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Minerals and Phytochemical Compositions of *Xanthosoma Mafafa* Leaf Meal Treated With Varying Levels of Palm Bunch Ash Solution

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Abstract
Varying concentrations of palm bunch ash solutions (0.00, 0.25, 0.50, 0.75 and 1.00 g/100ml water) were used to blanchcocoyam (*Xanthosoma mafafa*) leaf meal (XMLM) at 100°C for three minutes and its minerals and phytochemical compositions were determined. The mineral concentrations of XMLM generally increased due to palm bunch ash solution treatment, with values increasing continuously as the electrolyte concentration increases.Calcium and potassium composition recorded high concentration levels which indicate ahigh amount of both minerals in the leaf meal. The phytochemical composition values were reduced by the ash solution treatment ($p<0.05$) except for TF and phytate which gave a higher value than the control across the treatments. It was concluded that blanching with palm fruit bunch mineral electrolyte has a significant effect in the treatment of *Xanthosoma mafafa* leaf meal which was positive especially at 0.75% concentration of the mineral electrolyte that showed a promising outcome.Based on the result it was recommended that farmers should adopt the use of *Xanthosoma mafafa* leaf meal treated with 0.75% palm fruit bunch derived mineral electrolyte as a feedstuff in formulating adiet for their livestock as this will reduce the cost of feed.

Keywords: Cocoyam, *Xanthosoma mafafa* leaf meal, palm bunch, ash solution, minerals, phytochemical

Introduction

Green leafy vegetables are important items of diet for both man and animals as they are excellent sources of nutrient which may be inadequate in the diet (Uwegbute, 1989). For example, leaf meals of many plants have been shown to be very high in their crude protein and other nutrients.Several studies have also highlighted the value of leaf meal from local plants in the teaching of livestock production practices (Ukorebi *et al*., 2012). However, considering the diversity of browse and edible plant documented in the rainforest zone in Nigeria, much work still needs to be done in this area.

Xanthosoma mafafa also called "edeoku" in Igbo land is a cocoyam species currently classified as an abandoned plant food in southern Nigeria (Okoli, 2014). The leaf of *Xanthosoma mafafa* has been reported to be rich in protein, carbohydrate, vitamin A,and K as well as other nutrients found at various percentages in it (Fasuyi, 2006). Cocoyam leaf meals have however been shown to contain anti-nutritional factors such as oxalate which gives it a serious itching characteristics. Lewu *et al.* (2009) however showed that boiling improves the nutrient value of cocoyam leave by reducing the concentration of tannin and other ANF. Ani *et al*. (2015) also showed that plant ash derived from plantain peels could serve as a DE bittering agent and also influence other phytochemical content of leafy vegetables. Since the palm bunch ash is an organic food tenderizer (Narisu *et al*., 2011), there is the possibility that it may confer a positive value to Xanthosoma leaf meal when used as a blanching agent on it.

Therefore this study determined the minerals and phytochemical composition of *Xanthosoma mafafa* leaf meal treated with varying levels of palm bunch ash solution**.**

Materials and Methods

The leaves of *X. mafafa* were gathered from the wild within Imo state, after identification at the Department of Crop Science Technology, Federal University of Technology Owerri. Ash derived from palm fruit bunch was used to prepare five ash solutions by mixing 0.00, 0.25, 0.50, 0.75 and 1.00 g ash to 100 ml of clean water and represented as samples A, B, C, D, and E respectively. 13.33 g of chopped *X. mafafa* leaves were blanched by boiling them at 100°C for three minutes in 100ml of the ash solutions and thereafter allowing them to cool before being removed and air dried to crispy, milled and were analyzed in the laboratory for their minerals compositions with an atomic absorption spectrophotometer (AAS) bulk scientific model 210 VGB, to determine the following minerals: calcium (Ca), phosphorus (P), sodium (Na), potassium (K) and magnesium (Mg) and for their phytochemical compositions according to the methods described by Sofowora (1980).

