ANALYTICAL STUDY OF LOCAL POTASH AROUNND YOLA METROPOLIS OF ADAMAWA STATE

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ABSTRACT

Potash was separately prepared using Guinea corn husk, Baobab pod, Water hyacinth and Banana husk locally. There chemical compositions were studied. Analysis of calcium and magnesium ion content in the samples was done using atomic absorption spectrophotometer (AAS). Determination of potassium and sodium ions was carried out using flame photometer. Carbonate and hydrogen carbonate ions levels were obtained by back titration. The determination of chloride ion was done by Mohr titration, while hydroxide ion determination was carried out using total alkaline method. Lastly percentage insoluble residue was determined by ashing method. The results generally indicated that local potash prepared from different sources differ in chemical composition.

Key words: Potash, composition, atomic absorption spectrophotometer, magnesium.

INTRODUCTION

The word potash is the trade term commonly applied to crude potassium carbonate obtained by leaching the ashes of burnt plant and animal bones with water and evaporating the resulting solution to dryness. Potash is thought to consist of the following cations ands anions in solution namely: HCO^{-}_{3}, CI^{-}, OH^{-}, CO_3^{2-}, K^{+}, Na^{+}, Ca^{2+} and mg^{2+}. However the concentration of the cations and anions may differ from one source to another. Local potash is a brownish or blackish substance (due to impurities) but when pure, it is white in appearance. Potash has the following physical and chemical properties. Its chemical configuration is K_2CO_3 and molecular weight of 138.7. It is a translucent (granular) or white odourless (powder when purified) deliquescent solid known in the anhydrous and hydrated form. The anhydrous form K_2CO_3 (specific gravity 2.4 and melting point 891^0C) decomposes without boiling. The hydrated form $2k_2CO_33H_20$ (specific gravity 2.04) dehydrate to K_2CO_3. H_20 above 100^0C and to K_2CO_3 above 130^0C. Potash is soluble in water (insoluble in alcohol) with significant hydrolysis to produce basic solutions, which is alkali to litmus paper. Potash is not-combustible. Potash has a solubility of 1g in 1ml of water at 25^0C (Stocchi, 1990; Backet, 1988; Chambers, 1967; Catsbery and Kempen, 1990). Most raw materials for industrial development are derived from natural resources. Salts and potash are natural mineral resource found in natures which are use in different industries. The industrial growth and development of a developing country depend largely on her available raw material resources as well as their exploitation and utilization (Maduka, 2001).

The origin of natural potash deposited by many different theories, most of which agree except for minor details. It is formed as a result of evaporation of water from seas and takes. (Fite, 1961). Potash can also be produced locally apart from the natural occurring deposit on

the earth crust. Local potash can be produced by burning broad left tress and wood in order to obtain ash. The ashes obtained from the burn plant material are dissolves in water on a large pot. The dissolved ashes are leached in a large pots, hence the name "potash". After leaching the solution of the potash then it is boil using local fire wood in order to evaporate the water content. The solution is allowed to cool over night for crystallization to take place from the supersaturated solution of potash. Crystal of potash produced can now be use for local food sweetening given to animal as feed supplement. Potash was one of the most important industrials chemicals in Canada. It was refined from the ashes of broad leaved trees and produced primarily in the forest area of Europe, Russia, and North America. The first U.S. patent was issued in 1790 to Samuel Hopkins for an improvement "in the making pot ash and pearl ash by a new apparatus and process" (Hoffman, 1988).

Potash production provided late 18 and early 19 century settlers in North America a way to obtain badly needed cash and credit as they cleared their wooded land for crops. Ashes from hard wood trees could be used to make lye (KOH), which could either be used to make soap or boiled, down to produce valuable potash (Hoffman, 1988). Potash has been used since antiquity in the manufacture of glass, soap and soil fertilizer (Godfrey and Eleanor, 1975). Potash is the common name given to potassium carbonate and various mined and manufactured salts that contain the element potassium in water soluble form. Potash has been an important item of commerce for centuries. Until recently, its use was restricted to the manufacture of soap, glass, and black gun powder (Hallbart, 1997). It became the principal product of the chemical industries in America before 1850 as a bye product of clearing the virgin forest land for agriculture. The total annual supply for these chemical uses, however never amounted to more than a few thousand tons for the entire world (Mcuster et al., 1985). After the discovery of subterranean potash salt at stassfurt, Germany, in 1851, supply became available for other uses. German scientist soon proved it to be valuable as a fertilizer on the agricultural lands of Germany (Fite, 1961). The first experimental use of potash as a fertilizer in America occurred in 1873. This was followed by increase and more wide spread consumption with each passing decade. Extensive potash deposits are not wide spread, but rather, restricted to only a few countries of the world. (Mcluster and Russell , 1985). Potash is generally use for food sweetening in local soup and it is also use as mineral supplement in animal feed. Potash is use to make special type of glass, potassium silicate is use as a dehydrating agent, it is also use to produce pigment, printing ink and soft soap, for washing raw wool, and as laboratory reagent and general - purpose food additive (Cameron, 2008). The aim of this study was to prepare local potash from some plant materials locally and to determine the composition. This study would reveal the actual concentration of major elements. The result will be use as a guide to know the quality of potash.

