LOW POTASSIUM PALM BUNCH ASH (LPPBA) AS POSSIBLE SOURCE OF ORGANIC MINERALS FOR POULTRY PRODUCTION.

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ABSTRACT
This study was to produce and further improve the value and utilization of palm bunch which is a readily available agricultural product regarded as waste. Palm bunches whose fruit had already been harvested were collected from an oil mill, washed, sundried and burnt to produce ash. Potassium was reported to be very high in most plant ashes, and high potassium concentration contributes to high dietary electrolyte balance (dEB) values of plant ash supplemented diets. Palm bunch ash produced therefore was sieved and mixed liberally with water and poured in a woven sack and liquid was allowed to drain out and the solid undissolved ash was sundried. It was assumed that since potassium is the major soluble mineral in the ash, a reasonable percentage was dissolved in the discarded solution. Samples of the ashes were analyzed for mineral concentrations using the atomic absorption spectrophotometer. Results showed a significant ($P< 0.05$) reduction of potassium in the sieved, pressed in bag and sundried ash. There was also a corresponding reduction of Na. This result showed that the quantity of potassium in the palm bunch ash has been reduced to low potassium palm bunch ash.
Keywords: Palm bunch waste, ash, minerals, poultry production

Introduction
Trace minerals have been used as inorganic forms such as oxides and sulphate salts since long time in poultry diets. However, these inorganic minerals suffer a huge loss during their passage through GIT due to interfering substances present in the poultry diet. Inorganic forms are usually supplemented from two to almost ten times of the National Research Council (NRC) standards (NRC, 1994) for poultry birds (Inal *et al*., 2001).
A number of studies have been carried out on the utilization of plant ashes which include enhancement of certain mineral element absorption from diets fed to broilers, pullets and rabbits (Iwu *et al*., 2013; Nwogu, 2013; Ohanaka, 2016); Mild agonist effect of dietary coconut shell ash supplementation on reproductive organ development and sex hormone release in both male and female rabbits (Iwu *et al*., 2013).
However, previous studies on ash supplementation have shown that as inclusion levels increased in such diets, feed intake reduced and resulted in poorer egg production and growth performance of broiler chicken (Ohanaka, 2016). These earlier results from our station that showed reduction in feed intake due to increasing inclusion levels of plant ash were initially attributed to the high alkalinity of the plant ashes used in these studies (Ebere, 2013; Iwu, 2013; Nwogu, 2013; Ohanaka, 2016). Borges (2003) reported that dietary electrolyte balance (dEB) specifically influences the palatability of feed and as such could affect feed intake. Thus, an imbalance in dietary minerals consequently affects production and performance parameters leading to failure to meet production targets and possibly reductions in profit margins and economic losses, where the imbalance is wide (Unamba-Opara *et al*., 2017). Studies by Okonkwo *et al*. (2018 a & b) and Duruanyim (2017) reported very high potassium content of most plant ashes. It is therefore suspected that this high potassium concentration may contribute to high dEB values of plant ash supplemented diets.
The objective of this study therefore was to produce a lower potassium palm bunch ash (LPPBA) from palm bunch ash (PBA) and determine the mineral contents of these ashes.

MATERIALS AND METHODS

Collection and preparation of palm bunch ash (PBA): Palm bunches whose fruits had already been harvested were collected from a palm oil mill located at Umuagwo in Ohaji Egbema local government area, Imo state. The empty palm bunch was gathered, washed with clean water to remove sand and other particles and sundried for seven to fifteen days. The sundried palm bunch was weighed on a platform scale (Binatone SF- 400) to determine its weight in kilograms. Thereafter, the palm bunch was burnt to produce the ash. The ash was allowed to cool for a day and weighed again. The palm bunch ash (PBA) so produced was gathered into a polythene sac and sealed to prevent moisture absorption (Nwogu *et al*., 2013).

Production of low potassium palm bunch ash (LPPBA): Two methods were adopted. In the first method, the ash was sieved to remove unburnt parts and charcoal and therefore mixed liberally with water in a plastic bowl to dissolve it. The mixture was allowed to settle for about two days. Thereafter, the product was sieved through a cloth or polythene woven sack and the liquid allowed to drain out. It is assumed that since potassium is the major soluble mineral in the ash (Duruanyim, 2017; Okonkwo et al., 2018a), a reasonable percentage was dissolved in the discarded solution. The undissolved solid product was sundried for 6 days and stored in a poly ethylene sac until needed for analysis.

In the second method, the sieved PBA was dissolved in liberal amount of water to form a paste. The ash paste was spread on polythene sheet and allowed to dry for six days. Sample was taken for analysis.

