermo scientific thermolyne FB1315M compact benchtop muffle furnace; 76 cu in; 120V)

(Ogunsuyi and Akannawp, 2012). The concentration of KOH and pH was determined (Undiandenye *et al.*, 2015). The ashes were collected in clean stainless steel container and stored at room temperature.

Determination of potassium hydroxide

The potassium hydroxide content of the lye from banana peels and olive tree was quantified using titrimetric method (Akunna *et al.*, 2013).

Determination of pH

The pH of the lye from banana peels and olive tree pH meter (827 pH lab model). One hundred cm^3 of each lye was weighed and placed in a 100 cm^3 volumetric flask. The electrode of the pH meter was inserted into the lye (Ikotun *et al.*, 2017).

Soap preparation

Separately, 2L of water was placed in stainless steel bowls. Two hundred grams each ash was weighed and separately placed into the bowls. Straining of the mixture was carried out using a baft cloth to remove large sediments followed by filtration using cotton wool. The mixture was boiled in separate stainless pots to get concentrated solutions of the potash. Beef fat and plant oil were separately added. While the potash is still on fire beef fat and plant oil were separately added. Stirring was continuously carried out until it was properly saponified (Isah, 2006). The mixture was poured into Petri dishes and left for at least 24 h to mould after addition of colour dyes to some of them. The soaps were separately placed in conical flask, a little water added followed by shaking. The height of the foam was measured in cm.

Test of acceptability of the soaps

Fifteen students from St. Joseph's Kirima School were randomly selected. Three drops of each soap were separately placed on the palm of their hands. They were asked to rub the soaps between their hands and say whether they liked the soap extremely, very much, moderately, slightly, neither liked nor disliked the soaps, disliked moderately, very much or extremely (Akpan *et al.*, 2006).

RESULTS

Yield of potassium hydroxide and pH of the banana peels and olive tree ashes

The concentration of potassium hydroxide (KOH) varied from 14.04 ± 0.2 g/ dm^3 in banana.

Table 1: Concentration of KOH and pH of lye from banana peels and olive tree ashes

Replicate	Banana peels		Olive tree	
	KOH (g/dm ³)	pH	KOH (g/dm ³)	pH
1	13.57±0.2	11.31±0.1	4.82±0.3	9.17±0.2
2	12.69±0.3	10.04±0.2	4.70±0.3	8.79±0.3
3	13.02±0.1	11.13±0.1	4.50±0.2	9.00±0.2
4	14.04±0.2	11.10±0.3	4.80±0.1	9.80±0.3
5	13.78±0.1	11.00±0.1	4.00±0.1	8.50±0.1

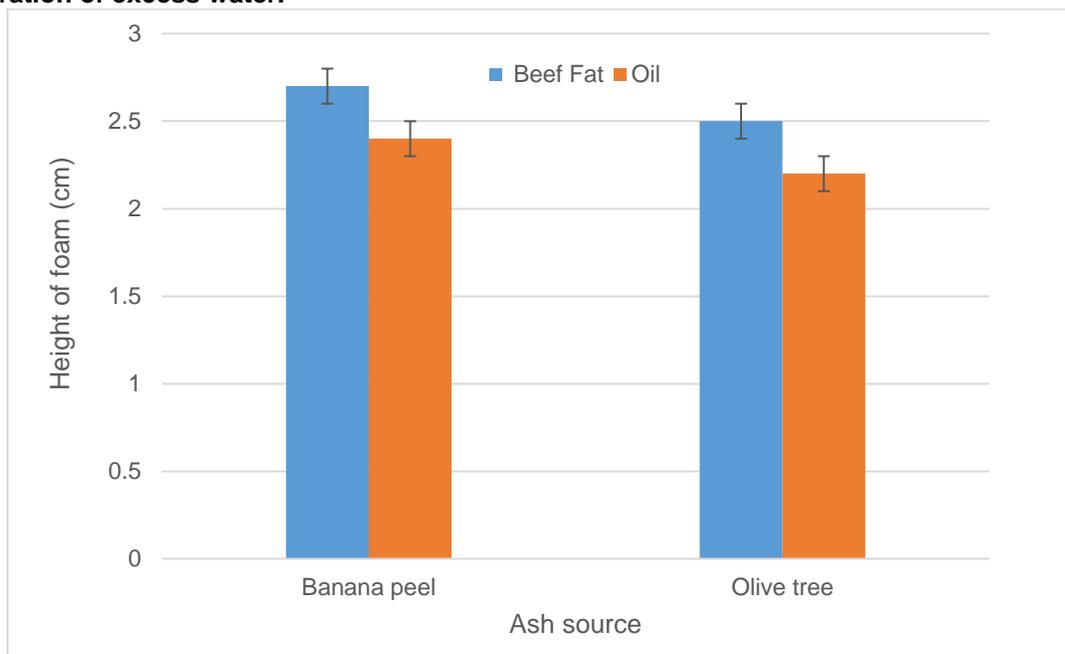
**Figure 1: Colour of lye obtained from olive tree (A) and banana peels (B) after concentration by evaporation of excess water.****Figure 2: Height of foam produced by the soaps**

Table 2: The general acceptability of the soaps by the students.