SAMPLING AND PREPARATION OF LOCAL POTASH

Sampling of local potash

The samples for the analysis were sampled from different locations in Yola metropolis of Adamawa State. Table 1: shows the sample code, sample material sources and area of sampling.

Table 1: Sample code, sample material and area of sampling

Sample code	Sample material	Sampling area
Pa	Guinea corn	Viniklang
Pb	Baobab pod	Wuro Hausa
Pc	Water hyacinth	Geriyo
Pd	Banana husk	Doubeli

Four samples, one each from Guinea corn husk, Baobab pod, Water hyacinth and Banana husk local potash were used as the gross sample.

Sample preparation for analysis

The sample materials were separately burnt into ashes. And the ashes were washed (leached) with distilled water. The filtrate collected was then boiled to evaporate the water until a molten substance is left. The molten substance was then poured into different containers which are then allowed to cool down and crystals formed. The prepared samples were then dried in an oven in order to achieve a uniform and reproducible composition. Generally a temperature of 130^0 C for 1 to 2 hour is needed to dry the samples in an oven; which is then kept in desiccators. 4g of each of the four samples were measured and dissolved in distilled water, warmed and filtered off. The solution obtained were made up to1 litre with the distilled water, 10ml was pipette in a 100 ml flask for each of the four sample and the volume as made up to mark The samples were then stored in bottles and ready for analysis.

DETERMINATION OF THE COMPOSITION OF LOCAL POTASH

Determination of magnesium and calcium: The determination of magnesium and calcium was done using atomic absorption spectrophotometer model pye unicam SP 9.

Determination of potassium and sodium: The determination of potassium and sodium was done using flame photometer model corning 410.

Determination of carbonate and hydrogen carbonate: Carbonate and hydrogen carbonate was determined by back titration.

Determination of Chloride: Chlorine was determined using Mohr's methods.

Determination of Hydroxide: The hydroxide was determined by total alkali titration.

Determination of insoluble residue: The determination of insoluble residue was determined by ashing and weighing the ashed residue.

RESULTS AND DISCUSSION

From the result generally, it shows that local potash prepared from different source contain varying level of chemical composition. The level of the concentration in part per million (ppm) or milligram per litre (mg/1) in the potash sample obtained locally from four sources viz: Banana husk, Guinea corn husk, Baobab pod, and water hyacinth in Yola metropolis differs. Table 2 showed the result of the composition of local potash. Out of the samples analyzed, water hyacinth shows the highest concentration of magnesium (3.40 ppm), followed by Guinea corn husk (3.0 ppm), Baobab pod (2.73 ppm) and Banana husk (2.68 ppm). The analysis of the samples for calcium revealed the following: Boabab pod (2.0 ppm) has the highest calcium content, followed by Banana husk (1.80 ppm) then Guinea corn husk (1. 77ppm) and water hyacinth (1. 64 ppm). Potassium was found to be high in water hyacinth (3.0 ppm) compared to Banana husk (2.79 ppm), Baobab pod (2.67 ppm) and Guinea corn husk (2.49 ppm). Other result shows that Banana husk has the highest sodium content (2.78 ppm) followed by Baobab pod (2.33 ppm) and then Guinea corn husk (2.0 ppm.) and water hyacinth (1.47 ppm).

The analysis of some of the potash composition includes carbonate, hydrogen carbonate, chloride, hydroxide and percentage insoluble residue (I.R). Analysis of the sample for carbonate content showed that water hyacinth being the highest with the concentration of (2.3 ppm) followed by Baobab pod (2.25 ppm). Banana husk (2.0ppm) and Guinea corn husk (1.8ppm). Hydrogen carbonate revealed the following result, (4.1 ppm) for Banana husk which is the highest, then followed by Guinea corn husk, water hyacinth and Baobab pod having the values of (3.60 ppm), (2.67 ppm) and (2.5 ppm) respectively. For chloride content, Banana husk has the highest(3.80 ppm) and Guinea husk has the lowest(1.87 ppm). Banana husk has the highest hydroxide content (4.12 ppm) and Baobab pod with (2.9 ppm) the lowest. The highest percentage insoluble residue goes to Baobab pod (2.71 ppm) while water hyacinth carries the lowest (1.86 ppm). It can then be concluded that the local potash obtained from different materials contains different composition. There are some plants parts that need to be analyzed. For example the stalk of guinea corn instead of the husk. Also the study should be extended to determine the other possible component.

Sample code	Sample material	Composition (ppm)								
		Mg^{2+}	Ca^{2+}	K^{+}	Na^{+}	CO_3^{2-}	HCO_3^{-}	I^{-}	OH^{-}	% I.R
Pa	Guinea corn	3.00	1.77	2.49	2.00	1.80	3.60	1.87	3.77	2.65
Pb	Baobab pod	2.73	2.00	2.67	2.33	2.25	2.50	2.92	2.90	2.71
Pc	Water hyacinth	3.40	1.64	3.00	1.47	2.30	2.67	2.41	3.10	1.86
Pd	Banana husk	2.68	1.80	2.79	2.78	2.00	4.10	3.80	4.12	1.95

Table 2 Result of the analysis of local potash

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