Analyses for Mineral content of the ashes: **:** A measured quantity (2g) of the PBA will be put into a Kjeldahl flask and 20 ml of concentrated nitric acid (HNO_3) was added and the sample pre – digested by heating gently for 20 minutes. More acid will be added later and heating continued for about 30 – 40 minutes. Digestion was stopped when a clear digest was obtained. The flask was cooled and the contents filtered into a 50 ml volumetric flask through a Whatman (No. 42), 150 mm diameter filter paper and was made up to mark with distilled water. The resultant solution was analysed for mineral elements. The mineral concentrations of the ash materials were determined using the Atomic Absorption Spectrophotometer (Spectrum Lab Model 23_A) as described by (AOAC, 2003). Concentrations of metals such as Calcium (Ca), Magnesium (Mg), Potassium (K), Phosphorus (P), sodium (Na), Manganese (Mn), Zinc (Zn), Copper (Cu), Iron (Fe), Cobalt (Co), Cadmium (Cd) Chromium (Cr) and lead were determined.

Statistical analysis: All parameter measurements were analyzed in triplicates and data generated were subjected to analysis of variance (ANOVA) and means separated using the Least significant difference (LSD) method (SPSS, 2012).

RESULTS AND DISCUSSION

Mineral characteristics of PBA

The mineral compositions of three samples of PBA were summarized in table 1. These results show that the raw ash is a natural accumulator of high levels of potassium. However, sieving and sun drying reduced the value of K in the two other samples. Sieved ash recorded higher phosphorus, Sample C which the ash was sieved, and the fluid evaporated recorded higher phosphorus, calcium and magnesium. Though it recorded lower K value, It recorded a very high Na value, hence the choice of sample B (sieved, pressed in bag and sundried). These results are in agreement with the reports of Ochetim (1998), Iwu (2013), Nwogu (2013), Ohanaka (2016), Duruanyim (2017), Okonkwo (2018) that plant ash is an excellent source of minerals. The results show that sample B and sample C ashes recorded higher values of P, Ca and Mg but lower K. However, sample C recorded a very high value of Na. The order of mineral elements in PBA is K> Ca > P >Mg > Na > Mn > Fe > Zn > Cu. These results are in agreement with the reports of Ochetim (1998), Iwu (2013), Nwogu (2013), Ohanaka, 2016, Duruanyim, 2017 that wood ash is an excellent source of minerals. The order of mineral concentration in the ash samples is however not in agreement with reports of Nolte *et al.,* (1987) that wood ash may have lower values of K, Na and Mg and greater values of Ca and P. In animal feed, wood ash improves digestibility of straws and its mineral content which could improve goat and sheep production (Nolte *et al*., 1987; Ramirez *et al*., 1990). Reports of Nwogu, 2013 showed that ash supplementation also influenced higher mineral uptake from the intestines of birds.

The zinc, copper and manganese recorded in the present study were far higher than those reported by Akpakpan *et al*. (2012) and Ohanaka, 2016 for palm kernel shell. However, PBA recorded no value for cobalt in this present study.

CONCLUSION

The result of this study showed that the quantity of potassium in the palm bunch ash can be reduced to Low potassium palm bunch ash thereby further improve the value and utilization of this readily available product regarded as waste.

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Table 1: Mineral composition of the ashes

Parameters	Ash A	Ash B	Ash C	SEM
P (mg/kg)	30,200^c	37,800^b	46,300^a	2332.73
Ca (mg/kg)	55,500^c	74,700^b	77,300^a	3436.90
Mg (mg/Kg)	26,900^c	41,800^b	48,500^a	3204.60
K (mg/kg)	209,700^a	164,300^b	119,900^c	12664.31
Na (mg/kg)	15,800^b	11,800^c	87,000^a	12221.47
Mn (Mg/kg)	1283.01^c	1817.54^b	2136.44^a	124.65
Fe (Mg/Kg)	1038.92^b	1448.22^a	1474.15^a	70.66
Cu (Mg/Kg)	204.02^c	303.17^b	374.35^a	24.76
Zn (Mg/Kg)	375.25^c	507.92^b	586.29^a	30.87
Co (Mg/Kg)	0.00	0.00	0.00	0.00
Cr (Mg/Kg)	2.32^b	108.98^a	0.00^c	17.97
Cd (Mg/Kg)	4.57^a	3.51^b	2.67^c	0.38
Lead	39.83^a	0.00	0.00	6.64

^{abc} Means within rows having different superscript are significantly different (p< 0.05

Ash A: Raw palm bunch ash

Ash B: sieved, pressed in bag and sundried

Ash C: Sieved, allowed to evaporate and sundried