Scientific Research and Essay Vol.3 (10), pp. 515-517, October, 2008
Available online at http://www.academicjournals.org/SRE
ISSN 1992-2248 © 2008 Academic Journals

Short Communication

Extraction and potential application of caustic potash from kolanut husk, ugwu pod husk and plantain peels

Taiwo, A. A.[1]*, Oluwadare, I.[1]*, Shobo, A. O.[1]* and Amolegbe, S. A.[2]

[1]Department of Science Laboratory Technology, Moshood Abiola Polytechnic, PMB 2210, Ojere, Abeokuta, Nigeria.
[2]Department of Chemistry, University of Agriculture, PMB 2240, Abeokuta, Nigeria.

Accepted 23 September, 2008

Caustic potash from kola nut pod husk (*Cola nitida),* ugwu pod husk (*Teleferia occidentalis*) and plantain peels (*Musa paradisiaca*) were extracted using combustion and leaching process with distilled water as the solvent. Yield observed at varying temperatures are 31, 23, 35% (at 300, 400, 500°C, respectively). Free caustic alkali contents, free fatty matter and chloride were a bit higher than the value obtained for local black soap (using caustic potash extracted from cocoa pod ash) which served as control (1.00%). It was observed that the samples contained appreciable amount of caustic potash, (kolanut pod husk 24.54 g/100 g, ugwu pod husk 1.60 g/100 g and plantain peel 39.28 g/100 g). This work, thus established the fact that it is possible to convert the erstwhile wasteful caustic potash into a useful raw material.

Key words: Caustic potash, kolanut husk, ugwu pod husk and plantain peels.

INTRODUCTION

Kola tree is a tropical tree which belongs to the family sterihaceace; it is mostly common in the rain forest region of West Africa. This crop is of socio-economic importance. There are over 40 kola species, out of which *Cola nitida* and *Cola acuminata* are of major economic and social importance in Nigeria (Egbe and Oladokun, 1987). They are used industrially for the manufacturing of different types of soft drink flavour (Beatle, 1970); caffeine contained in kola nuts are useful as a fat burner (Blades, 2000).

Kolanut is chewed in Nigeria to reduce hunger and fatigue and to fight intoxication and hangover. It is cultivated mainly in the South Western Nigeria states where large plantation was established. It was observed that kolanut pod husk share several similarities with cocoa pod husk; both have high crude protein and low crude fibre content. Nigeria produces 70% of world kolanut and consequently the bulk of kolanut pod husk is estimated at 210000 tones annually (Oguntuga, 1975).

Plantain peels have long been used locally as a remedy for cough, wounds, inflamed skin or dermatitis, insect bites and strings ecyema and small wound or cuts (Hoffman,1990). Koicher (1983) reported that plantain peels are effective in the treatment of chronic bronchitis, but no work has been published on ugwu pod husk which can also be referred to as vegetable matter.

This study is designed to determine the content of caustic potash in kolanut pod husk, ugwu pod husk and plantain peels and to produce soap from the three caustic potash sources and then compares it with the soap produce from cocoa pod husks.

MATERIALS AND METHODS

The kolanut pod husks, ugwu pod husks and plantain peels used in this work were obtained from a farm in Ojere village in Abeokuta, Ogun State, Nigeria. The seeds and yellow pulps were removed from the kola and ugwu and the plantain peels were washed and sun dried for 16 days. The dried samples were blended to increase the surface area for ashing at 300, 400, 500 and 600°C. The samples ashed at 600°C were used for soap making while samples ashed at 300, 400 and 500°C were used to study the effects of temperature on the extracted caustic potash (KOH).

One litre of distilled water was added to 10 g of ashed samples which were obtained at the three different temperatures of 300, 400 and 500°C. The mixture was boiled for an hour, the resulting solution were filtered and properly labelled, and the process of extraction was repeated on the residue twice. Three filtrates were obtained for each temperature; these were evaporated to dryness to obtain the extract which was weighed when cool. 25 ml of distil-

*Corresponding author. E-mail: ladytaiwo2005@yahoo.com. Tel: 2348030463282.

Table 1. Weight of extract and caustic potash contents of kolanut pod husks, ugwu pod husks and plantain peels ashed at different temperatures.

Temp (°C)	Weight of extract (g)			Caustic potash contents (g)		
	Kola	Ugwu	Plantain	Kola	Ugwu	Plantain
300	9.26	0.38	0.80	0.08	0.07	0.06
400	10.04	0.90	1.66	0.28	0.10	0.14
500	13.40	3.44	4.00	4.97	5.65	5.70

Table 2. Extracted KOH (%) from kolanut pod husks, ugwu pod husks and plantain peels ashed at different temperatures.