Data obtained from the study were subjected to analysis of variance (ANOVA) procedure (Steel and Torrie, 1980). Treatment means were separated using Duncan Multiple Range Test (Duncan, 1955).

Result and Discussion

The mineral composition results (Table 1) showed that Ca, Mg, K, P and Na concentrations of XMLM generally increased due to palm bunch ash solution treatment, with values increasing continuously as the electrolyte concentration increases as well. Calcium and potassium composition recorded high concentration levels which indicate ahigh amount of both minerals in the leaf meal and can also be attributed to the present of Potassium carbonate (K_2CO_3) in the palm fruit bunch (Taiwo and Osinowo, 2001).

Table 1: Minerals composition of *Xanthosoma mafafa* leaf meal

Parameter (mg/kg)	A	B	C	D	E	SEM
Calcium	17255.00	17735.00	17850.00	17950.00	18772.50	131.52
Magnesium	2263.00	1975.50	2268.50	2491.50	2750.00	68.90
Potassium	13090.00	13002.00	16499.50	18765.00	22005.00	919.27
Phosphorous	2460.00	560.50	868.00	1058.00	1425.00	175.26
Sodium	1252.50	1382.00	1507.50	1599.00	1799.00	49.89

A= 0.0% palm bunch ash solution; B= 0.25% palm bunch ash solution; C= 0.50% palm bunch ash solution; D= 0.75% palm bunch ash solution; E= 1.00 palm bunch ash solution

Table 2 shows that the phytochemical composition values were reduced by the ash solution treatment ($p<0.05$) except for TF and phytate which gave a higher value than the control across the treatments. Odedeji *et al*. (2014) reported that blanching had a significant reducing effect on the tannin content of feed materials. Phytochemical concentrations dropped as electrolyte concentrations increases but there was a sharp increase in sample E, as the best result was obtained in sample D at 0.75 concentrations. Alkaloid concentration increases with increase in electrolyte concentrations.

Table 2:The phytochemical compositionof*Xanthosomamafafa*leaf meal

Parameters	A	B	C	D	E	Mean	SEM
Tannin	1610.2^{A}	1486.7^{B}	1335.7^{C}	1272.2^{C}	1340.77^{C}	1409.12	32.91
Phenol	860.56^{A}	708.90^{C}	604.54^{D}	589.94^{E}	842.34^{B}	721.25	30.51
Cyanide	6.3567^{A}	3.2367^{E}	3.5400^{D}	4.1667^{C}	4.4267^{B}	4.3453	.29209
TI	1109.02^{B}	1013.55^{C}	1001.47^{D}	979.920^{E}	1243.21^{A}	1069.43	26.0744
Alkaloids	2.61^{B}	1.63^{E}	2.02^{D}	2.36^{C}	3.40^{A}	2.40	.15975
TC	17.560^{E}	32.4200^{D}	35.8100^{C}	52.3467^{A}	43.8300^{B}	36.3933	3.12350
TF	5283.15^{E}	5393.09^{D}	6006.76^{B}	7095.90^{A}	5674.19^{C}	5890.619	174.424
Phytate	91.917^{E}	99.1267^{D}	101.260^{C}	107.630^{B}	111.257^{A}	102.2380	1.80747

A= 0.0% palm bunch ash solution; B= 0.25% palm bunch ash solution; C= 0.50% palm bunch ash solution; D= 0.75% palm bunch ash solution; E= 1.00 palm bunch ash solution, TI = Trypsin inhibitor, TC= Total carotenoids, TF= Total flavonoid

Conclusion and Recommendation

From the study, it was concluded that blanching with palm fruit bunch mineral electrolyte has a significant effect in the treatment of *Xanthosoma mafafa* leaf meal which was positive especially at 0.75% concentration of the mineral electrolyte that showed a promising outcome. Based on the result it was recommended that farmers should adopt the use of *Xanthosoma mafafa* leaf meal treated with 0.75% palm fruit bunch derived mineral electrolyte as a feedstuff in formulating adiet for their livestock as this will reduce the cost of feed.

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