Rating	Banana peels	%	Olive tree	%
Likes extremely	4.00	26.60	0.00	0.00
Like very much	5.00	33.30	5.00	33.30
Like moderately	4.00	26.70	5.00	33.30
Like slightly	1.00	6.70	0.00	20.00
Neither like nor dislike	1.00	6.70	1.00	6.70
Dislike slightly	0.00	0.00	0.00	0.00
Dislike moderately	0.00	0.00	1.00	6.70
Dislike very much	0.00	0.00	0.00	0.00
Dislike extremely	0.00	0.00	0.00	0.00



Figure 3: Colours of soaps from banana peels (A) and olive tree ashes (B) after addition of colouring dyes

peels to 4.00 ± 0.1 g/dm³ in olive tree ashes (Table 1). However, the pH ranged from 11.31 ± 0.1 in banana peels to 8.79 ± 0.3 in olive tree ashes. There was a significant difference ($P=0.000001$) in the concentration of potassium hydroxide between lye obtained from banana and olive tree ashes. The pH of the lye from banana and olive tree ashes varied significantly ($P=0.001656$). The colour of the lye changed upon concentration by

heating (Figure 1).

Height of foam produced by the soaps

The height of foam produced by soap made banana peel ashes using beef fat was 2.7cm while that from olive tree was 2.5cm (Figure 2). In addition, the height of foam made from banana peel ashes using plant oil was 2.4cm while that from olive tree was 2.2cm.

Acceptability of the soaps made from banana peel and Olive tree ashes

A proportion of 26.6% liked soaps made from banana peels extremely, very much (33.3%), moderately (26.7%), slightly (6.7%), neither like nor dislike (6.7%) (Table 2). On the other hand, none of the students liked soaps from olive tree extremely, very much (33.3%), moderately (33.3%), slightly (20%), neither like nor dislike (6.7), and disliked moderately (6.7%). There was no significant differences ($P=0.45$) in the responses given for soap obtained from banana peels and olive tree ashes. The soaps had different colours after addition of colouring dyes (Figure 3),

DISCUSSION

Waste materials such as ashes from banana peels, cassava peel, palm bunch, coco pods and trees have been shown to yield high percentage of potash which is suitable for soap making (Onyegbado *et al.*, 2002). The materials need to be slowly combusted so as not to adversely affect the concentration of the potash (Isah, 2006). The findings of this study revealed that plantain peels ash has higher concentration of potassium Hydroxide (KOH) than olive tree ash. The result of the current study analysis of ashes from banana peels as an alternative source of caustic soda for soap making concurs with a previous study by Olobanji *et al.* (2012). This may be attributed to similarity in the sauces of the ashes (Akpan *et al.*, 2006).

The results obtained in this project indicated that the height of foam produced by soap made from animal fat was 2.7cm while that from olive tree was 2.5cm. In addition, the height of foam made from plant oil using banana peels was 2.4cm while that from olive tree ash was 2.2cm. This differed with a previous study by Ahmed (2004). Possible reason could be differences in the source of ashes used in the two studies (Warra *et al.*, 2010).

The data obtained indicated that, the student respondents liked the soap samples very much. This could have resulted from improved colour, texture, odour and lathering quality of the soaps made from banana peels and the olive tree ashes (Undiandeye *et al.*, 2015). The soap when made with well filtered ash solutions and the fat and oil has improved colour and increase lathering ability as was observed from the sensory evaluation of the soaps. This is in agreement with the findings of Warra *et al.* (2009). In addition, Mabrouk (2005)

asserted that clearer filtration in the extraction stage to a point of removing all black particles greatly improves the soaps. However, elimination of metallic ions in the ash extract, which could otherwise colour the resulting soap increases the acceptability of the soaps to potential customers (Ainie *et al.*, 2013).

This study revealed that the lathering ability of the soaps were generally liked by the respondents, due to high quantity of alkali which when completely saponified with the oils lathered very well. The finding agreed with Adaku and Melody (2013), who observed that soaps made with alkalis derived from vegetable matter ashes when reacted with oils had good lathering abilities and cleaning properties.

CONCLUSION

Soap was prepared using Banana peels and olive tree ashes. The ashes produced adequate potassium hydroxide that reacted with animal and vegetable oil during the saponification process. The soaps that were formed appealed to the students.

RECOMMENDATIONS

There is need for mass production of soap from banana peels and olive tree ashes. Mass education on use of banana peels and olive tree ashes in production of soap need to be carried out. There is need to create awareness of using plantain peel ash and cassava peel ash solutions as alternative source to caustic soda.

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CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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