Temp (°C)	Kola	Ugwu	Plantain
300	21.38 (9.40)	6.56 (11.30)	5.67 (15.00)
400	35.50 (16.80)	21.33 (18.30)	19.17 (18.00)
500	55.29 (31.11)	63.79 (23.33)	72.54 (35.00)

Values in parenthesis are yield (%).

led water was added to each extract followed by 2 drops of methyl orange indicator. Each of the solutions was titrated against 0.5 M HCl (Onifade, 1994).

The ashed samples at 600°C was used for soap making, 100 g of the ashes were put separately on a piece of white cloth which was tied o a plastic bucket. Water was added, the brown liquid collected was heated for about 21/2 h. The resulting brown liquid is the potash use for saponification process. Crude palm kernel oil was added with continuous stirring for 1 h, more filtrate was added until foaming was at a maximum and mixture dried up gradually. The soap were collected and spread on a flat surface to cool and moulded into balls.

Free caustic alkali was determined by using 2 g of prepared soap weighed in to the conical flask, 15 ml of ethanol (C_2H_5OH) was added followed by the addition of 5 ml of 20% $BaCl_2$. The resulting solution was titrated against 0.5 N H_2SO_4 using phenolphthalein as indicator.

To determine total fatty acid (TFM), 2 g of the prepared soap was heated with 20 ml of Diethyl-ether. 10 ml of 20% H_2SO_4 was added to liberate the oils; methyl orange was used to separate the oils and diethyl-ether layers. Weight of oil was obtained by difference (Onyegbade et.al., 2004).

For chloride content determination, 10 ml of $Ca(NO_3)_2$ solution was added to 2 g of soap. The mixture was cooled and filtered. The filtrate was titrated against 0.1 N $AgNO_3$ using K_2CrO_7 as indicator (Onyegbade et.al., 2004).

Foaming power was measured by dissolving 2 g of the prepared soap and local black soap (control) in 50 ml of boiled distilled water, separately. Four drops of oil was placed in 3 test tubes. 5 ml of distilled water was added to first tube, prepared soap solution to the second tube while the local soap solution was added to the third tube. Each tube was shaken for 1 min, the emulsifying nature and oil mixture was observed.

RESULTS AND DISCUSSION

Caustic potash contents and extracted KOH of kolanut pod husks, ugwu pod husks and plantain peels ashed at different temperatures are shown in Tables 1 and 2. It was observed that the amount of KOH obtained decreased as the extraction proceeds. During the titration, effervescence occurred in the extracts of kola pods husks, as a result of the presence of carbonate compound in the extracts. The amount in the first extract was higher than the second extract while the third extract had the lowest amount. On the other hand the percentage purity is higher in the third extraction and least in the first extraction. This may be as a result of impurities present. The first extract will have higher amount of these impurities which will in subsequent extracts. It was also observed that the purity increases with temperature; this indicates that the components which serve as the impurities were broken down at higher temperature.

The texture of the soap produced from extracted caustic potash was compared with the industrially produced soap (using potassium hydroxide). The difference in texture may be due to the presence of other metallic ions noticeably sodium ions (Onyegbado et al., 2004).

Foaming power was better in soap made from kola pod husk and plantain peel (Table 3). This is because the content of the caustic potash in the filtrate from the ash of kola husk and plantain peel are higher than that of Ugwu pod husk. This is one of the factors responsible for the foaming power; the poor foaming power can also be associated with the total fatty matter which is higher in plantain peel. The good foaming power of the local black soap can also be traced to the natural water used for the extraction of caustic potash. The water used for the extraction of caustic potash from kolanut, ugwu pod husk and plantain peel in this study is chlorinated. This may also be the reason for high content of chloride in the prepared soap, which indicates that the prepared soap contains more acid than local black soap (control).

Conclusion

The result obtained clearly indicates that there is a very

Table 3. Chemical properties of soap prepared from kolanut pod husks, ugwu pod husks and plantain peels ashed at 600°C.

Sample	FCA (%)	TFM (%)	Chloride content	Foaming power
Kola soap	1.24	70	1.60	Fair
Ugwu soap	1.09	75	1.46	Poor
Plantain soap	1.30	85	1.11	Fair
Local black soap (control)	1.40	80	0.90	Good

FCA, Free fatty acid; TFM, total fatty acid.

good probability that caustic potash can be provided from kola, ugwu pod husks and plantain peel. So, there is need to develop a suitable local technology which can be used to extract the caustic potash at the site of production. There is also need to analyse for the impurities and type of carbonate present.

Over 30000 tones pod husks are wasted annually (Edewor, 1984); however the country can get more tones of caustic potash if kola ugwu pod husks and plantain peels which are referred to as agricultural wastes are properly harnessed. There will be drastic reduction in environmental pollution as these materials are likely to have adverse effect on soil fertility.

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